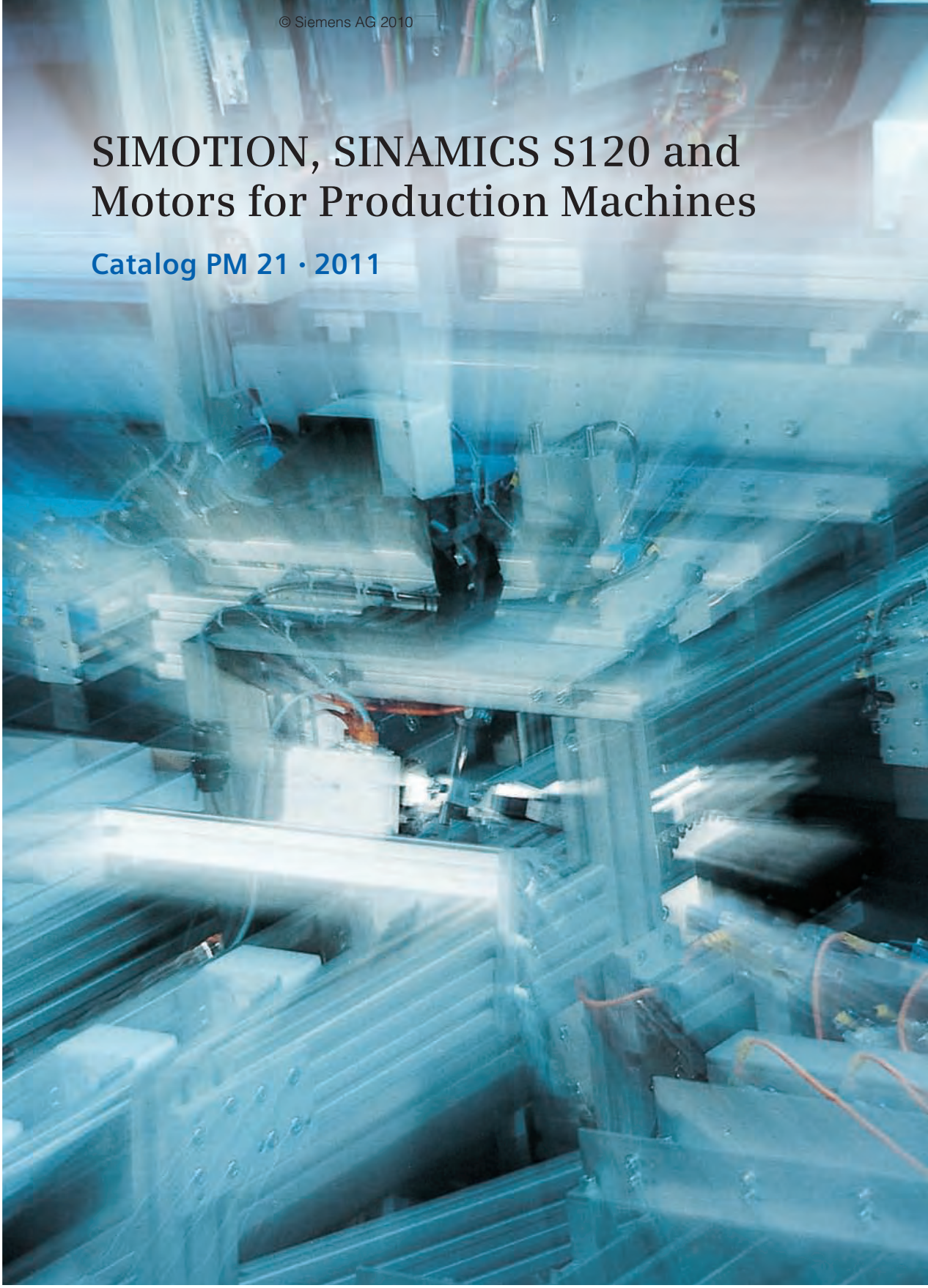
SIMOTION, SINAMICS S120 and Motors for Production Machines

Catalog PM 21 · 2011



Motion Control

Answers for industry.

SIEMENS

Related catalogs

SINAMICS S110 PM 22
The Basic Positioning Drive

E86060-K4922-A101-A1-7600

SINAMICS G110, SINAMICS G120
Standard Inverters
SINAMICS G110D, SINAMICS G120D
Distributed Inverters
E86060-K5511-A111-A6-7600 D 11.1
E86060-E5511-A111-A1-7600 (News) D 11.1 N

SINAMICS G130 D 11
Drive Converter Chassis Units
SINAMICS G150
Drive Converter Cabinet Units

E86060-K5511-A101-A4-7600

SINAMICS S120 D 21.3
Chassis Format Units
and Cabinet Modules
SINAMICS S150
Converter Cabinet Units
E86060-K5521-A131-A2-7600

SINUMERIK & SINAMICS NC 61
Equipment for
Machine Tools

E86060-K4461-A101-A3-7600

SIMATIC
Products for Totally Integrated Automation
and Micro Automation

E86060-K4670-A101-B2-7600 ST 70
E86060-K4670-A151-A5-7600 (News) ST 70 N

SIMATIC HMI / ST 80 / ST PC
PC-based Automation
Human Machine Interface Systems/
PC-based Automation

E86060-K4680-A101-B7-7600

SIMATIC NET
Industrial Communication

E86060-K6710-A101-B6-7600 IK PI
E86060-K6710-A121-A3-7600 (News) IK PI N

[1] Language: German.

SITRAIN ITC
Training for Automation and
Industrial Solutions[1]

E86060-K6850-A101-C1

Interactive Catalog CA 01
Products for Automation and Drives

E86060-D4001-A510-C9-7600

Industry Mall
Information and ordering platform in the
Internet:
www.siemens.com/industrymall

CD-ROM for Catalog PM 21 · 2011

In the CD-ROM that accompanies Catalog PM 21 · 2011, you will find:

- Information about planning/configuring based on the technical documentation; additional technical documentation can be found under:
  www.siemens.com/automation/doconweb
- Dimensional drawings of our motors in PDF/DXF format or via CAD CREATOR
  www.siemens.com/cadcreator
- Glossary for the explanation of terms and functions
- Catalog PM 21 · 2011 in electronic form (PDF format)

Hardware and software requirements:

- Intel Pentium 1 GHz or higher
- Minimum 512 MB of RAM
- Screen resolution 1024 x 768 pixels
- CD-ROM drive, at least 16 x
- Windows XP/Vista
- Acrobat Reader 7.0 or higher
- MS Internet Explorer V6.0 (SP2) or higher

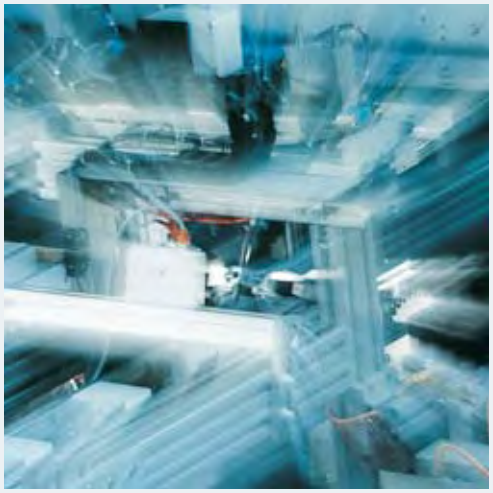
Start
Insert the CD-ROM into the CD-ROM drive.
The program starts automatically.
If the AutoRun function is not activated in your system, start file start.hta from the CD-ROM using the Windows Explorer.

Note
Installation is not necessary to view the information on this CD-ROM. This does not apply, however, when using dimensional drawings in DXF format.

Hotline
Please send any questions or suggestions to:
docu.motioncontrol@siemens.com

Motion Control
SIMOTION, SINAMICS S120 and Motors for Production Machines

Catalog PM 21 · 2011



The products and systems described in this catalog are distributed under application of a certified quality and environmental management system in accordance with DIN EN ISO 9001 (Certified Registration No. 001258 QM) and DIN EN ISO 14001 (Certified Registration No. 081342 UM). The certificate is recognized by all IQNet countries.

Supersedes:
Catalog PM 21 · 2008
Catalog News PM 21 N · November 2009

Refer to the Industry Mall for current updates of this catalog:
www.siemens.com/industrymall

The products contained in this catalog can also be found in the Interactive Catalog CA 01.
Order No.:
E86060-D4001-A510-C9-7600

Please contact your local Siemens branch

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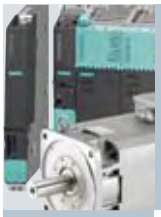
Overview



System overview

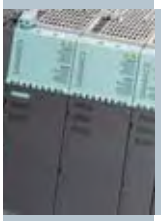
Excellence in Motion Control
Energy efficiency due to targeted energy management
The SINAMICS drive family
SINAMICS S120 built-in devices
Motors
Connection system MOTION-CONNECT
The SIMOTION system

1

Communication

PROFIBUS
Industrial Ethernet
PROFINET
PROFINET for SIMOTION and SINAMICS
PROFIdrive

2



SINAMICS S120 drive system

Control Units
Engineering software
Power Modules
Line Modules
Motor Modules
Line-side/DC link/load-side components
Supplementary system components
Encoder system connection

3

Servomotors

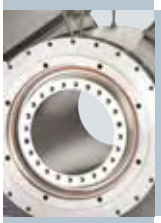
1FT7 Compact servomotors
1FT7 High Dynamic servomotors
1FK7 Compact servomotors
1FK7 High Dynamic servomotors
1FK7 High Inertia servomotors
1FK7 geared servomotors

4

Main motors

1PH8 asynchronous motors
1PH8 synchronous motors
1PH7 asynchronous motors
1PL6 asynchronous motors

5



Direct drives

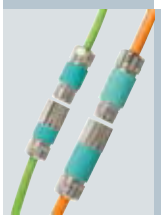
1FN3 linear motors
1FN6 linear motors
1FW6 built-in torque motors
1FW3 complete torque motors

6

Measuring systems

Built-on optoelectronic rotary encoders
Incremental encoders
Absolute encoders
Accessories

7



Connection system MOTION-CONNECT

Power cables for SINAMICS S120
Signal cables for SINAMICS S120/SIMOTION D
Accessories
Length code

8

SIMOTION Motion Control System

SIMOTION C – Controller-based
SIMOTION P – PC-based
SIMOTION D – Drive-based
SIMOTION software
SIMOTION runtime software
SIMOTION engineering software
Overview of SIMOTION functions

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SIMOTION I/O components

Power supplies
SIMATIC S7-300 I/O
Distributed I/O
SINAMICS drive I/O
Other I/O modules

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SIMOTION HMI devices

Mobile Panels
Touch Panels/Operator Panels
Multi Panels
Panel PCs
Engineering software
Visualization software

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Safety Integrated

Overview, Functions
Safe Torque Off (STO)
Safe Brake Control (SBC)
Safe Stop 1 (SS1)
Safe Stop 2 (SS2)
Safe Operating Stop (SOS)
Safely Limited Speed (SLS)
Safe Speed Monitor (SSM)

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System description – Dimensioning

SIZER configuration tool
Planning
SINAMICS S120 Control Units
Motors
Power units
System components
Mechanical configuration of the drive system
Heat dissipation

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Services and documentation

Applications
Training
Mechatronic Support
Control cabinets
Repair service contract RSC
Service & Support, SPARESonWeb
My Documentation Manager, Documentation
CAD CREATOR

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Sector-specific solutions

Packaging solutions
Printing presses, Textile machines
Converting
Plastics
Metal forming technology
Handling
Customer applications
Renewable energy

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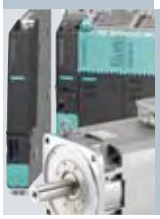

Appendix

Glossary
Approvals
Software licenses
Partners at Industry Automation and Drive Technologies
Information and ordering in the Internet and on DVD
Subject index, Order number index
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Conditions of sale and delivery, Export regulations

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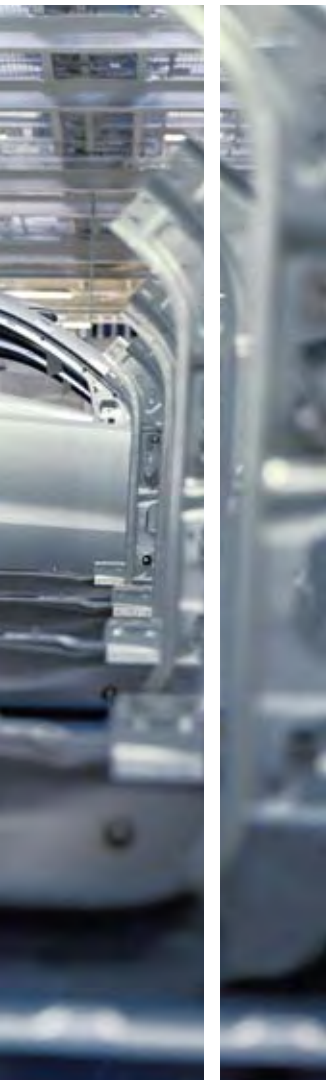


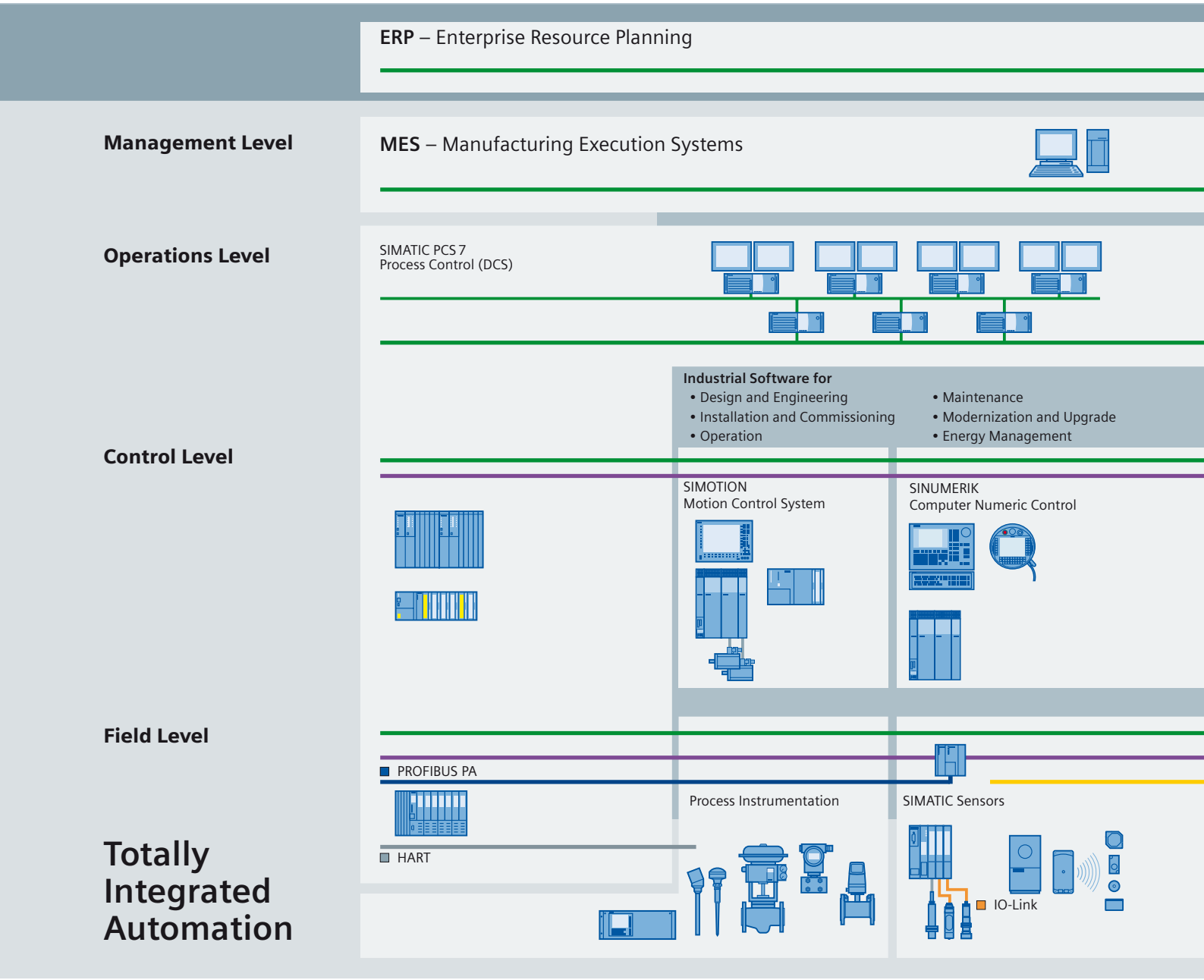
Answers for industry.

Siemens Industry answers the challenges in the manufacturing and the process industry as well as in the building automation business. Our drive and automation solutions based on Totally Integrated Automation (TIA) and Totally Integrated Power (TIP) are employed in all kinds of industry. In the manufacturing and the process industry. In industrial as well as in functional buildings.

Siemens offers automation, drive, and low-voltage switching technology as well as industrial software from standard products up to entire industry solutions. The industry software enables our industry customers to optimize the entire value chain – from product design and development through manufacture and sales up to after-sales service. Our electrical and mechanical components offer integrated technologies for the entire drive train – from couplings to gear units, from motors to control and drive solutions for all engineering industries. Our technology platform TIP offers robust solutions for power distribution.

The high quality of our products sets industry-wide benchmarks. High environmental aims are part of our eco-management, and we implement these aims consistently. Right from product design, possible effects on the environment are examined. Hence many of our products and systems are RoHS compliant (Restriction of Hazardous Substances). As a matter of course, our production sites are certified according to DIN EN ISO 14001, but to us, environmental protection also means most efficient utilization of valuable resources. The best example are our energy-efficient drives with energy savings up to 60 %.

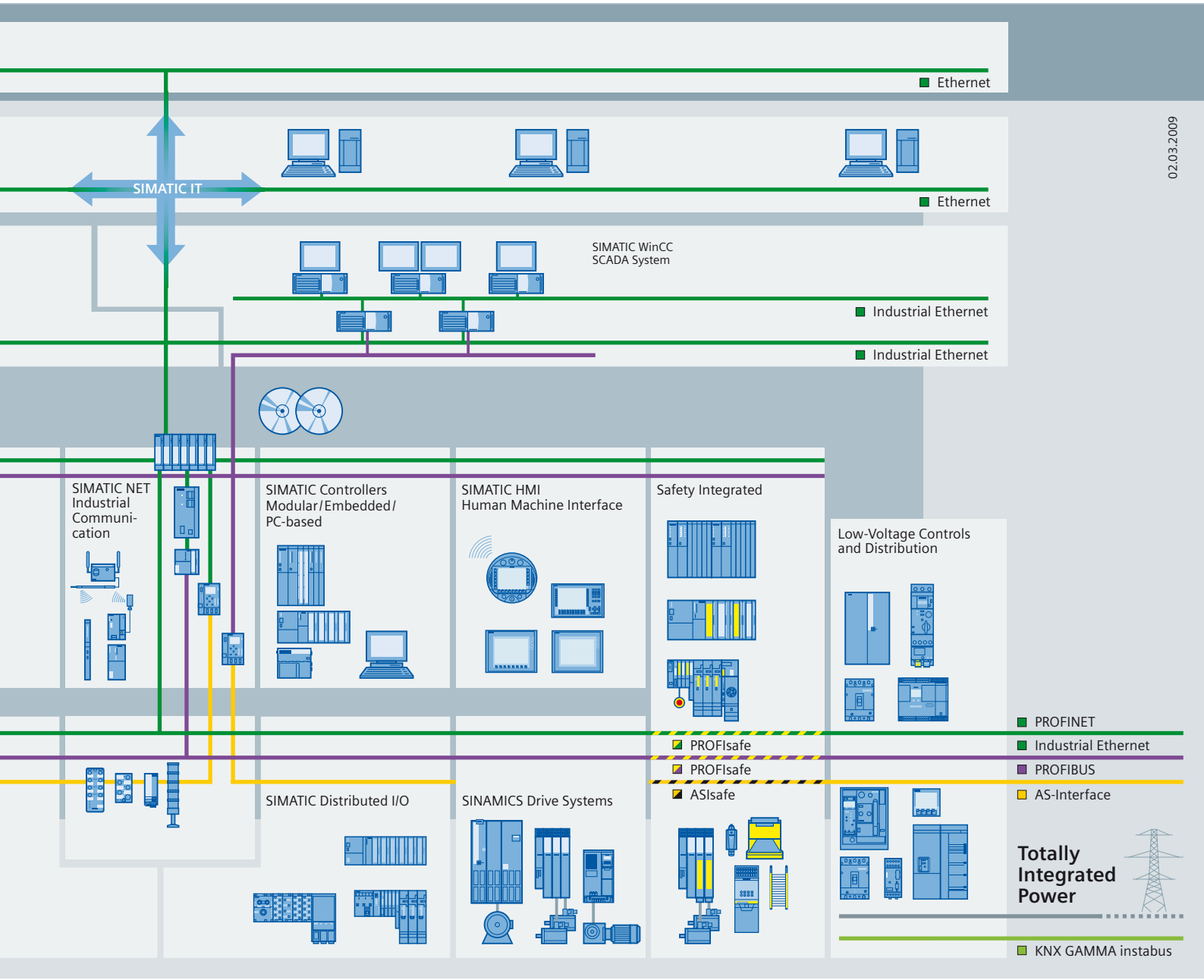
Check out the opportunities our automation and drive solutions provide. And discover how you can sustainably enhance your competitive edge with us.



Setting standards in productivity and competitiveness.

Totally Integrated Automation.

Thanks to Totally Integrated Automation, Siemens is the only provider of an integrated basis for implementation of customized automation solutions – in all industries from inbound to outbound.



TIA is characterized by its unique continuity.

It provides maximum transparency at all levels with reduced interfacing requirements – covering the field level, production control level, up to the corporate management level. With TIA you also profit throughout the complete life cycle of your plant – starting with the initial planning steps through operation up to modernization, where we offer a high measure of investment security resulting from continuity in the further development of our products and from reducing the number of interfaces to a minimum.

The unique continuity is already a defined characteristic at the development stage of our products and systems.

The result: maximum interoperability – covering the controller, HMI, drives, up to the process control system. This reduces the complexity of the automation solution in your plant. You will experience this, for example, in the engineering phase of the automation solution in the form of reduced time requirements and cost, or during operation using the continuous diagnostics facilities of Totally Integrated Automation for increasing the availability of your plant.

Much more than a catalog. The Industry Mall.

You have a catalog in your hands that will serve you well for selecting and ordering your products. But have you heard of the electronic online catalog (the Industry Mall) and all its benefits? Take a look around it sometime:

www.siemens.com/industrymall

Selecting

Find your products in the structure tree, in the new "Bread-crumb" navigation or with the integral search machine with expert functions. Electronic configurators are also integrated into the Mall. Enter the various characteristic values and the appropriate product will be displayed with the relevant order numbers. You can save configurations, load them and reset them to their initial status.

Ordering

You can load the products that you have selected in this way into the shopping basket at a click of the mouse. You can create your own templates and you will be informed about the availability of the products in your shopping cart. You can load the completed parts lists directly into Excel or Word.

Delivery status

When you have sent the order, you will receive a short e-mail confirmation which you can print out or save. With a click on "Carrier", you will be directly connected to the website of the carrier where you can easily track the delivery status.

Added value due to additional information

So you have found your product and want more information about it? In just a few clicks of the mouse, you will arrive at the image data base, manuals and operating instructions. Create your own user documentation with My Documentation Manager.
Also available are FAQs, software downloads, certificates and technical data sheets as well as our training programs. In the image database you will find, depending on the product, 2D/3Dgraphics, dimension drawings and exploded drawings, characteristic curves or circuit diagrams which you can download.

Convinced? We look forward to your visit!

System overview

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1/17	Runtime system
1/18	Engineering system

Excellence in Motion Control

Motion Control Solutions "Made by Siemens"

The Motion Control Systems division of Automation and Drive Technologies offers complete future-oriented automation solutions for machine tools and production machines.

Thanks to the strong innovation capacity, the sector know-how and the outstanding customer benefit of these solutions, Siemens is one of the leading suppliers of Motion Control Systems worldwide.

Innovative products, systems, solutions and services for each sector

Siemens Motion Control Systems achieve very high requirements: All products stand out through the use of the latest technologies, high functionality and quality. In addition, the individual systems and products are optimally matched to one another so that they can be easily and consistently combined into an economic machine solution.

Examples of this are the Motion Control System SIMOTION and the drive system SINAMICS. These products constitute an innovative system platform, with which you can optimally adapt the control system to machine requirements. As a result you can find optimized, economic and future-oriented Motion Control solutions for different sectors such as the packaging, plastics and glass, timber and metal, textile and printing industries which can be easily expanded for increased requirements and combined with our high performance servo, linear, torque and standard motors.

Furthermore, Siemens supports its customers over the entire life cycle of a machine, e.g. with worldwide presales and aftersales service at more than 295 service points in 130 countries or with special services for Motion Control solutions such as application consulting and Mechatronics Support.

Application support: The safe path to top solutions

Several application centers in China, France, Germany, Italy, Turkey and the USA support the specialist and application consultants on site who accompany customer projects from planning through startup – from the idea to the operational machine.

Application consulting includes:

- Planning and implementing projects
- Technical verification with test configuration and simulation
- Development of requirements and functional specifications
- Application workshops and customer-specific training courses

Partnership for joint success

During this cooperation Siemens not only supports its customers, but also includes them as technology partners in the development process of systems and components which results in practical and future-oriented automation solutions.

In this way Siemens helps its customers to increase productivity, competitiveness and profitability over the long term.

Energy efficiency due to targeted energy management

Siemens sets the standard in energy efficiency and energy management

In industrial applications, energy efficiency has a large impact on electrical drive systems in particular, as these account for more than 70 % of industrial energy consumption.
(Source: ZVEI EU-15/2002)

The SINAMICS S120 drive system is combined with Siemens motors to create energy-efficient solutions with high degrees of efficiency which help to achieve considerable reductions in energy consumption.

Energy efficiency in drive technology

Siemens supports its customers during every phase of the energy management process, at the product and system levels and with planning.

At the product level with:

- Energy consumption measurement
- High degrees of energy efficiency already in the design phase

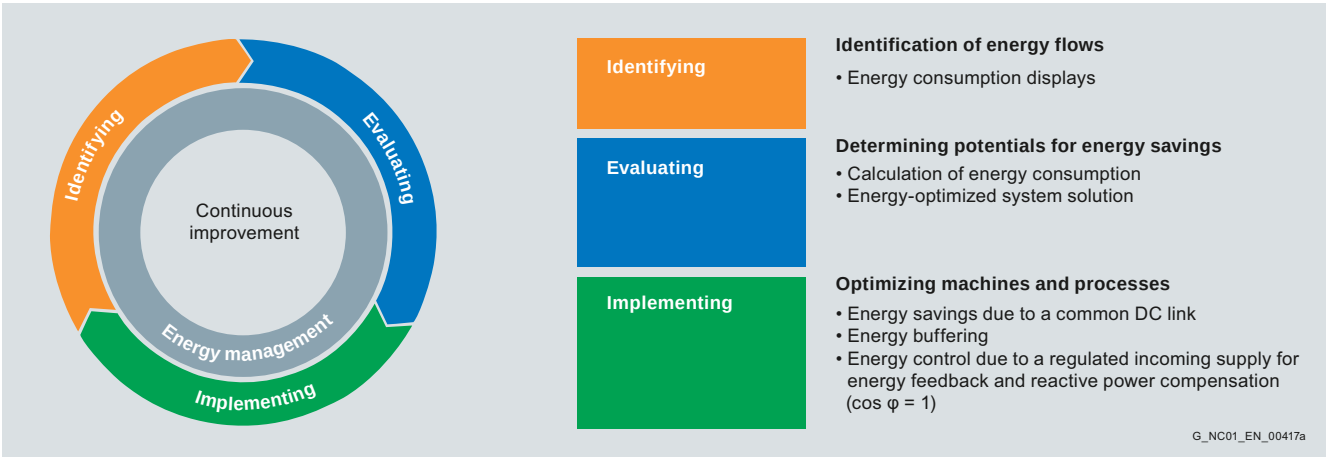
At the system level with:

- Energy savings due to a common DC link
- Energy buffering
- Energy control due to a regulated incoming supply

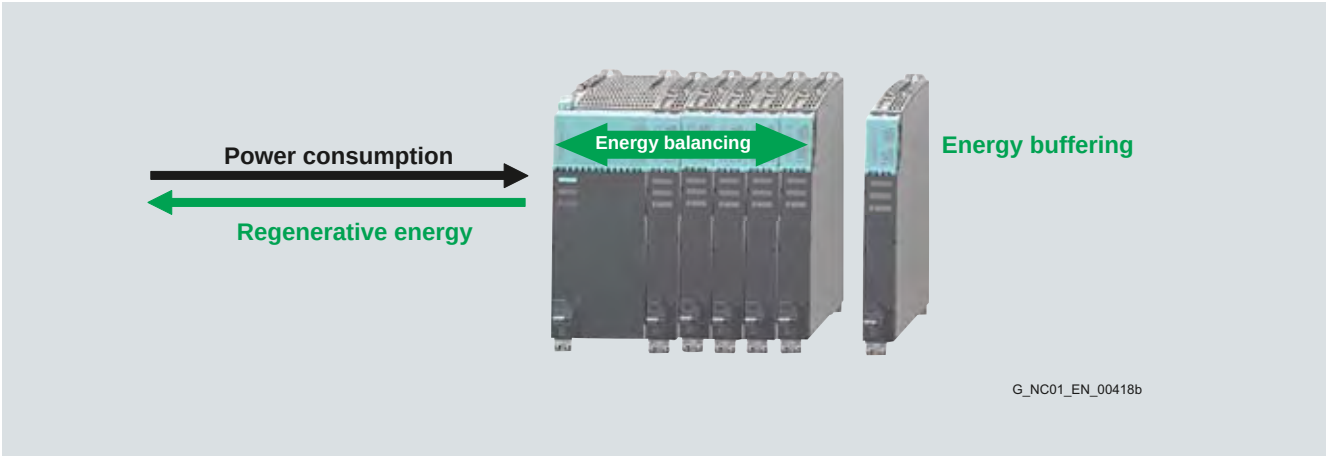
At the planning level with:

- Calculation of energy consumption
- Energy-optimized system solution

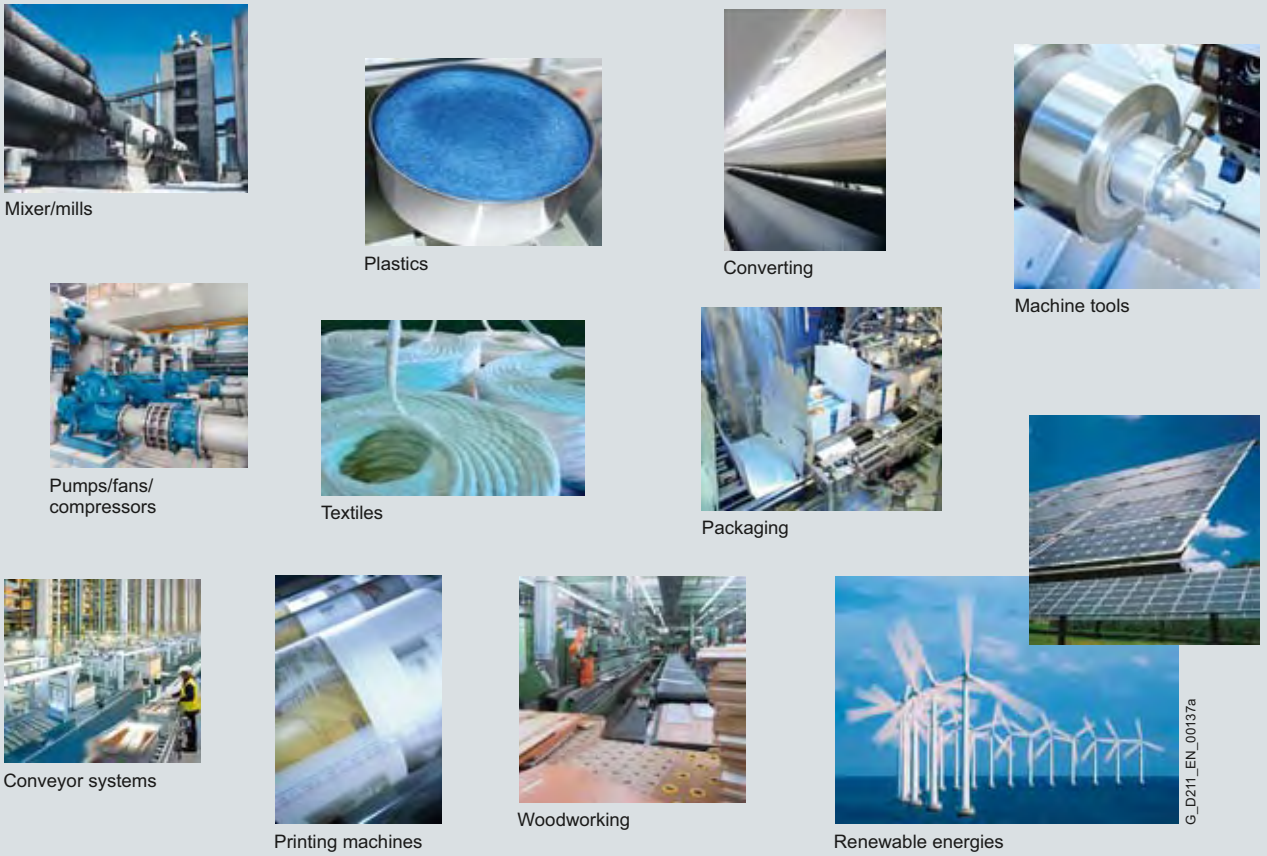
Energy management is a process in three phases



Increasing energy efficiency at the system level with the SINAMICS S120 drive system



The SINAMICS drive family



Application areas of the SINAMICS drive family

Area of application

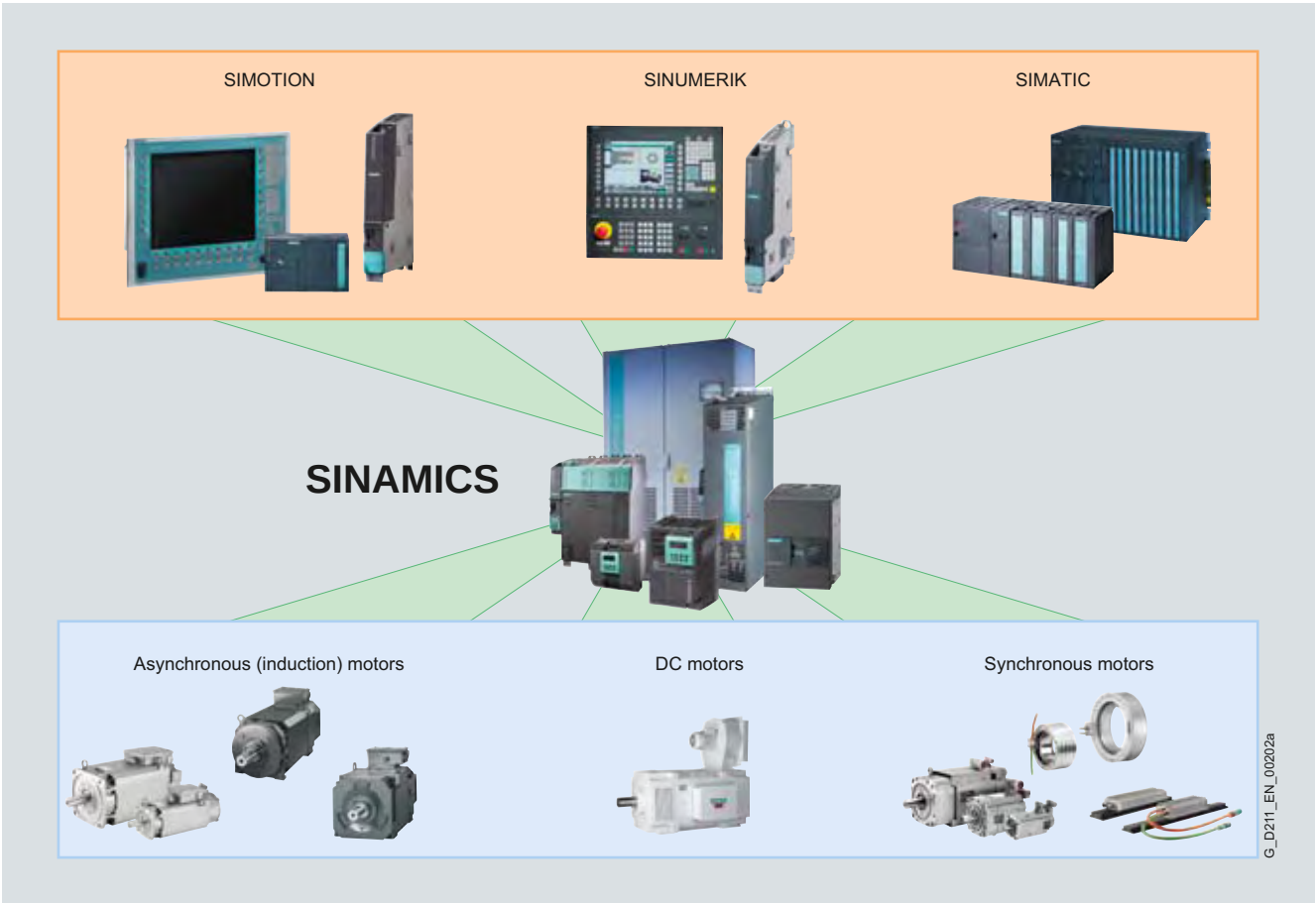
SINAMICS is the family of drives from Siemens designed for machine and plant engineering applications. SINAMICS offers solutions for all drive tasks:

- Simple pump and fan applications in the process industry
- Applied single drives in centrifuges, presses, extruders, elevators, as well as conveyor and transport systems
- Drive line-ups in textile, plastic film, and paper machines, as well as in rolling mill plants
- High-precision servo drives for the manufacture of wind turbines
- Highly dynamic servo drives for machine tools, as well as packaging and printing machines

Variants

Depending on the application, the SINAMICS range offers the ideal variant for any drive task.

- SINAMICS G is designed for standard applications with asynchronous (induction) motors. These applications have less stringent requirements regarding the dynamic performance of the motor speed.
- SINAMICS S handles complex drive tasks with synchronous and asynchronous (induction) motors and fulfills stringent requirements regarding
  - the dynamic performance and accuracy
  - integration of extensive technological functions in the drive control system
- SINAMICS DCM is the DC drive belonging to the SINAMICS family. As a result of its standard expandability, it addresses both basic as well as demanding drive applications.



SINAMICS as part of the Siemens modular automation system

Platform concept and Totally Integrated Automation

All SINAMICS versions are based on a platform concept. Common hardware and software components, as well as standardized tools for design, configuration and commissioning tasks, ensure high-level integration across all components. SINAMICS handles a wide variety of drive tasks with no system gaps. The different SINAMICS versions can be easily combined with each other.

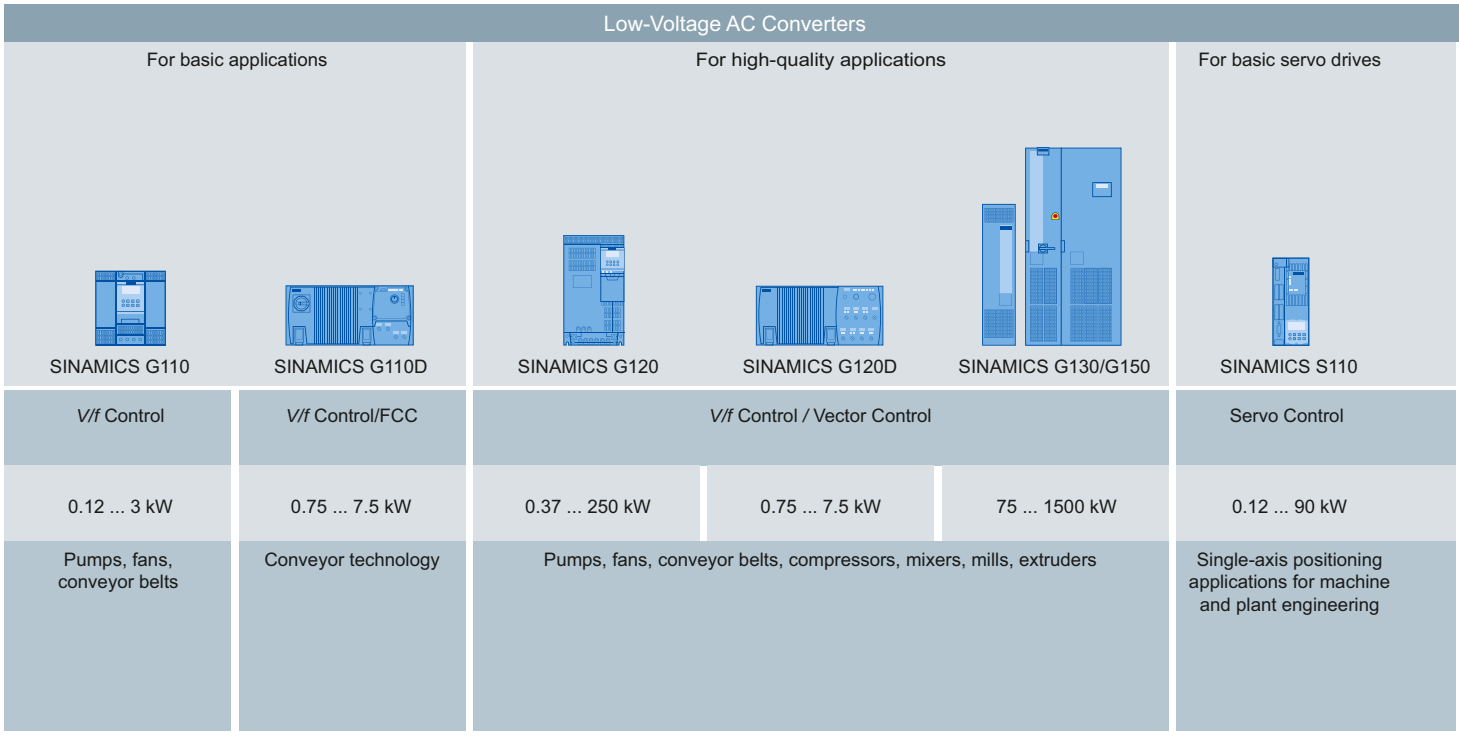
SINAMICS is a part of the Siemens "Totally Integrated Automation" concept. Integrated SINAMICS systems covering configuration, data management and communication at the automation level, result in extremely cost-effective solutions based on SIMOTION, SINUMERIK and SIMATIC control systems.

Quality management according to DIN EN ISO 9001

SINAMICS conforms to the most exacting quality requirements. Comprehensive quality assurance measures in all development and production processes ensure a consistently high level of quality.

Of course, our quality management system is certified by an independent authority in accordance with DIN EN ISO 9001.

The SINAMICS drive family



System properties

The SINAMICS range is characterized by the following system properties:

- Uniform functionality based on a single platform concept
- Standardized engineering
- High degree of flexibility and combination capability
- Wide range of performance
- Designed for global use
- SINAMICS Safety Integrated
- Greater efficiency and effectiveness
- High energy efficiency
- Multiple communication options
- Totally Integrated Automation

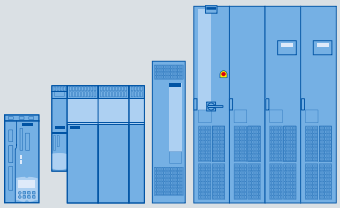
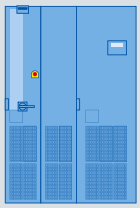
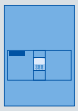
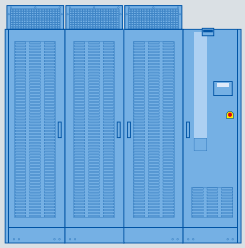
Areas of application

Tailored to suit different application areas, the SINAMICS range encompasses the following products:

AC low-voltage converters (line supply voltage < 1000 V)

- **SINAMICS G110**
  - The versatile drive for low outputs
- **SINAMICS G120**
  - The modular single drive for low to medium power ranges
- **SINAMICS G110D**
  - The distributed, compact single drive in a high degree of protection for basic applications
- **SINAMICS G120D**
  - The distributed, modular single drive in a high degree of protection for sophisticated applications
- **SINAMICS G130** and **SINAMICS G150**
  - The universal drive solution for high-performance single drives
- **SINAMICS S110**
  - The basic positioning drive for single-axis applications

The SINAMICS drive family

Low-Voltage AC Converters		DC Converters	Medium-Voltage AC Converters
For demanding applications		For basic and demanding applications	For high-power applications
 SINAMICS S120	 SINAMICS S150	 SINAMICS DCM	 SINAMICS GM150/SM150/GL150/SL150
V/f Control / Vector Control / Servo Control		Closed-loop speed control / torque control	*V/f* Control / Vector Control
0.12 ... 4500 kW	75 ... 1200 kW	6 kW ... 30 MW	0.8 ... 120 MW
Motion Control applications in production machines (packaging, textile, printing, paper, plastic), machine tools, plants and process lines, metal forming technology, renewable energies	Test stands, cross cutters, centrifuges	Rolling mills, cross cutters and shears, wire-drawing machines, extruders and kneaders, presses, elevator and crane installations, cableways and lifts, mining hoists, test stand drives	Pumps, fans, compressors, mixers, extruders, mills, rolling mills, mining hoist drives, excavators, test stands

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Common Engineering Tools

SIZER – for simple planning and configuration **STARTER – for fast commissioning, optimization and diagnostics**

Areas of application (continued)

AC low-voltage converters (line supply voltage < 1000 V)

- **SINAMICS S120**
  - The flexible, modular drive system for demanding drive tasks
- **SINAMICS S150**
  - The drive solution for demanding high-performance single drives

DC converter (line supply voltage < 1000 V)

- **SINAMICS DCM**
  - The scalable drive system for basic and demanding applications

AC medium-voltage converters (line supply > 1000 V)

- **SINAMICS GM150**
  - The universal drive solution for single drives
- **SINAMICS SM150**
  - The drive solution for demanding single-motor and multi-motor drives
- **SINAMICS GL150**
  - The drive solution for synchronous motors up to 120 MW
- **SINAMICS SL150**
  - The drive solution for slow speed motors with the highest torques and overloads

SINAMICS S120 built-in devices

Flexibility for successful machine concepts

As part of the SINAMICS drive family, the SINAMICS S120 drive system is a modular system for high-performance applications in machine construction and plant engineering. SINAMICS S120 offers high-performance single-axis and multi-axis drives for a very broad range of industrial applications. By virtue of its scalability and flexibility, SINAMICS S120 is the ideal system for satisfying the ever increasing demand for more axes and better performance. SINAMICS S120 supports flexible machine designs and faster implementation of customized drive solutions.

The response to ever increasing demands

Modern machines must be built at ever lower cost, but deliver ever greater productivity. The SINAMICS S120 drive concept meets both these challenges! It is easy to configure and thus helps to reduce project completion times. Its excellent dynamic response and accuracy permit higher cycle rates for maximum productivity.

Applications in machine and plant engineering

Regardless of whether the application involves continuous material webs or cyclic, highly dynamic processes – SINAMICS S120 means increased machine performance in many industries:

- Packaging machines
- Plastics processing machines
- Textile machines
- Printing machines
- Paper machines
- Hoisting equipment
- Handling and assembly systems
- Machine tools
- Rolling mills
- Test stands
- Renewable energy

Modularity for mechanical engineering

SINAMICS S120 is designed to allow free combination of power and control performance. Multi-axis drives with higher-level motion control can be implemented with the SINAMICS S120 modular system as easily as single-drive solutions.

Greater flexibility with central control intelligence

On the SINAMICS S120, the drive intelligence is combined with closed-loop control functions into Control Units.

These units are capable of controlling drives in Vector, Servo and *V/f* modes. They also perform the speed and torque control functions plus other intelligent drive functions for all axes on the drive.

Free performance selection for Vector and Servo control modes

The use of a SINAMICS S120 Vector control is recommended for drive solutions with continuous material webs, for example, wire-drawing machines, film and paper machines, as well as for hoisting gear, centrifuges and marine drives.

Servo control with SINAMICS S120 is employed for cyclic processes with precise, highly dynamic position control and servomotors, e.g. in textile, packaging, printing machines and machine tools.

SINAMICS S120 – functions for better efficiency

- Basic functions: Speed control, torque control, positioning functions
- Intelligent starting functions for independent restart after power supply interruption
- BICO technology with interconnection of drive-related I/Os for easy adaptation of the drive system to its operating environment
- Integrated safety functions for realizing the implementation of safety concepts
- Regulated infeed/regenerative feedback functions for preventing undesirable reactions on the supply, allowing recovery of braking energy and ensuring greater stability against line fluctuations.

DRIVE-CLiQ – the digital interface between all components

All SINAMICS S120 components, including the motors and encoders, are interconnected by a shared serial interface called DRIVE-CLiQ. DRIVE-CLiQ forms the backplane for the complete drive system. The standardized cables and connectors reduce the variety of different parts and cut storage costs. Converter boards (Sensor Modules) for converting standard encoder signals to DRIVE-CLiQ are available for third-party motors or retrofit applications.

Swift and automatic: The electronic rating plate

An important digital linkage element of the SINAMICS S120 drive system are the electronic rating plates integrated in every component. They allow all drive components to be detected automatically via a DRIVE-CLiQ link. As a result, data do not need to be entered manually during commissioning or component replacement – helping to ensure that drives are commissioned quickly and successfully! The electronic rating plates of the motors contain, for example, the parameters of the electrical equivalent circuit diagram and the characteristic data of the built-in motor encoder in addition to information such as order and identification numbers.

Modular design ensures flexibility and scalability

The multi-axis design, also, referred to as common DC bus, is very modular with a power offering of Line Modules and Motor Modules – both available in booksize compact, booksize and chassis formats. Line Modules function as the central energy supply to the voltage-source DC link. Line Modules are optionally available with regulated infeed/regenerative feedback to provide a constant DC link voltage. Motor Modules (DC/AC units) supply the motors with energy from the DC link. All the drive intelligence is organized into Control Units. The Control Units perform all the closed-loop control functions for the drive line-up. They also handle all other drive functions such as the interconnection of drive-related I/Os, positioning functions, and feature PROFIBUS DP or PROFINET as the central interface for linking to higher-level automation systems.

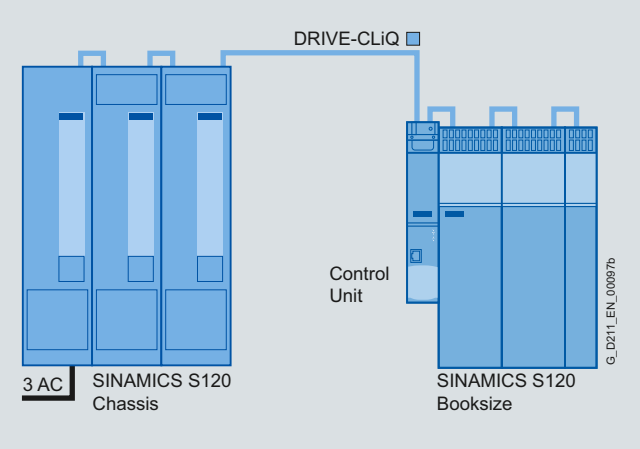
On single axis units, also referred to as AC drives, the rectifier and inverter power section are contained in one device, the Power Module – available in blocksize and chassis formats. For single axis applications, drive control functions are performed by a single axis Control Unit (e.g. CU310) mounted on to the Power Module. This separation of power and intelligence allows for maximum flexibility and scalability. Integration into multi-axis applications is easily accomplished by connecting a DRIVE-CLiQ link to a multi-axis Control Unit (e.g. CU320). This is accomplished by mounting a CU adapter (CUA31) on a blocksize Power Module in place of the single axis Control Unit.

Together this integrated line offers the most optimal drive solution for any application servo or vector.

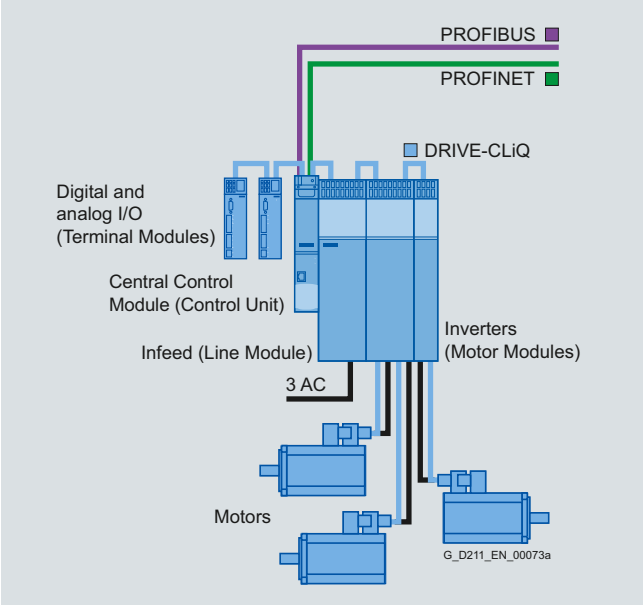
SINAMICS S120 blocksize, booksize compact, booksize and chassis formats

All formats can be combined as required

The different SINAMICS S120 formats can be combined freely thanks to their DRIVE-CLiQ interfaces, e.g. Line Modules in chassis format can be freely combined with Motor Modules in booksize format for multi-axis applications with high total output.

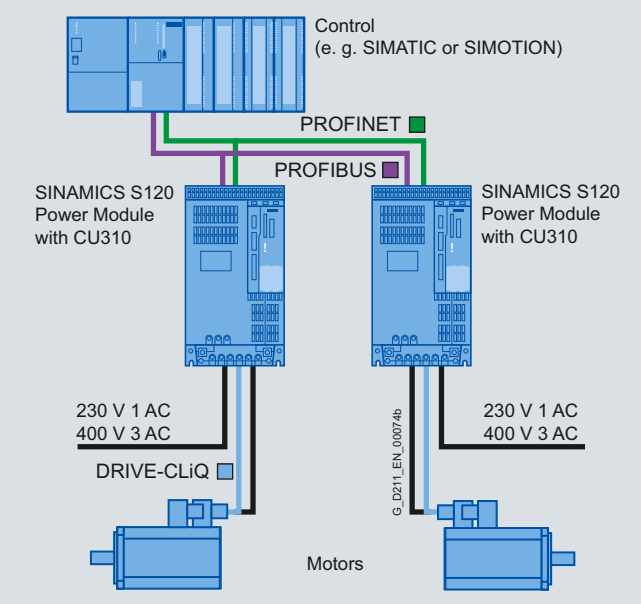


SINAMICS S120 Control Unit with booksize and chassis formats

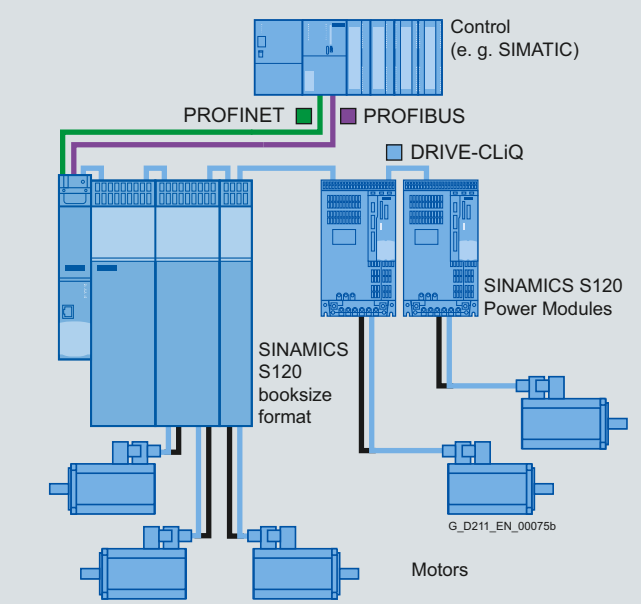


Example configuration of SINAMICS S120 booksize format

SINAMICS S120 built-in devices



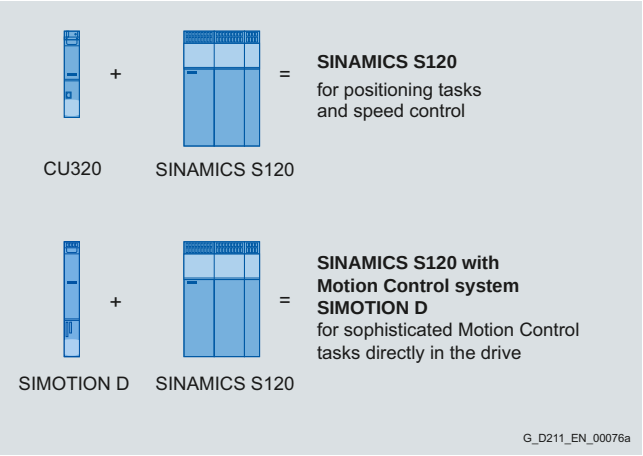
Example configuration of SINAMICS S120 blocksize format



Example configuration of SINAMICS S120 booksize and blocksize formats

SINAMICS S120 and SIMOTION – the perfect team

Modern machines must be capable of handling ever more complex Motion Control tasks and performing them with increasing accuracy and speed. In regard to this requirement, the SIMOTION Motion Control System and high-performance SINAMICS S120 drive system form a perfect team. The SIMOTION D variant, which is physically integrated in the SINAMICS S120 drive, is the ideal solution for machines with a large number of axes and stringent precision requirements. This distributed automation structure allows the machine to be segmented into various axis groupings, with each grouping controlled by a separate SIMOTION Motion Control System. The SIMOTION systems communicate either via PROFIBUS DP or PROFINET. Another important aspect: The compact machine design thanks to the distributed automation structure and a Control Unit directly in the drive.



Scalable MOTION CONTROL functionality

Totally Integrated Automation – the unique automation platform

With Totally Integrated Automation (TIA), Siemens is the only single-source provider to offer an integrated spectrum of products and systems for all industries. Tailored to meet individual customer requirements, industry-specific automation solutions can be implemented efficiently on the basis of TIA. Lower life-cycle costs for plant operation and a significant reduction in the time to market result in a marked improvement in productivity and greater investment security.

Easy – Totally Integrated Automation with SINAMICS S120

Apart from SIMATIC, SIMOTION and SINUMERIK, SINAMICS is also one of the core components of TIA. The STARTER commissioning tool is therefore an integral element of the TIA platform. It is thus possible to parameterize, program and commission all components in the automation system using a standardized engineering platform and without any gaps. The system-wide data management functions ensure consistent data and simplify archiving of the entire plant project.

PROFIBUS

PROFIBUS DP, the standard fieldbus of the TIA system, is supported by all SINAMICS S120 variants. It provides a high-performance, system-wide communication network which links all automation components: HMI, controls, drives and I/O devices.

PROFINET – for enhanced performance and open IT communication

SINAMICS S120 is also available with a PROFINET interface. This Ethernet-based bus enables control data to be exchanged at high speed via PROFINET IO with IRT or RT and makes SINAMICS S120 a suitable choice for integration in top-performance multi-axis applications.

At the same time, PROFINET also uses standard IT mechanisms (TCP/IP) to transport information, e.g. operating and diagnostic data, to higher-level systems. A SINAMICS S120 with this interface can thus easily be integrated into factory IT networks.

The components of the SINAMICS S120 drive system

SINAMICS S120 drive system

Line-side components

Line reactors

Line filters

Active Interface Modules

Line Modules

Basic Line Modules

Smart Line Modules

Active Line Modules

Power supply

For applicable 24 V device, see Catalog KT 10.1

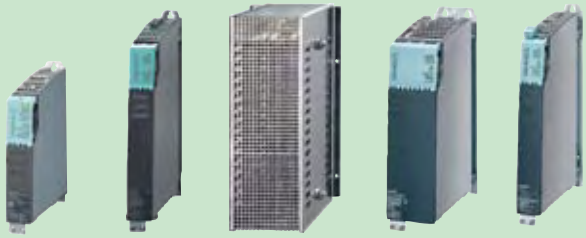
DC link components

Braking Module

Braking resistors

Capacitor Module

Control Supply Module



Control Units

CU310

CU320-2

Control Units SIMOTION

D410

D425

D435

D445-1

CX32

Motor Modules

Single Motor Modules

Double Motor Modules

Supplementary system components

Power Modules

Load-side components

Motor reactors

Sine-wave filters

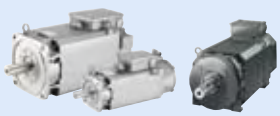
AC motors

Asynchronous motors

1PH8 motors

1PH7 motors

1PL6 motors



Synchronous motors

1PH8 motors

1FT7 motors

1FK7 motors

1FN3/1FN6 motors

1FW6/1FW3 motors

Connection system

MOTION-CONNECT

Power cables

Signal cables

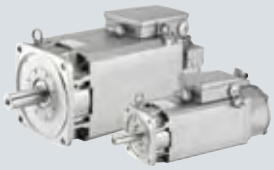
G_D211_EN_00077a

Motors

Servomotors

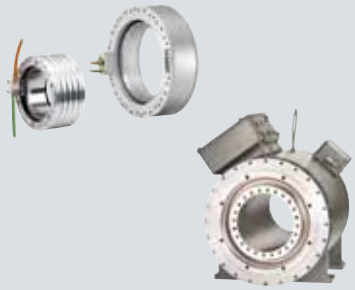
1FT7 synchronous motors	Machines with the highest demands in dynamic response and precision. Very low torque ripple for exacting standards in machine tools.
1FK7 synchronous motors	Robots and handling systems, wood, glass, ceramics and stone processing, packaging, plastics and textile machines
1FK7-DYA compact geared motors	Handling systems, wood, glass and ceramics processing, packaging machines, injection molding and foil stretching machines, auxiliary axes
1FK7 geared servomotors	Packaging machines, high-bay racking units, wood, glass and ceramics processing, beverage filling plants, conveyor belts

Main motors



1PH8 asynchronous motors	Main drives in presses and extruders, converting applications, paper and printing industries, crane applications
1PH8 synchronous motors	Main drives in presses and extruders, converting applications, paper and printing industries, crane applications
1PH7 asynchronous motors	Hoisting equipment, printing industry, rubber, plastics, wire and glass manufacturing
1PL6 asynchronous motors	Hoisting equipment, printing industry, rubber, plastics, wire manufacturing

Direct drives



1FN3 linear motors	Extremely fast dynamic response and very quick traversing speeds, highly dynamic and flexible mechanical engineering, oscillating motions
1FN6 linear motors	Exacting requirements of precision combined with fast dynamic response, handling and linked axes, long traverse paths
1FW6 built-in torque motors	Rotary tables, rotary indexing machines, rollers and winders, swivel axes, spindle machines, machine tools
1FW3 complete torque motors	Injection molding machines, extruders, foil stretching machines, rollers and winders, rotary tables, paper machines, shredders

Motors

The ideal motor for any application

Users of Motion Control drives are demanding ever more compact and dynamic motors in a very wide range of power ratings and variants, as well as mechanically integrated solutions. Siemens is offering a broad spectrum of servo motors, main motors and direct drives to satisfy these demands.

A suitable motor of asynchronous or synchronous design is available for every Motion Control task – with ratings ranging from 0.05 kW to 630 kW.

Uniform integrated system solutions

All motors are optimally designed to operate with the SINAMICS S120 drive system.

Motors equipped with a DRIVE-CLiQ interface ensure quick commissioning, smooth operation and simple diagnostic procedures. The DRIVE-CLiQ interface transfers the electronic rating plate data of the motors, e.g. their unique identification number and rating data such as voltage, current and torque, to the Control Unit.

Pre-assembled MOTION-CONNECT signal and power cables offer an easy, reliable method for connecting the components. Precisely tailored Motion Control solutions – state of the art in all rating classes – are made possible by a combination of globally available standard components and the control systems.

Powerful tools and competent support

Siemens offers expert advice and efficient tools to help users select the right motor solution. Experienced specialists are always ready to lend a hand in designing mechanically integrated motor solutions.

- SIZER configuration tool
  - User-friendly support in dimensioning motor and gear unit
    www.siemens.com/sizer
- CAD CREATOR
  - Dimension drawing and 2D/3D CAD generator
    www.siemens.com/cadcreator

Connection system MOTION-CONNECT

MOTION-CONNECT includes connection systems and components which are optimally tailored to individual areas of application. MOTION-CONNECT cables feature state-of-the-art connection systems to ensure fast, reliable connection of different components. The use of pre-assembled MOTION-CONNECT cables ensures high quality and system-tested, problem-free operation.

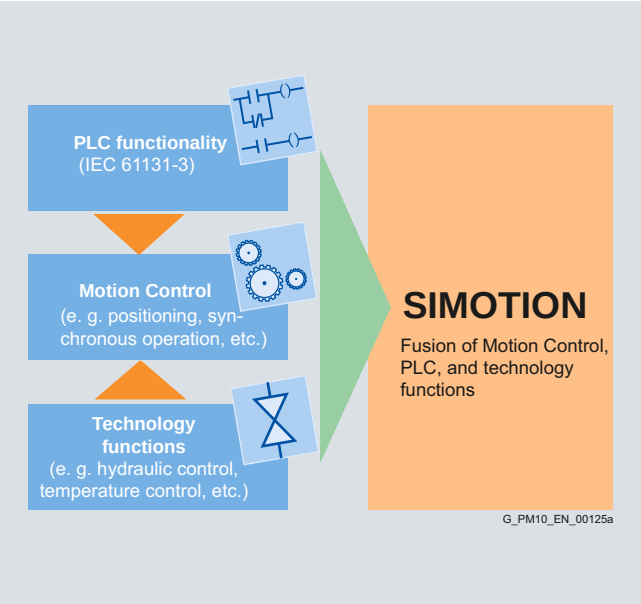
MOTION-CONNECT cables are available in three versions to suit different applications:

- **MOTION-CONNECT 500**
  The solution for predominantly fixed installation.
- **MOTION-CONNECT 700**
  Ideally suited to extreme acceleration rates and traversing speeds and for use with linear motors. Resistant to cutting oils.
- **MOTION-CONNECT 800**
  Ideally satisfies all requirements for use in machine tools and production machines. The cables meet all exacting mechanical requirements for application in cable carriers on machine tools and production machines and are resistant to cutting oils.

MOTION-CONNECT cables are available as power cables or signal cables, pre-assembled or by the meter depending on the application. The pre-assembled cables can be ordered in length units of 10 cm (3.94 in) and can be extended, if necessary.

The SIMOTION system

The system approach



SIMOTION is recommended for all machines with Motion Control tasks – from simple to high-performance. The focus is on a simple and flexible solution for the greatest possible range of Motion Control tasks.

SIMOTION is based on the fusion of Motion Control with two other control functions which are found in most machines: PLC and technology functions.

This approach means that Motion Control of axes and control of the complete machine can be implemented within the same system. The same applies to technology functions, such as pressure control of a hydraulic axis. A seamless switch can be made from position-controlled positioning mode to pressure control.

Combining the three open-loop control functions of Motion Control, PLC and technology functions has the following benefits:

- Reduced engineering overhead and increased machine performance
- Fast system response – Time-critical interfaces between the individual components are no longer required
- Simple, uniform and transparent programming as well as diagnostics of the entire machine

The SIMOTION system is made up of three components:

Engineering system

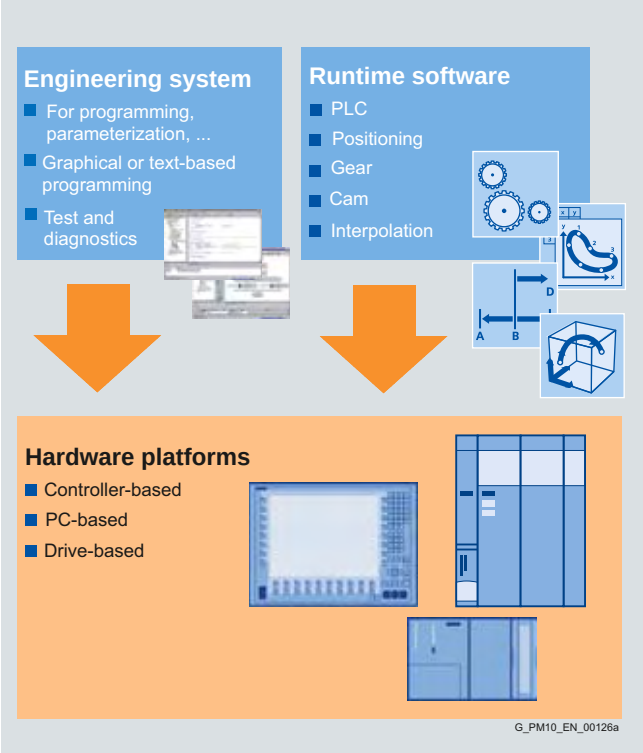
SCOUT enables Motion Control, PLC and technology functions to be incorporated in one comprehensive, integrated system and provides all the necessary tools: From programming and parameterization through testing and commissioning, to diagnostics.

Runtime system

The runtime system offers a high-performance execution system for cyclic and sequential tasks. The runtime software modules make the different PLC, Motion Control and technology functions available. By selecting the appropriate modules, the overall functionality of the system can be flexibly adapted to the machine.

Hardware platforms

The hardware platforms are the basis of the SIMOTION Motion Control System. The application created with the engineering system and the associated runtime software modules can be implemented on different hardware platforms.



The fast path to the automation solution

Thanks to the SIMOTION system components and the concept of ready-to-apply standard applications and complete machine solutions called SIMOTION Easy Set (Ready to Run), it is possible to reduce engineering costs, speed up project completion times and implement successful automation systems more quickly.

One concept – 3 platforms

Automation systems are primarily identified by the following characteristics:

- System-specific characteristics, e.g. functionality and engineering
- Hardware-dependent characteristics, e.g. performance, design and expandability

However, mechanical engineering demands vary greatly, depending on the version of the machine in question.

Every hardware platform has its benefits when used in certain applications.

The various platforms can also be combined very easily, which is a particular advantage in modular machines and plants. This is because the individual hardware platforms always have the same system characteristics, i.e. functionality and engineering are always identical, irrespective of the platform used.

PROFIBUS or PROFINET can be used to create the link to the drives and the I/Os remotely.

PROFIBUS/PROFINET can also be used for communication with HMI devices such as SIMATIC HMI or higher-level controllers such as SIMATIC S7. This means that SIMATIC HMI panels as well as PCs with ProTool/Pro or WinCC flexible can be used as operator systems. Even 3rd party applications can communicate with SIMOTION by means of the OPC interface.

SIMOTION D – Compact and integrated in the drive

In SIMOTION D, the SIMOTION functionality is integrated directly in the closed-loop control module of the SINAMICS S120 drive system. Therefore, the complete system (consisting of the open-loop control and the drive) is extremely compact and powerful. Two SIMOTION D versions are available: as a single-axis SIMOTION D410 system and as a multi-axis SIMOTION D4x5 system in different performance variants. This ensures a high degree of scalability and flexibility. The field of application ranges from single axes to high-performance multi-axis machines. SIMOTION D4x5 is supplied with two integrated PROFIBUS interfaces supporting PROFIdrive and two integrated Industrial Ethernet interfaces. An optional Communication Board is used to connect via PROFINET. With SIMOTION D410, a PROFIBUS variant or a PROFINET variant can be selected.

The SIMOTION system
Hardware platforms

SIMOTION C – Modularity and flexibility

SIMOTION C is a motion controller based on the SIMATIC S7-300 design.

It is available in two variants which differ in terms of their interfaces, but not with respect to Motion Control functionality or performance. In addition to the already integrated interfaces, both controllers can be expanded using I/O modules from the SIMATIC S7-300 range.

Variant C240 with its four drive and encoder interfaces is ideal for machine automation applications and the operation of drives with analog setpoint interface or stepper drives. As a result, this variant is particularly suitable for machine retrofits.

Variant C240 PN with its three PROFINET ports, which support PROFINET with IRT as well as TCP/IP and RT communication, is used to automate machines on the basis of PROFINET. It is capable of operating PROFINET drives with PROFIdrive, as well as PROFINET I/Os, such as SIMATIC ET 200S High Speed.

Both variants are equipped additionally with two PROFIBUS interfaces via which drives with PROFIdrive profile as well as standard I/Os can be connected. In addition, both controllers feature an Industrial Ethernet interface, thus offering further communication options.

SIMOTION P – Open for other tasks

SIMOTION P is a PC-based Motion Control System. An Embedded PC for Motion Control has been added to the portfolio of PC-based controls. As a result, the provenly successful SIMOTION P350-3 with Windows XP Professional operating system is now available for applications other than high-end tasks, as was previously the case. SIMOTION P320-3 has been created for Embedded PC Motion Control applications. Thanks to the Embedded Windows operating system and elimination of rotating parts in the PC, the SIMOTION P320-3 is particularly compact and ideal for applications in harsh environments. Both PCs are equipped with the usual real-time expansion for SIMOTION. This means that in addition to SIMOTION machine applications, it is possible to run other PC applications at any time including, for example, the SIMOTION engineering system, an operator application, a process data evaluation routine or standard PC applications.

Thanks to its excellent processor performance, SIMOTION P350-3 has been designed for applications with exacting performance requirements (such as hydraulic applications with highly dynamic position and pressure control loops). SIMOTION P320-3 is particularly suitable for harsh operating environments. Its small footprint makes it the preferred choice for many applications in which available space and rugged design play a key role.

The SIMOTION P350-3 can be operated by a variety of different panel fronts. These are available in various screen sizes and can either be operated using a keyboard and mouse, or a touch screen. The SIMOTION P320-3 can be linked to the SIMOTION fronts by means of the Remote Panel PC Kit.

SIMOTION P350-3 is available in either a PROFIBUS or PROFINET variant for the connection of I/Os, while SIMOTION P320-3 is available only as a PROFINET variant.

Multi-layer software architecture

With SIMOTION, motion tasks in many different machines are performed easily and uniformly.

To facilitate this, a very special, multi-layer architecture was chosen as the runtime system. All SIMOTION devices provide basic functionality such as PLC functionality with a command set according to IEC 61131-3. You can expand this basic functionality using the included technology packages and function libraries.

Scalable functionality

The technology packages, function libraries and multi-layer architecture of the runtime system combine to achieve the scalable functionality of SIMOTION.

Scalable

- Thanks to various functionality levels
- Thanks to software modules and technology packages with extensive functionality

Flexible

- Thanks to the integrated, freely programmable PLC following IEC 61131-3 standards
- Thanks to technology packages that can be used limitlessly
- Thanks to a broad functional scope with a complex command set as well as function blocks according to the PLCopen standard
- Thanks to the option to run servo, vector, stepper, and hydraulic drives
- Thanks to the ability to combine the various technology packages and function libraries

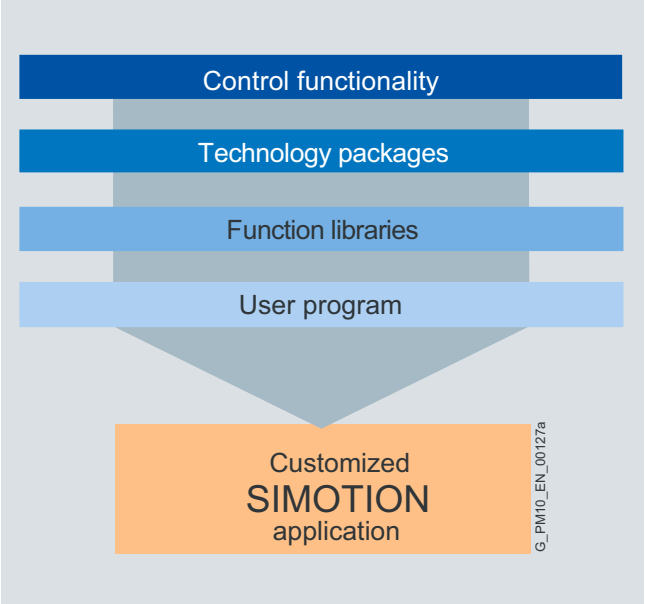
Expandable

- Thanks to standard functions of the function libraries

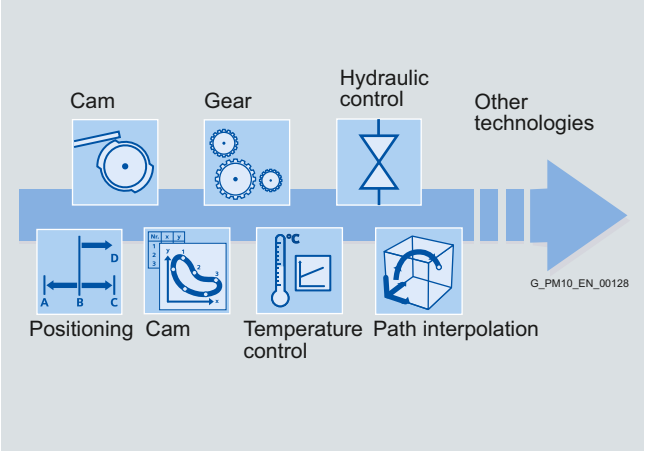
Technology packages

Each of these packages provides complete functionality for the technology in question. For example, the Motion Control technology package provides all functions for precise positioning movements, including camming.

It also handles the cyclic exchange of setpoints and actual values with the drive including position control, calculation of the movement profile, removal or overriding of motions, homing functions, encoder changeover, axis release, status information, and more.



In addition to the Motion Control technology package (including positioning, synchronous operation, coutput cam, and path interpolation), packages for other technologies, e.g. temperature control, are also available.



Function libraries

The function libraries offer standard functions

- For integration of special I/O modules (e.g. counter modules, communication modules, AS-Interface)
- For expanding the system functions (e.g. closed-loop controllers)

Modular user functions can also be stored as libraries for standardized implementation in projects.

The SIMOTION system
Engineering system

Focus is on user friendliness

As the performance capability of a system grows, so do the requirements of its user friendliness. This is the only means of ensuring the usability of the system. With SCOUT, the engineering system for SIMOTION, particular emphasis has therefore been placed on user friendliness:

- The engineering for Motion Control, PLC and technology as well as the drive configuration and commissioning are all performed in the same manner in the same engineering environment.
- All tasks are largely resolved in a graphical manner: Configuring, programming, testing and commissioning.
- Intuitive operation, context-sensitive help functions and automatic consistency checks make engineering easier, especially for those users who are new to in Motion Control programming.
- All the tools that are associated with the SCOUT engineering system are integrated, giving a uniform Look & Feel.

The SCOUT engineering system supports you step-by-step, making the engineering easy and efficient.

SCOUT can be used in SIMATIC STEP 7, either with standardized data management and configuring procedures, or as a stand-alone engineering tool (SCOUT Stand-Alone).

Programming for everyone

One of the options listed below can be selected for programming SIMOTION with the SCOUT engineering system:

- Graphic programming with Motion Control Chart (MCC)
- Graphic programming with Drive Control Chart (DCC)
- Ladder logic (LAD)/Function block diagram (FBD), often used as PLC programming languages
- High-level language Structured Text (ST)

In addition to Motion Control commands (e.g. referencing of axis), commands for I/O access, logic and calculations, subroutine calls and control of the program flow are also available.

Complex motion relationships are also easy to set up using the graphical cam editors.

Central management with integrated tools

All the data for your complete machine can be managed in a single project: Configuration data, programs, movement profiles, drive data and HMI.

The appropriate tools are then called from the central project management, e.g. for entering a disk or for commissioning a drive.

Test and diagnostics

SCOUT supports the testing, commissioning and error diagnostics of SIMOTION applications with a series of tools, such as those providing program status, control variables, trace, and the axis control panel.

Communication

2

2/2	**Overview**
2/4	**PROFIBUS**
2/5	**Industrial Ethernet**
2/6	**PROFINET**
2/9	**PROFINET for SIMOTION and SINAMICS**
2/10	**PROFIdrive**

Overview

Overview

Digital field bus systems are commonly used in factory automation today. These handle the communication between the controller, the device and the executing units, i.e. sensors and actuators. There are two different types of communication in accordance with the data that is being exchanged: process communication and data communication.

Process communication

In the case of process communication, control data, setpoints and actual values are transferred cyclically between the higher-level controller and the devices at the field level. The data volume is comparatively low. For example, a drive only uses between 4 and 32 bytes of process data. The number of connected sensors and actuators is usually specified by the configuration, which makes the bus cycle of process communication very constant.

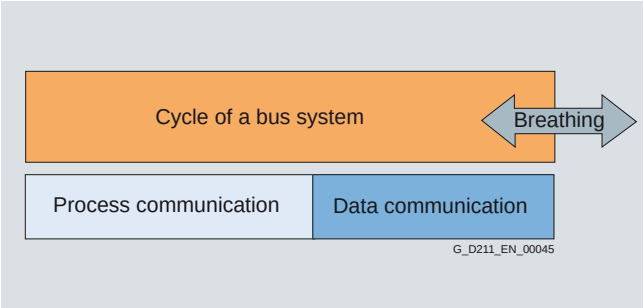
Data communication

Data communication is often required for engineering and is not directly linked to the execution of the production process. Data is sporadically (acyclically) exchanged between connected devices. The volume of this communication can be very large with over 100 bytes per device and communication task.

Cycle time of a bus system

The cycle time of a bus system comprises time segments for process communication and data communication. The overall cycle time is therefore not constant in the case of conventional bus systems, but it varies according to the amount of data communication. The cycle time is much shorter without data communication.

Some say: The bus cycle breathes. This "breathing" of the bus cycle time can be tolerated for simple drive applications or for drives in stand-alone operation and does not cause any problems as far as the quality of the application is concerned. However, for highly accurate drive applications, it must be ensured that the bus cycle is constant irrespective of the volume of data communication.

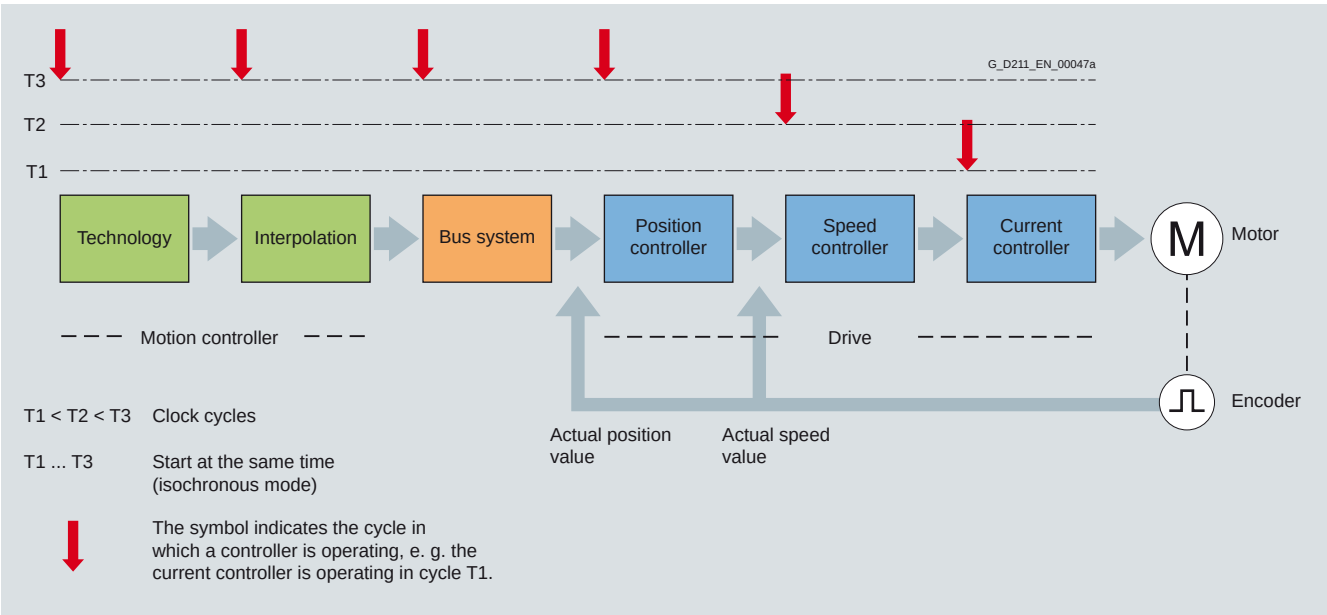


Breathing of the bus cycle

Demands placed on the fieldbus by digital drive controllers

Most current drives have a digital closed-loop control. This closed-loop control ensures that the controlled variable of the drive, for example the speed or position, are achieved and maintained. Such a digital closed-loop control comprises several intertwined controls (position, speed, current, etc.). These must be matched to one another, and to achieve this, they must be synchronized. This synchronization is important in keeping the controls stable, to achieve the setpoints quickly and to accurately maintain them.

If some of the components of the closed-loop control are located outside the drive, a bus system must be used to manage the communication between these components. The bus system must then operate synchronously just like closed-loop controls.

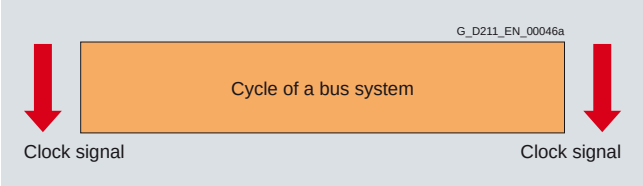


Digital drive control: Synchronous operation of all stations

Overview

The solution: Isochronous mode

To ensure that all the connected devices can communicate synchronously over the bus system, an additional clock signal is used to synchronize the cycle time of the bus system. This is also known as isochronous mode.



Constant bus cycle due to isochronous mode

For drives in the area of motion control systems, isochronous operation must be extremely quick and very accurate. It ensures that the length of the bus cycle varies only slightly.

This is then no longer referred to as the breathing of the bus cycle (large deviations), but as jitter (small deviations). Acceptable values are <1 µs.

Bus systems for motion control applications

So that a bus system can be used for motion control applications, the bus cycle must be constant and deterministic. Only deviations of less than 1 µs (jitter) from bus cycle to bus cycle can be tolerated.

To fulfill these requirements with conventional bus systems, an additional bus system is frequently implemented for high-volume, non-time-critical data communication, such as Industrial Ethernet.

PROFIBUS DP and PROFINET satisfy the requirements for process communication and isochronous mode. PROFINET also supports communication via standard TCP/IP and TCP/UDP for data communication on the network.

Industrial Ethernet – the predecessor of PROFINET – is not suitable for real-time communication, but for data communication using standard IT protocols such as TCP/IP and UDP/IP.

PROFIBUS

Overview

PROFIBUS – The most successful open fieldbus in automation

The demands of users for an open, vendor-independent communication system resulted in the specification and standardization of the PROFIBUS protocol.

PROFIBUS defines the technical and functional features of a serial fieldbus system with which distributed programmable field controllers of the low-end (sensor/actuator level) to mid performance range (cell level) can be networked.

Standardization according to IEC 61158 / EN 50170 provides future protection for your investment.

Through the conformity and interoperability test performed by the test laboratories authorized by PROFIBUS & PROFINET International (PI) and the certification of the devices by PI, the user can rest assured that quality and functionality are also ensured for multi-vendor installations.

PROFIBUS variants

Three different PROFIBUS variants have been defined to fulfill the wide range of different requirements at the field level:

PROFIBUS FMS (Fieldbus Message Specification) – the universal solution for communication tasks on the field and cell level of the industrial communication hierarchy.

PROFIBUS PA (Process Automation) – the variant for applications in process automation. PROFIBUS PA uses the intrinsically safe transmission technology specified in IEC 61158-2.

PROFIBUS DP (Distributed Peripherals) – this variant, which is optimized for speed, is tailored especially for the communication of automation systems with distributed IO stations and drives. PROFIBUS DP is characterized by its very short response times and high degree of fault tolerance and replaces cost-intensive parallel signal transmission with 24 V and the measured value transmission with 0/4 … 20 mA technology.

Design

Bus nodes for PROFIBUS DP

PROFIBUS DP distinguishes between two different master classes and one slave class:

DP master Class 1

The DP master Class 1 is the central component in PROFIBUS DP. The central master station exchanges information with distributed stations (DP slaves) in a fixed, repeated message cycle.

DP master Class 2

Devices of this type are used (programming, configuration or control devices) during start-up, for configuring the DP system, for diagnostics or controlling the plant during normal operation. A DP master Class 2 can be used, for example, to read the input, output, diagnostics and configuration data of the slaves.

Design (continued)

DP slave

A DP slave is an IO device which receives output information or setpoints from the DP master and sends input information, measured values or actual values to the DP master in response. A DP slave never sends data automatically, it must always be prompted by the DP master.

The volume of input and output data depends on the device and can be up to 244 bytes per DP slave and transfer direction.

Function

Functional scope in DP masters and DP slaves

The functional scope can differ between DP masters and DP slaves. The functional scope is different for DP-V0, DP-V1 and DP-V2.

DP-V0 communication functions

The DP-V0 master functions comprise the functions "Configuration", "Parameter Assignment", "Read Diagnostics Data" as well as cyclic reading of input data/actual values and writing output data/setpoints.

DP-V1 communication functions

The DP-V1 function expansions make it possible to perform acyclic read and write functions as well as processing cyclic data communication. This type of slave must be supplied with extensive parameterization data during start-up and during normal operation. These acyclically transferred parameterization data are only rarely changed in comparison to the cyclic setpoints, actual values, and measured values, and are transferred at lower priority in parallel with the cyclic high-speed user data transfer. Detailed diagnostic information can be transferred in the same way.

DP-V2 communication functions

The extended DP-V2 master functions mainly comprise functions for isochronous operation and direct data exchange between DP slaves.

- Isochronous mode:
  Isochronous mode is implemented by means of an equidistant signal in the bus system. This cyclic, equidistant cycle is sent by the DP master to all bus nodes in the form of a Global Control Telegram. Master and slaves can then synchronize their applications with this signal. The signal jitter between cycles is less than 1 µs.
- Slave-to-slave communication:
  The "publisher/subscriber" model is used to implement slave-to-slave communication. Slaves declared as publishers make their input data/actual values and measured values available to other slaves, the subscribers, for reading. This is performed by sending the response frame to the master as a broadcast. Slave-to-slave communication is therefore a cyclic process.

PROFIBUS for SINAMICS and SIMOTION

SINAMICS and SIMOTION use the PROFIBUS protocol PROFIBUS DP.

SINAMICS S120 drives can operate only as DP slaves and support all communication functions, i.e. DP-V0, DP-V1 and DP-V2.

The SIMOTION systems can be used both as DP masters and DP slaves. The DP-V0, DP-V1 and DP-V2 communication functions are supported.

Overview

Ethernet is the basic Internet technology for worldwide networking. The many possibilities of intranet and Internet, which have been available for office applications for a long time, are now utilized for production automation with Industrial Ethernet.

IT technology as well as the use of distributed automation systems is continuously increasing. This entails breaking up complex control tasks into small, simple control systems close to the drive. This increases the demand for communication and consequently a comprehensive and powerful communication system.

Industrial Ethernet offers a powerful area and cell network according to IEEE 802.3 (ETHERNET) for industrial applications.

Benefits

Ethernet with 100 Mbaud data rate and full duplex capability is the ideal basis. With a share of over 80 %, Ethernet is now the number one network worldwide and offers important features which have essential advantages:

- Fast commissioning thanks to the simplest connection method
- High availability since existing networks can be extended without any adverse effects
- Almost unlimited communication performance because scalable performance is available through switching technology and high data rates when required
- Networking of different application areas such as office and production areas
- Company-wide communication based on WAN (Wide Area Network) technology or the Internet
- Investment protection from continuous compatibility with further developments

In order to make Ethernet suitable for industrial applications, considerable expansions with respect to functionality and design are required:

- Network components for use in harsh industrial environments
- Fast assembly of the RJ45 connectors
- Failure protection through redundancy
- Expanded diagnostics and message concept
- Use of future-oriented network components (e.g. switches)

SIMATIC NET offers corresponding network components and products.

Design

Industrial Ethernet for SINAMICS and SIMOTION

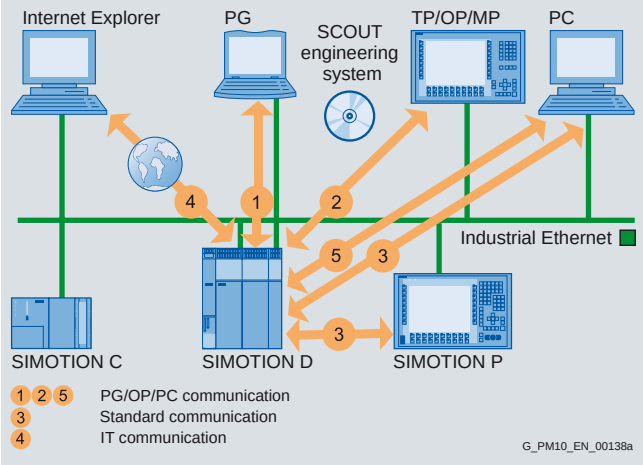
SINAMICS S120 Control Units can be integrated into an Industrial Ethernet architecture using the Communication Boards for Ethernet (CBE). In addition to PROFINET IO communication, these offer standard TCP/IP for engineering or also direct HMI.

SINAMICS S120 CU320-2 Control Units can additionally be incorporated into an Industrial Ethernet architecture via the integrated Ethernet interface.

SIMOTION can be integrated into any Industrial Ethernet communication architecture because each SIMOTION device offers at least one Ethernet interface as standard.

Industrial Ethernet is used in SIMOTION for data communication. Cyclic process communication with SINAMICS drives and distributed IO is implemented over PROFIBUS DP or PROFINET IO and PROFIdrive.

Function



Communication with SIMOTION over Industrial Ethernet

PG/OP communication (1, 2, 5)

- Engineering and diagnostics with SIMOTION SCOUT (1)
- Connection of SIMATIC HMI panels with Ethernet interface using ProTool Pro (only PC-based) or WinCC flexible (2)
- Open communication of, for example, vendor-specific HMI tools over OPC server from SIMATIC NET (5)

Standard communication (3)

This uses the basic protocols UDP and TCP/IP, which are also used with Ethernet. SIMOTION offers the corresponding system functions for UDP and TCP/IP communication. This permits data to be exchanged over TCP/IP and UDP communication between:

- Different SIMOTION devices (3)
- SIMOTION and SIMATIC S7 devices (3)
- SIMOTION devices and any other device which uses standard TCP/IP or UDP communication. Such devices can be any kind of PC with any kind of operating system or other programmable controllers (3)

IT communication (4)

IT communication is performed using protocols which are based on the basic TCP/IP protocol. The most important IT protocols are:

- HTTP: Hypertext Transfer Protocol
- FTP: File Transfer Protocol
- SMTP: Simple Mail Transfer Protocol
- SNMP: Simple Network Management Protocol

SIMOTION supports the HTTP and FTP. In addition, the following communication options are available for SIMOTION:

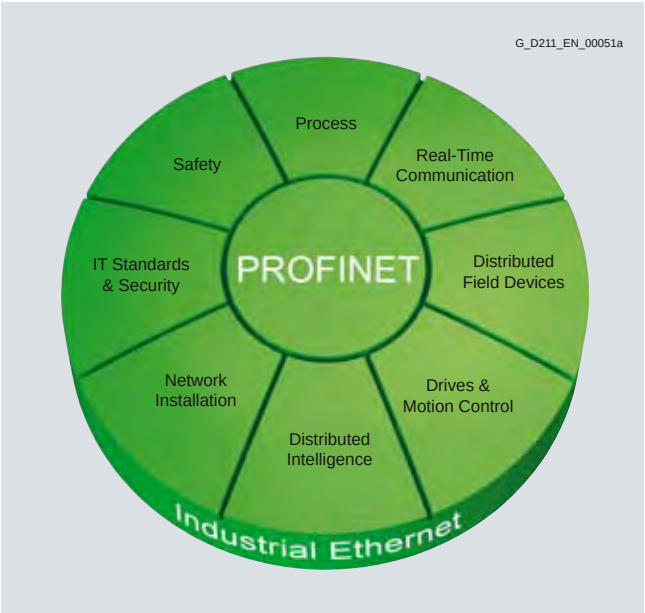
- Web pages in the SIMOTION device (4)
  A standard Internet browser can be used to access predefined web pages with diagnostics information on the SIMOTION device. Furthermore, user-defined web pages can be stored in the SIMOTION device which contain information defined by the user.
- OPC XML-DA (4)
  SIMOTION offers an OPC XML-DA server integrated into the device. This server supplies SIMOTION process data. Communication from any external device is performed with the SOAP protocol (in accordance with the specification of the OPC Foundation), which is integrated into the HTTP protocol.

PROFINET

Overview

PROFINET is the innovative and open Industrial Ethernet standard (IEC 61158) for industrial automation. With PROFINET, IT communication, data communication and process communication are combined on one communication medium. PROFINET thus permits integrated communication from the control level down through to the field level, offers plant-wide engineering and uses well-proven standards from the IT world, such as TCP/IP and UDP.

Existing fieldbus systems such as PROFIBUS can be easily integrated without any modification of existing devices.



PROFINET satisfies all the requirements of industrial automation:

- Industry-standard installation technology
- Real-time capability
- Deterministic behavior
- Integration of distributed field devices
- Simple network administration and diagnostics
- Protection against unauthorized access
- Efficient, cross-vendor engineering as well as
- Isochronous motion control applications

PROFINET relies on switch technology and has expanded this technology for isochronous real-time applications. Switch technology enables the network topology to be optimized to the requirements of the machine. Collisions are prevented allowing optimal data throughput.

Function

PROFINET communication

Data communication

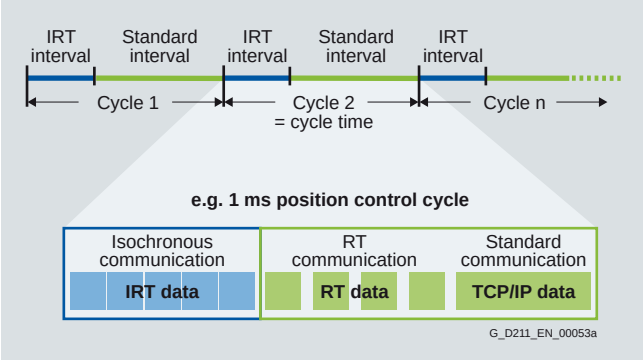
PROFINET uses standard TCP/IP for non-time-critical data communication, e.g. for parameter assignment, configuration, commissioning and diagnostics.

Process communication/Real-time communication

Real-time communication for process data transfer and non-time-critical data communication is performed on the same cable in the case of PROFINET IO. PROFINET IO offers the following performance levels for real-time communication:

- Real-time (RT):
  RT uses the option of prioritizing the communication stack of the bus nodes. This permits high-performance data transmission with standard network components.
- Isochronous real-time (IRT):
  IRT permits strict deterministic, cyclic data transmission with short response times and minimum jitter for high performance motion control applications. This feature is implemented with a PROFINET ASIC in the corresponding interfaces (switch integrated into device) or network components (switch).

In PROFINET, the communication cycle is subdivided into different, time-specific intervals. The first interval is used for isochronous real-time communication (IRT), followed by real-time communication (RT) and standard TCP/IP communication. The temporal sequence of the individual messages for each network section can be calculated with a special algorithm which takes the topology into account. This permits a switch to forward the IRT messages without delay from the input port to the specified output port and then to the target device.



Function (continued)

Device classes for PROFINET IO

PROFINET IO recognizes several different device classes within a PROFINET IO system:

IO Supervisor

An IO Supervisor is typically an engineering station that is granted time-limited access to the field devices for parameterization, commissioning or diagnostics. Engineering data is transferred over the standard TCP/IP channel of PROFINET IO.

IO Controller

An IO Controller is typically a programmable logic controller (PLC) or a motion control system, e.g. SIMATIC S7 or SIMOTION. The IO Controller cyclically transmits control signals and setpoints to the IO Devices that are assigned to it and reads actual values and any alarms from the subordinate IO Devices. Communication is performed between the IO Controller and the IO Devices – depending on the requirements of the application – in real-time (RT) or isochronous real-time (IRT).

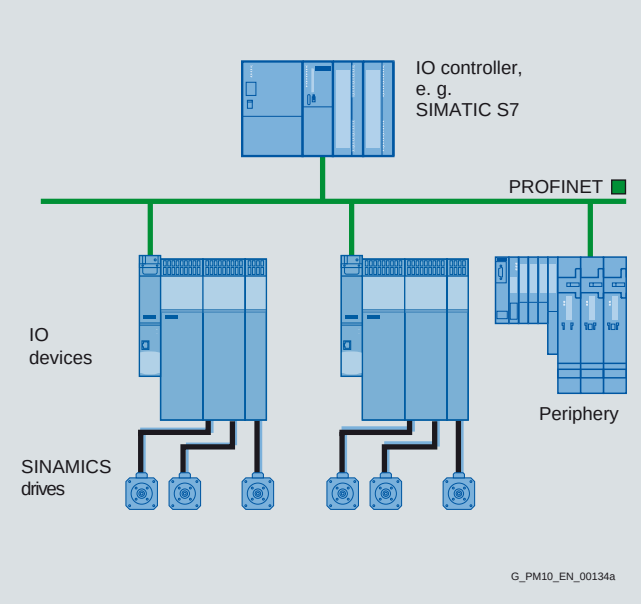
IO Device

IO Devices are typically distributed IO systems and drives, such as SIMATIC ET 200S and SINAMICS S120. IO Devices receive control signals and setpoints from a higher-level IO Controller and represent the direct interface to the process. They send actual values to the higher-level IO Controller so that it can update its internal process image.

Device concept for a PROFINET IO System

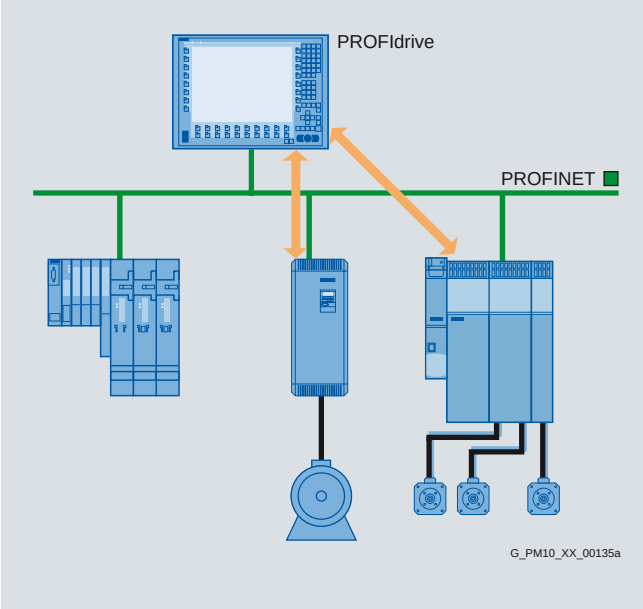
A PROFINET IO System comprises, in the simplest case, one IO Controller and several IO Devices that are assigned to it. The IO Devices are initialized and parameterized by the IO Controller on startup. The IO controller and its IO devices together constitute a PROFINET IO System (compare master-slave system for PROFIBUS).

The IO Controller updates its internal process image via cyclic process communication with the assigned IO Devices. The process image is updated cyclically in real-time (RT) or isochronous real-time (IRT) depending on requirements and device characteristics. In addition, PROFINET permits communication between controllers and devices of different IO systems.



PROFIdrive – The standardized drive profile for PROFIBUS and PROFINET

The functional interface between the controller and the SINAMICS drives for PROFINET and PROFIBUS is defined by the PROFIdrive drive profile V4 of PROFIBUS International. It is not necessary to change a user program to transfer from PROFIBUS to PROFINET.



PROFINET IO with RT: The right choice for standard drive applications

With typical cycle times between 4 ms and 10 ms, PROFINET IO with RT offers the same performance characteristics as PROFIBUS as regards cyclic data transmission.

Thus all standard drive applications can be automated by specifying the speed, torque and current setpoints, or by target positions, which do not have to be linked isochronously.

Note: In the case of real-time communication (RT), the process data can also be transferred wirelessly using wireless LAN products.

PROFINET IO with IRT: The right choice for demanding motion control applications in isochronous mode

In this case, a motion control system (e.g. SIMOTION) controls or synchronizes axes via PROFINET. This requires cyclic, isochronous data exchange with the drives where the following criteria must be met:

- Synchronization of the control-loop pulses with the bus cycle
- Closing of the control loops over the bus
- Time-synchronized acquisition of the actual position values
- Time-synchronized activation of the setpoints

PROFINET IO with IRT fulfills these requirements. By configuring the application, e.g. synchronous operation of two axes, the IRT messages are determined implicitly and the corresponding configuration data is generated.

PROFINET

Function (continued)

Motion control architectures with SIMOTION and SINAMICS

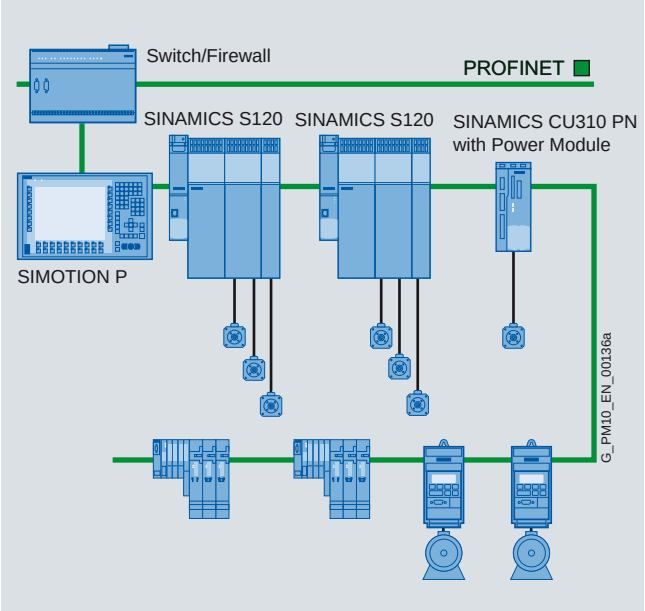
With SIMOTION and SINAMICS, a range of different automation structures can be implemented over PROFINET. In this case, central architectures can be supported with one controller (e.g. SIMOTION P) as well as decentralized, distributed architectures with several distributed controllers (e.g. SIMOTION D4xx with SINAMICS S120).

When SIMOTION is integrated in a complete automation system, hierarchic automation structures often result.

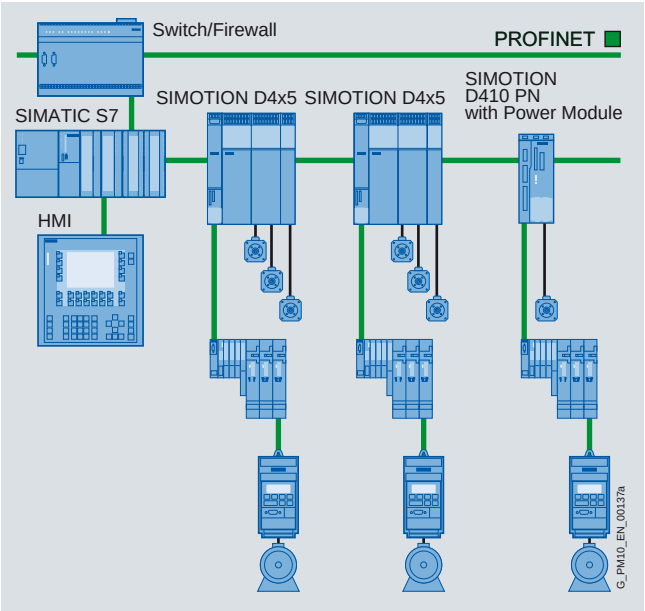
Both hierarchic automation structures and modular machine concepts can be implemented easily and without additional components due to the option of configuring SIMOTION as controller and device on the same PROFINET interface (I device).

- On one hand, SIMOTION as a device can communicate with a higher-level controller, e.g. a SIMATIC S7 PLC or a non-Siemens PLC.
- On the other hand, SIMOTION as a controller can simultaneously communicate with local IO Devices, e.g. drives and IO modules.

Multiple axes can also be synchronized over more than one SIMOTION IO controller using controller-controller and controller-device communication on the basis of PROFINET IO with IRT. This functionality is called distributed synchronous operation.



Central motion control architecture



Distributed motion control architecture

Overview

	SIMOTION					SINAMICS	
	C240 PN	P320-3	P350-3	D4x5	D410 PN	Control Unit CU320-2	Control Unit CU310 PN
							
PROFINET functionality through	Onboard interface	Onboard interface	MCI-PN Communication Board	CBE30 Communication Board	Onboard interface	CBE20 Communication Board	Onboard interface
	Is part of the basic functionality of the controller	Is part of the basic functionality of the controller			Is part of the basic functionality of the Control Unit		Is part of the basic functionality of the Control Unit
PROFINET interfaces	Integrated 3-port switch	Integrated 3-port switch	Integrated 4-port switch	Integrated 4-port switch	Integrated 2-port switch	Integrated 4-port switch	Integrated 2-port switch
Communi-cation as	Controller and device	Controller and device	Controller and device	Controller and device	Controller and device	Device	Device
Protocols	TCP, UDP, RT, IRT	TCP, UDP, RT, IRT	TCP, UDP, RT, IRT	TCP, UDP, RT, IRT	TCP, UDP, RT, IRT	TCP, RT, IRT	TCP, RT, IRT

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PROFINET for SIMOTION and SINAMICS

SIMOTION and SINAMICS are completely integrated into PROFINET communication. Interaction with the following PROFINET components is possible.

- Distributed IO on SIMOTION
- SINAMICS on SIMATIC S7 CPU or SIMOTION
- SIMOTION as I-Device on SIMATIC S7 CPU
- Active network components (e.g. SCALANCE) with SIMOTION and SINAMICS
- Wireless with SIMOTION and SINAMICS

When an automation topology is configured, the real-time classes RT and IRT can be used alongside each other on the same network or cable. It must, however, be noted that not all devices support both real-time classes RT and IRT. For devices that should be synchronized with IRT, it is important that all the PROFINET components that lie in between support the IRT real-time class, especially the SCALANCE switches of the X200 family.

PROFIdrive

Overview

PROFIdrive – The standardized drive profile for PROFIBUS and PROFINET

PROFIdrive defines the device behavior and the access procedure to internal drive data for electrical drives on PROFIBUS and PROFINET, from simple frequency converters up to high-performance servo controllers.

It contains a detailed description of how the communication functions "slave-to-slave communication", "constant bus cycle time" and "isochronous operation" are used for drive applications. In addition, it clearly specifies all device characteristics which influence interfaces connected to a controller over PROFIBUS or PROFINET. This includes the sequence control, encoder interface, standardization of values, definition of standard messages, and access to drive parameters, etc.

The PROFIdrive profile supports both central as well as distributed motion control concepts.

What are profiles?

Profiles specify specific properties and responses for devices and systems in automation. In this manner, manufacturers and users pursue the goal of defining common standards. Devices and systems that comply with a multi-vendor profile can interoperate on a fieldbus and can be operated interchangeably to a certain extent.

Do different profile types exist?

A distinction is made between application profiles (general or specific) and system profiles:

- Application profiles (also known as device profiles) mainly refer to devices (e.g. drives) and contain an agreed selection of bus communication modes, as well as specific device applications.
- System profiles describe system classes and include the master functionality, program interfaces and integration methods.

Is PROFIdrive future-proof?

PROFIdrive has been specified by PROFIBUS and PROFINET International (PI) and has been laid down in IEC 61800-7 as a future-proof standard.

The basic philosophy: Keep it simple

The PROFIdrive profile tries to keep the drive interface as simple as possible and free from technology functions. This philosophy ensures that reference models as well as the functionality and performance of the PROFIBUS/PROFINET master have no or very little influence on the drive interface.

One drive profile – Different application categories

The integration of drives into automation solutions depends strongly upon the drive task. To cover the extensive range of drive applications from the simple frequency converter up to highly dynamic, synchronized multi-axis systems with a single profile, PROFIdrive defines six application categories which define most drive applications:

- Category 1 – Standard drives (such as pumps, fans, stirring units, etc.)
- Category 2 – Standard drives with technology functions
- Category 3 – Positioning drives
- Category 4 – Motion control drives with central, higher-level motion control intelligence and the patented "Dynamic Servo Control" position control concept
- Category 5 – Motion control drives with central, higher-level motion control intelligence and position setpoint interface
- Category 6 – Motion control drives with distributed motion control intelligence integrated in the drives

Design

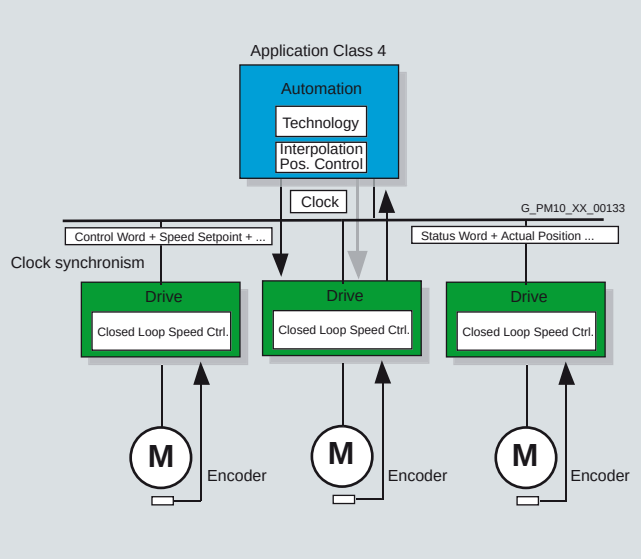
The PROFIdrive device model

PROFIdrive defines a device model based on function modules which cooperate in the device and generate the intelligence of the drive system. These modules have objects assigned to them which are described in the profile and are defined with respect to their functions. The overall functionality of a drive is therefore described through the sum of its parameters.

In contrast to other drive profiles, PROFIdrive defines only the access mechanisms to the parameters as well as a few profile parameters (about 30) such as the fault buffer, drive control and device identification.

All other parameters are vendor-specific which gives drive manufacturers great flexibility with respect to implementing control functions. The elements of a parameter are accessed acyclically over data records.

As a communication protocol, PROFIdrive uses DP-V0, DP-V1, and the DP-V2 expansions for PROFIBUS including the functions "Slave-to-Slave Communication" and "Isochronous Mode", or PROFINET IO with real-time classes RT and IRT.



PROFIdrive for motion control

Category 4 is the most important category for highly dynamic and highly complex motion control tasks. This application category describes in detail the master/slave relationship between the controller and the drives which are connected to each other over PROFIBUS and PROFINET.

The DSC (Dynamic Servo Control) function significantly improves the dynamic response and stiffness of the position control circuit by minimizing the dead times which usually occur for speed setpoint interfaces with an additional, relatively simple feedback network in the drive. The position control loop is closed in the drive which permits very fast position control cycles (e.g. 125 µs for SINAMICS S120) and thus limits dead times exclusively to the control behavior.

PROFIdrive for SIMOTION and SINAMICS

In SIMOTION and SINAMICS S120, the drive interface has been implemented according to the PROFIdrive profile V4 and application categories 1 to 4 (category 4 with and without DSC) and is referred to below as the PROFIdrive interface.

When SINAMICS S120 is used on SIMOTION, application category 4 with DSC is used by default.

Notes

SINAMICS S120 drive system

3

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Part 14 **CAD CREATOR**
Dimension drawing and 2D/3D CAD generator
www.siemens.com/cadcreator

	Designation	Description	Page
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General technical specifications			**3/10**
Control Units			**3/11**
	EPos basic positioner	Integral functionality for absolute and relative positioning of linear and rotary axes	**3/14**
	CU310 DP Control Unit	Single-axis control module with PROFIBUS interface	**3/15**
	CU310 PN Control Unit	Single-axis control module with PROFINET interface	**3/18**
	CompactFlash card for CU310	Memory card for firmware, licenses and project data	**3/21**
	CU320-2 DP Control Unit	Multi-axis control module	**3/22**
	CompactFlash card for CU320-2	Memory card for firmware, licenses and project data	**3/25**
Engineering software			**3/26**
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	Air-cooled Power Modules in blocksize format	AC/AC devices 0.9 ... 178 A (0.12 ... 90 kW)	**3/31**
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	Air-cooled Power Modules in chassis format	AC/AC devices 210 ... 490 A (110 ... 250 kW)	**3/57**
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System overview

Overview

With its separate power units and Control Units, the SINAMICS S120 drive system can be perfectly adapted to a wide variety of different drive tasks.

The Control Unit is selected according to the number of drives to be controlled and the required performance level, while the power unit must be rated to meet the energy requirements of the system. The connection between the Control Unit and power unit is made very simply using the digital system interface DRIVE-CLiQ.

Control Units

CU310 DP, CU320-2 DP and SIMOTION D4x5 Control Units

CU310 DP and CU310 PN Control Unit

CU310 Control Units are designed to control a single drive. They feature as standard a PROFIBUS interface (CU310 DP) or PROFINET interface (CU310 PN) and a TTL/HTL encoder evaluation circuit.

CU320-2 Control Unit

The CU320-2 Control Unit has been designed to control multiple drives. A CU320-2 is capable of operating up to

- 12 drives in *V/f* control mode or
- 6 drives in Servo or Vector control mode.

The CU320-2 Control Unit can be used to control a group of single drives and implement basic drive technology functions.

SIMOTION D Control Units

A SIMOTION D Control Unit is used for applications requiring coordinated motion control such as synchronous operation, electronic gear, cam disk or complex technology functions.
SIMOTION D Control Units are available in a range of performance variants:

- SIMOTION D410 for controlling 1 axis
- SIMOTION D425 for controlling up to 16 axes
- SIMOTION D435 for controlling up to 32 axes
- SIMOTION D445-1 for controlling up to 64 axes

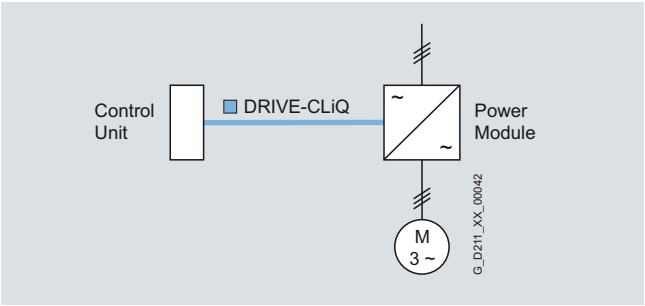
The STARTER commissioning tool is used to commission and diagnose the various types of SINAMICS drives through the Control Units. The SCOUT engineering system, which includes the STARTER tool, is required for SIMOTION D Control Units.

For further information about STARTER and SCOUT, see Engineering software and chapter SIMOTION Motion Control System.

Power Modules

The stand alone version of a SINAMICS S120 drive system consists of a CU310 Control Unit and a Power Module. A mains rectifier, a voltage-source DC link and an inverter for supplying a motor are integrated in the Power Module.

Power Module in blocksize format with CU310 DP Control Unit



Power Modules are designed for single drives which are not capable of regenerating energy to the supply. Generated energy produced during braking can be converted to heat via braking resistors.

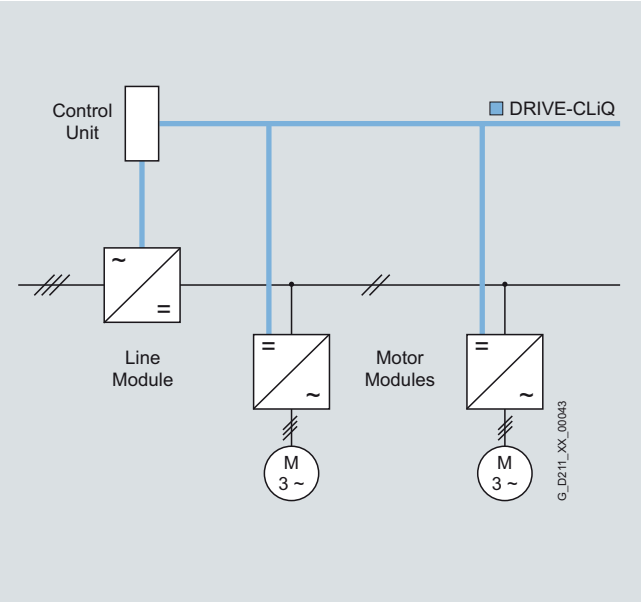
Power Modules can also be operated by a CU320-2 DP or a SIMOTION D4x5 Control Unit, e.g. in configurations where a single drive is added to a multi-axis drive grouping. In this case, the power modules of the blocksize construction form must be equipped with the CUA31/CUA32 Control Unit adapter. This is connected with the CU320-2 DP or SIMOTION D4x5 Control Unit using DRIVE-CLiQ. Power Modules in chassis format can be directly connected to the mullti-axis Control Unit using a DRIVE-CLiQ cable.

Overview (continued)

Motor Modules

A voltage-source DC link and an inverter for supplying a motor are integrated in the Motor Module.

CU320-2 Control Unit, Line Module and three Motor Modules in booksize format



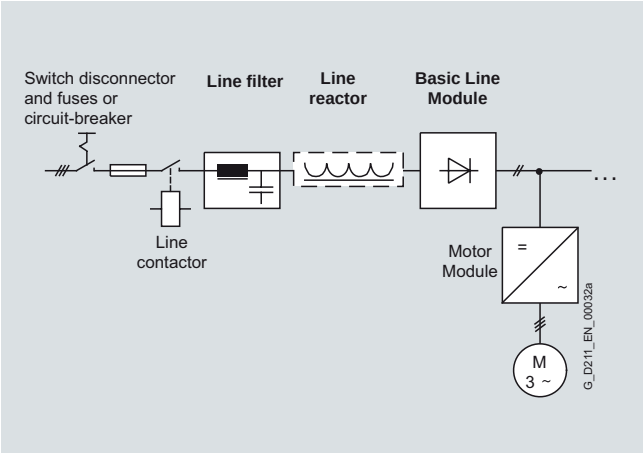
Motor Modules are designed for multi-axis drive systems and are controlled by either a CU320-2 or a SIMOTION D4x5 Control Unit. Motor Modules are interconnected by means of a shared DC busbar. Since the Motor Modules have a common DC link, they can exchange energy with one another, i.e. if one Motor Module operating in generator mode produces energy, the energy can be used by another Motor Module operating in motor mode. The voltage-source DC link is supplied with main line voltage by a Line Module.

Line Modules

Line Modules generate a DC voltage from the AC line voltage and supply Motor Modules with energy via the voltage-source DC link.

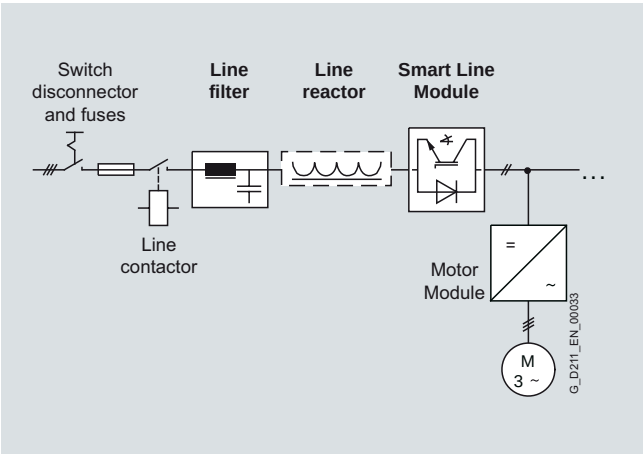
Basic Line Modules

Basic Line Modules are designed only for infeed operation, i.e. they are not capable of recovering regenerative energy to the supply system. If regenerative energy is produced, e.g. when drives brake, it must be converted to heat by means of a Braking Module and a braking resistor. When a Basic Line Module is used as the infeed, the matching line reactor must be installed. A line filter can be installed optionally to restrict conducted interference to Class C2 limits (EN 61800-3).



Smart Line Modules

Smart Line Modules can supply energy and return regenerative energy to the supply system. A Braking Module and braking resistor are required only if the drives need to be decelerated in a controlled manner after a power failure (i.e. when energy cannot be recovered to the supply). When a Smart Line Module is used as the infeed, the matching line reactor must be installed. A line filter can be installed optionally to restrict conducted interference to Class C2 limits (EN 61800-3).



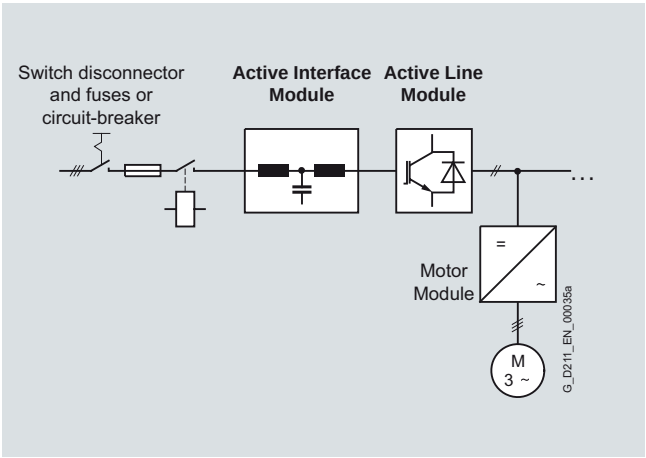
System overview

Overview (continued)

Active Line Modules

Active Line Modules can supply energy and return regenerative energy to the supply system. A Braking Module and braking resistor are required only if the drives need to be decelerated in a controlled manner after a power failure (i.e. when energy cannot be recovered to the supply). In contrast to Basic Line Modules and Smart Line Modules, however, Active Line Modules generate a regulated DC voltage which remains constant despite fluctuations in the line voltage. In this case, the line voltage must remain within the permissible tolerance range. Active Line Modules draw a virtually sinusoidal current from the supply which limits any harmful harmonics.

In order to operate an Active Line Module, it is absolutely essential to use the Active Interface Module for the appropriate rating.



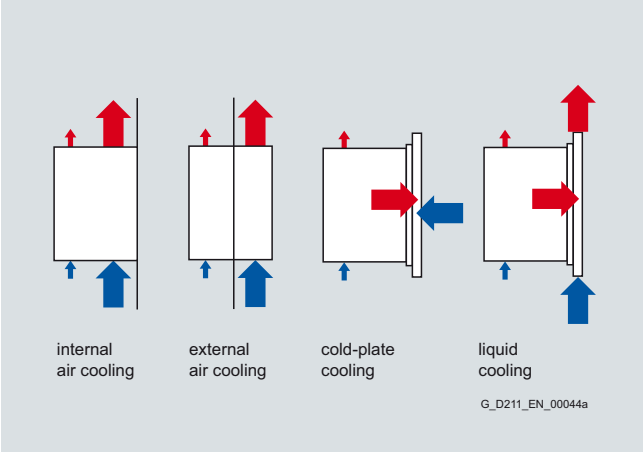
Please refer to chapter System description – Dimensioning for more information about designing a drive system with SINAMICS S120.

Power Modules, Motor Modules and Line Modules are available in booksize, booksize compact, blocksize and chassis format:

- Power Modules in blocksize and chassis,
- Motor Modules and Line Modules in booksize, booksize compact and chassis formats.

Cooling methods

Depending on the frame size there are several cooling options:



Internal air cooling

In this standard solution, the power loss from the electronics and power units of the drive components is removed by natural cooling or by a forced-ventilation system and routed to the interior of the control cabinet.

External air cooling

External air cooling uses the "through-hole" method. The components' power unit heat sinks pass through the mounting surface in the control cabinet and can thus release the heat losses of the power circuit to a separate external cooling circuit. The only heat loss that remains in the cabinet is emitted by the electronics. Degree of protection IP54 can be achieved at this "mechanical interface". The heat sink, with its cooling fins and the fan unit (part of the scope of supply), protrudes through the back into a separate ventilation area, which can also open outwards.

Cold plate cooling

Units designed with cold plate cooling can pass the power unit heat losses to an external heat sink via a thermal interface on the unit's rear panel. This external heat sink is water-cooled, for example.

Liquid cooling

On liquid-cooled units, the power semiconductors are mounted on a heat sink through which the cooling medium flows. Most of the heat produced by the unit is absorbed by the cooling medium and can be dissipated outside the control cabinet.

Overview (continued)

Customized application

The devices can be purchased in the different formats as a complete system solution. The user profits from the know-how of the drive specialists and no longer has to consider the thermal design of the application. Especially in applications with devices that use cold plate cooling, external air cooling and liquid-cooled devices in chassis format, the user obtains a technically reliable solution and saves time on engineering. The system solution ranges, for example, from a drive line-up in booksize format with cold plate cooling completely installed on a common cooling plate through to complete control cabinets with a cooling system and temperature/condensation control.

Further information is available from the Siemens branch offices.

Energy efficiency

The SINAMICS S120 drive system saves energy by recovering energy from the axes and using it within the DC link group of a multi-axis configuration and by feeding it back into the supply system. Even at full infeed capacity, no unnecessary heat is generated in the control cabinet.

Because the Active Line Modules prevent capacitive and inductive reactive currents, SINAMICS S120 also ensures that no unnecessary power losses occur in the power supply and that no current harmonics occur. This not only prevents detrimental effects on other loads, but it also reduces the heat generated in the control cabinet.

Varnished modules

The following units are equipped as standard with varnished or partially varnished modules:

- Blocksize format units
- Booksize format units
- Chassis format units
- Control Units (except for SIMOTION D445-1)
- Sensor Modules
- Terminal Modules

The varnish coating protects the sensitive SMD components against corrosive gases, chemically active dust and moisture.

The selection of Control Unit and Power section defines the structure of the drive system. The range of system components provided allows optimum adaptation of the drive system to the application.

System components

System components are divided into the following categories:

- ***DC link components***
  e.g. Braking Modules and braking resistors
- ***Power components on the output side***
  e.g. motor reactors
- ***Supplementary system components***
  e.g. Terminal Modules, Operator Panel and communication boards
- ***Encoder system connection***
  for connecting various types of encoders to SINAMICS S120

System overview

Overview (continued)

Booksize format

Booksize format units are optimized for multi-axis applications and are mounted adjacent to one another. The connection for the shared voltage-source DC link is an integral feature. The booksize format offers the full range of cooling options: Internal air cooling, external air cooling, cold plate cooling and liquid cooling in some cases.

Booksize compact format

Derived from the booksize format we developed the booksize compact format for machines with particularly high requirements for the compactness of their drives. The booksize compact format combines all benefits of the booksize format and provides the same performance with an even smaller overall height and an extended overload capability. The booksize compact format is thus particularly well suitable for integration into machines with high dynamic requirements and confined installation conditions.

The booksize compact format has the same design for the cooling methods of internal air cooling and cold plate cooling.

Blocksize format

Blocksize format units are optimized for single-axis applications and are available only as Power Modules.

The CU310 Control Unit can be snapped onto them directly. The units are cooled by internal air cooling or liquid cooling.

Chassis format

Higher-output units (approximately 100 kW (150 HP) and above) are constructed in chassis format. These are available as Line Modules, Power Modules and Motor Modules. Chassis format units are cooled by an internal air cooling circuit. For special applications, e.g. for extrusion or marine applications, liquid-cooled devices can be ordered. The CU310 Control Unit can be integrated in the Power Modules.

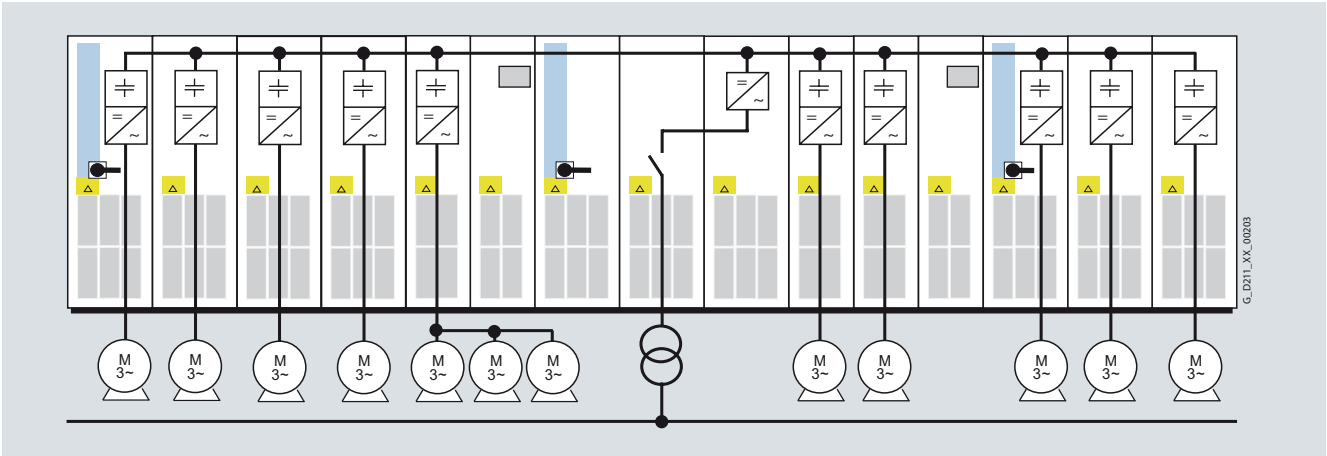
Overview (continued)

Cabinet Module format

Apart from the built-in converter units described in this catalog, SINAMICS S120 Cabinet Modules represent a cabinet-mounted system that is specially designed for use in plant construction and can be combined with drive cabinet series with a total output of up to 4500 kW (6000 HP).

The modular system is ideally suited to multi-motor drives with a central supply infeed and a common DC busbar, of the type typically used in, for example, paper-making machines, roller mills, test stands, or hoisting gear. The modular concept allows all components to be combined to meet requirements in a closed cabinet system.

For the Cabinet Modules, apart from Motor Modules, the three Basic Line Module, Smart Line Module and Active Line Module infeeds are available as well as special Braking Modules and Auxiliary Modules. The system is available with the degrees of protection IP20, IP21, IP23, IP43 and IP54. Communication between the Power Modules and the central Control Unit takes place via DRIVE-CLiQ.



Example of a drive line-up with SINAMICS S120 Cabinet Modules for a multi-motor drive

The power range can be extended as required by means of a parallel connection of up to 4 individual modules.

Further information is available on request.

General technical specifications

Technical specifications

Unless specified otherwise, the following technical specifications are valid for all the following components of the SINAMICS S120 drive system.

Electronics power supply	24 V DC, -15 %/+20 %
Vibratory load	
• Transport [1] acc. to EN 60721-3-2	
- All units and components except for chassis format	Class 2M3
- Chassis format units	Class 2M2
• Operation Test values acc. to EN 60068-2-6	Test Fc 10 ... 58 Hz: Constant deflection 0.075 mm 58 ... 150 Hz: Constant acceleration = 9.81 m/s^2 (1 × *g*)
Shock stressing	
• Transport [1] acc. to EN 60721-3-2	
- All units and components except for chassis format	Class 2M3
- Chassis format units	Class 2M2
• Operation Test values acc. to EN 60068-2-27	Test Ea
- Booksize and blocksize formats FSA to FSC	147 m/s^2 (15 × *g*)/11 ms
- Blocksize format FSD to FSF	- 49 m/s^2 (5 × *g*)/30 ms
- Chassis format	- 98 m/s^2 (10 × *g*)/20 ms
Ambient conditions	
• Protection class according to EN 61800-5-1	Class I (with protective conductor system) and Class III (PELV)
• Shock protection	DIN VDE 0106 Part 100 and BGV A 3 when used properly
• Type of cooling	Internal/external air cooling, power units with increased air cooling by means of built-in fan
Permissible ambient/coolant temperature (air) during operation	
• For line-side components, Power Modules, Line Modules and Motor Modules	0 ... 40 °C (32 ... 104 °F) without derating, > 40 ... 55 °C (104 ... 131 °F), see derating characteristics
• For Control Units, supplementary system components, DC link components, and Sensor Modules	0 … 55 °C (32 … 131 °F) up to 2000 m (6562 ft) above sea level
Climatic ambient conditions	
• Storage [1] acc. to EN 60721-3-1	Class 1K4 Temperature -25 ... +70 °C (-13 ... +158 °F)
• Transport [1] acc. to EN 60721-3-2	Class 2K4 Temperature -40 … +70 °C (-40 ... +158 °F) Max. air humidity 95 % at 40 °C (104 °F)
• Operation according to EN 60721-3-3	Class 3K3 Temperature 0 ... 55 °C (32 ... 131 °F) Condensation, splashwater, and ice formation are not permitted (EN 60204, Part 1)
Environmental class/ harmful chemical substances	
• Storage [1] acc. to EN 60721-3-1	Class 1C2
• Transport [1] acc. to EN 60721-3-2	Class 2C2
• Operation acc. to EN 60721-3-3	Class 3C2
Organic/biological influences	
• Storage [1] acc. to EN 60721-3-1	Class 1B1
• Transport [1] acc. to EN 60721-3-2	Class 2B1
• Operation acc. to EN 60721-3-3	Class 3B1
Degree of contamination According to EN 61800-5-1	2

[1] In transport packaging.

European Standards	
EN 954-1	Safety of machinery – safety-related parts of control systems Part 1: General design principles
EN 61508-1	Functional safety of electrical/electronic/ programmable electronic safety-related systems Part 1: General requirements
EN 50370-1	Electromagnetic compatibility (EMC) – Product family standard for machine tools Part 1: Radiated interference
EN 55011	Industrial, scientific and medical high-frequency devices (ISM devices) – radio interference – limit values and measuring techniques
EN 60204-1	Electrical equipment of machines Part 1: General definitions
EN 61800-3	Variable-speed electric drives Part 3: EMC product standard including specific test methods
EN 61800-5-1	Adjustable-speed electrical power drive systems Part 5: Safety requirements Main section 1: Electrical and thermal requirements
North American standards	
UL508C	Power Conversion Equipment
CSA C22.2 No. 14	Industrial Control Equipment
Approvals	
cULus	Testing by UL (Underwriters Laboratories, www.ul.com) according to UL and CSA standards

More information

For satisfactory and reliable operation of the drive system, original components of the SINAMICS system and the original Siemens accessories as described in this Catalog and the Configuration Manuals, in the functional descriptions or user manuals should be used.

The user must observe the configuring instructions.

Combinations that differ from the configuring instructions (also in conjunction with non-Siemens products) require a special agreement.

If no original components are used, for example for repairs, approvals such as UL, EN, Safety Integrated, etc. can become invalid and thus the operation authorization for the machine with the non-Siemens components installed becomes invalid.

All of the approvals, certificates, declarations of conformity, test certificates, e.g. CE, UL, Safety Integrated etc. have been performed with the associated system components as they are described in the Catalogs and Configuration Manuals. The certificates are only valid if the products are used with the described system components, are installed according to the Installation Guidelines and are used for their intended purpose. In other cases, the vendor of these products is responsible for arranging that new certificates are issued.

Please refer to chapter System description – Dimensioning for more engineering guidance to designing a drive system with SINAMICS S120.

Note: The products described in this catalog may cause high-frequency disturbances in a residential environment and necessitate the implementation of interference-suppression measures.

Overview

Innovative system architecture with a central Control Unit

Electronically coordinated individual drives work together to perform your drive tasks. Higher-level controllers operate the drives to achieve the required coordinated movement. This requires cyclic data exchange between the controller and the drives. This exchange usually took place via a field bus, which required a great deal of time and effort for installation and configuration. SINAMICS S120 takes a different approach: A central Control Unit controls the drives for all connected axes and also establishes the technological links between the drives and/or axes. Since all the required data is stored in the central Control Unit, it does not need to be transferred. Inter-axis connections can be established within a Control Unit and easily configured in the STARTER commissioning tool using a mouse.

- Simple technological tasks can be carried out automatically by the SINAMICS S120 Control Unit
- The **CU310 DP** or **CU310 PN** Control Unit are available for single drives
- The **CU320-2** Control Unit is designed for multi-axis applications
- Sophisticated motion control tasks can be implemented with the support of the more powerful Control Units **D410**, **D425**, **D435** and **D445-1** of **SIMOTION D** (graded according to performance)

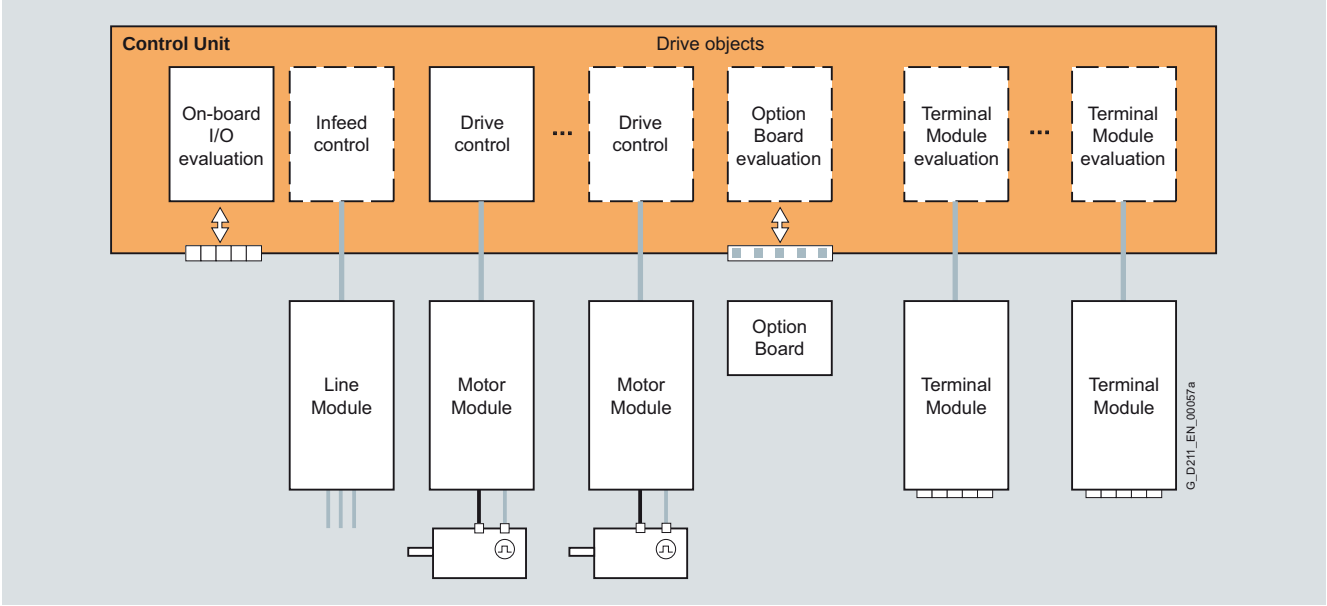
Each of these Control Units is based on an object-oriented SINAMICS S120 standard firmware which contains all of the most popular control modes and can be scaled to meet even the most advanced performance requirements.

The drive controls are supplied as ready-to-configure drive objects:

- Infeed Control for line infeed,
- Vector Control for the broad scope of rugged asynchronous (induction) motor applications
- Servo Control for permanent-field synchronous motors with demanding dynamic requirements
- *V/f* control modes for simple applications such as group drives with SIEMOSYN motors

Drive objects

A drive object is a self-contained software function with its own parameters and, if necessary, its own fault messages and alarms.



Extended technology with SIMOTION

SIMOTION D Control Units support the coordinated motion control of multiple drives. Technology objects are implemented in addition to drive objects on these Control Units. These are grouped to form technology packages and make available extended motion control functions (e.g. synchronous operation, cam disk, gearing and others) or technological functions (e.g. a cam controller, a temperature or pressure control). The IEC 61131-3-compliant PLC integrated in SIMOTION D Control Units means that they are not just capable of controlling sequences of motions, but the entire machine including HMI and I/Os.

Comprehensive package of open-loop and closed-loop control functions

A wide variety of standard functions such as setpoint input, data set changeover, controller optimization, kinetic buffering, ensure a high degree of operational reliability and excellent flexibility of application.

Control Units

3

Overview (continued)

Overview of key open-loop and closed-loop control functions

	Closed-loop control types S120	Open-loop control types S120	Main functions S120 for booksize/chassis	Comment, note
Infeed Control	• Booksize - Current control with/without mains sensor - U_{DC} control with/without mains sensor • Chassis - Current control with mains sensor - U_{DC} control with mains sensor	• Booksize/chassis - Basic Mode Rectification only - Smart Mode Rectification and regenerative feedback	• Mains identification • Controller optimization • Harmonics filter • Automatic restart	The mains sensor is the VSM 10 Voltage Sensing Module; "current" is the line current; 3-phase with line frequency
Vector Control	• Asynchronous (induction) motor - Torque control with/without encoder - Speed control with/without encoder • Torque motor - Torque control with encoder - Speed control with/without encoder • For asynchronous (induction) motor and torque motor - Position control with encoder	- Linear parabolic characteristic - Fixed-frequency characteristic (textile) - Independent voltage setpoint input	• Data set changeover • Extended setpoint input • Motor identification • Current/speed controller optimization • Technology controller • Basic positioner • Automatic restart • Flying restart with/without encoder • Kinetic buffering • Synchronization • Droop • Brake control	Mixed operation with *V/f* control modes is possible; it is for this reason that the *V/f* control modes are stored only once in the "Vector Control" drive object Position control can be selected as a function module from both Servo and Vector mode. Synchronous motors (1FK and 1FT) and linear motors can be operated only in Servo mode.
Servo Control	• Asynchronous (induction) motor - Torque control with encoder - Speed control with/without encoder • Synchronous motor, linear motor and torque motor - Torque control with encoder - Speed control with encoder • All motor types - Position control with encoder	- Linear parabolic characteristic - Fixed-frequency characteristic (textile) - Independent voltage setpoint input	• Data set changeover • Setpoint input • Motor identification • Damping application • Technology controller • Basic positioner • Brake control	Mixed operation with *V/f* control modes is possible; it is for this reason that the *V/f* control modes are stored only once in the "Vector Control" drive object Position control can be selected as a function module from both Servo and Vector mode.

Overview (continued)

BICO technology

Every drive object contains a large number of input and output variables which can be freely and independently interconnected using Binector Connector Technology (BICO). A binector is a logic signal which can assume the value 0 or 1. A connector is a numerical value, e.g. the actual speed or current setpoint.

Drive Control Chart (DCC)

DCC Drive Control Chart for SINAMICS S120 for simple, graphical configuration of timing, logic and calculation functions at the drive level.

It expands the possibilities for easy configuring of technology functions for the SIMOTION Motion Control system as well as for the SINAMICS S120 drive system.

The user-friendly DCC editor supports easy graphical configuration and a clear presentation of control loop structures.

The associated block library contains a large choice of closed-loop control, calculation and logic modules as well as more complex open-loop and closed-loop control functions.

Drive Control Chart for SINAMICS S120 therefore provides a convenient basis for resolving drive-level application functions (i.e. Winders) directly in the Control Unit.

Function module

The basic positioner EPos can be called on all SINAMICS S120 Control Units as an additionally activatable function module. The basic positioner can be used to resolve basic positioning tasks without additional external technological outlay from the drive itself.

The **Technology controller** is designed as a PID controller. It is suitable for implementing controls for regulating variables such as fill level, temperature, tension, pressure, flow rate and dancer position.

Integral safety functions (Safety Integrated)

The Control Units support comprehensive safety functions.

The integrated safety functions are the Safety Integrated Basic Functions

- STO = Safe Torque Off
- SBC = Safe Brake Control
- SS1 = Safe Stop 1

And the Safety Integrated Extended Functions that require a license

- SS2 = Safe Stop 2
- SOS = Safe Operating Stop
- SLS = Safely Limited Speed
- SSM = Safe Speed Monitor

(abbreviations in accordance with IEC 61800-5-2)

If the extended safety functions are used, licenses, supplementary system components such as TM54F terminal modules, or suitable safety controls will be necessary.

For further information on the integrated safety functions see chapter Safety Integrated.

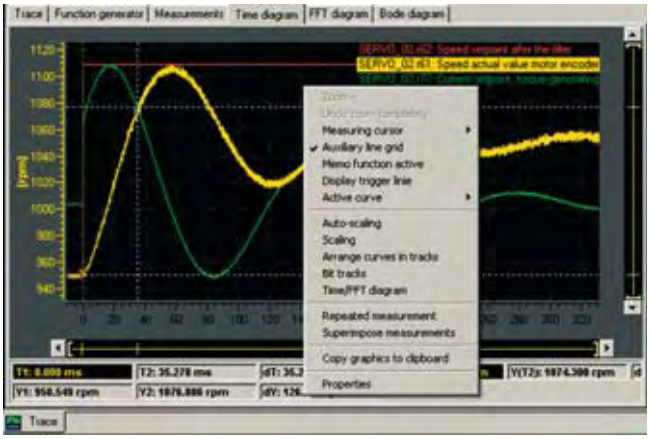
CompactFlash card

The functions of the SINAMICS S120 drives are stored on a CompactFlash card. This card contains the firmware and parameter settings for all drives in the form of a project. The CompactFlash card can also hold additional projects, which means that the correct project can be accessed immediately when series machines of different types are commissioned. When the Control Unit has booted, the data on the CompactFlash card are read and loaded to the RAM.

The firmware is organized in objects. Drive objects are used to implement open-loop and closed-loop control functions for Line Modules, Motor Modules, Power Modules and other system components connected by DRIVE-CLiQ.

Diagnostics optimally supported by trace function

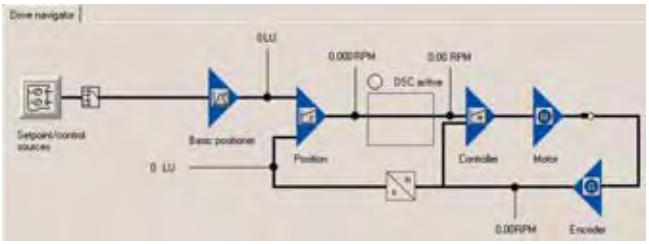
The time characteristics of input and output variables associated with drive objects can be measured by the integrated trace function and displayed using the STARTER commissioning tool. The trace can record up to 4 signals simultaneously. A recording can be triggered dependent on freely selectable boundary conditions, e.g. the value of an input or output variable.

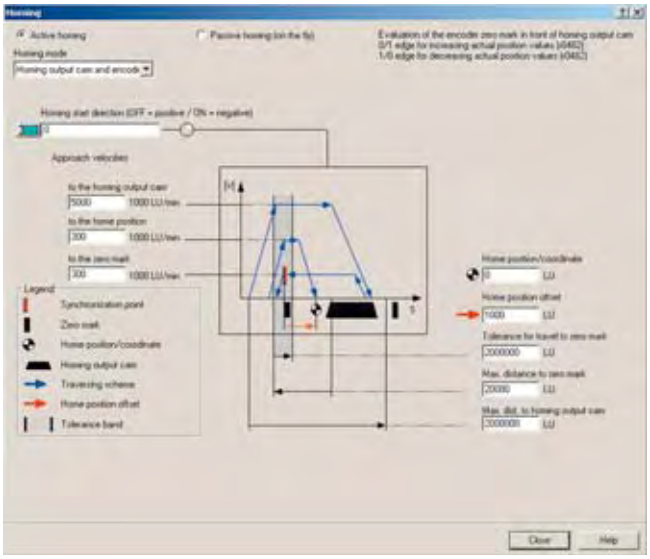


EPos basic positioner

Overview

EPos provides integrated easy to use positioning functions for the servo and vector axes with motor encoders or machine encoders.





The EPos basic positioner in the SINAMICS S120 drive system provides powerful and precise positioning functions. Due to its flexibility and adaptability, the basic positioner can be used for a wide range of positioning tasks.

The functions are easy to handle both during commissioning and during operation, and the comprehensive monitoring functions are outstanding.

In many applications, external position controls can thus be dispensed with.

The EPos basic positioner is used to position linear and rotary axes (modulo) in absolute/relative terms with rotary as well as linear motor encoder or machine encoder (indirect or direct measuring system).

EPos is a function module that can be activated in Servo Control and in Vector Control.

User-friendly configuring and commissioning including control panel (operation using PC) and diagnostics with the STARTER commissioning tool.

In addition to extremely flexible positioning functions, EPos offers a high degree of user-friendliness and reliability thanks to integral monitoring and compensation functions.

Different operating modes and their functionality increase flexibility and plant productivity, for example, by means of "on-the-fly" and bumpless correction of the motion control.

Preconfigured PROFIdrive positioning profiles are available which, when selected, automatically establish the internal "connection" to the basic positioner.

Functionality of the EPos basic positioner

Closed-loop position control with the following essential components

- Position actual value sensing (including the lower-level measuring probe evaluation and reference mark search)
- Position controller (including limits, adaptation and pre-control calculation)
- Monitoring functions (standstill, positioning and dynamic following error monitoring and cam signals)

Mechanical system

- Backlash compensation
- Modulo offset

Limits

- Speed/acceleration/delay/jerk limitation
- Software limit switch (traversing range limitation by means of position setpoint evaluation)
- Stop cams (traversing range limitation by means of hardware limit switch evaluation)

Homing and alignment

- Set reference point (for an axis at standstill that has reached its target position)
- Search for reference (separate mode including reversing cam functionality, automatic reversal of direction, homing to "output cam and encoder zero mark" or only "encoder zero mark" or "external zero mark (BERO)")
- Flying referencing (seamless homing possible during "normal" traversing with the aid of the measuring input evaluation; generally evaluation, e.g. of a BERO. Subordinate function for the modes "jog", "direct setpoint input/MDI" and "traversing blocks")
- Absolute encoder alignment

Traversing blocks mode (64 traversing blocks)

- Positioning using traversing blocks that can be stored in the drive unit including block change enable conditions and specific tasks for an axis that was previously referenced
- Traversing block editor using STARTER
- A traversing block contains the following information:
  - Job number and job (e.g. positioning, waiting, GOTO set jump, setting of binary outputs, travel to fixed stop)
  - Motion parameters (target position, override speed for acceleration and deceleration)
  - Mode (e.g.: hide block, continuation conditions such as "Continue_with_stop", "Continue_flying" and "Continue_externally using high-speed probe inputs")
  - Job parameters (e.g. wait time, block step conditions)

Direct setpoint input (MDI) mode

- Positioning (absolute, relative) and setting-up (endless closed-loop position control) using direct setpoint inputs (e.g. via the PLC using process data)
- It is always possible to influence the motion parameters during traversing (on-the-fly setpoint acceptance) as well as on-the-fly change between the setup and positioning modes
- The direct setpoint specification operating mode (MDI) can also be used in positioning or setup mode if the axis is not homed. This means that on-the-fly synchronization and re-homing can be carried out with "flying referencing".

Jog mode

- Closed-loop position controlled traversing of the axis with the "endless position controlled" or "jog incremental" modes, which can be toggled between (traverse through a "step width")

Overview

The CU310 DP Control Unit provides the communications and open-loop/closed-loop control functions for a Power Module. The CU310 DP combined with a Power Module and CompactFlash card creates a powerful single-axis AC drive with a PROFIBUS interface to a higher-level control.

Design

CU310 DP Control Unit features the following interfaces as standard:

- 1 DRIVE-CLiQ socket for communication with other DRIVE-CLiQ devices, e.g. Sensor or Terminal Modules
- 1 PM-IF interface for communication with Power Modules in blocksize format
- 1 interface to the BOP20 Basic Operator Panel
- 1 PROFIBUS interface with PROFIdrive V4 profile
- 1 encoder evaluation
  The following encoder signals can be evaluated:
  - Incremental encoder TTL/HTL
  - SSI encoder without incremental signals
- 4 parameterizable digital inputs (floating)
- 4 parameterizable bidirectional digital inputs/digital outputs (non-floating)
- 1 serial RS232 interface
- 1 slot for the CompactFlash card on which firmware and parameters are stored
- 3 test sockets and one reference ground for commissioning support
- 1 connection for the electronic power supply via the 24 V DC power supply connector
- 1 PE/ground conductor connection
- 1 safe standstill input (enable pulses) for controlling the connected PM340 Power Module
- 1 temperature sensor input (KTY84-130 or PTC)

The status of the CU310 DP Control Unit is indicated via multi-color LEDs.

A BOP20 Basic Operator Panel can also be snapped directly onto the CU310 DP Control Unit for diagnostic purposes.

As the firmware and parameter settings are stored on a plug-in CompactFlash card, the Control Unit can be changed without the need for software tools.

Integration

The CU310 DP Control Unit drives Power Modules in blocksize format via the PM-IF interface. In this case, other DRIVE-CLiQ components such as Sensor or Terminal Modules, can be connected to the DRIVE-CLiQ socket on the CU310 DP Control Unit.

Power Modules in chassis format are driven by the CU310 DP Control Unit via the DRIVE-CLiQ interface. With this option, Sensor and Terminal Modules must be connected to the free DRIVE-CLiQ sockets on the chassis Power Module.

Parameter settings can be changed with the BOP20 Basic Operator Panel. The BOP20 panel can also be snapped onto the CU310 DP Control Unit during operation to perform trouble-shooting procedures.

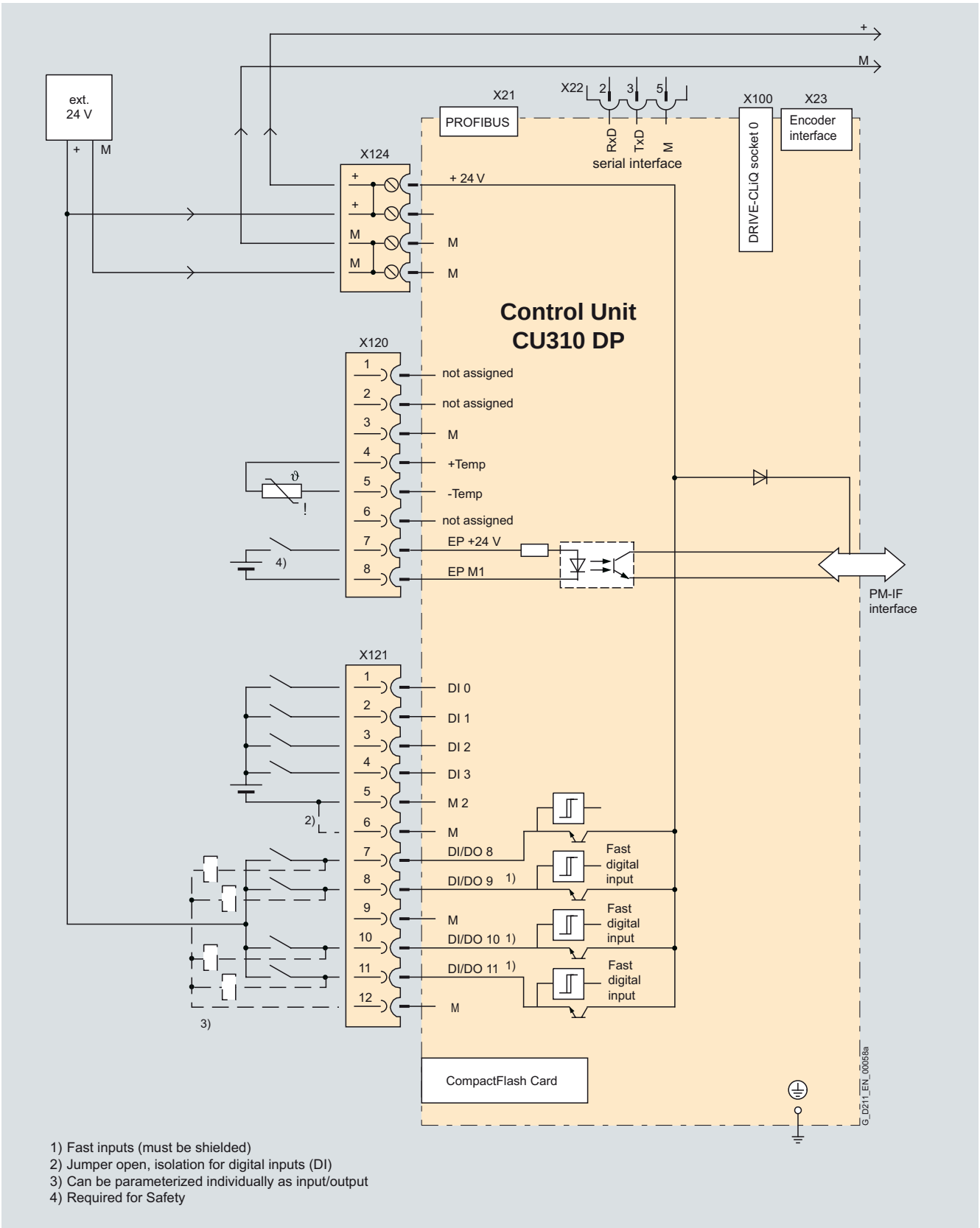
The CU310 DP Control Unit and other connected components are commissioned and diagnosed with the STARTER commissioning tool. The CU310 DP Control Unit requires a CompactFlash card with firmware version 2.4 or higher.

A CU310 DP Control Unit communicates with the higher-level control system using PROFIBUS and the PROFIdrive V4 profile.

An external 24 V power supply can be connected to the CU310 DP to power the Control Unit when the power connection for the Power Module is not energized.

3

Integration (continued)



1) Fast inputs (must be shielded)
2) Jumper open, isolation for digital inputs (DI)
3) Can be parameterized individually as input/output
4) Required for Safety

Connection example of CU310 DP Control Unit

Technical specifications

CU310 DP Control Unit 6SL3040-0LA00-0AA1	
Power requirement, max. At 24 V DC, without taking account of digital outputs and DRIVE-CLiQ supply	0.35 A for CU310 DP + 0.5 A for PM340 Power Module
• Conductor cross-section, max.	2.5 mm^2
• Fuse protection, max.	20 A
Digital inputs	In accordance with IEC 61131-2 Type 1 4 × floating digital inputs 4 bidirectional non-floating digital inputs/digital outputs
• Voltage	-3 … +30 V
• Low level (an open digital input is interpreted as "low")	-3 … +5 V
• High level	15 … 30 V
• Current consumption at 24 V DC, typ.	10 mA
• Delay time of digital inputs [1], approx.	
- L → H	50 µs
- H → L	100 µs
• Delay time of high-speed digital inputs [1], approx. (high-speed digital inputs can be used for position detection)	
- L → H	5 µs
- H → L	50 µs
• Conductor cross-section, max.	0.5 mm^2
Digital outputs Sustained short-circuit strength	4 bidirectional non-floating digital inputs/digital outputs
• Voltage	24 V DC
• Load current per digital output [2], max.	500 mA
• Delay time [1], typ./max.	
- L → H	150 µs/400 µs
- H → L	75 µs/100 µs
• Conductor cross-section, max.	0.5 mm^2
Encoder evaluation	• Incremental encoder TTL/HTL • SSI encoder without incremental signals
• Input impedance	
- TTL	570 Ω
- HTL, max.	16 mA
• Encoder supply	24 V DC/0.35 A or 5 V DC/0.35 A
• Encoder frequency, max.	300 kHz
• SSI baud rate	100 ... 250 kBaud
• Resolution absolute position SSI	30 bit
• Cable length, max.	
- TTL encoder	100 m (328 ft) (only bipolar signals permitted) [3]
- HTL encoder	100 m (328 ft) for unipolar signals 300 m (984 ft) for bipolar signals [3]
- SSI encoder	100 m (328 ft)
Power loss	< 20 W
PE connection	M5 screw
Dimensions	
• Width	73 mm (2.87 in)
• Height	183.2 mm (7.21 in)
• Depth	89.6 mm (3.53 in)
Weight, approx.	0.95 kg (2.09 lb)
Approvals, according to	cULus

Selection and ordering data

Description	Order No.
CU310 DP Control Unit Without CompactFlash card	**6SL3040-0LA00-0AA1**
Accessories	
PROFIBUS connectors	
• Without PG/PC connection	**6ES7972-0BA42-0XA0**
• With PG/PC connection	**6ES7972-0BB42-0XA0**
STARTER commissioning tool	**6SL3072-0AA00-0AG0**
Accessories for re-ordering	
Dust-proof blanking plugs (50 units) For DRIVE-CLiQ port	**6SL3066-4CA00-0AA0**

For further information on connectors and cables, please refer to Catalog IK PI or the Siemens Industry Mall:
www.siemens.com/industrymall

[1] The specified delay times refer to the hardware. The actual reaction time depends on the time slot in which the digital input or output is processed.

[2] In order to use the digital outputs, an external 24 V power supply must be connected to terminal X124.

[3] Signal cables twisted in pairs and shielded.

CU310 PN Control Unit

Overview

The CU310 PN Control Unit is designed for the communication and open-loop/closed-loop control functions of a Power Module. The CU310 PN combined with a Power Module and CompactFlash card creates a powerful single-axis AC drive. The communication link to the higher-level control is provided by PROFINET IO.

Design

CU310 PN Control Units feature the following interfaces as standard:

- 1 DRIVE-CLiQ socket for communication with other DRIVE-CLiQ devices, e.g. Sensor or Terminal Modules
- 1 PM-IF interface for communication with Power Modules in blocksize format
- 1 interface to the BOP20 Basic Operator Panel
- 1 PROFINET interface with 2 ports (RJ45 sockets) with PROFIdrive V4 profile
- 1 encoder evaluation
  The following encoder signals can be evaluated:
  - Incremental encoder TTL/HTL
  - SSI encoder without incremental signals
- 4 parameterizable digital inputs (floating)
- 4 parameterizable bidirectional digital inputs/digital outputs (non-floating)
- 1 serial RS232 interface
- 1 slot for the CompactFlash card on which firmware and parameters are stored
- 3 test sockets and one reference ground for commissioning support
- 1 connection for the electronic power supply via the 24 V DC power supply connector
- 1 safe standstill input (enable pulses) for controlling the connected PM340 Power Module
- 1 temperature sensor input (KTY84-130 or PTC)
- 1 PE/ground conductor connection

The status of the CU310 PN Control Unit is indicated via multi-color LEDs.

A BOP20 Basic Operator Panel can also be snapped directly onto the CU310 PN Control Unit for diagnostic purposes.

As the firmware and parameter settings are stored on a plug-in CompactFlash card, the Control Unit can be changed without the need for software tools.

Integration

The CU310 PN Control Unit drives Power Modules in blocksize format via the PM-IF interface. In this case, other DRIVE-CLiQ components such as Sensor or Terminal Modules can be connected to the DRIVE-CLiQ socket on the CU310 PN Control Unit.

Power Modules in chassis format are driven by the CU310 PN Control Unit via the DRIVE-CLiQ interface. With this option, Sensor and Terminal Modules must be connected to the free DRIVE-CLiQ sockets on the chassis Power Module.

Parameter settings can be changed with the BOP20 Basic Operator Panel. The BOP20 panel can also be snapped onto the CU310 PN Control Unit during operation to perform trouble-shooting procedures.

The CU310 PN Control Unit and other connected components are commissioned and diagnosed with the STARTER commissioning tool. The CU310 PN Control Unit requires a CompactFlash card with firmware version 2.4 or higher.

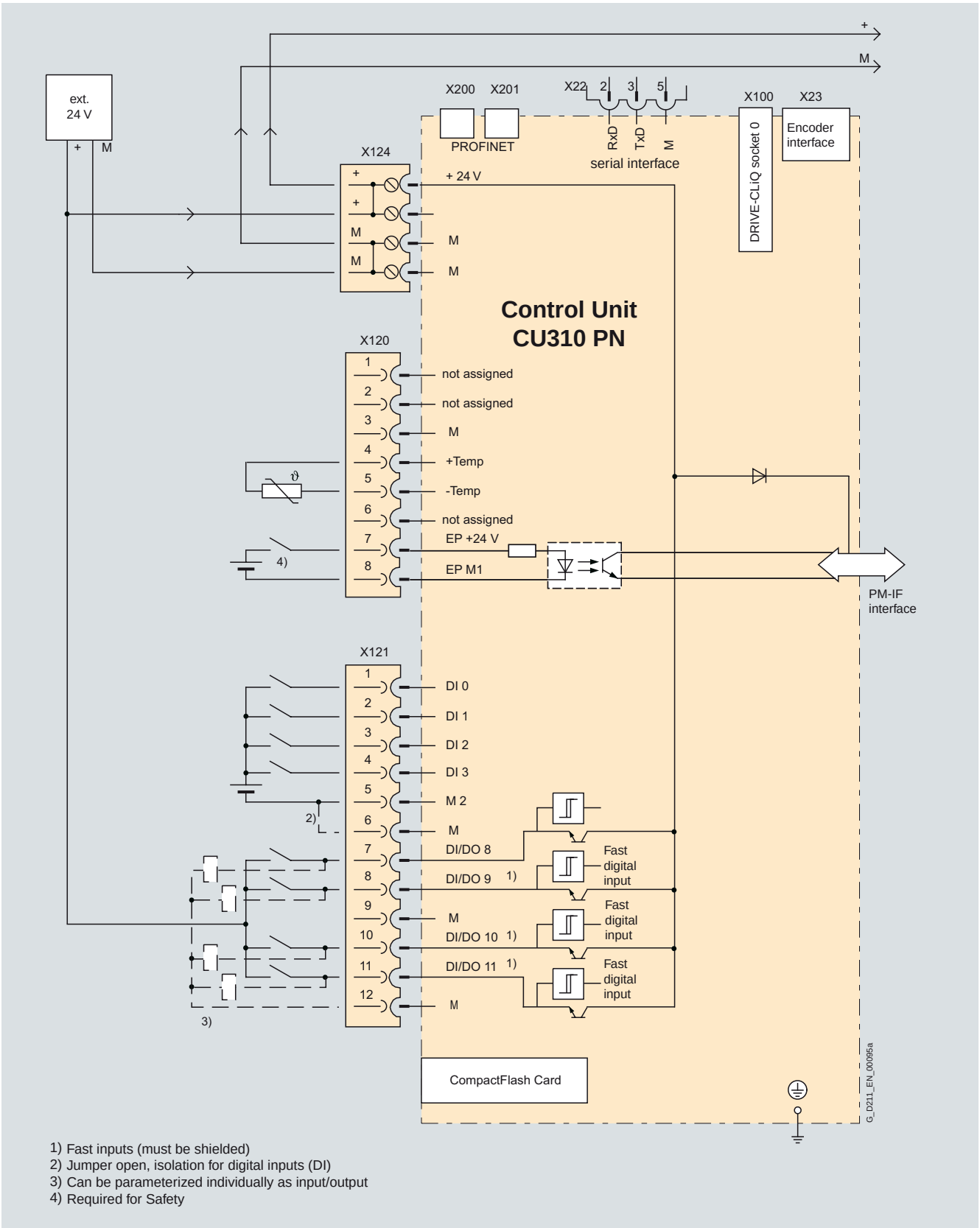
A CU310 PN Control Unit communicates with the higher-level control system using PROFINET IO and the PROFIdrive V4 profile.

The SINAMICS S120 drive system with CU310 PN then assumes the function of a PROFINET IO device and can perform the following functions:

- PROFINET IO device
- 100 Mbit/s full duplex
- Supports real-time classes of PROFINET IO:
  - RT (Real-Time)
  - IRT (Isochronous Real-Time), minimum send cycle 500 µs
- Connects to controls as PROFINET IO devices using PROFIdrive compliant with Specification V4
- Standard TCP/IP communication for engineering processes using the STARTER commissioning tool
- Integrated 2-port switch with 2 RJ45 sockets based on the ERTEC ASIC. The optimum topology (line, star, tree) can therefore be configured without additional external switches.

An external 24 V power supply can be connected to the CU310 PN to power the Control Unit when the power connection for the Power Module is not energized.

Integration (continued)



1) Fast inputs (must be shielded)
2) Jumper open, isolation for digital inputs (DI)
3) Can be parameterized individually as input/output
4) Required for Safety

Connection example of CU310 PN Control Unit

CU310 PN Control Unit

Technical specifications

CU310 PN Control Unit 6SL3040-0LA01-0AA1	
Power requirement, max. At 24 V DC without taking account of digital outputs and DRIVE-CLiQ supply	0.4 A for CU310 PN + 0.5 A for PM340 Power Module
Conductor cross-section, max.	2.5 mm^2
Fuse protection, max.	20 A
Digital inputs	In accordance with IEC 61131-2 Type 1 4 × floating digital inputs 4 bidirectional non-floating digital inputs/digital outputs
• Voltage	-3 … +30 V
• Low level (an open digital input is interpreted as "low")	-3 … +5 V
• High level	15 … 30 V
• Current consumption at 24 V DC, typ.	10 mA
• Delay time of digital inputs [1], approx.	
- L → H	50 µs
- H → L	100 µs
• Delay time of high-speed digital inputs [1], approx. (high-speed digital inputs can be used for position detection)	
- L → H	5 µs
- H → L	50 µs
• Conductor cross-section, max.	0.5 mm^2
Digital outputs Sustained short-circuit strength	4 bidirectional non-floating digital inputs/digital outputs
• Voltage	24 V DC
• Load current per digital output [2], max.	500 mA
• Delay time [1], typ./max.	
- L → H	150 µs/400 µs
- H → L	75 µs/100 µs
• Conductor cross-section, max.	0.5 mm^2
Encoder evaluation	• Incremental encoder TTL/HTL • SSI encoder without incremental signals
• Input impedance	
- TTL	570 Ω
- HTL, max.	16 mA
• Encoder supply	24 V DC/0.35 A or 5 V DC/0.35 A
• Encoder frequency, max.	300 kHz
• SSI baud rate	100 ... 250 kBaud
• Resolution absolute position SSI	30 bit
• Cable length, max.	
- TTL encoder	100 m (328 ft) (only bipolar signals permitted) [3]
- HTL encoder	100 m (328 ft) for unipolar signals 300 m (984 ft) for bipolar signals [3]
- SSI encoder	100 m (328 ft)
Power loss	< 20 W
PE connection	M5 screw
Dimensions	
• Width	73 mm (2.87 in)
• Height	183.2 mm (7.21 in)
• Depth	89.6 mm (3.53 in)
Weight, approx.	0.95 kg (2.09 lb)
Approvals, according to	cULus

Selection and ordering data

Description	Order No.
CU310 PN Control Unit Without CompactFlash card	**6SL3040-0LA01-0AA1**
Accessories	
Industrial Ethernet FC	
• RJ45 Plug 180 (1 unit)	**6GK1901-1BB10-2AA0**
• RJ45 Plug 180 (10 units)	**6GK1901-1BB10-2AB0**
• Stripping tool	**6GK1901-1GA00**
• Standard cable GP 2x2	**6XV1840-2AH10**
• Flexible cable GP 2x2	**6XV1870-2B**
• Trailing cable GP 2x2	**6XV1870-2D**
• Trailing cable 2x2	**6XV1840-3AH10**
• Marine cable 2x2	**6XV1840-4AH10**
STARTER commissioning tool	**6SL3072-0AA00-0AG0**
Accessories for re-ordering	
Dust-proof blanking plugs (50 units) For DRIVE-CLiQ port	**6SL3066-4CA00-0AA0**

For further information on connectors and cables, please refer to Catalog IK PI or the Siemens Industry Mall:
www.siemens.com/industrymall

[1] The specified delay times refer to the hardware. The actual reaction time depends on the time slot in which the digital input or output is processed.

[2] In order to use the digital outputs, an external 24 V power supply must be connected to terminal X124.

[3] Signal cables twisted in pairs and shielded.

Overview

The CompactFlash card contains the firmware and parameter settings. The CompactFlash card is plugged into the correct slot on the CU310 Control Unit.

Design

A CU310 Control Unit can perform the communication, open-loop and closed-loop control functions for one Power Module. The performance expansion is not required in this case.

In addition to the firmware, the CompactFlash card also contains licensing codes which are required to enable firmware options. To order the Safety Integrated Extended Functions (Safe Stop 2, Safe Operating Stop, Safely Limited Speed, Safe Speed Monitor), order codes must be stated (**F..**) in addition to the Order No. based on the number of axes requiring the Safety License.

The firmware options can also be enabled on-site, for example, if the Safety Integrated Extended Functions are to be enabled retrospectively. You will need the serial number of the CompactFlash card and the order number of the firmware option to be enabled. With this information, you can purchase the associated license code from a license database and enable the firmware option. The license code is only valid for the CompactFlash card declared and cannot be transferred to other CompactFlash cards.

Selection and ordering data

Description	Order No.
CompactFlash card for CU310 DP, CU310 PN Control Units With firmware version 2.6 including Certificate of License	**6SL3054-0CG00-1AA0**
• With safety license for 1 axis	**6SL3054-0CG00-1AA0-Z F01**
Firmware license Safety Integrated Extended Functions option including Certificate of License for one axis for upgrading the license of a CompactFlash card.	**6SL3074-0AA10-0AA0**

More information

Firmware version

The firmware version is encoded as follows in the order number printed on the CompactFlash card:

Order No.	6SL3054-	0 ■ ■ 0 0 -1AA0
Firmware version		↑
	1	B
	2	C
Version		↑
	.1	B
	.2	C
	.3	D
	.4	E
	.5	F
	.6	G

Example 1:

A CompactFlash card with firmware version 2.5 and a Safety license for a CU310 PN Control Unit are required:
Order No. 6SL3054-0CF00-1AA0-Z
F01

CU320-2 DP Control Unit

Overview

The communication, open-loop and closed-loop control functions for one or more Motor Modules and the Line Module are executed in a CU320-2 DP Control Unit. The CU320-2 DP Control Unit is designed for multi-axis operation.

Design

CU320-2 DP Control Unit with BOP20 Basic Operator Panel

The CU320-2 DP Control Unit has the following interfaces and connections as standard:

- 4 × DRIVE-CLiQ sockets for communication with other DRIVE-CLiQ devices, e.g., Motor Modules, Active Line Modules, Sensor Modules, Terminal Modules
- 1 PROFIBUS interface with PROFIdrive V4 profile
- 12 parameterizable digital inputs (floating)
- 8 parameterizable bidirectional digital inputs/digital outputs (non-floating)
- 1 serial RS232 interface
- 1 interface for the BOP20 Basic Operator Panel
- 1 slot for the CompactFlash card on which firmware and parameters are stored
- 1 slot for mounting an option module (e.g. TB30 Terminal Board)
- 2 rotary coding switches for manually setting the PROFIBUS address
- 1 Ethernet interface for commissioning and diagnostics
- 3 test sockets and one reference ground for commissioning support
- 1 connection for the electronics power supply via the 24 V DC power supply connector
- 1 PE (protective earth) connection
- 1 ground connection

A shield connection for the signal cable shield on the option module is located on the CU320-2 DP Control Unit.

The available option slot is used to expand the interfaces, for example, to include additional terminals or for communication purposes.

The status of the CU320-2 DP Control Unit is indicated via multicolor LEDs.

As the firmware and parameter settings are stored on a plug-in CompactFlash card, the Control Unit can be changed without the need for software tools.

The CU320-2 DP Control Unit can be mounted on the side of the Line Module in booksize format via brackets integrated in a Line Module. The CU320-2 DP Control Unit can also be fixed to the wall of the control cabinet using the integrated fixing lugs. As the CU320-2 DP Control Unit is not as deep as the Line Modules, suitable spacers are available to increase the depth of the CU320-2 DP Control Unit to 270 mm (10.63 in).

Integration

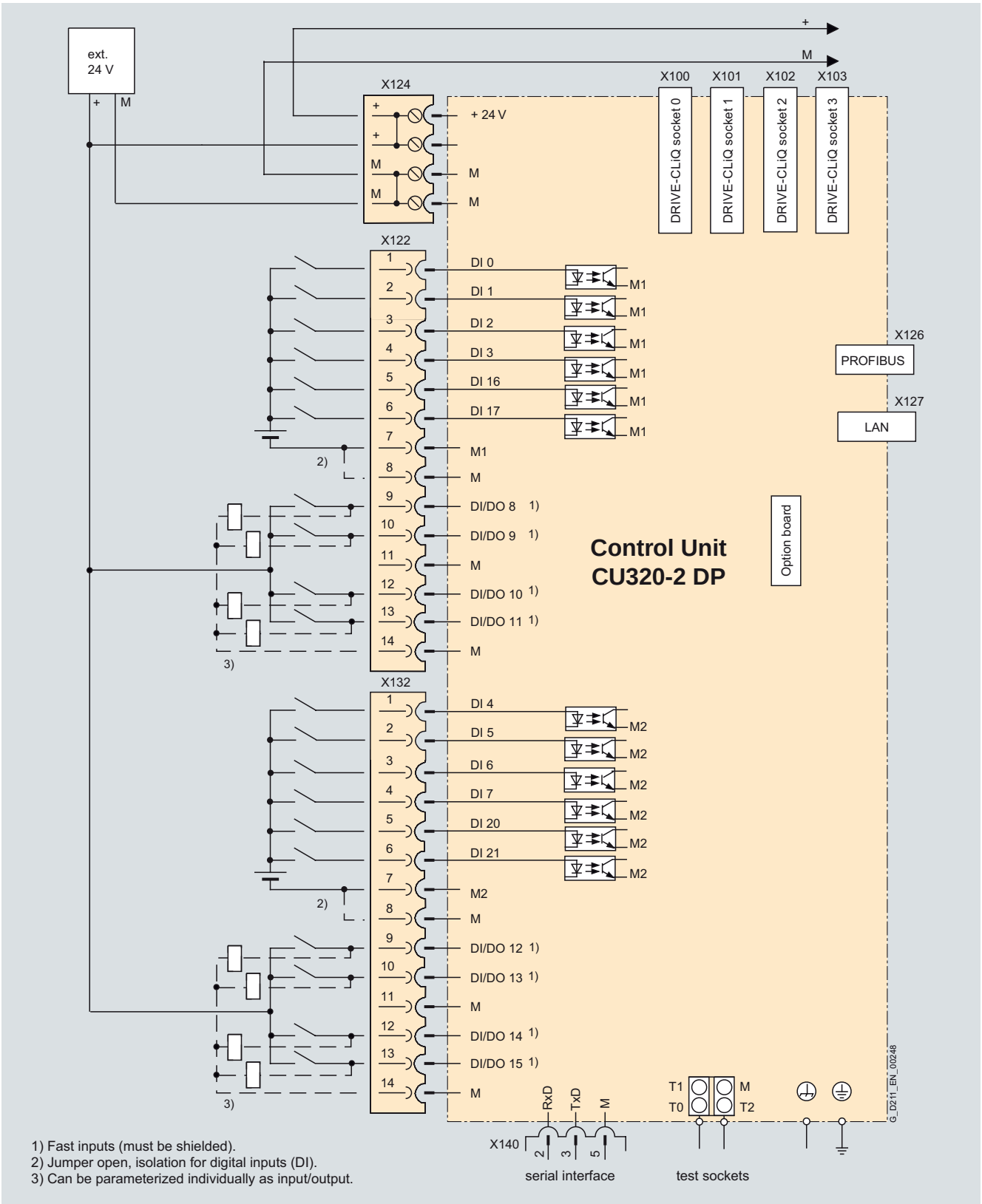
DRIVE-CLiQ components, for example, Motor Modules and Active Line Modules, are connected to a CU320-2 DP Control Unit. The number of modules depends on the performance required, including duty type and additional functions.

The BOP20 Basic Operator Panel can also be snapped onto the CU320-2 DP Control Unit during operation to perform troubleshooting procedures.

The CU320-2 DP Control Unit and other connected components are commissioned and diagnosed with the STARTER commissioning tool (version 4.1 and higher, SP5) and installed SINAMICS Support Package SSP_SINAMICS_V4_3_1.

The CU320-2 DP Control Unit requires a CompactFlash card with firmware version 4.3 or higher.

Integration (continued)



Connection example of a CU320-2 DP Control Unit

CU320-2 DP Control Unit

Technical specifications

CU320-2 DP Control Unit 6SL3040-1MA00-0AA0	
Power requirement, max. At 24 V DC, without taking account of digital outputs, expansion option slot and DRIVE-CLiQ supply	1.0 A
Conductor cross-section, max.	2.5 mm^2
Fuse protection, max.	20 A
Digital inputs	In accordance with IEC 61131-2 type 1 12 × floating digital inputs 8 bidirectional non-floating digital inputs/digital outputs
• Voltage	-3 … +30 V
• Low level (an open digital input is interpreted as "low")	-3 … +5 V
• High level	15 … 30 V
• Current consumption at 24 V DC, typ.	9 mA
• Delay time of digital inputs [1], approx.	
- L → H	5 µs
- H → L	50 µs
• Conductor cross-section, max.	1.5 mm^2
Digital outputs Sustained short-circuit strength	8 bidirectional non-floating digital inputs/digital outputs
• Voltage	24 V DC
• Load current per digital output, max.	500 mA
• Delay time [1], typ./max.	
- L → H	150 µs/400 µs
- H → L	75 µs/100 µs
• Conductor cross-section, max.	1.5 mm^2
Power loss	24 W
PE connection	M5 screw
Ground connection	M5 screw
Dimensions	
• Width	50 mm (1.97 in)
• Height	300 mm (11.81 in)
• Depth	226 mm (8.90 in)
Weight, approx.	2.3 kg (4.5 lb)
Approvals, according to	cULus

Selection and ordering data

Description	Order No.
CU320-2 DP Control Unit Without CompactFlash card	**6SL3040-1MA00-0AA0**
Accessories	
PROFIBUS connectors	
• Without PG/PC connection	**6ES7972-0BA42-0XA0**
• With PG/PC connection	**6ES7972-0BB42-0XA0**
Spacers (2 units) For increasing the depth of the CU320-2 DP Control Unit to 270 mm (if the integrated brackets are not used, but the depth still has to be 270 mm)	**6SL3064-1BB00-0AA0**
STARTER commissioning tool	**6SL3072-0AA00-0AG0**
Accessories for re-ordering	
Dust-proof blanking plugs (50 units) For DRIVE-CLiQ port	**6SL3066-4CA00-0AA0**

[1] The specified delay times refer to the hardware. The actual reaction time depends on the time slot in which the digital input or output is processed.

Overview

The CompactFlash card contains the firmware and parameter settings. It is inserted into the appropriate slot on the CU320-2 DP Control Unit.

Design

A CU320-2 Control Unit can perform the communication, open-loop and closed-loop control functions for several Motor Modules. The computing capacity requirement increases in proportion to the number of connected Motor Modules and system components and in relation to the dynamic response required. The performance expansion is required for the CU320-2 Control Unit for 4 axes or more. The utilization of the CU320-2 Control Unit can be calculated with the SIZER configuration tool.

In addition to the firmware, the CompactFlash card also contains licensing codes which are required to enable firmware options (the performance expansion and the Safety Integrated Extended Functions in the current version). To order the Safety Integrated Extended Functions (see chapter Safety Integrated), order codes must be stated (**F..**) in addition to the Order No. which contains the required number of axis.

The firmware options can also be enabled on-site, for example, if the performance expansions required are not known at the time of placing the order or the Safety Integrated Extended Functions must be enabled retrospectively. You will need the serial number of the CompactFlash card and the order number of the firmware option to be enabled. With this information, you can purchase the associated license code from a license database and enable the firmware option. The license code is only valid for the CompactFlash card declared and cannot be transferred to other CompactFlash cards.

Selection and ordering data

Description	Order No.
CompactFlash card for CU320-2 DP Control Unit	
With firmware version 4.3 including Certificate of License	
• Without performance expansion	**6SL3054-0ED00-1BA0**
• With performance expansion firmware option	**6SL3054-0ED01-1BA0**
• With safety license for 1 axis	**6SL3054-0ED0■-1BA0-Z F01**
• With safety license for 2 axes	**6SL3054-0ED0■-1BA0-Z F02**
• With safety license for 3 axes	**6SL3054-0ED0■-1BA0-Z F03**
• With safety license for 4 axes	**6SL3054-0ED01-1BA0-Z F04**
• With safety license for 5 axes	**6SL3054-0ED01-1BA0-Z F05**
• With safety license for 6 axes	**6SL3054-0ED01-1BA0-Z F06**
Without performance expansion	**0**
With performance expansion firmware option	**1**
Firmware license	
• Performance expansion option including Certificate of License for upgrading the license of a CompactFlash card	**6SL3074-0AA01-0AA0**
• Safety Integrated Extended Functions option including Certificate of License for one axis for upgrading the license of a CompactFlash card. This option must be ordered once per axis, up to 5 times for one CompactFlash card	**6SL3074-0AA10-0AA0**

More information

Firmware version

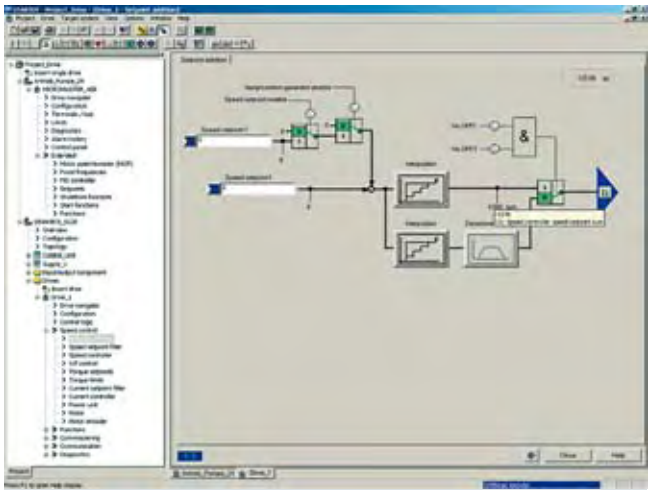
The firmware version is encoded as follows in the order number printed on the CompactFlash card:

Order No.	6SL3054-	0 ■ ■ 0 ■ -1BA0
Firmware version		↑
	4	E
Version		↑
	.1	B
	.2	C
	.3	D
	.4	E
	.5	F
	.6	G
		↑
Without performance expansion		0
With performance expansion		1

The actual firmware version at the press-time of this catalog is version 4.3.

STARTER commissioning tool

Overview



The user-friendly STARTER commissioning tool can be used for:

- Commissioning,
- Optimizing and
- Diagnostics

This software can be operated either as a standalone PC application, integrated in SIMATIC STEP 7 with TIA compatibility via Drive ES Basic, or it can be integrated into the SCOUT engineering system (for SIMOTION). The basic functions and handling are the same in both cases.

In STARTER, MICROMASTER 4 devices and the SIMATIC ET 200S FC and SIMATIC ET 200pro FC frequency converters are also supported in addition to the SINAMICS drives.

The project wizards can be used to create the drives within the structure of the project tree.

Beginners are supported by solution-based dialog guidance, whereby a standard graphics-based display maximizes clarity when setting the drive parameters.

First commissioning is guided by a wizard which makes all the basic settings in the drive. Therefore, getting a motor up and running is merely a question of setting a few of the drive parameters as part of the drive configuration process.

The individual settings required are made using graphics-based parameterization screens, which also precisely visualize the principle of operation of the drive.

Examples of individual settings that can be made include:

- How terminals are used
- Bus interface
- Setpoint channel (e.g., fixed setpoints)
- Closed-loop speed control (e.g., ramp-function generator, limits)
- BICO interconnections
- Diagnostics

For experts, the expert list can be used to specifically and quickly access individual parameters at any time. An individual compilation of frequently used parameters can be saved in dedicated user lists.

In addition, the following functions are available for optimization purposes:

- Self-optimization of the controller settings (depending on drive unit)
- Trace (for SINAMICS S120 only)

Diagnostics functions provide information about:

- Control/status words
- Parameter status
- Conditions of use
- Communication states

Performance features

- User-friendly: Only a small number of settings need to be made for successful first commissioning: The motor starts to rotate
- Solution-based dialog-based user guidance simplifies commissioning
- Self-optimization functions reduce manual effort for optimization

Minimum hardware and software requirements

PG or PC Pentium III min. 800 MHz (1 GHz recommended)

512 MB main memory (1 GB recommended)

Screen resolution 1024 × 768 pixels, 16 bit color depth

Free hard disk memory: min. 2 GB

Microsoft Windows 2000 SP4

Microsoft Windows 2003 Server SP1, SP2

Microsoft Windows XP Professional SP2, SP3

Microsoft Windows Vista Business SP1 *)

Microsoft Windows Vista Ultimate SP1 *)

Microsoft Internet Explorer V6.0 or higher

Integration

The SINAMICS S120/SINAMICS S150 Control Units can communicate with one another via PROFIBUS or PROFINET/Ethernet, or over a serial RS232 interface, depending on the Control Unit version (DP or PN).

The PG/PC will require a PROFIBUS communications board and a connecting cable for this purpose.

If the optional CBE20 PROFINET Communication Board is available, this can be used instead to provide an Ethernet communications link between the CU320-2 and PG/PC.

Selection and ordering data

Description	Order No.
STARTER commissioning tool for SINAMICS and MICROMASTER English, French, German, Italian, Spanish	**6SL3072-0AA00-0AG0**

*) DCC cannot be used. STARTER can be used on these operating systems only if it does not include the DCC option.

Accessories

Connection

Depending on the version of the Control Unit, the Control Unit (CU) of the drive can communicate with the programming device (PG) or PC via a serial interface, PROFIBUS, or Ethernet/PROFINET. The following accessories are available for the particular drive system as listed in the following table.

Selection and ordering data

Description	Order No.
RS232 SIMATIC S7 connecting cable RS232 null-modem cable, 6 m (19.7 ft)	**6ES7901-1BF00-0XA0**
PROFIBUS communications module CP 5512 PCMCIA type 2 card + adapter with 9-pin SUB-D socket, for Windows 2000/XP Professional and PCMCIA 32	**6GK1551-2AA00**
SIMATIC DP plug-in cable 12 Mbaud, for PG connector, pre-assembled with 2 × 9-pin SUB-D connector, 3 m (9.8 ft)	**6ES7901-4BD00-0XA0**
PROFINET/Ethernet Standard CAT5 Ethernet cable or PROFINET cable is required.	

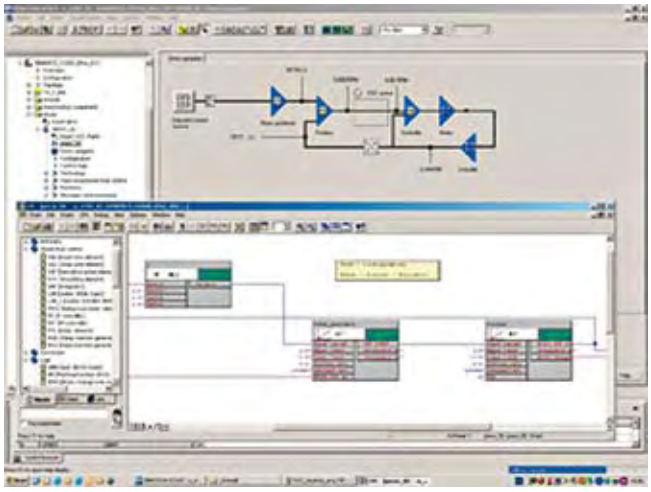
More information

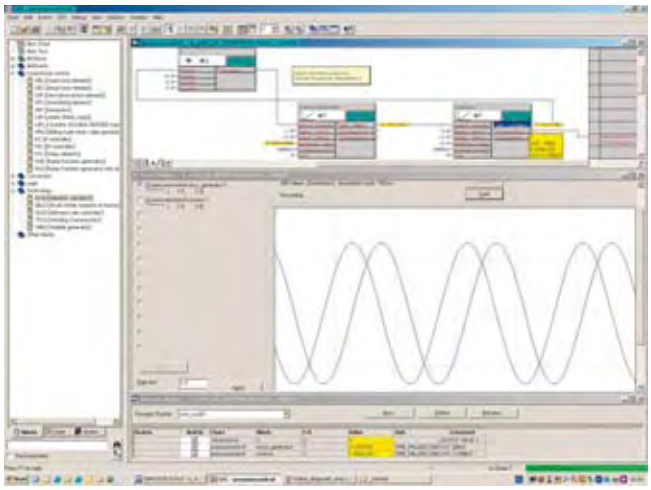
Updates for the STARTER commissioning are also available on the Internet at
http://support.automation.siemens.com/WW/view/com/10804985/133100

Drive Control Chart (DCC)

Overview

Drive Control Chart (DCC) expands the scope of device functions by means of freely available closed-loop control, calculation and logic modules and offers a means by which technological functions can be graphically configured in the SINAMICS S120 drive system. DCC is installed as a supplementary application to the STARTER commissioning tool.





Drive Control Chart expands the facility for the simplest possible configuring of technological functions both for the Motion Control System SIMOTION as well as for the SINAMICS S120 drive system. For users, this opens up a new dimension regarding the adaptability of the systems mentioned to the specific functions of their machines. DCC has no restrictions with regard to the number of usable functions; this is only limited by the performance capability of the target platform.

The user-friendly DCC editor enables easy graphics-based configuration, allows control loop structures to be clearly represented and provides a high degree of reusability of diagrams that have already been created.

The open-loop and closed-loop control functions are defined by using multi-instance-capable blocks (Drive Control Blocks (DCBs)) from a pre-defined library (DCB library) that are selected and graphically linked with one another by dragging and dropping. Test and diagnostic functions allow the program behavior to be verified and in the case of a fault, the cause identified.

The block library encompasses a large selection of closed-loop, arithmetic and logic blocks, as well as comprehensive open-loop and closed-loop control functions.

For logically combining, evaluating and acquiring binary signals, all commonly used logic functions are available for selection (AND, XOR, on/off delay, RS flipflop, counter, etc.). A wide range of arithmetic functions, such as absolute value generation, dividers and minimum/maximum evaluation are available to monitor and evaluate numerical quantities. In addition to the closed-loop drive control, axial winder functions, closed-loop PI controllers, ramp-function generators or wobble generators can be configured simply and easily.

Closed-loop control structures can be programmed with almost no restrictions in conjunction with the SIMOTION motion control system. These can then be combined with other program sections to form an overall program.

Drive Control Chart for SINAMICS S120 also provides a convenient basis for resolving drive-level open-loop and closed-loop control tasks directly in the converter. This further extends the possibility of adapting SINAMICS to the particular application. Local data processing in the drive supports the implementation of modular machine concepts and results in an increase in the overall machine performance.

Minimum hardware and software requirements

See the SCOUT or STARTER engineering software, since DCC is installed and integrated into these programs.

Selection and ordering data

DCC comprises the graphical configuring tool (DCC Editor) and the block library (DCB Library).

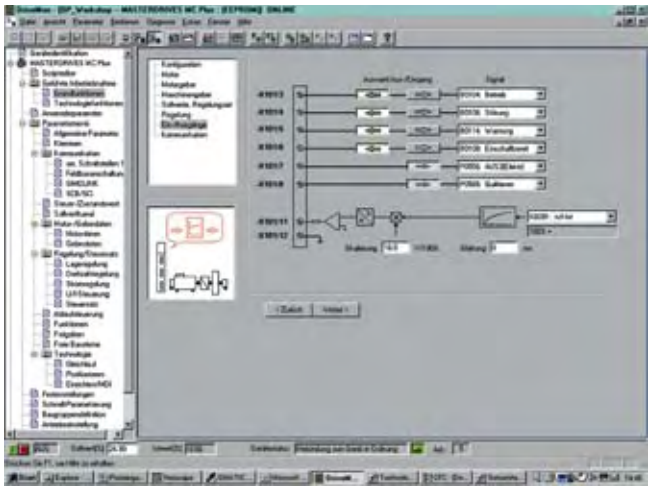
DCC is installed in addition to the SCOUT or STARTER engineering software.

The necessary engineering license for each PC (floating) for DCC is acquired at the same time the order is placed; additional runtime licenses are not required.

DCC can be ordered in two versions: The version for SIMOTION and SINAMICS applications, or as version for SINAMICS applications only.

Description	Order No.
DCC-SIMOTION/-SINAMICS V2.0 SP5 for SCOUT/STARTER V4.1 SP5 (single Engineeering License with DCC data carrier) DCC editor + DCB libraries for use on SIMOTION V4.1 SP5 and SINAMICS S120 V2.6 SP2 / V4.3 SP1 English, French, German, Italian (SIMOTION) English, French, German, Italian, Spanish (SINAMICS)	**6AU1810-1JA20-5XA0**
DCC-SINAMICS V2.0 SP5 for STARTER V4.1 SP5 (single Engineeering License with DCC data carrier) DCC editor + DCB library for use on SINAMICS S120 V2.6 SP2 / V4.3 SP1 English, French, German, Italian, Spanish	**6AU1810-1HA20-5XA0**

Overview



Drive ES is the engineering system used to integrate Siemens drive technology into the SIMATIC automation world easily, efficiently and cost-effectively in terms of communication, configuration and data management.

It is based on the operator interface of the STEP 7 Manager, the essential element when it comes to engineering.

Various software packages are available for selection:

- **Drive ES Basic** for first-time users of the world of Totally Integrated Automation and the option for routing beyond network limits along with the use of the SIMATIC TeleService. Drive ES Basic is the basic software program for setting the parameters of all drives online and offline. Drive ES Basic enables both the automation system and drives to the handled via the SIMATIC Manager user interface. Drive ES Basic is the starting point for common data archiving for complete projects and for extending the use of the SIMATIC teleservice to drives. Drive ES Basic provides the configuration tools for the new Motion Control functions – slave-to-slave communication, equidistance and isochronous operation with PROFIBUS DP.
- **Drive ES SIMATIC** simple parameterization of the STEP 7 communication instead of programming. In order to use Drive ES SIMATIC, STEP 7 must be installed. It features a SIMATIC function block library, thereby making the programming of the PROFIBUS and/or PROFINET IO interface in the SIMATIC CPU for the drives easy and secure.
  There is no need for separate, time-consuming programming of the data exchange between the SIMATIC CPU and the drive.
  All Drive ES users need to remember is:
  Copy – Modify – Load – Finished.
  Customized, fully-developed function blocks are copied from the library into user-specific projects.
  Frequently-used functions are set to run in program format:
  - The complete diagnostics memory is automatically read-out of the drive
  - Download complete parameter set automatically from the SIMATIC CPU to the drive, e.g. when a device has to be replaced.
  - Automatically download partial parameter sets (e.g. for recipe or product change) from the SIMATIC CPU to the drive
  - Upload the complete parameter assignment or partial parameter sets from the drive to the SIMATIC CPU, that needs update.

  Detailed contents of the Drive ES SIMATIC package:
  - **"PROFIBUS DP" communications software** for S7-300 with CPUs with integrated DP interface (function block libraries DRVDPS7, POSMO) S7-400 with CPUs with integrated DP interface or with CP443-5 (DRVDPS7, POSMO function block libraries) and S7-300 with CP342-5 (DRVDPS7C function block library)
  - **"USS protocol" communications software** for S7-300 with integral PtP interfaces or with CP 340/341 and S7-400 with CP 441 (DRVUSSS7 function block library)
  - **STEP 7 slave object manager** for the easy configuration of drives as well as for non-cyclic PROFIBUS DP communication with the drives; supports the conversion of DVA_S7 to Drive ES projects (V5.1 and higher)
  - **STEP 7 device object manager** for convenient configuration of drives with PROFINET IO interfaces (V5.4 and higher)
  - SETUP program **for installing the software in the STEP 7** environment
  - **"PROFINET IO" communications software** for S7-300 with CPUs with integral PN interface, S7-400 with CPUs with integral PN interface or with CP (DRVDPS7 block library, respectively). PROFINET IO and PROFIBUS DP use the same blocks from the DRVDPS7 library, i.e. the blocks are able to serve both buses with a common block (only for V5.4 and higher)
- **Drive ES PCS7**
  requires that SIMATIC PCS7 (version 5.2 and higher) has first been installed. Drive ES PCS7 provides a function block library with function blocks for the drives and the corresponding faceplates for the operator station which enables the drives to be operated from the PCS7 process control system. From version V6.1 and higher, drives will also be able to be represented in the PCS7 Maintenance Station.

  Detailed contents of the Drive ES PCS7 package:
  - **Block library for SIMATIC PCS7** Faceplates and control blocks for SIMOVERT MASTERDRIVES VC and MC, as well as MICRO-/MIDIMASTER of the third and fourth generation and SIMOREG DC MASTER and SINAMICS
  - **STEP 7 slave object manager** for convenient configuration of drives and acyclic PROFIBUS DP communications with the drives
  - **SETUP program** for installing the software in the PCS 7 environment

Drive ES engineering software

Selection and ordering data

Description	Order No.
Drive ES Basic V5.4 SPx [1] • Configuration software for the integration of drives into Totally Integrated Automation • Precondition: STEP 7, V5.3 and higher, SP 3 • Supplied as: CD-ROM Ger., Eng., Fr., Sp., It. with electronic documentation	
Floating license, 1 user	**6SW1700-5JA00-4AA0**
Floating license (copy license), 60 users	**6SW1700-5JA00-4AA1**
Update service for single-user license	**6SW1700-0JA00-0AB2**
Update service for copy license	**6SW1700-0JA00-1AB2**
Upgrade from V5.x to V5.4 SPx [*]	**6SW1700-5JA00-4AA4**
Drive ES SIMATIC V5.4 SPx [1] • Function block library for SIMATIC for the parameterization of communication with the drives • Precondition: STEP 7, V5.3 and higher, SP3 • Supplied as: on CD-ROM Ger., Eng., Fr., Sp., It. with electronic documentation	
Single-user license incl. 1x runtime license	**6SW1700-5JC00-4AA0**
Runtime license (without data carrier)	**6SW1700-5JC00-1AC0**
Update service for single-user license	**6SW1700-0JC00-0AB2**
Upgrade from V5.x to V5.4 SPx [*]	**6SW1700-5JC00-4AA4**
Drive ES PCS7 V6.1 SPx [1] • Block library for PCS7 for the integration of drives • Precondition: PCS7, V6.1 and higher • Supplied as: on CD-ROM Ger., Eng., Fr., Sp., It. with electronic documentation	
Single-user license incl. 1x runtime license	**6SW1700-6JD00-1AA0**
Runtime license (without data carrier)	**6SW1700-5JD00-1AC0**
Update service for single-user license	**6SW1700-0JD00-0AB2**
Upgrade from V5.x to V6.1 SPx [*]	**6SW1700-6JD00-1AA4**
Drive ES PCS7 V7.0 SPx [1] • Block library for PCS7 for the integration of drives • Precondition: PCS7, V7.0 and higher • Supplied as: on CD-ROM Ger., Eng., Fr., Sp., It. with electronic documentation	
Single-user license incl. 1x runtime license	**6SW1700-7JD00-0AA0**
Runtime license (without data carrier)	**6SW1700-5JD00-1AC0**
Update service for single-user license	**6SW1700-0JD00-0AB2**
Upgrade from V5.x to V7.0 SPx [*]	**6SW1700-7JD00-0AA4**
Drive ES PCS7 V7.1 SPx [1] • Block library for PCS7 for the integration of drives • Precondition: PCS7, V7.1 and higher • Supplied as: on CD-ROM Ger., Eng., Fr., Sp., It. with electronic documentation	
Single-user license incl. 1x runtime license	**6SW1700-7JD00-1AA0**
Runtime license (without data carrier)	**6SW1700-5JD00-1AC0**
Update service for single-user license	**6SW1700-0JD00-0AB2**
Upgrade from V6.x to V7.1 SPx [1]	**6SW1700-7JD00-1AA4**

Further information is available on the Internet under:
www.siemens.com/drivesolutions

[1] Orders are always automatically supplied with the latest SP.

Design

PM340 Power Modules in blocksize format, frame sizes FSA to FSF

The PM340 Power Modules in blocksize format feature the following connections and interfaces as standard:

- Line connection
- PM-IF interface for connection of the PM340 Power Module and CU310/SIMOTION D410 Control Unit or CUA31/CUA32 Control Unit Adapter. The PM340 Power Module also supplies power to the CU310/SIMOTION D410 Control Unit or CUA31/CUA32 Control Unit Adapter by means of an integrated power supply
- Terminals DCP/R1 and R2 for connection of an external braking resistor
- Motor connection made with screw-type terminals or screw studs
- Control circuit for the Safe Brake Relay to control a holding brake
- 2 PE (protective earth) connections

Power Modules without integrated line filter can be connected to grounded TN/TT systems and non-grounded IT systems. Power Modules with integrated line filter are suitable only for connection to TN systems with grounded star points.

The integrated Braking Unit (Braking Chopper) is rated with the capability to continuously utilize the braking resistor. The temperature of the external braking resistor must be monitored (i.e. thermostatic switch) to provide protection against thermal overloading.

Integration

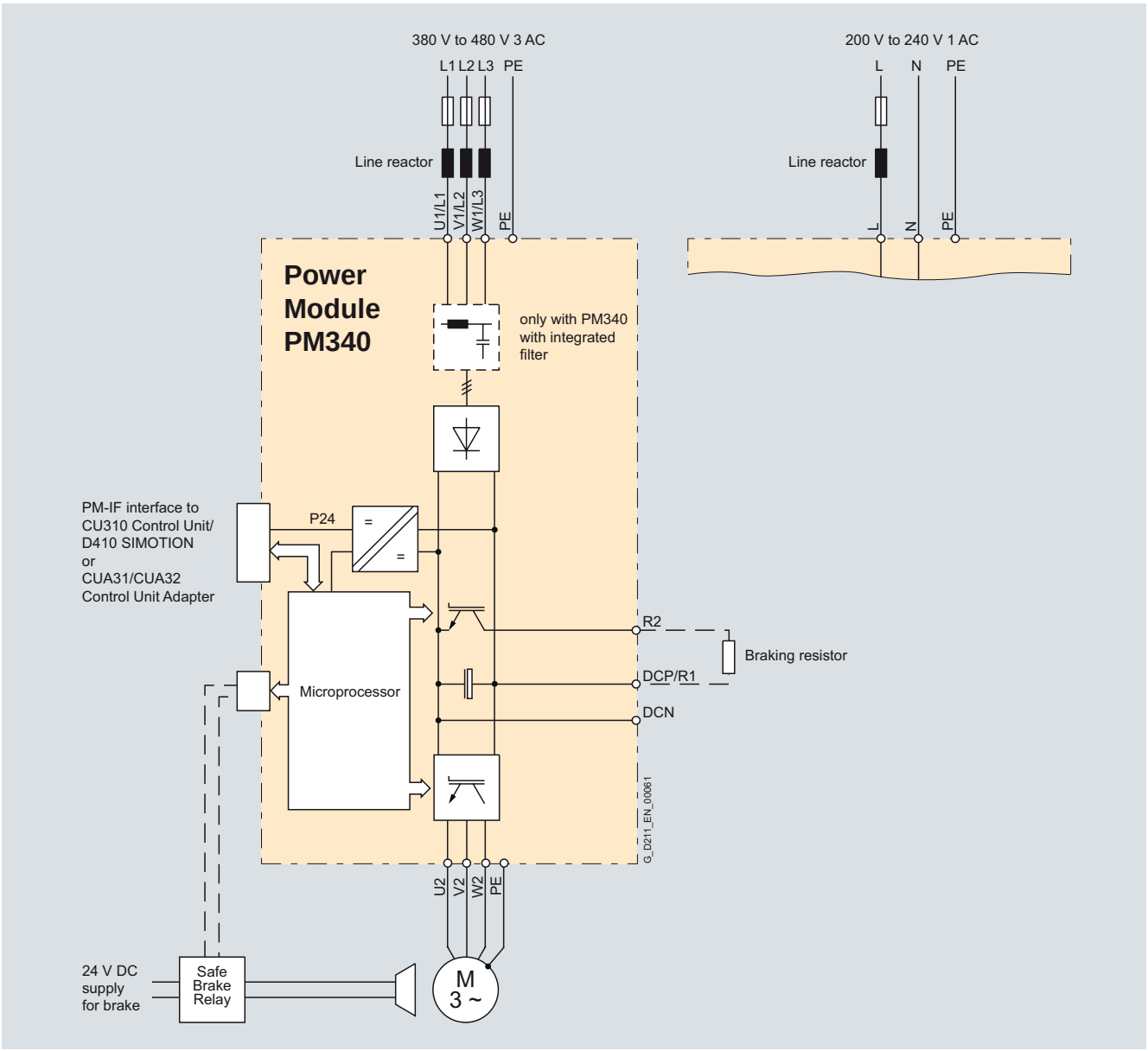
PM340 Power Module in blocksize format with CU310 DP Control Unit

PM340 Power Module in blocksize format with CUA31 Control Unit Adapter

3

Integration (continued)

The PM340 Power Modules in blocksize format communicate with the CU310/SIMOTION D410 Control Unit or the CUA31/ CUA32 Control Unit Adapter via the PM-IF interface.



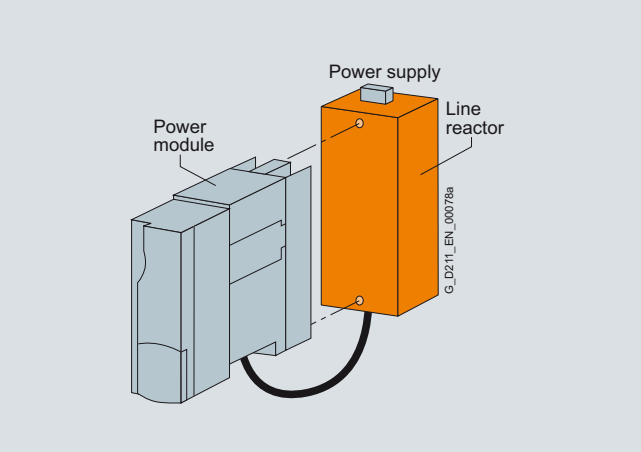
Connection example of PM340 Power Module in blocksize format

Integration (continued)

Many system components for PM340 Power Modules are designed as base components, i.e. the component is mounted on the baseplate and the PM340 Power Module in front of them in a space-saving construction. Up to two base components can be mounted in front of one another.

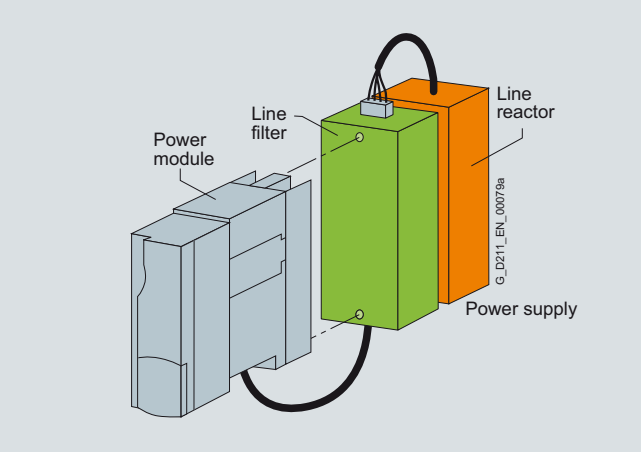
	FSA	FSB	FSC	FSD	FSE	FSF
Line filter	✓	–	–	–	–	–
Line reactor	✓	✓	✓	✓	✓	O
Braking resistor	✓	✓	O	O	O	O
Motor reactor	✓	✓	✓	O	O	O

✓ = suitable as base-type
O = not suitable as base-type
– = not available (use Power Modules with integrated line filter)



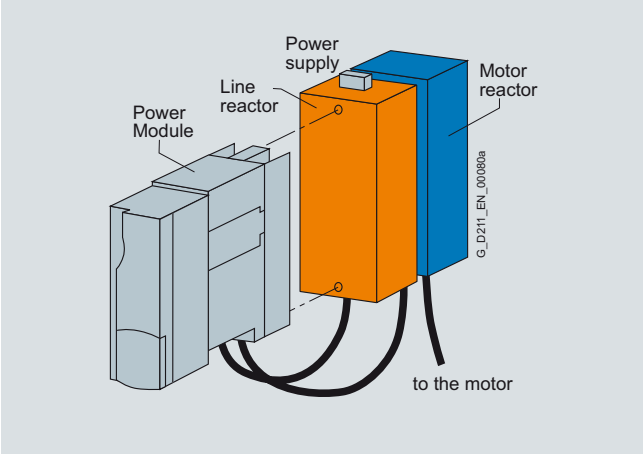
Basic layout of a PM340 Power Module with line reactor as base component

The line-side reactors are equipped with terminals on the line side and with a pre-assembled cable on the Power Module side. When installed, the mains terminals are at the top on frame sizes FSA to FSC, and at the bottom on frame sizes FSD and FSE.



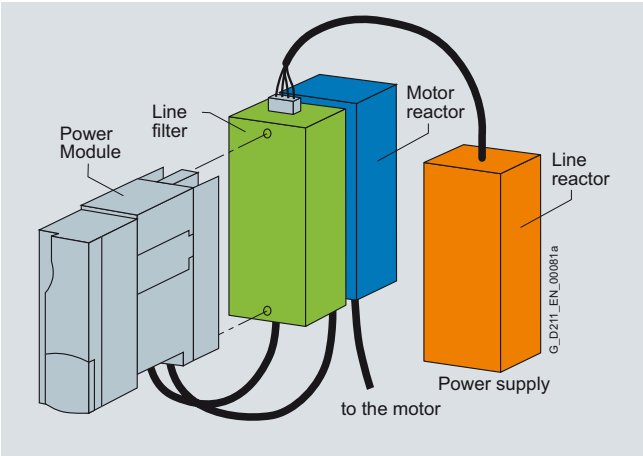
Power Module PM340 frame size FSA with line reactor and line filter

If a line filter is installed in addition to the line reactor on frame size FSA, the components must be arranged as shown in the diagram above. In this case, the line connection is at the bottom.



Power Module PM340 frame size FSA with line reactor and motor reactor

Power Modules of frame size FSB and higher are available with integrated line filters, alleviating the need for an external line filter.



For configurations involving more than two base-type system components, e.g. line reactor + motor reactor + braking resistor, individual components must be mounted to the side of the Power Module. In this instance, the line and motor reactors must be installed behind the Power Module and the braking resistor to the side.

Air-cooled Power Modules in blocksize format

Technical specifications

Air-cooled PM340 Power Module in blocksize format 6SL3210-1S...	
Line connection voltage (up to 2000 m (6562 ft) above sea level)	200 ... 240 V 1 AC ±10 % (in operation -15 % < 1 min) or 380 ... 480 V 3 AC ±10 % (in operation -15 % < 1 min)
Line	
• Power Modules without integrated line filter	Grounded TN/TT systems and non-grounded IT systems
• Power Modules with integrated line filter	TN systems with grounded star point
Line frequency	47 … 63 Hz
Line power factor at rated power	
• Fundamental power factor (cos φ_1)	> 0.96
• Total (λ)	
- 200 … 240 V 1 AC	0.45 … 0.7
- 380 … 480 V 3 AC	0.65 … 0.95
Overvoltage category to EN 60664-1	Class III
Precharging frequency of the DC link, max.	1× every 30 s
DC link voltage, approx.	1.35 × line voltage
Output frequency	
• Control type Servo	0 … 650 Hz [1]
• Control type Vector	0 … 300 Hz [1]
• Control type *V/f*	0 … 600 Hz [1]
Electronics power supply	24 V DC -15 %/+20 %
Radio interference suppression	
• Standard	No radio interference suppression
• With line filter	Category C2 to EN 61800-3
Type of cooling	Forced air cooling by means of built-in fan
Permissible ambient and coolant temperature (air) In operation for line-side components, Line Modules and Motor Modules	0 … 40 °C (32 … 104 °F) without derating, > 40 … 55 °C (104 … 131 °F) see derating characteristics
Installation altitude	Up to 1000 m (3281 ft) above sea level without derating, > 1000 ... 4000 m (3281 ... 13124 ft) above sea level, see derating characteristics
Conformity	CE (low-voltage and EMC Directives)
Approvals, according to	cULus
Safety Integrated	Safety Integrity Level 2 (SIL2) acc. to IEC 61508, Performance Level d (PLd) acc. to ISO 13849-1 and Control Category 3 acc. to ISO 12849-1 or EN 954-1 For further information see chapter Safety Integrated

[1] Note the correlation between max. output frequency, pulse frequency and current derating.
For further information see chapter System description – Dimensioning.

Technical specifications (continued)

Line voltage 200 ... 240 V 1 AC		Air-cooled PM340 Power Module in blocksize format		
		6SL3210-1SB11-0...	6SL3210-1SB12-3...	6SL3210-1SB14-0...
Output current				
• Rated current I_{rated}	A	0.9	2.3	3.9
• Base-load current I_H	A	0.8	2.0	3.4
• For S6 duty (40 %) I_{S6}	A	1.4	3.3	5.5
• I_{max}	A	2.0	4.6	7.8
Type rating [1]	kW (HP)	0.12 (0.2)	0.37 (0.5)	0.75 (0.75)
• Based on I_{rated}				
Rated pulse frequency	kHz	4	4	4
Power loss	kW	0.06	0.075	0.11
Cooling air requirement	m^3/s (ft^3/s)	0.005 (0.02)	0.005 (0.02)	0.005 (0.02)
Sound pressure level L_{pA} (1 m)	dB	< 45	< 45	< 45
24 V DC power supply for the Control Unit	A	1.0	1.0	1.0
Rated input current [2] with/without line reactor	A	1.4/2.2	4/6	6.5/10
Resistance value of the external braking resistor	Ω	≥ 180	≥ 180	≥ 180
Cable length to braking resistor, max.	m (ft)	15 (49)	15 (49)	15 (49)
Line connection U1/L1, V1/L2, W1/L3		Screw-type terminals	Screw-type terminals	Screw-type terminals
• Conductor cross-section	mm^2	1.0 … 2.5	1.0 … 2.5	1.0 … 2.5
DC link connection, connection for braking resistor DCP/R1, DCN, R2		Screw-type terminals	Screw-type terminals	Screw-type terminals
• Conductor cross-section	mm^2	1.0 … 2.5	1.0 … 2.5	1.0 … 2.5
Motor connection U2, V2, W2		Screw-type terminals	Screw-type terminals	Screw-type terminals
• Conductor cross-section	mm^2	1.0 … 2.5	1.0 … 2.5	1.0 … 2.5
PE connection		M4 screw	M4 screw	M4 screw
Motor cable length [3]**, max.** (without external options)				
• Shielded	m (ft)	50 (164)	50 (164)	50 (164)
• Unshielded	m (ft)	75 (246)	75 (246)	75 (246)
Degree of protection		IP20	IP20	IP20
Dimensions				
• Width	mm (in)	73 (2.87)	73 (2.87)	73 (2.87)
• Height	mm (in)	173 (6.81)	173 (6.81)	173 (6.81)
• Depth				
- PM340	mm (in)	145 (5.71)	145 (5.71)	145 (5.71)
- PM340 with CU310	mm (in)	234.6 (9.24)	234.6 (9.24)	234.6 (9.24)
- PM340 with CUA31/CUA32	mm (in)	175.3 (6.90)	175.3 (6.90)	175.3 (6.90)
Frame size		FSA	FSA	FSA
Weight, approx.	kg (lb)	1.2 (3)	1.3 (3)	1.3 (3)

[1] Nominal HP based on Asynchronous motors (induction motors) and 460 V AC. For specific sizing select drive based on motor nameplate current and overload.

[2] The input current depends on the motor load and line impedance. The input currents apply for rated power loading (based on I_{rated}) for a line impedance corresponding to u_k = 1 %.

[3] Max. motor cable length 15 m (49 ft) (shielded) for PM340 Power Modules with integrated line filter to maintain the limit values of EN 61800-3 Category C2.

Technical specifications (continued)

Line voltage 380 … 480 V 3 AC		Air-cooled PM340 Power Module in blocksize format				
		6SL3210-1SE11-3UA0	6SL3210-1SE11-7UA0	6SL3210-1SE12-2UA0	6SL3210-1SE13-1UA0	6SL3210-1SE14-1UA0
Output current						
• Rated current I_{rated}	A	1.3	1.7	2.2	3.1	4.1
• Base-load current I_H	A	1.1	1.5	1.9	2.7	3.6
• For S6 duty (40 %) I_{S6}	A	1.3	2.0	2.5	3.5	4.5
• I_{max}	A	2.6	3.4	4.4	6.2	8.2
Type rating [1]						
• Based on I_{rated}	kW (HP)	0.37 (0.5)	0.55 (0.75)	0.75 (1)	1.1 (1.5)	1.5 (2)
• Based on I_H	kW (HP)	0.37 (0.5)	0.55 (0.5)	0.75 (0.75)	1.1 (1)	1.5 (2)
Rated pulse frequency	kHz	4	4	4	4	4
Power loss	kW	0.10	0.10	0.10	0.11	0.11
Cooling air requirement	m^3/s (ft^3/s)	0.005 (0.02)	0.005 (0.02)	0.005 (0.02)	0.005 (0.02)	0.005 (0.02)
Sound pressure level L_{pA} (1 m)	dB	< 45	< 45	< 45	< 45	< 45
24 V DC power supply for the Control Unit	A	1.0	1.0	1.0	1.0	1.0
Rated input current [2] with/without line reactor	A	1.3/1.7	1.7/2.2	2.2/2.6	3.1/3.9	4.1/4.8
Resistance value of the external braking resistor	Ω	≥ 390	≥ 390	≥ 390	≥ 390	≥ 390
Cable length to braking resistor, max.	m (ft)	15 (49)	15 (49)	15 (49)	15 (49)	15 (49)
Line connection U1/L1, V1/L2, W1/L3		Screw-type terminals	Screw-type terminals	Screw-type terminals	Screw-type terminals	Screw-type terminals
• Conductor cross-section	mm^2	1.0 … 2.5	1.0 … 2.5	1.0 … 2.5	1.0 … 2.5	1.0 … 2.5
DC link connection, connection for braking resistor DCP/R1, DCN, R2		Screw-type terminals	Screw-type terminals	Screw-type terminals	Screw-type terminals	Screw-type terminals
• Conductor cross-section	mm^2	1.0 … 2.5	1.0 … 2.5	1.0 … 2.5	1.0 … 2.5	1.0 … 2.5
Motor connection U2, V2, W2		Screw-type terminals	Screw-type terminals	Screw-type terminals	Screw-type terminals	Screw-type terminals
• Conductor cross-section	mm^2	1.0 … 2.5	1.0 … 2.5	1.0 … 2.5	1.0 … 2.5	1.0 … 2.5
PE connection		M4 screw	M4 screw	M4 screw	M4 screw	M4 screw
Motor cable length [3], **max.**						
• Shielded	m (ft)	50 (164)	50 (164)	50 (164)	50 (164)	50 (164)
• Unshielded	m (ft)	75 (246)	75 (246)	75 (246)	75 (246)	75 (246)
Degree of protection		IP20	IP20	IP20	IP20	IP20
Dimensions						
• Width	mm (in)	73 (2.87)	73 (2.87)	73 (2.87)	73 (2.87)	73 (2.87)
• Height	mm (in)	173 (6.81)	173 (6.81)	173 (6.81)	173 (6.81)	173 (6.81)
• Depth						
- PM340	mm (in)	145 (5.71)	145 (5.71)	145 (5.71)	145 (5.71)	145 (5.71)
- PM340 with CU310	mm (in)	234.6 (9.24)	234.6 (9.24)	234.6 (9.24)	234.6 (9.24)	234.6 (9.24)
- PM340 with CUA31/CUA32	mm (in)	175.3 (6.90)	175.3 (6.90)	175.3 (6.90)	175.3 (6.90)	175.3 (6.90)
Frame size		FSA	FSA	FSA	FSA	FSA
Weight, approx.	kg (lb)	1.2 (3)	1.2 (3)	1.2 (3)	1.2 (3)	1.2 (3)

1) Nominal HP based on Asynchronous motors (induction motors) and 460 V AC. For specific sizing select drive based on motor nameplate current and overload.

2) The input current depends on the motor load and line impedance. The input currents apply for rated power loading (based on I_{rated}) for a line impedance corresponding to u_k = 1 %.

3) Max. motor cable length 25 m (82 ft) (shielded) for PM340 Power Modules with integrated line filter to maintain the limit values of EN 61800-3 Category C2.

Technical specifications (continued)

Line voltage 380 … 480 V 3 AC		Air-cooled PM340 Power Module in blocksize format					
		6SL3210-1SE16-0...	6SL3210-1SE17-7...	6SL3210-1SE21-0...	6SL3210-1SE21-8...	6SL3210-1SE22-5...	6SL3210-1SE23-2...
Output current							
• Rated current I_{rated}	A	5.9	7.7	10.2	18	25	32
• Base-load current I_H	A	5.2	6.8	9.1	14	21	27
• For S6 duty (40 %) I_{S6}	A	6.4	8.3	10.8	19.6	27.8	37.1
• I_{max}	A	11.8	15.4	20.4	26.4	38	52
Type rating [1]							
• Based on I_{rated}	kW (HP)	2.2 (3)	3 (5)	4 (5)	7.5 (10)	11 (15)	15 (20)
• Based on I_H	kW (HP)	2.2 (3)	3 (4)	4 (5)	5.5 (10)	7.5 (15)	11 (20)
Rated pulse frequency	kHz	4	4	4	4	4	4
Power loss	kW	0.14	0.16	0.18	0.24	0.30	0.40
Cooling air requirement	m^3/s (ft^3/s)	0.009 (0.3)	0.009 (0.3)	0.009 (0.3)	0.038 (1.3)	0.038 (1.3)	0.038 (1.3)
Sound pressure level L_{pA} (1 m)	dB	< 50	< 50	< 50	< 60	< 60	< 60
24 V DC power supply for the Control Unit	A	1.0	1.0	1.0	1.0	1.0	1.0
Rated input current [2] with/without line reactor	A	5.6/6.7	7.5/8.9	9.8/12.4	17.1/23.1	24.6/32.6	33/39
Resistance value of the external braking resistor	Ω	≥ 160	≥ 160	≥ 160	≥ 56	≥ 56	≥ 56
Cable length to braking resistor, max.	m (ft)	15 (49)	15 (49)	15 (49)	15 (49)	15 (49)	15 (49)
Line connection U1/L1, V1/L2, W1/L3		Screw-type terminals	Screw-type terminals	Screw-type terminals	Screw-type terminals	Screw-type terminals	Screw-type terminals
• Conductor cross-section	mm^2	1.0 … 6	1.0 … 6	1.0 … 6	2.5 … 10	2.5 … 10	2.5 … 10
DC link connection, connection for braking resistor DCP/R1, DCN, R2		Screw-type terminals	Screw-type terminals	Screw-type terminals	Screw-type terminals	Screw-type terminals	Screw-type terminals
• Conductor cross-section	mm^2	1.0 … 6	1.0 … 6	1.0 … 6	2.5 … 10	2.5 … 10	2.5 … 10
Motor connection U2, V2, W2		Screw-type terminals	Screw-type terminals	Screw-type terminals	Screw-type terminals	Screw-type terminals	Screw-type terminals
• Conductor cross-section	mm^2	1.0 … 6	1.0 … 6	1.0 … 6	2.5 … 10	2.5 … 10	2.5 … 10
PE connection		M5 screw	M5 screw	M5 screw	M5 screw	M5 screw	M5 screw
Motor cable length [3], **max.**							
• Shielded	m (ft)	50 (164)	50 (164)	50 (164)	50 (164)	50 (164)	50 (164)
• Unshielded	m (ft)	75 (246)	75 (246)	75 (246)	75 (246)	75 (246)	75 (246)
Degree of protection		IP20	IP20	IP20	IP20	IP20	IP20
Dimensions							
• Width	mm (in)	153 (6.02)	153 (6.02)	153 (6.02)	188.4 (7.42)	188.4 (7.42)	188.4 (7.42)
• Height	mm (in)	270 (10.63)	270 (10.63)	270 (10.63)	333.4 (13.13)	333.4 (13.13)	333.4 (13.13)
• Depth							
- PM340	mm (in)	165 (6.50)	165 (6.50)	165 (6.50)	185 (7.28)	185 (7.28)	185 (7.28)
- PM340 with CU310	mm (in)	254.6 (10.02)	254.6 (10.02)	254.6 (10.02)	274.6 (10.81)	274.6 (10.81)	274.6 (10.81)
- PM340 with CUA31/CUA32	mm (in)	195.3 (7.69)	195.3 (7.69)	195.3 (7.69)	215.3 (8.48)	215.3 (8.48)	215.3 (8.48)
Frame size		FSB	FSB	FSB	FSC	FSC	FSC
Weight, approx.	kg (lb)	4.0 (9)	4.0 (9)	4.0 (9)	6.5 (14)	6.5 (14)	6.5 (14)

1) Nominal HP based on Asynchronous motors (induction motors) and 460 V AC. For specific sizing select drive based on motor nameplate current and overload.

2) The input current depends on the motor load and line impedance. The input currents apply for rated power loading (based on I_{rated}) for a line impedance corresponding to u_k = 1 %.

3) Max. motor cable length 25 m (82 ft) (shielded) for PM340 Power Modules with integrated line filter to maintain the limit values of EN 61800-3 Category C2.

Technical specifications (continued)

Line voltage 380 … 480 V 3 AC		Air-cooled PM340 Power Module in blocksize format				
		6SL3210-1SE23-8...	6SL3210-1SE24-5...	6SL3210-1SE26-0...	6SL3210-1SE27-5...	6SL3210-1SE31-0...
Output current						
• Rated current I_{rated}	A	38	45	60	75	90
• Base-load current I_H	A	33	40	48	65	80
• For S6 duty (40 %) I_{S6}	A	49	58	78	98	117
• I_{max}	A	64	76	90	124	150
Type rating [1]						
• Based on I_{rated}	kW (HP)	18.5 (25)	22 (30)	30 (40)	37 (50)	45 (60)
• Based on I_H	kW (HP)	15 (20)	18.5 (30)	22 (30)	30 (50)	37 (60)
Rated pulse frequency	kHz	4	4	4	4	4
Power loss	kW	0.38	0.51	0.69	0.99	1.21
Cooling air requirement	m^3/s (ft^3/s)	0.022 (0.8)	0.022 (0.8)	0.039 (1.4)	0.022 (0.8)	0.039 (1.4)
Sound pressure level L_{pA} (1 m)	dB	< 60	< 60	< 61	< 60	62
24 V DC power supply for the Control Unit	A	1.0	1.0	1.0	1.0	1.0
Rated input current [2] with/without line reactor	A	40/46	47/53	63/72	78/88	94/105
Resistance value of the external braking resistor	Ω	≥ 27	≥ 27	≥ 27	≥ 15	≥ 15
Cable length to braking resistor, max.	m (ft)	15 (49)	15 (49)	15 (49)	15 (49)	15 (49)
Line connection U1/L1, V1/L2, W1/L3		M6 screw stud	M6 screw stud	M6 screw stud	M6 screw stud	M6 screw stud
• Conductor cross-section	mm^2	10 … 35	10 … 35	10 … 35	10 … 35	10 … 35
DC link connection, connection for braking resistor DCP/R1, DCN, R2		M6 screw stud	M6 screw stud	M6 screw stud	M6 screw stud	M6 screw stud
• Conductor cross-section	mm^2	10 … 35	10 … 35	10 … 35	10 … 35	10 … 35
Motor connection U2, V2, W2		M6 screw stud	M6 screw stud	M6 screw stud	M6 screw stud	M6 screw stud
• Conductor cross-section	mm^2	10 … 35	10 … 35	10 … 35	10 … 35	10 … 35
PE connection		M6 screw	M6 screw	M6 screw	M6 screw	M6 screw
Motor cable length [3]**, max.**						
• Shielded	m (ft)	70 (230)	70 (230)	70 (230)	70 (230)	70 (230)
• Unshielded	m (ft)	100 (328)	100 (328)	100 (328)	100 (328)	100 (328)
Degree of protection		IP20	IP20	IP20	IP20	IP20
Dimensions						
• Width	mm (in)	275 (10.83)	275 (10.83)	275 (10.83)	275 (10.83)	275 (10.83)
• Height PM340 without/with int. filter		418.3/511 (16.47/20.12)	418.3/511 (16.47/20.12)	418.3/511 (16.47/20.12)	498.3/633 (19.62/24.92)	498.3/633 (19.62/24.92)
• Depth						
- PM340	mm (in)	203.5 (8.01)	203.5 (8.01)	203.5 (8.01)	203.5 (8.01)	203.5 (8.01)
- PM340 with CU310	mm (in)	293.1 (11.54)	293.1 (11.54)	293.1 (11.54)	293.1 (11.54)	293.1 (11.54)
- PM340 with CUA31/CUA32	mm (in)	233.8 (9.20)	233.8 (9.20)	233.8 (9.20)	233.8 (9.20)	233.8 (9.20)
Frame size		FSD	FSD	FSD	FSE	FSE
Weight, approx. PM340 without/with int. filter	kg (lb)	15.9/19.3 (35/43)	15.9/19.3 (35/43)	15.9/19.3 (35/43)	19.8/27.1 (44/60)	19.8/27.1 (44/60)

1) Nominal HP based on Asynchronous motors (induction motors) and 460 V AC. For specific sizing select drive based on motor nameplate current and overload.

2) The input current depends on the motor load and line impedance.
The input currents apply for rated power loading (based on I_{rated}) for a line impedance corresponding to u_k = 1 %.

3) Max. motor cable length 25 m (82 ft) (shielded) for PM340 Power Modules with integrated line filter to maintain the limit values of EN 61800-3 Category C2.

Technical specifications (continued)

Line voltage 380 … 480 V 3 AC		Air-cooled PM340 Power Module in blocksize format		
		6SL3210-1SE31-1...	6SL3210-1SE31-5...	6SL3210-1SE31-8...
Output current				
• Rated current I_{rated}	A	110	145	178
• Base-load current I_H	A	95	115	155
• For S6 duty (40 %) I_{S6}	A	143	188	231
• I_{max}	A	180	220	290
Type rating [1]				
• Based on I_{rated}	kW (HP)	55 (75)	75 (100)	90 (125)
• Based on I_H	kW (HP)	45 (60)	55 (75)	75 (100)
Rated pulse frequency	kHz	4	4	4
Power loss	kW	1.42	1.93	2.31
Cooling air requirement	m^3/s (ft^3/s)	0.094 (3.3)	0.094 (3.3)	0.117 (4.1)
Sound pressure level L_{pA} (1 m)	dB	< 60	< 60	65
24 V DC power supply for the Control Unit	A	1.0	1.0	1.0
Rated input current [2] with/without line reactor	A	115/129	151/168	186/204
Resistance value of the external braking resistor	Ω	≥ 8.2	≥ 8.2	≥ 8.2
Cable length to braking resistor, max.	m (ft)	15 (49)	15 (49)	15 (49)
Line connection U1/L1, V1/L2, W1/L3		M8 screw stud	M8 screw stud	M8 screw stud
• Conductor cross-section, max.	mm^2	120	120	120
DC link connection, connection for braking resistor DCP/R1, DCN, R2		M8 screw stud	M8 screw stud	M8 screw stud
• Conductor cross-section, max.	mm^2	120	120	120
Motor connection U2, V2, W2		M8 screw stud	M8 screw stud	M8 screw stud
• Conductor cross-section, max.	mm^2	120	120	120
PE connection		M8 screw	M8 screw	M8 screw
Motor cable length [3]**, max.**				
• Shielded	m (ft)	70 (230)	70 (230)	70 (230)
• Unshielded	m (ft)	100 (328)	100 (328)	100 (328)
Degree of protection		IP20	IP20	IP20
Dimensions				
• Width	mm (in)	350 (13.78)	350 (13.78)	350 (13.78)
• Height PM340 without/with int. filter	mm (in)	634/934 (24.96/36.77)	634/934 (24.96/36.77)	634/934 (24.96/36.77)
• Depth				
- PM340	mm (in)	315.5 (12.42)	315.5 (12.42)	315.5 (12.42)
- PM340 with CU310	mm (in)	405.1 (15.95)	405.1 (15.95)	405.1 (15.95)
- PM340 with CUA31/CUA32	mm (in)	345.8 (13.61)	345.8 (13.61)	345.8 (13.61)
Frame size		FSF	FSF	FSF
Weight, approx. PM340 without/with int. filter	kg (lb)	50.7/66.7 (112/147)	50.7/66.7 (112/147)	50.7/66.7 (112/147)

[1] Nominal HP based on Asynchronous motors (induction motors) and 460 V AC. For specific sizing select drive based on motor nameplate current and overload.

[2] The input current depends on the motor load and line impedance.
The input currents apply for rated power loading (based on I_{rated}) for a line impedance corresponding to u_k = 1 %.

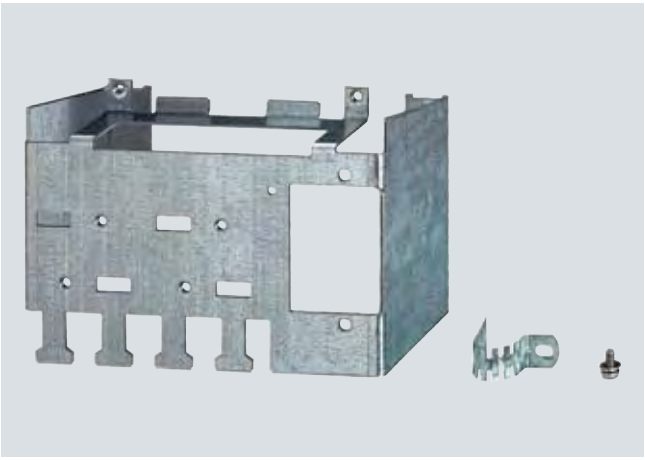
[3] Max. motor cable length 25 m (82 ft) (shielded) for PM340 Power Modules with integrated line filter to maintain the limit values of EN 61800-3 Category C2.

Air-cooled Power Modules in blocksize format

Selection and ordering data

Rated output current	Type rating	Frame size	Air-cooled PM340 Power Module in blocksize format without line filter	Air-cooled PM340 Power Module in blocksize format with integrated line filter
A	kW (HP)		Order No.	Order No.
Line voltage 200 ... 240 V 1 AC				
0.9	0.12 (0.2)	FSA	**6SL3210-1SB11-0UA0**	**6SL3210-1SB11-0AA0**
2.3	0.37 (0.5)	FSA	**6SL3210-1SB12-3UA0**	**6SL3210-1SB12-3AA0**
3.9	0.75 (0.75)	FSA	**6SL3210-1SB14-0UA0**	**6SL3210-1SB14-0AA0**
Line voltage 380 ... 480 V 3 AC				
1.3	0.37 (0.5)	FSA	**6SL3210-1SE11-3UA0**	–
1.7	0.55 (0.75)	FSA	**6SL3210-1SE11-7UA0**	–
2.2	0.75 (1)	FSA	**6SL3210-1SE12-2UA0**	–
3.1	1.1 (1.5)	FSA	**6SL3210-1SE13-1UA0**	–
4.1	1.5 (2)	FSA	**6SL3210-1SE14-1UA0**	–
5.9	2.2 (3)	FSB	**6SL3210-1SE16-0UA0**	**6SL3210-1SE16-0AA0**
7.7	3 (5)	FSB	**6SL3210-1SE17-7UA0**	**6SL3210-1SE17-7AA0**
10.2	4 (5)	FSB	**6SL3210-1SE21-0UA0**	**6SL3210-1SE21-0AA0**
18	7.5 (10)	FSC	**6SL3210-1SE21-8UA0**	**6SL3210-1SE21-8AA0**
25	11 (15)	FSC	**6SL3210-1SE22-5UA0**	**6SL3210-1SE22-5AA0**
32	15 (20)	FSC	**6SL3210-1SE23-2UA0**	**6SL3210-1SE23-2AA0**
38	18.5 (25)	FSD	**6SL3210-1SE23-8UA0**	**6SL3210-1SE23-8AA0**
45	22 (30)	FSD	**6SL3210-1SE24-5UA0**	**6SL3210-1SE24-5AA0**
60	30 (40)	FSD	**6SL3210-1SE26-0UA0**	**6SL3210-1SE26-0AA0**
75	37 (50)	FSE	**6SL3210-1SE27-5UA0**	**6SL3210-1SE27-5AA0**
90	45 (60)	FSE	**6SL3210-1SE31-0UA0**	**6SL3210-1SE31-0AA0**
110	55 (75)	FSF	**6SL3210-1SE31-1UA0**	**6SL3210-1SE31-1AA0**
145	75 (100)	FSF	**6SL3210-1SE31-5UA0**	**6SL3210-1SE31-5AA0**
178	90 (125)	FSF	**6SL3210-1SE31-8UA0**	**6SL3210-1SE31-8AA0**

Accessories

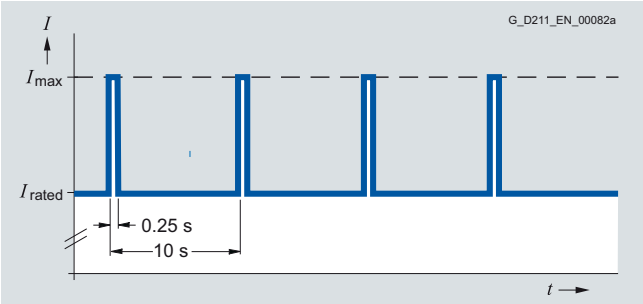


Example of shield connection kit for PM340 frame size FSB

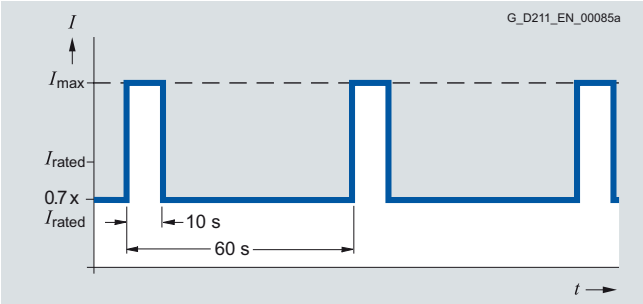
Description	Order No.
Shield connection kit for PM340	
• Frame size FSA	**6SL3262-1AA00-0BA0**
• Frame size FSB	**6SL3262-1AB00-0DA0**
• Frame size FSC	**6SL3262-1AC00-0DA0**
• Frame sizes FSD and FSE	**6SL3262-1AD00-0DA0**
• Frame size FSF	**6SL3262-1AF00-0DA0**

Characteristic curves

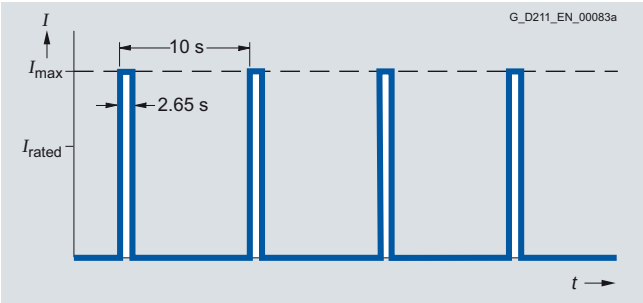
Overload capability



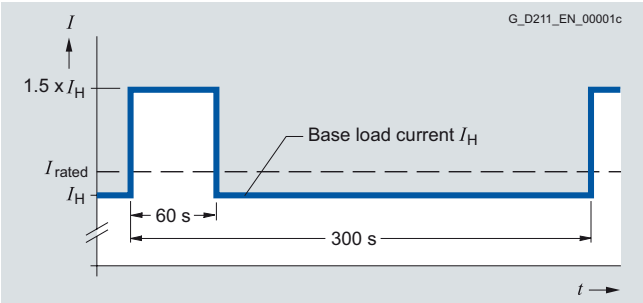
Load cycle with previous load



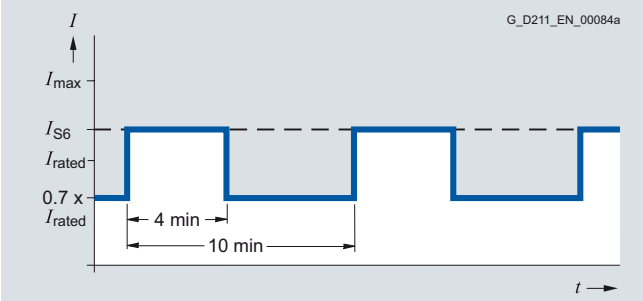
S6 load cycle with previous load with a load cycle period of 60 s



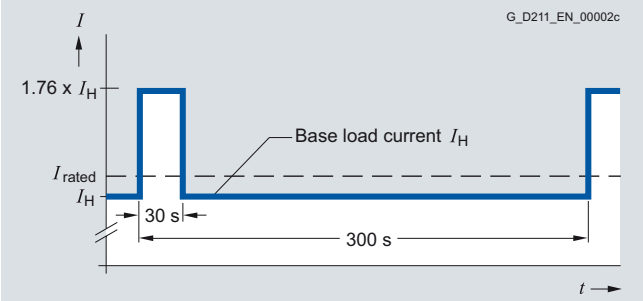
Load cycle without previous load



Load cycle with 60 s overload with a load cycle period of 300 s



S6 load cycle with previous load with a load cycle period of 600 s

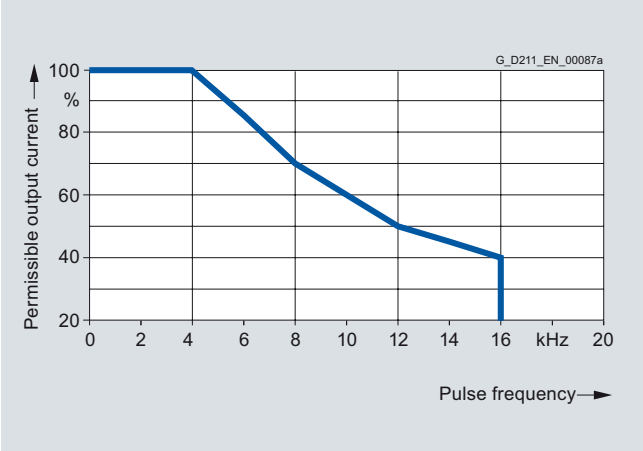


Load cycle with 30 s overload with a load cycle period of 300 s

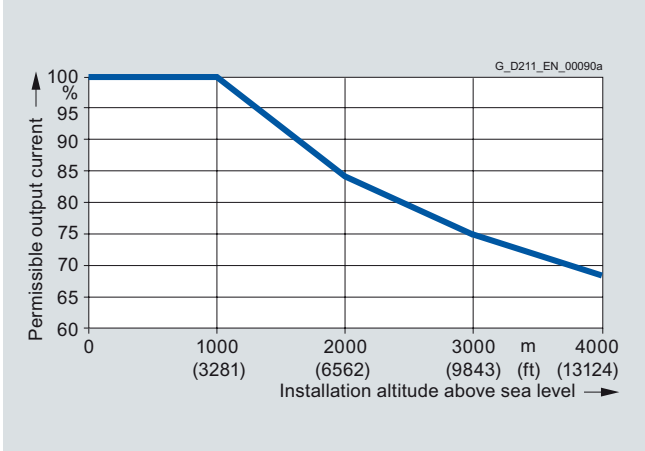
3

Characteristic curves (continued)

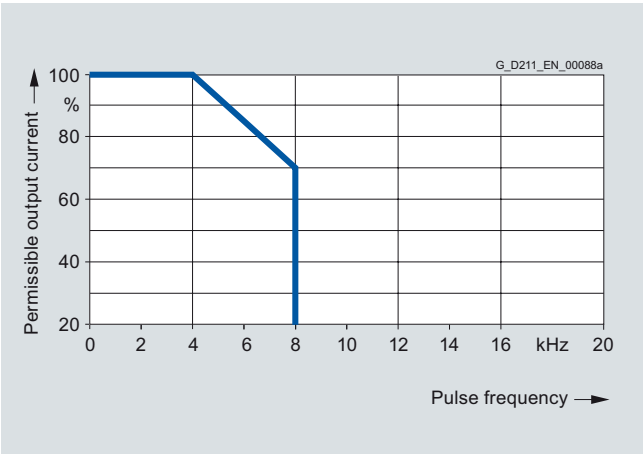
Derating characteristics



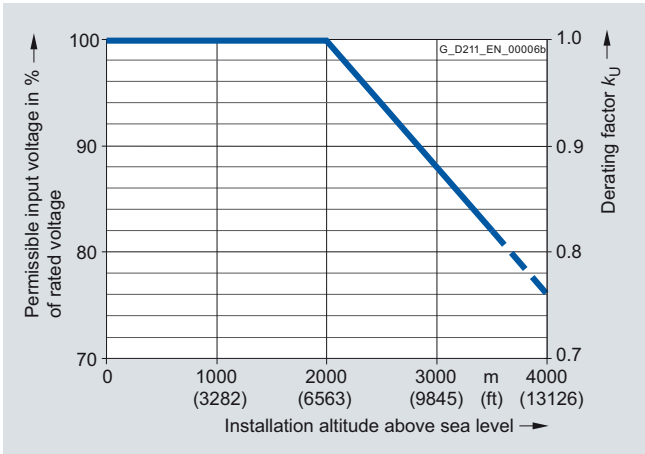
Frame sizes FSA to FSE: Output current dependent on pulse frequency



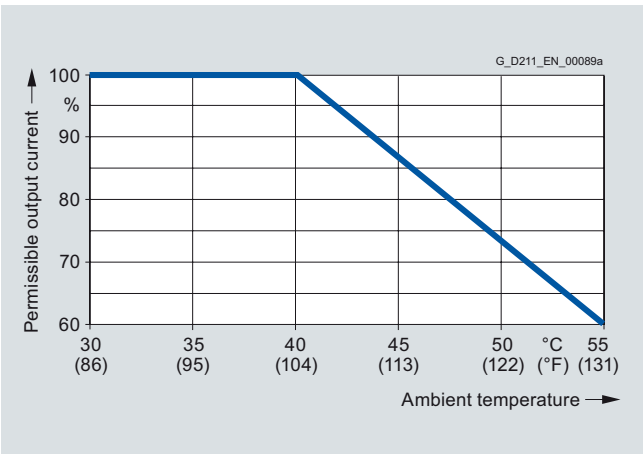
Output current dependent on installation altitude



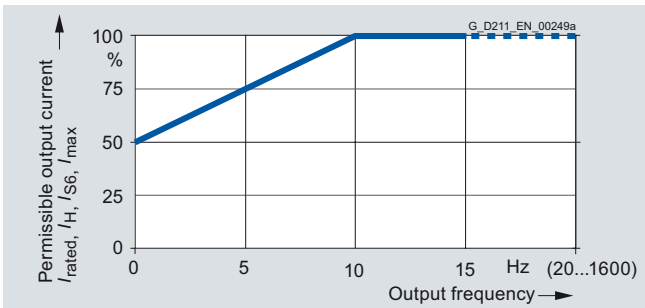
Frame sizes FSF: Output current dependent on pulse frequency



Voltage derating dependent on installation altitude



Output current dependent on ambient temperature



Output current dependent on output frequency

Design

Liquid-cooled Power Modules in blocksize format: Frame sizes FSD, FSE and FSF

Liquid-cooled PM340 Power Modules transfer most of their heat losses to the cooling liquid through the integrated stainless steel heat exchanger. As a result, they can be installed in control cabinets with high degrees of protection. They do not utilize high-maintenance filter mats or ventilation grilles. The units are designed for vertical mounting.

Liquid-cooled PM340 Power Modules have the following interfaces as standard:

- 1 power connection
- 1 PM-IF interface for connection of the PM340 Power Module and CU310/SIMOTION D410 Control Unit or CUA31/CUA32 Control Unit Adapter. The PM340 Power Module also supplies power to the Control Unit or Control Unit Adapter by means of an integrated power pack
- 1 connection for external braking resistor (DCP/R1 and R2)
- 1 motor connection
- 1 control circuit for the Safe Brake Relay for controlling a holding brake
- 2 PE (protective earth) connections
- 2 coolant connections

Liquid-cooled PM340 Power Modules are available only without integrated line filter and can be connected to grounded TN/TT systems and non-grounded IT systems. The integrated Braking Unit (Braking Chopper) is rated with the capability to continuously utilize the braking resistor. The temperature of the external braking resistor must be monitored (i.e. thermostatic switch) to provide protection against thermal overloading.

The scope of supply of the Power Modules includes:

- 2 seals for coolant connections
- 2 protective caps for coolant connections

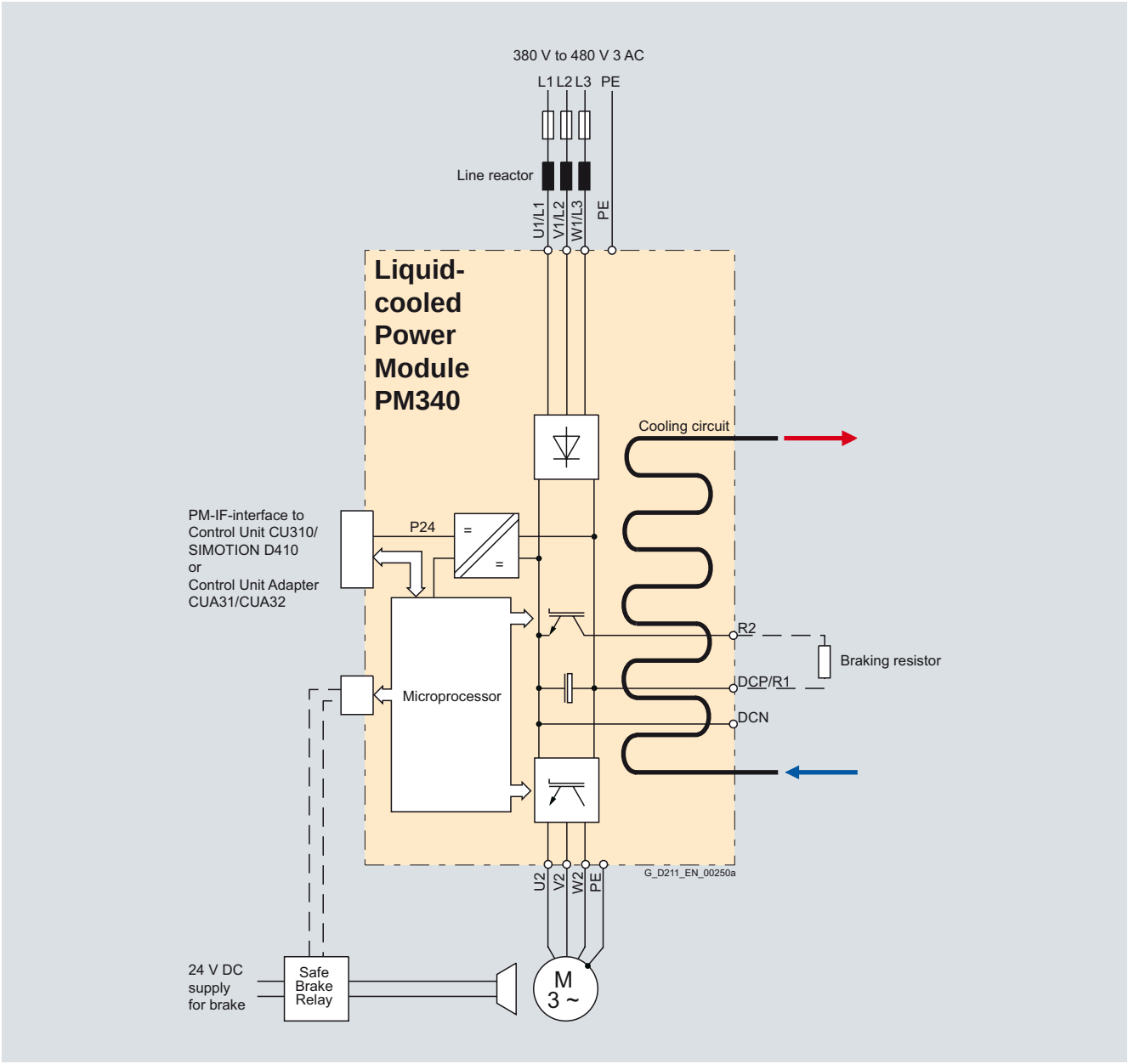
Selection and ordering data

Rated output current	Rated power	**Liquid-cooled PM340 Power Module in blocksize format**
A	kW (HP)	Order No.
Line voltage 380 ... 480 V 3 AC		
38	18.5 (25)	**6SL3215-1SE23-8UA0**
60	30 (40)	**6SL3215-1SE26-0UA0**
75	37 (50)	**6SL3215-1SE27-5UA0**
90	45 (60)	**6SL3215-1SE31-0UA0**
110	55 (75)	**6SL3215-1SE31-1UA0**
178	90 (125)	**6SL3215-1SE31-8UA0**

3

Integration

The liquid-cooled PM340 Power Modules in blocksize format communicate with the CU310/SIMOTION D Control Unit or the CUA31/CUA32 Control Unit Adapter via the PM-IF interface.



Connection example of a liquid-cooled PM340 Power Module

Technical specifications

Liquid-cooled PM340 Power Module in blocksize format 6SL3215-1SE...	
Line connection voltage (up to 2000 m (6562 ft) above sea level)	380 ... 480 V 3 AC ±10 % (in operation -15 % < 1 min)
Line	Grounded TN/TT systems and non-grounded IT systems
Line frequency	47 … 63 Hz
Line power factor with a 3 AC line connection voltage and rated power	
• Fundamental power factor (cos φ_1)	> 0,96
• Total (λ)	0.65 … 0.95
Overvoltage category to EN 60664-1	Class III
Precharging frequency of the DC link	1 × every 30 s
DC link voltage, approx.	1.35 × line voltage
Output frequency	
• Control type Servo	0 … 650 Hz [1]
• Control type Vector	0 … 300 Hz [1]
• Control type *V/f*	0 … 600 Hz [1]
Electronics power supply	24 V DC -15 %/+20 %
Radio interference suppression	
• Standard	No radio interference suppression
Type of cooling	Liquid cooling with integrated heat exchanger in stainless-steel version
Coolant [2]	
• pH value	6.0 … 9.0
• Chloride	< 200 mg/l
• Sulfate	< 240 mg/l
• Hardness	< 2.5 mmol/l [3]
• Conductivity	< 2000 µS/cm
• Colony number	< 1000 col/ml [4]
• Max. size of entrained particles	< 100 µm
Cooling circuit	
• System pressure with reference to atmospheric pressure, max.	600 kPa
• Pressure drop at rated volumetric flow	70 kPa
• Recommended pressure range	80 … 200 kPa
• Inlet temperature of liquid coolant	Dependent on the ambient temperature, condensation is not permitted 0 … 50 °C (32 … 122 °F) (temperature range between 0 °C and 5 °C (32 … 41 °F) with anti-freeze only; recommended anti-freeze: Antifrogen N from Clariant)
Permissible ambient temperature (air) during operation	Dependent on the inlet temperature of the coolant, condensation is not permissible 0 … 40 °C (32 … 113 °F) without derating, > 40 … 55 °C (113 … 122 °F) see derating characteristics
Installation altitude	Up to 2000 m (3281 ft) above sea level without derating, > 2000 ... 4000 m (3281 ... 13124 ft) above sea level, see derating characteristics
Conformity	CE (Low-Voltage and EMC Directives)
Approvals, according to	cULus
Safety Integrated	Safety Integrity Level 2 (SIL 2) acc. to IEC 61508, Performance Level d (PLd) acc. to ISO 13849-1 and Control Category 3 acc. to ISO 12849-1 or EN 954-1. For further information see chapter Safety Integrated

[1] Note the correlation between max. output frequency, pulse frequency and current derating.
For further information see chapter System description – Dimensioning.

[2] The values are applicable to coolant (water) without the addition of anti-freeze or inhibitors. When anti-freeze or inhibitors are added, the specifications of the manufacturer regarding water quality must be observed. The proportion of anti-freeze must not exceed a minimum concentration, otherwise the coolant has a marked corrosive effect. In the case of Antifrogen N, the recommended range of the ratio of Antifrogen N to water lies between 20/80 and 45/55 Vol.%

[3] The hardness of the coolant, especially the concentration of calcium compounds should be kept to a minimum to prevent the build-up of damaging calcium deposits (lime scale). A hardness < 1.5 mmol/l is recommended.

[4] The number of microbes should generally be as low as possible to prevent damage as a result of slime-producing, iron-depositing, corroding bacteria. In closed coolant circuits, the accumulation of microbes can be prevented, for example, by adding anti-freeze. The concentration of anti-freeze must only reach a minimum level to prevent corrosion, see Footnote [2].

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Technical specifications (continued)

Line voltage 380 … 480 V 3 AC		Liquid-cooled Power Module PM340 in blocksize format		
		6SL3215-1SE23-8UA0	6SL3215-1SE26-0UA0	6SL3215-1SE27-5UA0
Output current				
• Rated current I_{rated}	A	38	60	75
• Base-load current I_H	A	33	48	65
• For S6 duty (40 %) I_{S6}	A	49	78	98
• I_{max}	A	64	90	124
Type rating [1]				
• Based on I_{rated}	kW (HP)	18.5 (25)	30 (40)	37 (50)
• Based on I_H	kW (HP)	15 (20)	22 (30)	30 (50)
Rated pulse frequency	kHz	4	4	4
Power loss				
• Total, approx.	kW	0.38	0.69	0.99
• Lost to ambient air, approx.	kW	0.09	0.13	0.16
Cooling circuit				
• Rated volumetric flow for water at 70 kPa pressure drop	dm^3/min (l/min)	8	8	8
• Cooling circuit connection, inlet and return		Pipe thread ISO 228 – G ½ B (external thread ½, flat-sealing)	Pipe thread ISO 228 – G ½ B (external thread ½, flat-sealing)	Pipe thread ISO 228 – G ½ B (external thread ½, flat-sealing)
• Liquid volume of integrated heat exchanger	dm^3 (l)	0.1	0.1	0.13
Sound pressure level L_{pA} (1 m) at 50/60 Hz	dB	< 60	< 60	< 60
Rated input current with/without line reactor	A	40/46	63/72	78/88
Resistance value of the external braking resistor	Ω	≥ 27	≥ 27	≥ 15
Cable length, max. to braking resistor	m (ft)	15 (49)	15 (49)	15 (49)
24 V DC power supply for the Control Unit	A	1.0	1.0	1.0
Line connection U1/L1, V1/L2, W1/L3		M6 screw stud, max. connectable cable cross-section 35 mm^2	M6 screw stud, max. connectable cable cross-section 35 mm^2	M6 screw stud, max. connectable cable cross-section 35 mm^2
DC link connection, connection for the braking resistor DCP/R1, DCN, R2		M6 screw stud, max. connectable cable cross-section 35 mm^2	M6 screw stud, max. connectable cable cross-section 35 mm^2	M6 screw stud, max. connectable cable cross-section 35 mm^2
Motor connection U2, V2, W2		M6 screw stud, max. connectable cable cross-section 35 mm^2	M6 screw stud, max. connectable cable cross-section 35 mm^2	M6 screw stud, max. connectable cable cross-section 35 mm^2
PE connection		On housing with M6 screw	On housing with M6 screw	On housing with M6 screw
Motor cable length, max.				
• Shielded	m (ft)	70 (230)	70 (230)	70 (230)
• Unshielded	m (ft)	100 (328)	100 (328)	100 (328)
Degree of protection		IP20	IP20	IP20
Dimensions				
• Width	mm (in)	275 (10.83)	275 (10.83)	275 (10.83)
• Height	mm (in)	471 (18.54)	471 (18.54)	577 (22.72)
• Depth				
- PM340	mm (in)	159.5 (6.28)	159.5 (6.28)	159.5 (6.28)
- PM340 with CU310	mm (in)	240.4 (9.46)	240.4 (9.46)	240.4 (9.46)
- PM340 with CUA31/CUA32	mm (in)	181.3 (7.14)	181.3 (7.14)	181.3 (7.14)
Frame size		FSD	FSD	FSE
Weight, approx.	kg (lb)	10.5 (23)	10.5 (23)	15 (33)

[1] Rated output of a typical standard asynchronous motor at 460 V AC. For specific sizing select drive based on motor nameplate current and overload.

Technical specifications (continued)

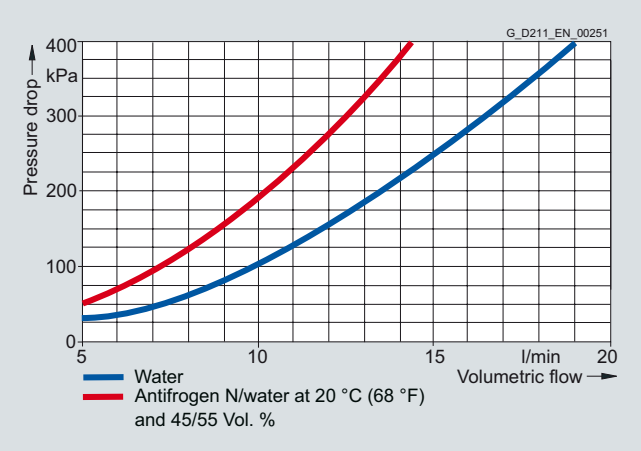
Line voltage 380 … 480 V 3 AC		Liquid-cooled Power Module PM340 in blocksize format		
		6SL3215-1SE31-0UA0	6SL3215-1SE31-1UA0	6SL3215-1SE31-8UA0
Output current				
• Rated current I_{rated}	A	90	110	178
• Base-load current I_H	A	80	95	155
• For S6 duty (40 %) I_{S6}	A	117	143	231
• I_{max}	A	150	180	290
Type rating [1]				
• Based on I_{rated}	kW (HP)	45 (60)	55 (75)	90 (125)
• Based on I_H	kW (HP)	37 (60)	45 (60)	75 (100)
Rated pulse frequency	kHz	4	4	4
Power loss				
• Total, approx.	kW	1.21	1.42	2.31
• Lost to ambient air, approx.	kW	0.19	0.21	0.35
Cooling circuit				
• Rated volumetric flow for water at 70 kPa pressure drop	dm^3/min (l/min)	8	8	8
• Cooling circuit connection, inlet and return		Pipe thread ISO 228 – G ½ B (external thread ½, flat-sealing)	Pipe thread ISO 228 – G ½ B (external thread ½, flat-sealing)	Pipe thread ISO 228 – G ½ B (external thread ½, flat-sealing)
• Liquid volume of integrated heat exchanger	dm^3 (l)	0.13	0.2	0.2
Sound pressure level L_{pA} (1 m) at 50/60 Hz	dB	< 62	62	65
Rated input current with/without line reactor	A	94/105	115/129	186/204
Resistance value of the external braking resistor	Ω	≥ 15	≥ 8.2	≥ 8.2
Cable length, max. to braking resistor	m (ft)	15 (49)	15 (49)	15 (49)
24 V DC power supply for the Control Unit	A	1.0	1.0	1.0
Line connection U1/L1, V1/L2, W1/L3		M6 screw stud, max. connectable cable cross-section 35 mm^2	M8 screw stud, max. connectable cable cross-section 120 mm^2	M8 screw stud, max. connectable cable cross-section 120 mm^2
DC link connection, connection for the braking resistor DCP/R1, DCN, R2		M6 screw stud, max. connectable cable cross-section 35 mm^2	M8 screw stud, max. connectable cable cross-section 120 mm^2	M8 screw stud, max. connectable cable cross-section 120 mm^2
Motor connection U2, V2, W2		M6 screw stud, max. connectable cable cross-section 35 mm^2	M8 screw stud, max. connectable cable cross-section 120 mm^2	M8 screw stud, max. connectable cable cross-section 120 mm^2
PE connection		On housing with M6 screw	On housing with M8 screw	On housing with M8 screw
Motor cable length, max.				
• Shielded	m (ft)	70 (230)	70 (230)	70 (230)
• Unshielded	m (ft)	100 (328)	100 (328)	100 (328)
Degree of protection		IP20	IP20	IP20
Dimensions				
• Width	mm (in)	275 (10.83)	350 (13.78)	350 (13.78)
• Height	mm (in)	577 (22.72)	660 (25.98)	660 (25.98)
• Depth				
- PM340	mm (in)	159.5 (6.28)	241.5 (9.51)	241.5 (9.51)
- PM340 with CU310	mm (in)	240.4 (9.46)	322.5 (12.70)	322.5 (12.70)
- PM340 with CUA31/CUA32	mm (in)	181.3 (7.14)	263 (10.35)	263 (10.35)
Frame size		FSE	FSF	FSF
Weight, approx.	kg (lb)	15 (30)	29 (64)	29 (64)

[1] Rated output of a typical standard asynchronous motor at 460 V AC. For specific sizing select drive based on motor nameplate current and overload.

3

Characteristic curves

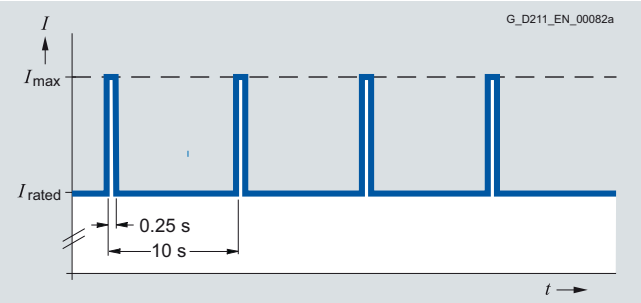
Pressure drop



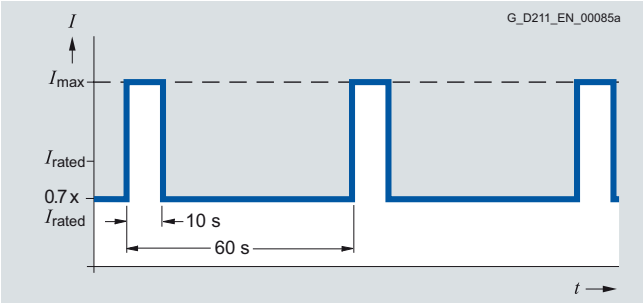
Pressure loss on frame sizes FSD, FSE, FSF

Overload capability

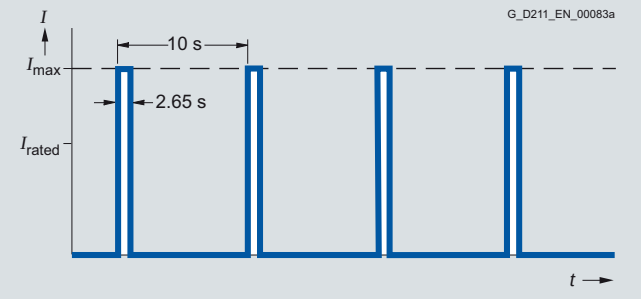
Load cycle data for liquid-cooled PM340 Power Modules in blocksize format



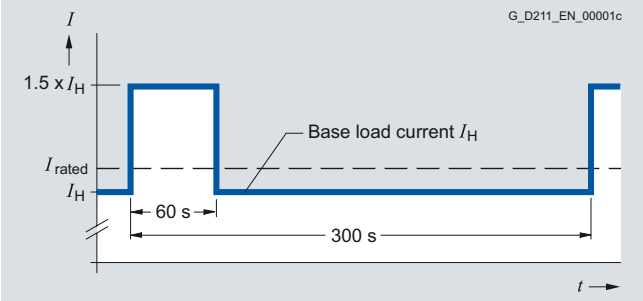
Load cycle with previous load



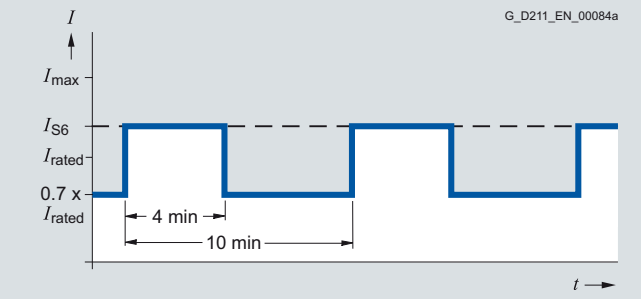
S6 load cycle with previous load with a load cycle period of 60 s



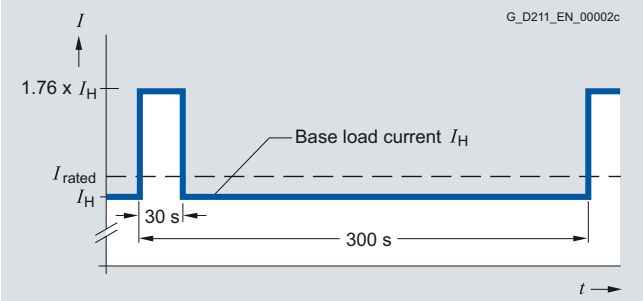
Load cycle without previous load



Load cycle with 60 s overload with a load cycle period of 300 s



S6 load cycle with previous load with a load cycle period of 600 s



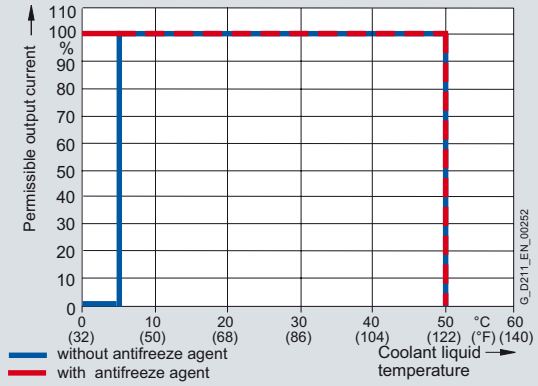
Load cycle with 30 s overload with a load cycle period of 300 s

Characteristic curves (continued)

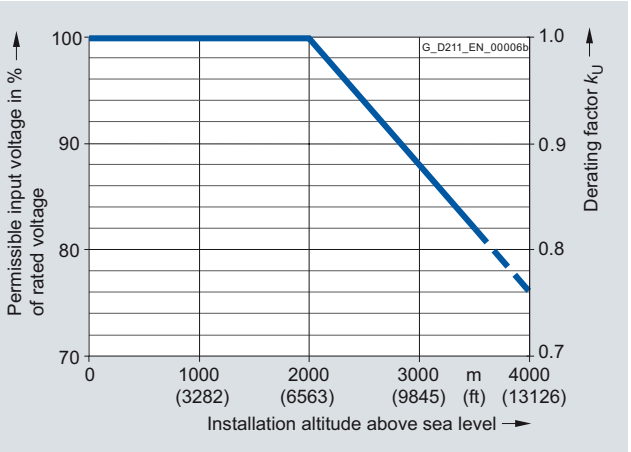
Derating factors

Output current dependent on pulse frequency

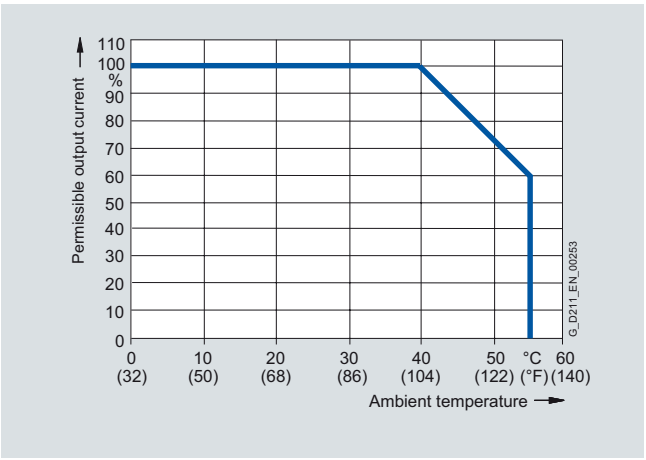
PM340 Power Module in blocksize format	Rated output current	**Derating factor**
Type	A	for a pulse frequency of 8 kHz
6SL3215-1SE23-8UA0	38	**0.7**
6SL3215-1SE26-0UA0	60	**0.7**
6SL3215-1SE27-5UA0	75	**0.7**
6SL3215-1SE31-0UA0	90	**0.7**
6SL3215-1SE31-1UA0	110	**0.7**
6SL3215-1SE31-8UA0	178	**0.7**



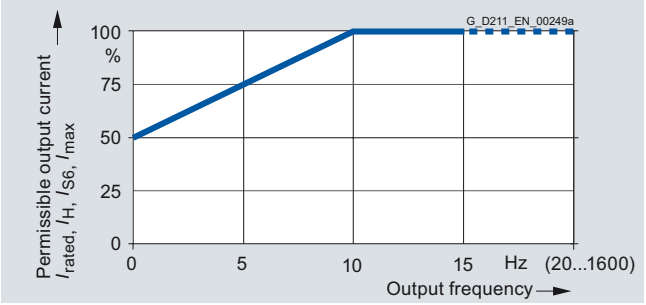
Current derating dependent on temperature of the cooling liquid



Voltage derating dependent on installation altitude



Current derating dependent on ambient temperature



Output current dependent on output frequency

Power Modules in blocksize format
Line reactors

Overview

Line reactors for PM340 Power Modules frame sizes FSA to FSE

Line reactor for PM340 Power Modules frame size FSF

Line reactors limit the low-frequency harmonic effects and reduce the load on the other loads in the same supply system. In low-impedance supply systems with $u_k \leq 1$ %, the phase effects on the system from the PM340 Power Modules are minimal. The matched line reactor is essential where the effective supply impedance equals $u_k > 1$ %. The voltage drop u_k across the supply impedance increases with the current. The specified condition therefore becomes more and more important as the rated output of the Power Modules increases.

For further information see chapter System description – Dimensioning.

Integration

The line reactors for PM340 Power Modules of frame sizes FSA to FSE are designed as base components. The line reactor is attached to the mounting surface and the Power Module is mounted directly on the line reactor. The cables to the Power Module are already connected at the line reactor.

The line reactor is connected to the line connection through terminals.

PM340 Power Module frame size FSB with base line reactor and shield connection kit

Technical specifications

Line voltage 200 ... 240 V 1 AC		Line reactor	
		6SE6400-3CC00-4AB3	6SE6400-3CC01-0AB3
Rated current	A	3.4	8.1
Power loss, approx. at 50/60 Hz	W	12.5/15	11.5/14.5
Line connection U1, V1, W1		Screw-type terminals	Screw-type terminals
• Conductor cross-section	mm^2	6	6
Load connection		Cable	Cable
• Conductor cross-section		3 × AWG16 (1.5 mm^2)	3 × AWG16 (1.5 mm^2)
• Length, approx.	m (ft)	0.38 (1.25)	0.38 (1.25)
PE connection		M5 screw stud	M5 screw stud
Degree of protection [1]		IP20	IP20
Dimensions			
• Width	mm (in)	75.5 (2.97)	75.5 (2.97)
• Height	mm (in)	201 (7.91)	201 (7.91)
• Depth	mm (in)	50 (1.97)	50 (1.97)
Weight, approx.	kg (lb)	1.3 (3)	1.3 (3)
Approvals, according to		cURus	cURus
Suitable for Power Module in blocksize format	Type (rated output current)	6SL3210-1SB11-0... (0.9 A) 6SL3210-1SB12-3... (2.3 A)	6SL3210-1SB14-0... (3.9 A)

Line voltage 380 ... 480 V 3 AC		Line reactor					
		6SE6400-3CC00-2AD3	6SE6400-3CC00-4AD3	6SE6400-3CC00-6AD3	6SL3203-0CD21-0AA0	6SL3203-0CD21-4AA0	6SL3203-0CD22-2AA0
Rated current	A	1.9	3.5	4.8	9	11.6	25
Power loss at 50/60 Hz	W	6/7	12.5/15	7.5/9	9/11	27/32	98/118
Line connection U1, V1, W1		Screw-type terminals	Screw-type terminals	Screw-type terminals	Screw-type terminals	Screw-type terminals	Screw-type terminals
• Conductor cross-section	mm^2	6	6	6	6	6	6
Load connection		Cable	Cable	Cable	Cable	Cable	Cable
• Conductor cross-section		3 × AWG16 (1.5 mm^2)	3 × AWG16 (1.5 mm^2)	3 × AWG16 (1.5 mm^2)	3 × AWG16 (1.5 mm^2)	3 × AWG16 (1.5 mm^2)	4 × AWG10 (2.5 mm^2)
• Length, approx.	m (ft)	0.38 (1.25)	0.38 (1.25)	0.38 (1.25)	0.46 (1.51)	0.46 (1.51)	0.49 (1.61)
PE connection		M5 screw stud	M5 screw stud	M5 screw stud	M5 screw stud	M5 screw stud	M5 screw stud
Degree of protection [1]		IP20	IP20	IP20	IP20	IP20	IP20
Dimensions							
• Width	mm (in)	75.5 (2.97)	75.5 (2.97)	75.5 (2.97)	153 (6.02)	153 (6.02)	190 (7.48)
• Height	mm (in)	201 (7.91)	201 (7.91)	201 (7.91)	270 (10.63)	270 (10.63)	336 (13.23)
• Depth	mm (in)	50 (1.97)	50 (1.97)	50 (1.97)	70 (2.76)	70 (2.76)	50 (1.97)
Weight, approx.	kg (lb)	1.2 (3)	1.3 (3)	1.3 (3)	3.4 (7.50)	3.4 (7.50)	6.3 (14)
Approvals, according to		cURus	cURus	cURus	cURus	cURus	cURus
Suitable for Power Module in blocksize format	Type (rated output current)	6SL3210-1SE11-3... (1.3 A) 6SL3210-1SE11-7... (1.7 A)	6SL3210-1SE12-2... (2.2 A) 6SL3210-1SE13-1... (3.1 A)	6SL3210-1SE14-1... (4.1 A)	6SL3210-1SE16-0... (5.9 A) 6SL3210-1SE17-7... (7.7 A)	6SL3210-1SE21-0... (10 A)	6SL3210-1SE21-8... (18 A) 6SL3210-1SE22-5... (25 A)

[1] With correctly connected load connection cable.

Technical specifications (continued)

Line voltage 380 ... 480 V 3 AC		Line reactor					
		6SL3203-0CD23-5AA0	6SL3203-0CJ24-5AA0	6SL3203-0CD25-3AA0	6SL3203-0CJ28-6AA0	6SE6400-3CC11-2FD0	6SE6400-3CC11-7FD0
Rated current	A	33	47	63	94	151	186
Power loss at 50/60 Hz	W	37/44	90/115	90/115	170/215	280/360	280/360
Line connection U1, V1, W1		Screw-type terminals	Screw-type terminals	Screw-type terminals	Screw-type terminals	Flat connector for M10 screw	Flat connector for M10 screw
• Conductor cross-section	mm^2	16	16	16	50	–	–
Load connection		Cable	Cable	Cable	Cable	Flat connector for M10 screw	Flat connector for M10 screw
• Conductor cross-section		4 × AWG10 (2.5 mm^2)	4 × 16 mm^2	4 × 16 mm^2	4 × 35 mm^2	–	–
• Length, approx.	m (ft)	0.49 (1.61)	0.7 (2.30)	0.7 (2.30)	0.7 (2.30)		
PE connection		M5 screw stud	M8 screw	M8 screw	M8 screw	M8 screw stud	M8 screw stud
Degree of protection [1]		IP20	IP20	IP20	IP20	IP00	IP00
Dimensions							
• Width	mm (in)	190 (7.48)	275 (10.83)	275 (10.83)	275 (10.83)	240 (9.45)	240 (9.45)
• Height	mm (in)	336 (13.23)	455 (17.91)	455 (17.91)	577 (22.72)	228 (8.98)	228 (8.98)
• Depth	mm (in)	50 (1.97)	83.5 (3.29)	83.5 (3.29)	93.5 (3.68)	141 (5.55)	141 (5.55)
Weight, approx.	kg (lb)	6.4 (14)	13 (29)	13 (29)	19 (42)	25 (55)	25 (55)
Approvals, according to		cURus	cURus	cURus	cURus	cURus	cURus
Suitable for Power Module in blocksize format	Type (rated output current)	6SL3210-1SE23-2... (32 A)	6SL3210-1SE23-8... (38 A) 6SL3210-1SE24-5... (45 A)	6SL3210-1SE26-0... (60 A)	6SL3210-1SE27-5... (75 A) 6SL3210-1SE31-0... (90 A)	6SL3210-1SE31-1... (110 A) 6SL3210-1SE31-5... (145 A)	6SL3210-1SE31-8... (178 A)

[1] With correctly connected load connection cable.

Selection and ordering data

Rated output current	Type rating	Suitable for Power Module in blocksize format		Line reactor
A	kW (HP)	Type	Frame size	Order No.
Line voltage 200 ... 240 V 1 AC				
0.9	0.12 (0.2)	6SL3210-1SB11-0...	FSA	**6SE6400-3CC00-4AB3**
2.3	0.37 (0.5)	6SL3210-1SB12-3...		
3.9	0.75 (0.75)	6SL3210-1SB14-0...	FSA	**6SE6400-3CC01-0AB3**
Line voltage 380 ... 480 V 3 AC				
1.3	0.37 (0.5)	6SL3210-1SE11-3UA0	FSA	**6SE6400-3CC00-2AD3**
1.7	0.55 (0.75)	6SL3210-1SE11-7UA0		
2.2	0.75 (1)	6SL3210-1SE12-2UA0	FSA	**6SE6400-3CC00-4AD3**
3.1	1.1 (1.5)	6SL3210-1SE13-1UA0		
4.1	1.5 (2)	6SL3210-1SE14-1UA0	FSA	**6SE6400-3CC00-6AD3**
5.9	2.2 (3)	6SL3210-1SE16-0...	FSB	**6SL3203-0CD21-0AA0**
7.7	3 (5)	6SL3210-1SE17-7...		
10	4 (5)	6SL3210-1SE21-0...	FSB	**6SL3203-0CD21-4AA0**
18	7.5 (10)	6SL3210-1SE21-8...	FSC	**6SL3203-0CD22-2AA0**
25	11 (15)	6SL3210-1SE22-5...		
32	15 (20)	6SL3210-1SE23-2...	FSC	**6SL3203-0CD23-5AA0**
38	18.5 (25)	6SL3210-1SE23-8...	FSD	**6SL3203-0CJ24-5AA0**
45	22 (30)	6SL3210-1SE24-5...		
60	30 (40)	6SL3210-1SE26-0...	FSD	**6SL3203-0CD25-3AA0**
75	37 (50)	6SL3210-1SE27-5...	FSE	**6SL3203-0CJ28-6AA0**
90	45 (60)	6SL3210-1SE31-0...		
110	55 (75)	6SL3210-1SE31-1...	FSF	**6SE6400-3CC11-2FD0**
145	75 (100)	6SL3210-1SE31-5...		
178	90 (125)	6SL3210-1SE31-8...	FSF	**6SE6400-3CC11-7FD0**

Power Modules in blocksize format
Line filters

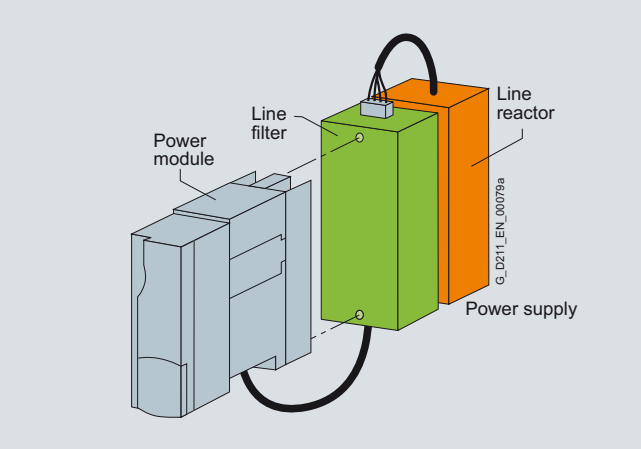
Overview

In plants with strict EMC requirements, the line filter for frame size FSA restricts the conducted interference emanating from the PM340 Power Module to the limit values of Class C2 as defined in EN 61800-3. The line filter is suited only for direct connection to TN (grounded) systems.

Note: The line filter is designed only for PM340 Power Modules of frame size FSA and a line voltage of 380 V to 480 V 3 AC. All other PM340 Power Modules are available with integrated line filter.

Integration

Line filter, line reactor and Power Module can be mounted in front of one another.



Technical specifications

Line voltage 380 ... 480 V 3 AC	**Line filter** 6SE6400-2FA00-6AD0
Rated current	6 A
Power loss	< 5 W
Line connection L1, L2, L3	Screw-type terminals
• Conductor cross-section	1 ... 2.5 mm^2
PE connection	M4 screw stud
Load connection U, V, W, PE	Shielded cable
• Conductor cross-section	4 × 1.5 mm^2
• Length, approx.	0.24 m (0.79 ft)
Degree of protection	IP20 (with correctly connected load connection cable)
Dimensions	
• Width	73.5 mm (2.89 in)
• Height	200 mm (7.87 in)
• Depth	44 mm (1.73 in)
Weight, approx.	0.5 kg (1 lb)
Approvals, according to	cURus
Suitable for Power Module in blocksize format Type (rated output current)	6SL3210-1SE11-... (1.3 A and 1.7 A) 6SL3210-1SE12-... (2.2 A) 6SL3210-1SE13-... (3.1 A) 6SL3210-1SE14-... (4.1 A)

Selection and ordering data

Suitable for Power Modules in blocksize format Frame size FSA	**Line filter**
Type	Order No.
Line voltage 380 ... 480 V 3 AC	
6SL3210-1SE11-...	**6SE6400-2FA00-6AD0**
6SL3210-1SE12-...	
6SL3210-1SE13-...	
6SL3210-1SE14-...	

Overview

Suitable line-side power components are assigned depending on the power rating of the Power Modules.

The following tables list recommended components and apply for ambient temperatures up to 40 °C (104 °F).

Further information about the line contactors, switch disconnectors, fuses and circuit breakers specified in the tables can be found in Catalogs LV 10.1 and IC 10.

Assignment of line-side power components to Power Modules in blocksize format

Rated output current	Type rating	Suitable for Power Module, blocksize format	**Line contactor (Insta contactor)**	**Circuit breaker IEC 60947 and UL489/ CSA C22.2 No. 5-02**	**UL/CSA fuse, Class J** Available from: Ferraz Shawmut www.ferrazshawmut.com		
A	kW (HP)	Type 6SL3210-	Type	Order No.	Rated current	Size d × l mm	Reference No.
Line voltage 200 ... 240 V 1 AC							
0.9	0.12 (0.2)	1SB11-0...	**5TT57…**	**5SJ4206-7HG41**	6 A	21 × 57	AJT6
2.3	0.37 (0.5)	1SB12-3...	**5TT57…**	**5SJ4210-7HG41**	10 A	21 × 57	AJT10
3.9	0.75 (0.75)	1SB14-0...	**5TT57…**	**5SJ4216-7HG41**	15 A	21 × 57	AJT15

Rated output current	Type rating	Suitable for Power Module, blocksize format	**Line contactor**	**Circuit breaker IEC 60947**	**Circuit breaker UL489/CSA C22.2 No. 5-02**	**Main switch**
A	kW (HP)	Type 6SL3210-	Type	Order No.	Order No.	Order No.
Line voltage 380 ... 480 V 3 AC						
1.3	0.37 (0.5)	1SE11-3UA0	**3RT1015-...**	**3RV1021-1DA10**	**–**	**3LD2003-1TP51**
1.7	0.55 (0.75)	1SE11-7UA0	**3RT1015-...**	**3RV1021-1DA10**	**–**	**3LD2003-1TP51**
2.2	0.75 (1)	1SE12-2UA0	**3RT1015-...**	**3RV1021-1FA10**	**–**	**3LD2003-1TP51**
3.1	1.1 (1.5)	1SE13-1UA0	**3RT1015-...**	**3RV1021-1GA10**	**–**	**3LD2003-1TP51**
4.1	1.5 (2)	1SE14-1UA0	**3RT1015-...**	**3RV1021-1HA10**	**–**	**3LD2003-1TP51**
5.9	2.2 (3)	1SE16-0...	**3RT1015-...**	**3RV1021-1KA10**	**–**	**3LD2003-1TP51**
7.7	3 (5)	1SE17-7...	**3RT1015-...**	**3RV1021-4AA10**	**–**	**3LD2003-1TP51**
10	4 (5)	1SE21-0...	**3RT1016-...**	**3RV1021-4BA10**	**–**	**3LD2103-1TP51**
18	7.5 (10)	1SE21-8...	**3RT1025-...**	**3RV1031-4EA10**	**–**	**3LD2203-0TK51**
25	11 (15)	1SE22-5...	**3RT1026-...**	**3RV1031-4FA10**	**–**	**3LD2504-0TK51**
32	15 (20)	1SE23-2...	**3RT1034-...**	**3RV1031-4HA10**	**–**	**3LD2504-0TK51**
38	18.5 (25)	1SE23-8...	**3RT1035-...**	**3RV1042-4JA10**	**–**	**3LD2504-0TK51**
45	22 (30)	1SE24-5...	**3RT1036-...**	**3RV1042-4KA10**	**–**	**3LD2504-0TK51**
60	30 (40)	1SE26-0...	**3RT1044-...**	**3RV1042-4MA10**	**3VL2191-3KN30-....**	**3LD2704-0TK51**
75	37 (50)	1SE27-5...	**3RT1045-...**	**3VL1712-1DD33-....**	**3VL2110-3KN30-....**	**3LD2704-0TK51**
90	45 (60)	1SE31-0...	**3RT1046-...**	**3VL1716-1DD33-....**	**3VL2112-3KN30-....**	**3LD2804-0TK51**
110	55 (75)	1SE31-1...	**3RT1054-...**	**3VL3720-1DC36-....**	**3VL2115-3KN30-....**	**3KA5330-1GE01**
145	75 (100)	1SE31-5...	**3RT1056-...**	**3VL3720-1DC36-....**	**3VL3120-3KN30-....**	**3KA5530-1GE01**
178	90 (125)	1SE31-8...	**3RT1064-...**	**3VL3725-1DC36-....**	**3VL3125-3KN30-....**	**3KA5530-1GE01**

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Overview (continued)

Rated output current	Type rating	Suitable for Power Module, blocksize format	**Fuse switch disconnector**	**Switch disconnector with fuse holders**	**Fuse** [1]	**UL/CSA fuse, Class J** [2] Available from: Ferraz Shawmut www.ferrazshawmut.com		
A	kW (HP)	Type 6SL3210-	Order No.	Order No.	Order No.	Rated current	Size d × l mm	Reference No.
Line voltage 380 … 480 V 3 AC								
1.3	0.37 (0.5)	1SE11-3UA0	**3NP1123-1CA20**	**3KL5030-1GB01**	**3NA3804**	4 A	21 × 57	AJT4
1.7	0.55 (0.75)	1SE11-7UA0	**3NP1123-1CA20**	**3KL5030-1GB01**	**3NA3804**	4 A	21 × 57	AJT4
2.2	0.75 (1)	1SE12-2UA0	**3NP1123-1CA20**	**3KL5030-1GB01**	**3NA3801**	6 A	21 × 57	AJT6
3.1	1.1 (1.5)	1SE13-1UA0	**3NP1123-1CA20**	**3KL5030-1GB01**	**3NA3803**	8 A	21 × 57	AJT8
4.1	1.5 (2)	1SE14-1UA0	**3NP1123-1CA20**	**3KL5030-1GB01**	**3NA3803**	10 A	21 × 57	AJT10
5.9	2.2 (3)	1SE16-0...	**3NP1123-1CA20**	**3KL5030-1GB01**	**3NA3803**	10 A	21 × 57	AJT10
7.7	3 (5)	1SE17-7...	**3NP1123-1CA20**	**3KL5030-1GB01**	**3NA3805**	12 A	21 × 57	AJT12
10	4 (5)	1SE21-0...	**3NP1123-1CA20**	**3KL5030-1GB01**	**3NA3805**	15 A	21 × 57	AJT15
18	7.5 (10)	1SE21-8...	**3NP1123-1CA20**	**3KL5030-1GB01**	**3NA3810**	25 A	21 × 57	AJT25
25	11 (15)	1SE22-5...	**3NP1123-1CA20**	**3KL5030-1GB01**	**3NA3814**	35 A	27 × 60	AJT35
32	15 (20)	1SE23-2...	**3NP1123-1CA20**	**3KL5030-1GB01**	**3NA3817**	45 A	27 × 60	AJT45
38	18.5 (25)	1SE23-8...	**3NP1123-1CA20**	**3KL5030-1GB01**	**3NA3820**	50 A	27 × 60	AJT50
45	22 (30)	1SE24-5...	**3NP1123-1CA20**	**3KL5030-1GB01**	**3NA3822**	60 A	27 × 60	AJT60
60	30 (40)	1SE26-0...	**3NP1123-1CA20**	**3KL5230-1GB01**	**3NA3824**	90 A	29 × 117	AJT90
75	37 (50)	1SE27-5...	**3NP1123-1CA20**	**3KL5230-1GB01**	**3NA3830**	100 A	29 × 117	AJT100
90	45 (60)	1SE31-0...	**3NP1133-1CA20**	**3KL5230-1GB01**	**3NA3832**	125 A	41 × 146	AJT125
110	55 (75)	1SE31-1...	**3NP1133-1CA20**	**3KL5330-1GB01**	**3NA3836**	150 A	41 × 146	AJT150
145	75 (100)	1SE31-5...	**3NP1143-1DA10**	**3KL5530-1GB01**	**3NA3140**	200 A	41 × 146	AJT200
178	90 (125)	1SE31-8...	**3NP1143-1DA10**	**3KL5530-1GB01**	**3NA3144**	250 A	54 × 181	AJT250

[1] Can also be protected by semiconductor protection or device protection fuses of type 3NE, and same fuse suitable for switch disconnector.
[2] Not suitable for 3NP and 3KL switch disconnectors

Design

Power Module in chassis format shown with Control Unit (not included in scope of supply)

The Power Modules in chassis format feature the following connections and interfaces as standard:

- 1 power connection
- 2 DC link connections for options such as Braking Modules
- 3 DRIVE-CLiQ sockets
- 1 safe standstill input (enable pulses)
- 1 temperature sensor input (KTY84-130 or PTC/PT100)
- 1 electronics power supply connection
- 1 motor connection
- 2 PE (protective earth) connections

The CU310 Control Unit can be mounted in Power Modules of chassis format.

The scope of supply of the Power Modules includes:

- 1 DRIVE-CLiQ cable
  for connection to the CU310/SIMOTION D410 Control Unit
- One 24 V supply cable
  for connection to the CU310/SIMOTION D410 Control Unit
- 1 mounting plate
  for attaching the CU310/SIMOTION D410 Control Unit
- One set of warning signs in 16 languages

Power Modules in chassis format can be connected to grounded TN/TT systems and non-grounded IT systems.

Application in multi-axis systems

Power Modules in chassis format can also be connected directly via DRIVE-CLiQ to a separate CU320-2 or SIMOTION D4xx Control Unit. The appropriate DRIVE-CLiQ cable for the required distance must be ordered as an additional accessory (see chapter Connection system MOTION-CONNECT). A CUA31/CUA32 adapter module need not be installed in the Power Module in chassis format.

Selection and ordering data

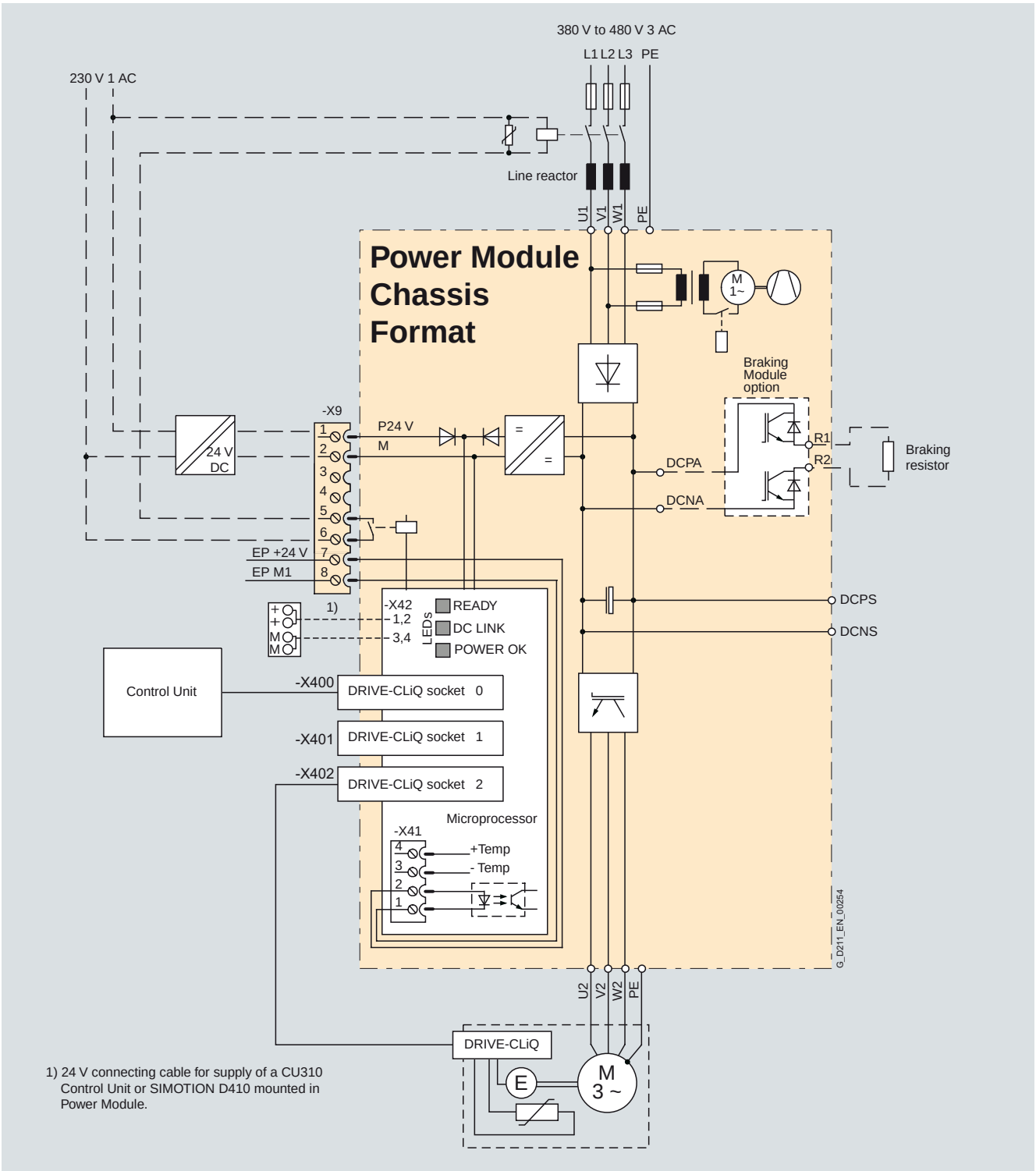
Rated output current	Type rating	**Air-cooled Power Module in chassis format**
A	kW (HP)	Order No.
Line voltage 380 ... 480 V 3 AC		
210	110 (150)	**6SL3310-1TE32-1AA3**
260	132 (200)	**6SL3310-1TE32-6AA3**
310	160 (250)	**6SL3310-1TE33-1AA3**
380	200 (300)	**6SL3310-1TE33-8AA3**
490	250 (400)	**6SL3310-1TE35-0AA3**
Accessories for re-ordering		
Warning labels in 16 languages This set of foreign language warning signs can be placed on top of the standard English or German signs. A set of signs is supplied with the units. One sign in each of the following languages is provided in each set: Chinese Simplified, Czech, Danish, Dutch, Finnish, French, Greek, Italian, Japanese, Korean, Polish, Portuguese/Brazilian, Russian, Spanish, Swedish, Turkish.		**6SL3166-3AB00-0AA0**
Dust-proof blanking plugs (50 units) For DRIVE-CLiQ port		**6SL3066-4CA00-0AA0**

3

Integration

The Power Modules in chassis format communicate with the higher-level Control Unit via DRIVE-CLiQ.

The Control Unit in this case could be a CU310 or CU320-2 or a SIMOTION D Control Unit.



Connection example of a Power Module in chassis format

Note: The integrated 24 V power supply is permitted to be loaded with up to 2 A on connector X42. When the Control Unit is supplied over the integrated power supply, particular attention must be paid to the summed load of the digital outputs so that the 2 A maximum is not exceeded.

Technical specifications

Air-cooled Power Module in chassis format 6SL3310-1TE3...	
Line connection voltage (up to 2000 m (6562 ft) above sea level)	380 ... 480 V 3 AC ±10 % (in operation -15 % < 1 min)
Line	Grounded TN/TT systems and non-grounded IT systems
Line frequency	47 … 63 Hz
Line power factor with a 3 AC line connection voltage and rated power	
• Fundamental power factor (cos φ_1)	> 0.96
• Total (λ)	0.75 … 0.93
Overvoltage category to EN 60664-1	Class III
Precharging frequency of the DC link, max.	1× every 300 s
DC link voltage, approx.	1.35 × line voltage
Output frequency	
• Control type Servo	0 … 650 Hz [1]
• Control type Vector	0 … 300 Hz [1]
• Control type *V/f*	0 … 300 Hz [1]
Electronics power supply	24 V DC -15 %/+20 %
Main contactor control Terminal strip X9/5-6	240 V AC/ max. 8 A 30 V DC/ max. 1 A
Radio interference suppression	
• Standard (in combination with line reactor)	Category C3 to EN 61800-3
• With line filter and line reactor	Category C2 to EN 61800-3
Type of cooling	Increased air cooling by means of built-in fan
Permissible ambient and coolant temperature (air) In operation for line-side components, Line Modules and Motor Modules	0 … 40 °C (32 … 104 °F) without derating, > 40 … 55 °C (104 … 131 °F) see derating characteristics
Installation altitude	Up to 2000 m (3281 ft) above sea level without derating, > 2000 ... 4000 m (3281 ... 13124 ft) above sea level, see derating characteristics
Conformity	CE (low-voltage and EMC Directives)
Approvals, according to	cULus
Safety Integrated	Safety Integrity Level 2 (SIL2) acc. to IEC 61508, Performance Level d (PLd) acc. to ISO 13849-1 and Control Category 3 acc. to ISO 13849-1 or EN 954-1. For further information see chapter Safety Integrated

[1] Note the correlation between max. output frequency, pulse frequency and current derating.
For further information see chapter System description – Dimensioning.

3

Technical specifications (continued)

Line voltage 380 ... 480 V 3 AC		Air-cooled Power Module in chassis format				
		6SL3310-1TE32-1AA3	6SL3310-1TE32-6AA3	6SL3310-1TE33-1AA3	6SL3310-1TE33-8AA3	6SL3310-1TE35-0AA3
Output current						
• Rated current I_{rated}	A	210	260	310	380	490
• Base-load current I_L	A	205	250	302	370	477
• Base-load current I_H	A	178	233	277	340	438
• For S6 duty (40 %) I_{S6}	A	230	285	340	430	540
• I_{max}	A	307	375	453	555	715
Type rating [1]						
• Based on I_{rated}	kW (HP)	110 (150)	132 (200)	160 (250)	200 (300)	250 (400)
• Based on I_H	kW (HP)	90 (150)	110 (150)	132 (200)	160 (250)	200 (350)
Rated pulse frequency	kHz	2	2	2	2	2
Current requirement with 24 V DC, max. [2]	A	0.9	0.9	1.2	1.2	1.2
Power loss	kW	2.54	3.36	4.07	4.67	5.96
Cooling air requirement	m^3/s (ft^3/s)	0.17 (6)	0.23 (8.1)	0.36 (12.7)	0.36 (12.7)	0.36 (12.7)
Sound pressure level L_{pA} (1 m) at 50/60 Hz	dB	66/67	68/72	68/72	68/72	68/72
Rated input current	A	229	284	338	395	509
Line connection U1, V1, W1		Flat connector for M10 screw	Flat connector for M10 screw	Flat connector for M10 screw	Flat connector for M10 screw	Flat connector for M10 screw
• Conductor cross-section, max.	mm^2	2 × 185	2 × 185	2 × 240	2 × 240	2 × 240
DC link connection DCPA, DCNA (option Braking Module)		Flat connector for M8 screw	Flat connector for M8 screw	Flat connector for M8 screw	Flat connector for M8 screw	Flat connector for M8 screw
• Conductor cross-section, max.	mm^2	1 × 35	1 × 35	1 × 50	1 × 50	1 × 50
DC link connection DCPS, DCNS		Flat connector for M8 screw	Flat connector for M8 screw	Flat connector for M8 screw	Flat connector for M8 screw	Flat connector for M8 screw
• Conductor cross-section, max.	mm^2	1 × 35	1 × 35	1 × 70	1 × 70	1 × 70
Motor connection U2, V2, W2		Flat connector for M10 screw	Flat connector for M10 screw	Flat connector for M10 screw	Flat connector for M10 screw	Flat connector for M10 screw
• Conductor cross-section, max.	mm^2	2 × 185	2 × 185	2 × 240	2 × 240	2 × 240
PE connection		Flat connector for M10 screw	Flat connector for M10 screw	Flat connector for M10 screw	Flat connector for M10 screw	Flat connector for M10 screw
• Conductor cross-section, max.	mm^2	2 × 185	2 × 185	2 × 240	2 × 240	2 × 240
Motor cable length [3], **max.**						
• Shielded	m (ft)	300 (984)	300 (984)	300 (984)	300 (984)	300 (984)
• Unshielded	m (ft)	450 (1476)	450 (1476)	450 (1476)	450 (1476)	450 (1476)
Degree of protection		IP20	IP20	IP20	IP20	IP20
Dimensions						
• Width	mm (in)	326 (12.83)	326 (12.83)	326 (12.83)	326 (12.83)	326 (12.83)
• Height	mm (in)	1400 (55.12)	1400 (55.12)	1533 (60.35)	1533 (60.35)	1533 (60.35)
• Depth	mm (in)	356 (14.02) [4]	356 (14.02) [4]	549 (21.61)	549 (21.61)	549 (21.61)
Frame size		FX	FX	GX	GX	GX
Weight, approx.	kg (lb)	104 (229)	104 (229)	162 (357)	162 (357)	162 (357)

1) Nominal HP based on Asynchronous motors (induction motors) and 460 V AC. For specific sizing select drive based on motor nameplate current and overload.

2) Current consumption of Power Module only. If a Control Unit is supplied with 24 V DC over the Power Module, its current consumption must be added.

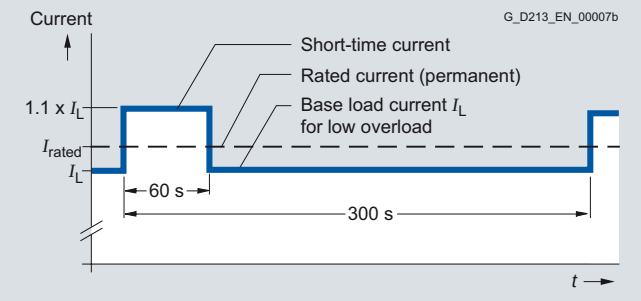
3) Motor cable length, max. 100 m (328 ft) (shielded) in conjunction with a line filter to maintain the limit values of EN 61800-3 Category C2.

4) Depth = 421 mm (16.47 in) including front cover when CU310 Control Unit is installed.

Characteristic curves

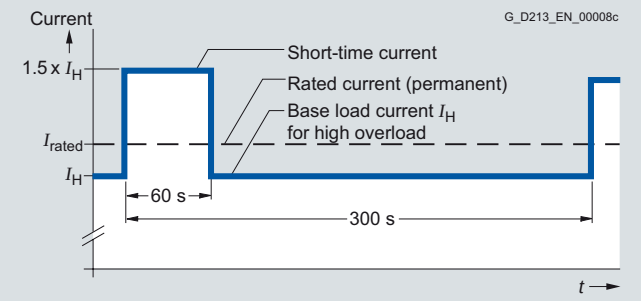
Overload capability

The base-load current I_L is based on a load cycle of 110 % for 60 s or 150 % for 10 s with a load cycle period of 300 s.

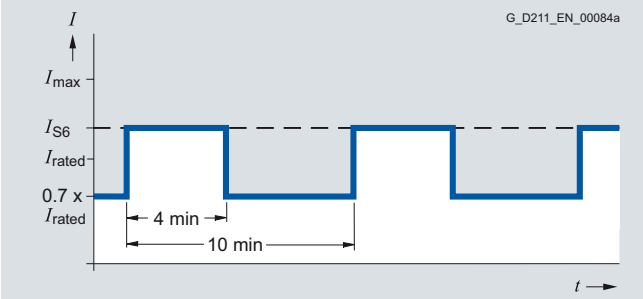


Low overload

The base-load current I_H is based on a load cycle of 150 % for 60 s or 160 % for 10 s with a load cycle period of 300 s.



Overload capability



S6 load cycle with previous load with a load cycle period of 600 s

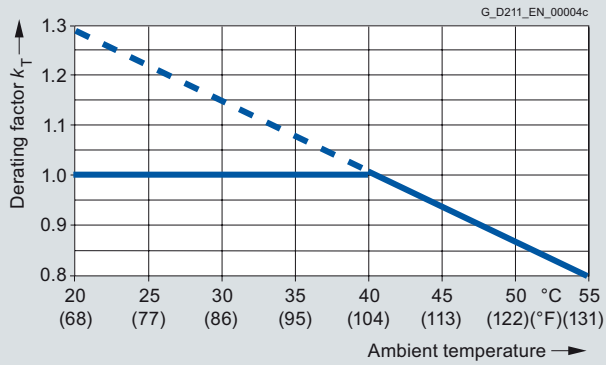
3

Characteristic curves (continued)

Derating factors

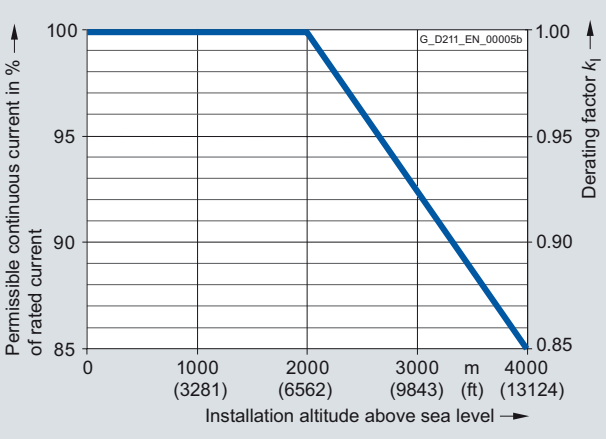
Output current dependent on pulse frequency

Power Module in chassis format	Rated output current	**Derating factor**
Type	A	for a pulse frequency of 4 kHz
6SL3310-1TE32-1AA3	210	**0.82**
6SL3310-1TE32-6AA3	260	**0.83**
6SL3310-1TE33-1AA3	310	**0.88**
6SL3310-1TE33-8AA3	380	**0.87**
6SL3310-1TE35-0AA3	490	**0.78**

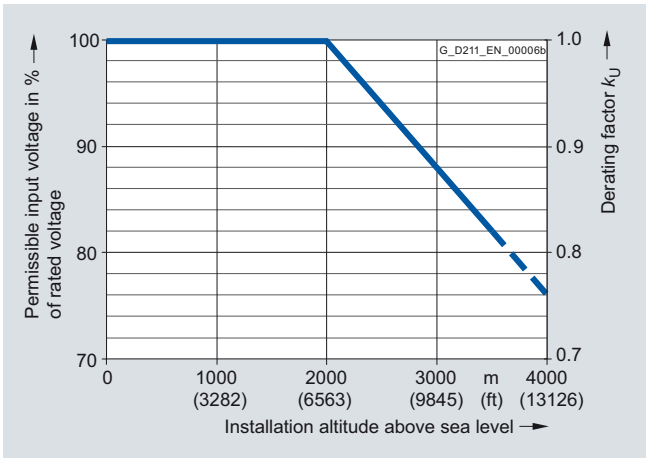


Current derating dependent on ambient temperature

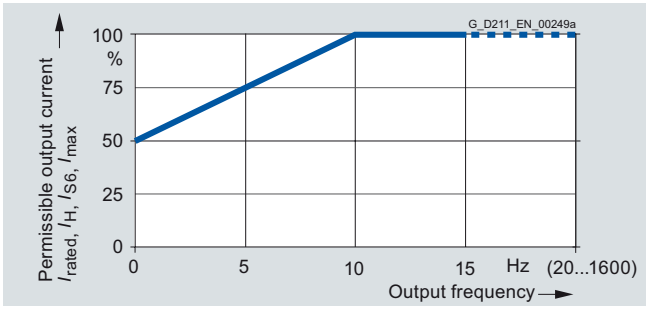
Note: A factor $k_T > 1$ must be applied only in conjunction with current derating dependent on installation altitude, see chapter System description – Dimensioning.



Current derating dependent on installation altitude



Voltage derating dependent on installation altitude



Current derating dependent on output frequency

Liquid-cooled Power Modules in chassis format

Design

Liquid-cooled Power Module in chassis format shown with Control Unit (not included in scope of supply)

The liquid-cooled Power Modules in chassis format are suitable for applications in confined spaces and plants/machines that cannot be equipped with air-cooled devices due to air quality. The liquid-cooled Power Modules in chassis format impress customers with their extremely compact dimensions and low noise level. The devices can be installed vertically or horizontally on the rear panel of the control cabinet. The connections for the coolant are located at the bottom of the Power Module in the case of vertical mounting.

The power connections for the supply system and DC link are connected externally and the motor connections are routed downwards.

Liquid-cooled Power Modules are designed for connection to grounded TN/TT systems and non-grounded IT systems.

The liquid-cooled Power Modules in chassis format feature the following connections and interfaces as standard:

- 1 power connection
- 1 DC link connection
- 3 DRIVE-CLiQ sockets
- 1 safe standstill input (enable pulses)
- 1 temperature sensor input (KTY84-130 or PTC/PT100)
- 1 electronics power supply connection
- 1 motor connection
- 2 PE (protective earth) connections
- 2 coolant connections

The CU310 Control Unit can be mounted in the liquid-cooled Power Modules of chassis format.

The scope of supply of the Power Modules includes:

- 1 DRIVE-CLiQ cable for connection to the CU310/SIMOTION D410 Control Unit
- 1 × 24 V supply cable for connection to the CU310/SIMOTION D410 Control Unit
- 1 CD-ROM with manual in PDF version
- 1 set of warning signs in 16 languages
- 2 seals for coolant connections
- 2 protective caps for coolant connections

Application in multi-axis systems

Power Modules in chassis format can also be connected directly via DRIVE-CLiQ to a separate CU320-2 or SIMOTION D4xx Control Unit. The appropriate DRIVE-CLiQ cable for the required distance must be ordered as an additional accessory (see chapter Connection system MOTION-CONNECT). A CUA31/CUA32 adapter module need not be installed in the Power Module in chassis format.

Selection and ordering data

Rated output current	Type rating	Liquid-cooled Power Modules in chassis format
A	kW (HP)	Order No.
Line voltage 380 ... 480 V 3 AC		
210	110 (150)	**6SL3315-1TE32-1AA3**
260	132 (200)	**6SL3315-1TE32-6AA3**
310	160 (250)	**6SL3315-1TE33-1AA3**
490	250 (400)	**6SL3315-1TE35-0AA3**
Accessories		
3-way valve DN15 ¾" connection [1]		**VXP45.15-2.5**
Actuator for 3-way valve [1]		
• 230 V 1 AC		**SSC31**
• 24 V 1 AC		**SSC81**
Accessories for re-ordering		
Warning labels in 16 languages This set of foreign language warning signs can be placed on top of the standard English or German signs. A set of signs is supplied with the units. One sign in each of the following languages is provided in each set: Chinese Simplified, Czech, Danish, Dutch, Finnish, French, Greek, Italian, Japanese, Korean, Polish, Portuguese/Brazilian, Russian, Spanish, Swedish, Turkish.		**6SL3166-3AB00-0AA0**
Dust-proof blanking plugs (50 units) For DRIVE-CLiQ port		**6SL3066-4CA00-0AA0**

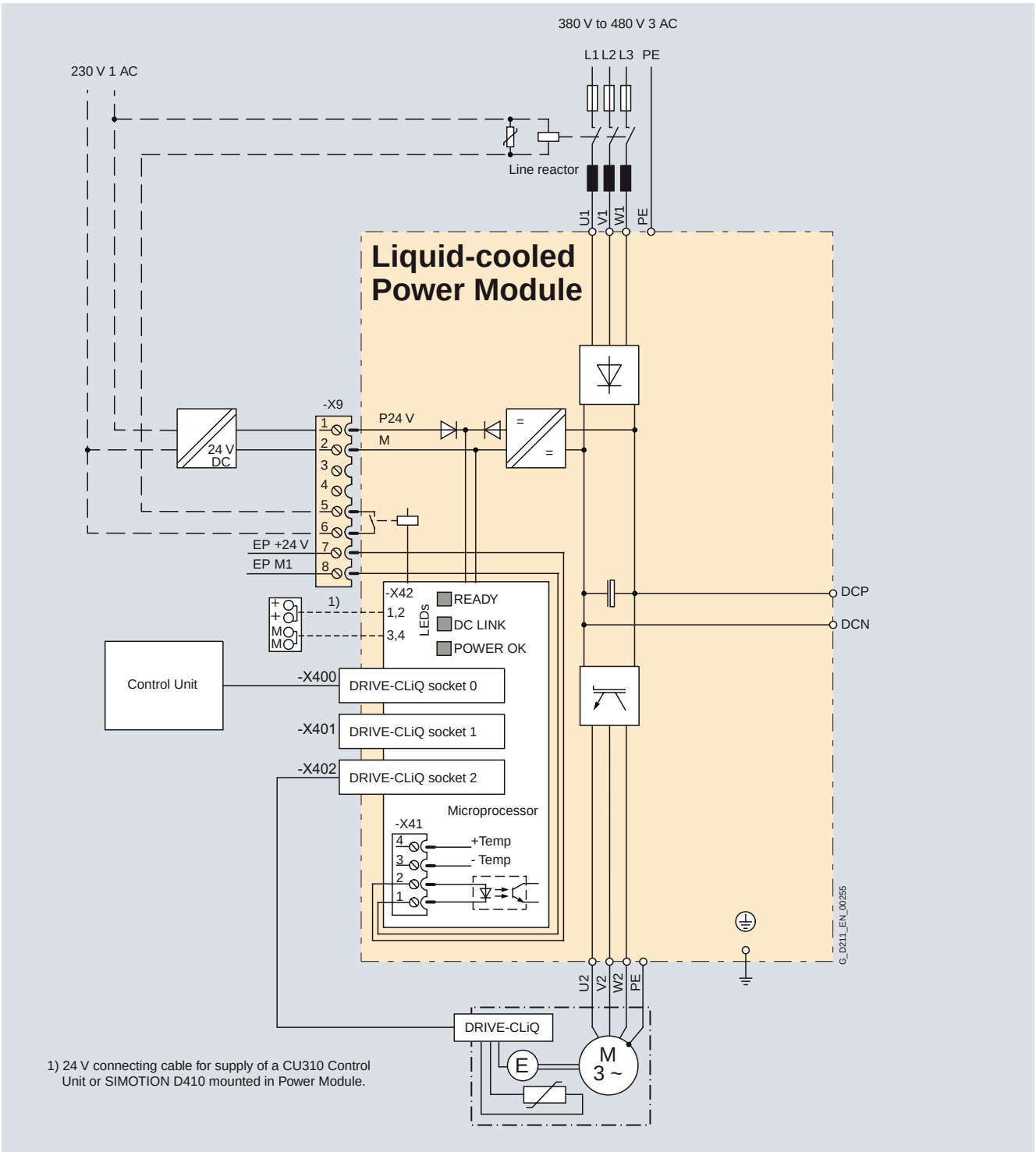
[1] Recommended components for installing a flow control as condensation protection; manufacturer: Siemens SBT
For further information, see Equipment Manual.

3

Integration

The liquid-cooled Power Modules in chassis format communicate with the higher-level Control Unit via DRIVE-CLiQ.

The Control Unit in this case could be a CU310 or CU320-2 or a SIMOTION D Control Unit. An external 24 V DC supply is required to operate liquid-cooled Power Modules.



Connection example of a liquid-cooled Power Module in chassis format

Note: The integrated 24 V power supply is permitted to be loaded with up to 2 A on connector X42. When the Control Unit is supplied over the integrated power supply, particular attention must be paid to the summed load of the digital outputs so that the 2 A maximum is not exceeded.

Technical specifications

Liquid-cooled Power Module in chassis format 6SL3315-1TE3...	
Line connection voltage (up to 2000 m (6562 ft) above sea level)	380 ... 480 V 3 AC ±10 % (in operation -15 % < 1 min)
Line	Grounded TN/TT systems and non-grounded IT systems
Line frequency	47 … 63 Hz
Line power factor with a 3 AC line connection voltage and rated power • Fundamental power factorr (cos φ_1) • Total (λ)	 > 0.96 0.75 … 0.93
Overvoltage category to EN 61800-5-1	Class III
Precharging frequency of the DC link	No limitation
DC link voltage, approx.	1.35 × line voltage
Output frequency • Control type Servo • Control type Vector • Control type *V/f*	 0 … 650 Hz [1] 0 … 300 Hz [1] 0 … 300 Hz [1]
Electronics power supply	24 V DC -15 %/+20 %
Main contactor control Terminal strip X9/5-6	240 V AC/max. 8 A 30 V DC/max. 1 A
Radio interference suppression • Standard (in combination with line reactor)	 Category C3 to EN 61800-3
Type of cooling	Liquid cooling with integrated heat exchanger in stainless-steel version
Coolant [2] • pH value • Chloride • Sulfate • Hardness • Conductivity • Colony number • Max. size of entrained particles	 6.0 … 9.0 < 200 mg/l < 240 mg/l < 2.5 mmol/l [3] < 2000 µS/cm < 1000 col/ml [4] < 100 µm
Cooling circuit • System pressure with reference to atmospheric pressure, max. • Pressure drop at rated volumetric flow • Recommended pressure range • Inlet temperature of liquid coolant	 600 kPa 70 kPa 80 … 200 kPa Dependent on the ambient temperature, condensation is not permitted 0 … 45 °C (32 … 113 °F) without derating > 45 … 50 °C (113 … 122 °F) see derating characteristics (temperature range between 0 °C and 5 °C (32 … 41 °F) with anti-freeze only; recommended anti-freeze: Antifrogen N from Clariant)
Permissible ambient temperature (air) during operation	Dependent on the inlet temperature of the coolant, condensation is not permissible 0 … 45 °C (32 … 113 °F) without derating, > 45 … 50 °C (113 … 122 °F) see derating characteristics
Installation altitude	Up to 2000 m (3281 ft) above sea level without derating, > 2000 ... 4000 m (3281 ... 13124 ft) above sea level, see derating characteristics
Conformity	CE (low-voltage and EMC Directives)
Approvals, according to	cULus
Safety Integrated	Safety Integrity Level 2 (SIL 2) acc. to IEC 61508, Performance Level d (PLd) acc. to ISO 13849-1 and Control Category 3 acc. to ISO 13849-1 or EN 954-1. For further information see chapter Safety Integrated

[1] Note the correlation between max. output frequency, pulse frequency and current derating.
For further information see chapter System description – Dimensioning.

[2] The values are applicable to coolant (water) without the addition of anti-freeze or inhibitors. When anti-freeze or inhibitors are added, the specifications of the manufacturer regarding water quality must be observed. The proportion of anti-freeze must not exceed a minimum concentration, otherwise the coolant has a marked corrosive effect. In the case of Antifrogen N, the recommended range of the ratio of Antifrogen N to water lies between 20/80 and 45/55 Vol.%

[3] The hardness of the coolant, especially the concentration of calcium compounds should be kept to a minimum to prevent the build-up of damaging calcium deposits (lime scale). A hardness < 1.5 mmol/l is recommended.

[4] The number of microbes should generally be as low as possible to prevent damage as a result of slime-producing, iron-depositing, corroding bacteria. In closed coolant circuits, the accumulation of microbes can be prevented, for example, by adding anti-freeze. The concentration of anti-freeze must only reach a minimum level to prevent corrosion, see Footnote [2].

3

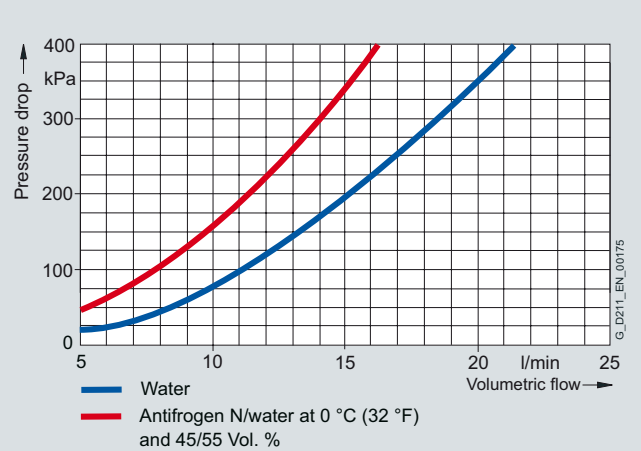
Technical specifications (continued)

Line voltage 380 ... 480 V 3 AC		Liquid-cooled Power Module in chassis format			
		6SL3315-1TE32-1AA3	6SL3315-1TE32-6AA3	6SL3315-1TE33-1AA3	6SL3315-1TE35-0AA3
Output current					
• Rated current I_{rated}	A	210	260	310	490
• Base-load current I_L	A	205	250	302	477
• Base-load current I_H	A	178	233	277	438
• For S6 duty (40 %) I_{S6}	A	230	285	340	540
• I_{max}	A	307	375	453	715
Type rating [1]					
• Based on I_{rated}	kW (HP)	110 (150)	132 (200)	160 (250)	250 (400)
• Based on I_H	kW (HP)	90 (150)	110 (150)	132 (200)	200 (350)
Rated pulse frequency	kHz	2	2	2	2
Power loss					
• Total, approx.	kW	2.51	3.16	3.50	5.36
• Lost to ambient air, approx.	kW	0.06	0.07	0.09	0.14
Cooling circuit					
• Rated volumetric flow for water at 70 kPa pressure drop	dm^3/min (l/min)	9	9	12	12
• Cooling circuit connection, inlet and return		Pipe thread ISO 228 – G ¾ B (external thread ¾", flat-sealing)	Pipe thread ISO 228 – G ¾ B (external thread ¾", flat-sealing)	Pipe thread ISO 228 – G ¾ B (external thread ¾", flat-sealing)	Pipe thread ISO 228 – G ¾ B (external thread ¾", flat-sealing)
• Liquid volume of integrated heat exchanger	dm^3 (l)	0.52	0.52	0.88	0.88
Sound pressure level L_{pA} (1 m) at 50/60 Hz	dB	52	52	52	52
Rated input current	A	230	285	340	540
Current requirement with 24 V DC, max.	A	1.5	1.5	1.8	1.8
Line connection U1, V1, W1		Flat connector for M12 screw	Flat connector for M12 screw	Flat connector for M12 screw	Flat connector for M12 screw
• Conductor cross-section, max.	mm^2	2 × 95	2 × 95	2 × 240	2 × 240
DC link connection DCP, DCN		Flat connector for M12 screw	Flat connector for M12 screw	Flat connector for M12 screw	Flat connector for M12 screw
• Conductor cross-section, max.	mm^2	2 × 95	2 × 95	2 × 240	2 × 240
Motor connection U2, V2, W2		Flat connector for M12 screw	Flat connector for M12 screw	Flat connector for M12 screw	Flat connector for M12 screw
• Conductor cross-section, max.	mm^2	2 × 95	2 × 95	2 × 240	2 × 240
PE connection		Flat connector for M12 screw	Flat connector for M12 screw	Flat connector for M12 screw	Flat connector for M12 screw
• Conductor cross-section, max.	mm^2	2 × 95	2 × 95	2 × 240	2 × 240
Motor cable length, max.					
• Shielded	m (ft)	300 (984)	300 (984)	300 (984)	300 (984)
• Unshielded	m (ft)	450 (1476)	450 (1476)	450 (1476)	450 (1476)
Degree of protection		IP00	IP00	IP00	IP00
Dimensions					
• Width	mm (in)	265 (10.43)	265 (10.43)	265 (10.43)	265 (10.43)
• Height	mm (in)	835.5 (32.89)	835.5 (32.89)	983 (38.70)	983 (38.70)
• Depth	mm (in)	549 (21.61)	549 (21.61)	549 (21.61)	549 (21.61)
Frame size		FL	FL	GL	GL
Weight, approx.	kg (lb)	77 (169)	77 (169)	108 (238)	108 (238)

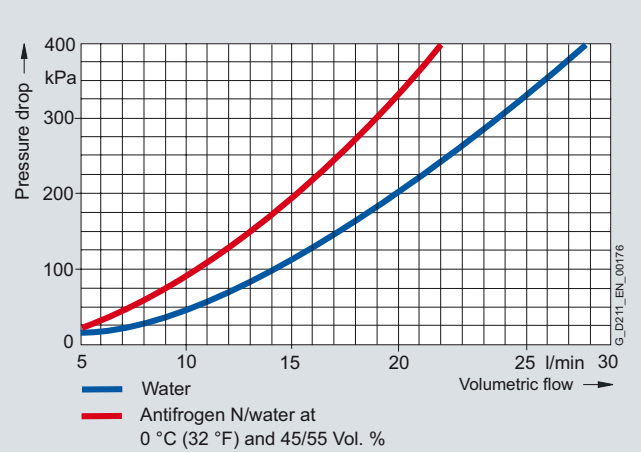
[1] Nominal HP based on Asynchronous motors (induction motors) and 460 V AC. For specific sizing select drive based on motor nameplate current and overload.

Characteristic curves

Pressure drop



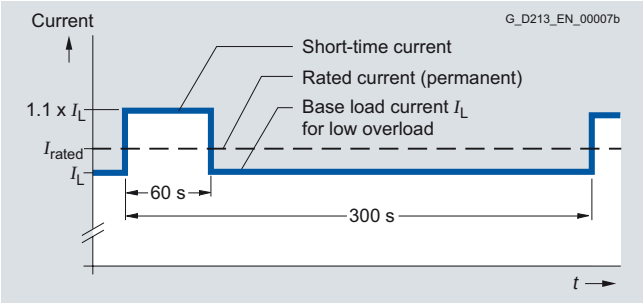
Press drop with frame size FL



Pressure drop with frame size GL

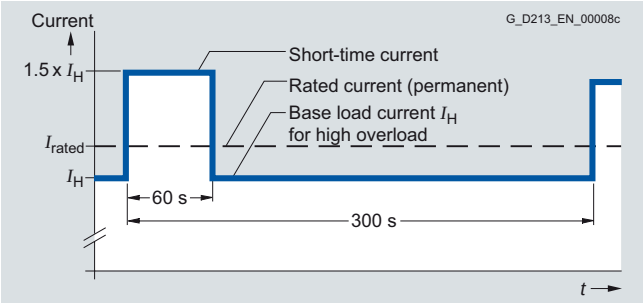
Overload capability

The base-load current I_L is based on a load cycle of 110 % for 60 s or 150 % for 10 s with a load cycle period of 300 s.

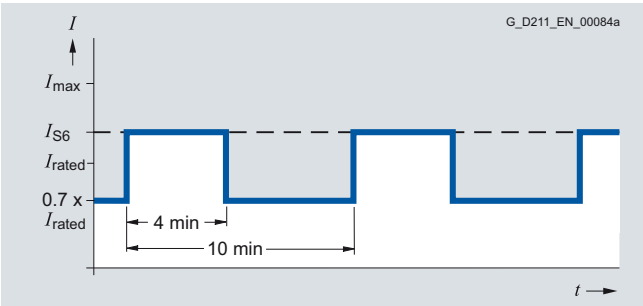


Low overload

The base-load current I_H is based on a load cycle of 150 % for 60 s or 160 % for 10 s with a load cycle period of 300 s.



Overload capability



S6 load cycle with previous load with a load cycle period of 600 s

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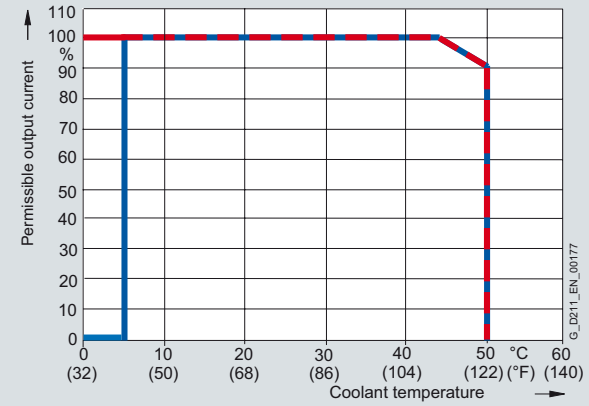
Characteristic curves (continued)

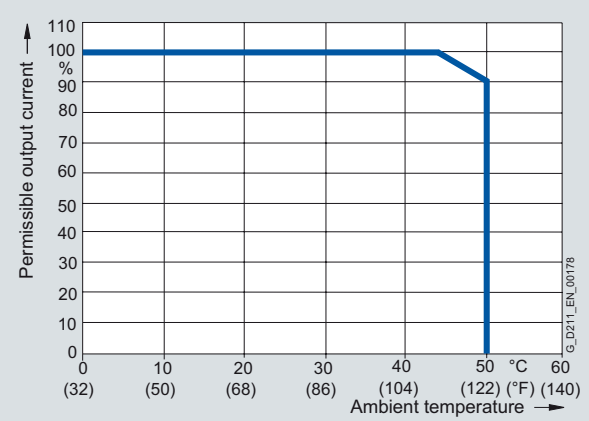
Derating factors

Output current dependent on pulse frequency

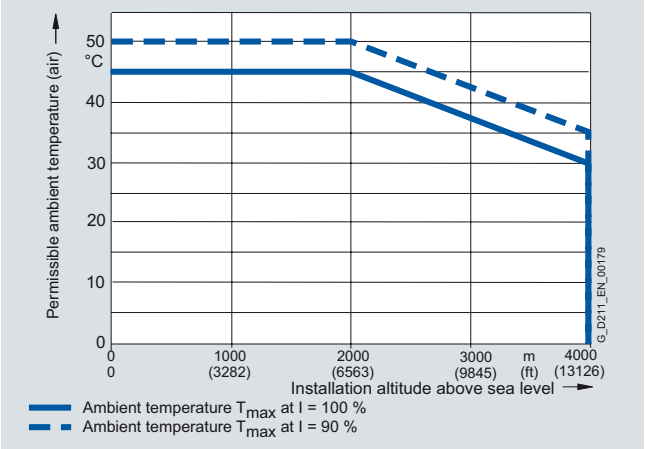
Liquid-cooled Power Modules in chassis format	Rated output current	Derating factor	
Type	A	for a pulse frequency of 2.5 kHz	for a pulse frequency of 4 kHz
6SL3315-1TE32-1AA3	210	**0.95**	**0.82**
6SL3315-1TE32-6AA3	260	**0.95**	**0.83**
6SL3315-1TE33-1AA3	310	**0.97**	**0.88**
6SL3315-1TE35-0AA3	490	**0.94**	**0.78**



Current derating dependent on temperature of the cooling liquid

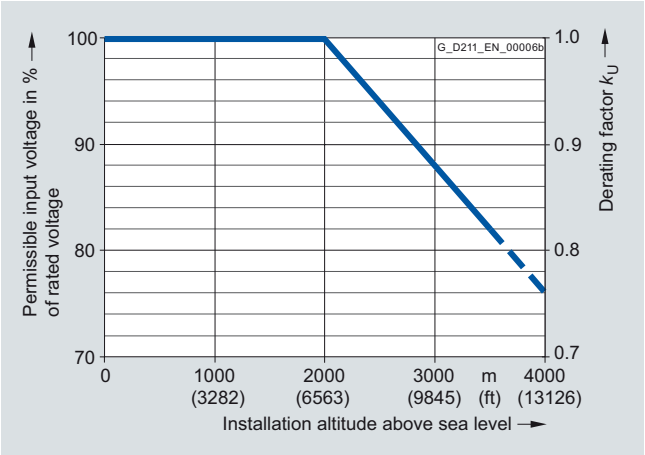


Current derating dependent on ambient temperature

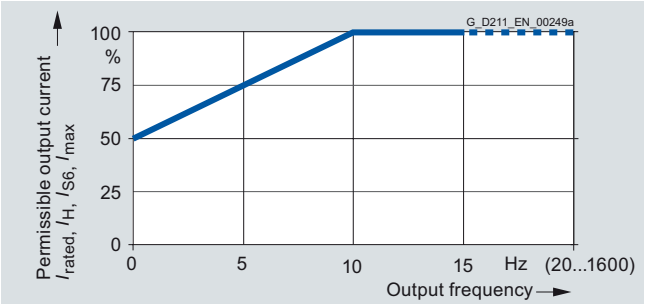


Current derating dependent on installation altitude

Note: For installation altitudes over 2000 m (6562 ft), current derating is required due to the power losses internally transferred to the ambient air. Current derating is not necessary when an additional external fan is used for ventilation.



Voltage derating dependent on installation altitude



Current derating dependent on output frequency

Overview

Line reactors limit the low-frequency harmonic effects and reduce the load on the rectifiers of the Power Modules. The higher the rated output of the Power Modules, the lower the required inductance of the line reactor. A line reactor is not required where the effective supply impedance equals $u_k > 3$ %.

For further information see chapter System description – Dimensioning.

Technical specifications

Line voltage 380 ... 480 V 3 AC		**Line reactor**			
		6SL3000-0CE32-3AA0	6SL3000-0CE32-8AA0	6SL3000-0CE33-3AA0	6SL3000-0CE35-1AA0
Rated current	A	224	278	331	508
Power loss at 50/60 Hz	kW	0.24/0.27	0.21/0.25	0.23/0.27	0.31/0.37
Line connection 1U1, 1V1, 1W1		Flat connector for M10 screw	Flat connector for M10 screw	Flat connector for M10 screw	Flat connector for M12 screw
Load connection 1U2, 1V2, 1W2		Flat connector for M10 screw	Flat connector for M10 screw	Flat connector for M10 screw	Flat connector for M12 screw
PE connection		M6 screw	M6 screw	M6 screw	M6 screw
Degree of protection		IP00	IP00	IP00	IP00
Dimensions					
• Width	mm (in)	270 (10.63)	270 (10.63)	270 (10.63)	300 (11.81)
• Height	mm (in)	248 (9.76)	248 (9.76)	248 (9.76)	269 (10.59)
• Depth	mm (in)	200 (7.87)	200 (7.87)	200 (7.87)	212.5 (8.37)
Weight, approx.	kg (lb)	24.5 (54)	26 (57)	27.8 (61)	38 (84)
Approvals, according to		cURus	cURus	cURus	cURus
Suitable for Power Module in chassis format	Type (rated output current)	6SL3310-1TE32-1... (210 A) 6SL3315-1TE32-1... (210 A)	6SL3310-1TE32-6... (260 A) 6SL3315-1TE32-6... (260 A)	6SL3310-1TE33-1... (310 A) 6SL3315-1TE33-1... (310 A)	6SL3310-1TE33-8... (380 A) 6SL3310-1TE35-0... (490 A) 6SL3315-1TE35-0... (490 A)

Selection and ordering data

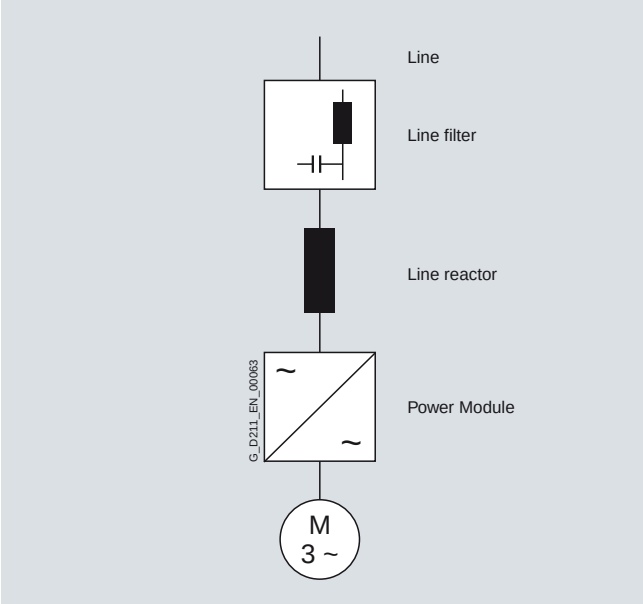
Rated output current A	Type rating kW (HP)	Suitable for Power Module in chassis format Type	**Line reactor** Order No.
Line voltage 380 ... 480 V 3 AC			
210	110 (150)	6SL3310-1TE32-1AA3 6SL3315-1TE32-1AA3	**6SL3000-0CE32-3AA0**
260	132 (200)	6SL3310-1TE32-6AA3 6SL3315-1TE32-6AA3	**6SL3000-0CE32-8AA0**
310	160 (250)	6SL3310-1TE33-1AA3 6SL3315-1TE33-1AA3	**6SL3000-0CE33-3AA0**
380	200 (300)	6SL3310-1TE33-8AA3	**6SL3000-0CE35-1AA0**
490	250 (400)	6SL3310-1TE35-0AA3 6SL3315-1TE35-0AA3	

Power Modules in chassis format
Line filters

Overview

In plants with strict EMC requirements, line filters work together with line reactors to restrict the conducted interference emanating from the Power Modules to the limit values of Category C2 as defined in EN 61800-3. Line filters are suited only for direct connection to TN (grounded) systems.

Integration



Technical specifications

Line voltage 380 ... 480 V 3 AC		Line filter		
		6SL3000-0BE32-5AA0	6SL3000-0BE34-4AA0	6SL3000-0BE36-0AA0
Rated current	A	250	440	600
Power loss	kW	0.05	0.05	0.06
Line connection 1U1, 1V1, 1W1		Flat connector for M10 screw	Flat connector for M10 screw	Flat connector for M10 screw
Load connection 1U2, 1V2, 1W2		Flat connector for M10 screw	Flat connector for M10 screw	Flat connector for M10 screw
PE connection		M8 drill	M8 drill	M10 drill
Degree of protection		IP00	IP00	IP00
Dimensions				
• Width	mm (in)	360 (14.17)	360 (14.17)	400 (15.75)
• Height	mm (in)	240 (9.45)	240 (9.45)	265 (10.43)
• Depth	mm (in)	116 (4.57)	116 (4.57)	140 (5.51)
Weight, approx.	kg (lb)	12.3 (27)	12.3 (27)	19 (42)
Approvals, according to		UR, cUR	UR, cUR	UR, cUR
Suitable for Power Module in chassis format	Type (rated output current)	6SL3310-1TE32-1... (210 A)	6SL3310-1TE32-6... (260 A) 6SL3310-1TE33-1... (310 A) 6SL3310-1TE33-8... (380 A)	6SL3310-1TE35-0... (490 A)

Selection and ordering data

Rated output current	Type rating	Suitable for Power Module in chassis format	**Line filter**
A	kW (HP)	Type	Order No.
Line voltage 380 ... 480 V 3 AC			
210	110 (150)	6SL3310-1TE32-1AA3	**6SL3000-0BE32-5AA0**
260	132 (200)	6SL3310-1TE32-6AA3	**6SL3000-0BE34-4AA0**
310	160 (250)	6SL3310-1TE33-1AA3	
380	200 (300)	6SL3310-1TE33-8AA3	
490	250 (400)	6SL3310-1TE35-0AA3	**6SL3000-0BE36-0AA0**

Overview

Suitable line-side power components are assigned depending on the power rating of the Power Modules.

The following tables list recommended components and apply for ambient temperatures up to 40 °C (104 °F).

Further information about the line contactors, switch disconnectors, fuses and circuit breakers specified in the tables can be found in Catalogs LV 10.1 and IC 10.

Assignment of line-side power components to Power Modules in chassis format

Rated output current	Type rating	Suitable for Power Module in chassis format	**Line contactor**	**Circuit breaker IEC 60947**	**Circuit breaker UL489/CSA C22.2 No. 5-02**
A	kW (HP)	Type 6SL3310-	Type	Order No.	Order No.
Line voltage 380 ... 480 V 3 AC					
210	110 (150)	1TE32-1AA3	**3RT1064-...**	**3VL4725-1DC36-0AA0**	**3VL3125-3KN30-0AA0**
260	132 (200)	1TE32-6AA3	**3RT1065-...**	**3VL4731-1DC36-0AA0**	**3VL4130-3KN30-0AA0**
310	160 (250)	1TE33-1AA3	**3RT1066-...**	**3VL4740-1DC36-0AA0**	**3VL4135-3KN30-0AA0**
380	200 (300)	1TE33-8AA3	**3RT1075-...**	**3VL5750-1DC36-0AA0**	**3VL4140-3KN30-0AA0**
490	250 (400)	1TE35-0AA3	**3RT1076-...**	**3VL5763-1DC36-0AA0**	**3VL4560-3KN30-0AA0**

Rated output current	Type rating	Suitable for Power Module in chassis format	**Main switch**	**Fuse switch disconnector**	**Switch disconnector with fuse holders**
A	kW (HP)	Type 6SL3310-	Order No.	Order No.	Order No.
Line voltage 380 ... 480 V 3 AC					
210	110 (150)	1TE32-1AA3	**3KA5530-1GE01**	**3NP1143-1DA10**	**3KL5530-1GB01**
260	132 (200)	1TE32-6AA3	**3KA5730-1GE01**	**3NP1153-1DA10**	**3KL5730-1GB01**
310	160 (250)	1TE33-1AA3	**3KA5730-1GE01**	**3NP1143-1DA10**	**3KL5730-1GB01**
380	200 (300)	1TE33-8AA3	**3KA5730-1GE01**	**3NP1143-1DA10**	**3KL5730-1GB01**
490	250 (400)	1TE35-0AA3	**3KA5830-1GE01**	**3NP1163-1DA10**	**3KL6130-1GB00**

Rated output current	Type rating	Suitable for Power Module in chassis format	**Fuse**	**UL/CSA fuse, Class J** [1] Available from: Ferraz Shawmut www.ferrazshawmut.com		
A	kW (HP)	Type 6SL3310-	Order No.	Rated current	Size d × l mm	Reference No.
Line voltage 380 ... 480 V 3 AC						
210	110 (150)	1TE32-1AA3	**3NA3144**	250 A	54 × 181	AJT250
260	132 (200)	1TE32-6AA3	**3NA3250**	300 A	54 × 181	AJT300
310	160 (250)	1TE33-1AA3	**3NA3254**	350 A	54 × 181	AJT350
380	200 (300)	1TE33-8AA3	**3NA3260**	400 A	54 × 181	AJT400
490	250 (400)	1TE35-0AA3	**3NA3372**	600 A	64 × 203	AJT600

[1] Not suitable for 3NP and 3KL switch disconnectors.

Basic Line Modules in booksize format

Overview

Basic Line Modules in booksize format

Basic Line Modules are used for applications in which no energy is returned to the supply or where the energy exchange between motor and generator axes takes place in the DC link. Basic Line Modules can only feed energy from the supply system into the DC link, energy cannot be fed back into the supply system. Basic Line Modules are designed for connection to grounded TN/TT systems and non-grounded IT systems. The connected Motor Modules are pre-charged over the integrated pre-charging resistors (20 kW and 40 kW) or through activation of the thyristors (100 kW).

The 20 kW and 40 kW Basic Line Modules are equipped with an integrated brake chopper. With the addition of an external braking resistor, they can be used for applications with intermittent regenerative operation such as stopping.
A Braking Module is required with a 100 kW Basic Line Module in addition to an external braking resistor for regenerative operation.

Design

The Basic Line Modules in booksize format feature the following connections and interfaces as standard:

- 1 power connection
- 1 connection for the 24 V DC electronics power supply
- 1 DC link connection
- 3 DRIVE-CLiQ sockets
- 1 connection for braking resistor
  (20 kW and 40 kW Basic Line Modules only)
- 1 temperature sensor input (KT84-130 or PTC/PT100)

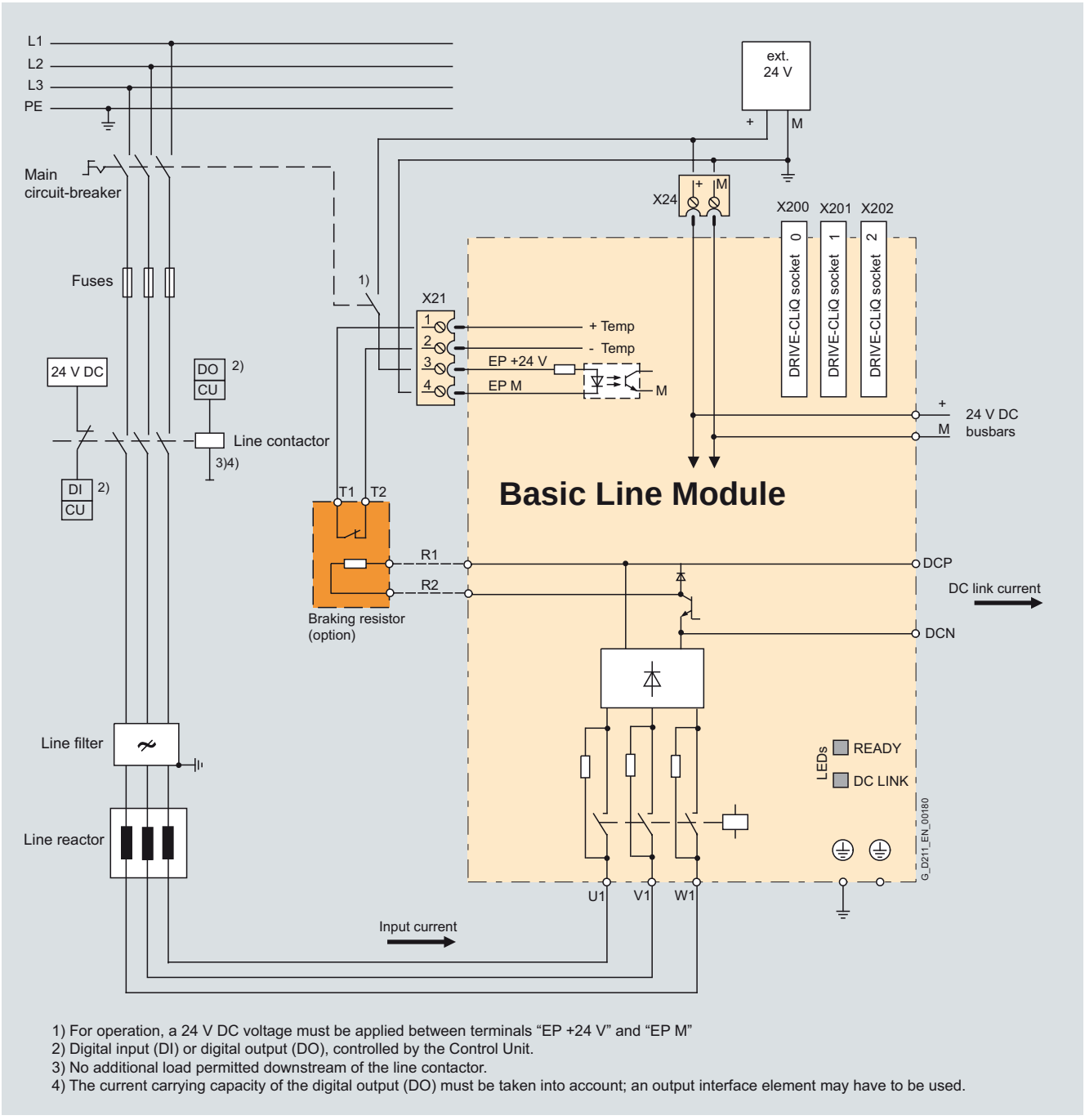
The status of the Basic Line Modules is indicated via two multi-color LEDs.

The scope of supply of the Basic Line Modules includes:

- DRIVE-CLiQ cable for connection to the adjacent Control Unit on the left for drive control, length 0.11 m (4.33 in)
- DRIVE-CLiQ cable (length depends on module width) to connect Basic Line Module to adjacent Motor Module, length-width Basic Line Module + 0.11 m (4.33 in)
- Jumper for connecting the 24 V DC busbar to the adjacent Motor Module
- 24 V terminal adapter (X24)
- Connector X21
- 2 blanking plugs for sealing unused DRIVE-CLiQ sockets
- 1 set of warning signs in 16 languages
- 1 heat conducting foil
  (for Basic Line Modules with cold plate cooling only)

Integration

The Basic Line Module communicates with a CU320-2 or SIMOTION D4x5 Control Unit via DRIVE-CLiQ.



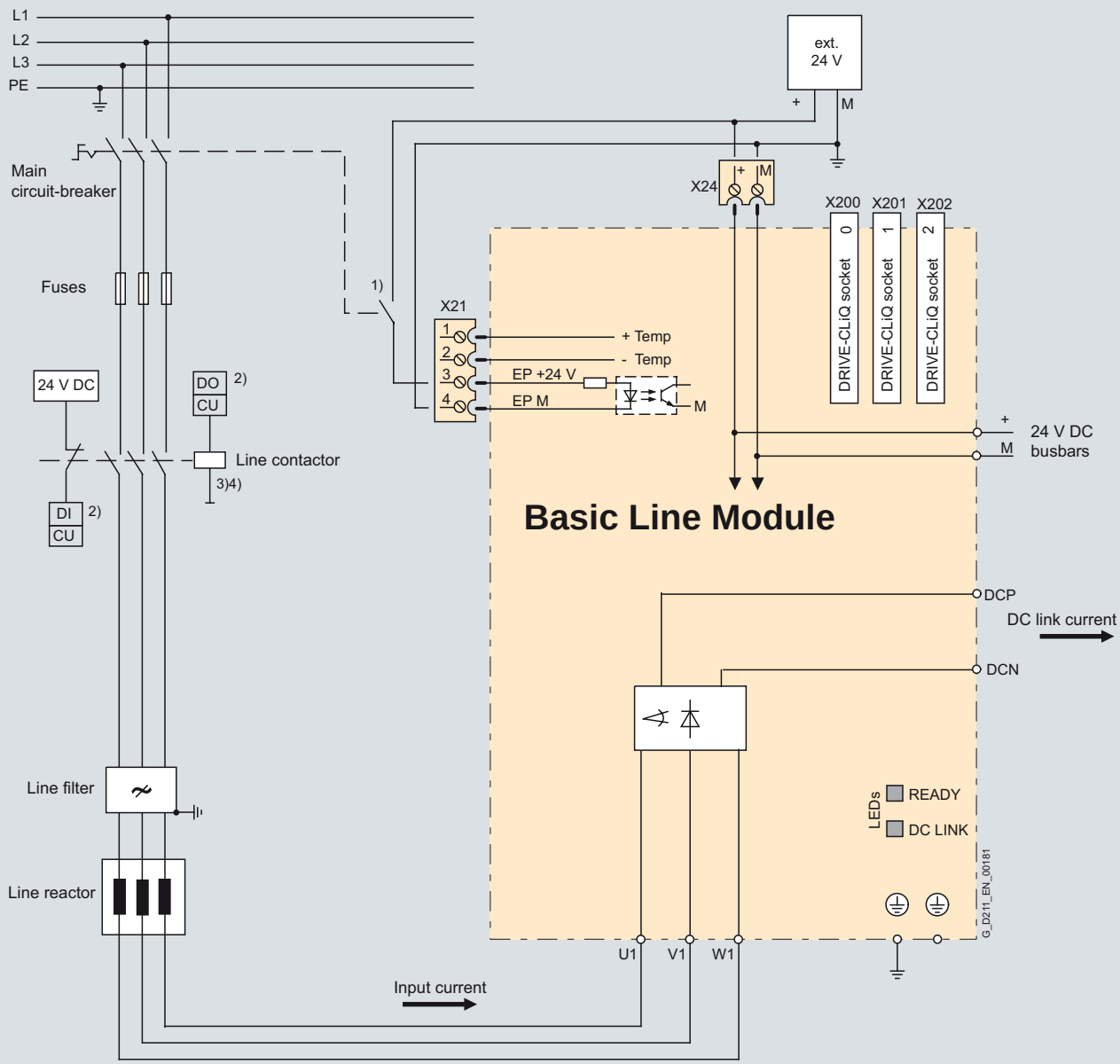
1) For operation, a 24 V DC voltage must be applied between terminals “EP +24 V” and “EP M”
2) Digital input (DI) or digital output (DO), controlled by the Control Unit.
3) No additional load permitted downstream of the line contactor.
4) The current carrying capacity of the digital output (DO) must be taken into account; an output interface element may have to be used.

Connection example for 20 kW and 40 kW Basic Line Modules in booksize format

Note: The thermostatic switch built into the braking resistor must be looped into the shutdown chain of the drive to prevent thermal overloading of the system in the event of a fault. If a braking resistor is not connected, a jumper must be connected between X21.1 and X21.2.

3

Integration (continued)



1) For operation, a 24 V DC voltage must be applied between terminals “EP +24 V” and “EP M”
2) Digital input (DI) or digital output (DO), controlled via Control Unit.
3) No additional load permitted downstream of the line contactor.
4) The current carrying capacity of the digital output (DO) must be taken into account; an output interface element may have to be used.

Connection example for 100 kW Basic Line Module in booksize format

Technical specifications

Basic Line Modules in booksize format 6SL313...	
Line connection voltage (up to 2000 m (6562 ft) above sea level)	380 ... 480 V 3 AC ±10 % (during operation -15 % < 1 min) [1]
Line frequency	47 … 63 Hz
SCCR (short-circuit current rating)	65 kA in conjunction with the recommended fuses class J or circuit breakers in accordance with UL489 / CSA 22.2 No. 5-02 see recommended line-side components
Line power factor at rated power	
• Fundamental Power factor (cos φ_1)	> 0.96
• Total (λ)	0.75 … 0.93
Overvoltage category according to EN 60664-1	Class III
DC link voltage, approx.	1.35 × line voltage [2]
Electronics power supply	24 V DC, -15 %/+20 %
Radio interference suppression	
• Standard	
- 20 kW and 40 kW Basic Line Modules	No radio interference suppression
- 100 kW Basic Line Module	Category C3 to EN 61800-3 Total cable length up to 350 m (1148 ft) (shielded)
• With line filter	Category C2 to EN 61800-3 Total cable length up to 350 m (1148 ft) (shielded)
Type of cooling	- Internal air cooling, power units with forced air cooling by built-in fans - Cold plate cooling
Permissible ambient and coolant temperature (air) during operation for line-side components, Line Modules and Motor Modules	0 … 40 °C (32 … 104 °F) without derating, > 40 … 55 °C (104 … 131 °F) see derating characteristics
Installation altitude	Up to 1000 m (3281 ft) above sea level without derating, > 1000 ... 4000 m (3281 ... 13124 ft) above sea level, see derating characteristics
Conformity	CE (low-voltage and EMC Directives)
Approvals, according to	cULus

[1] Can also be operated on supply systems with 200 ... 240 V 3 AC ±10 % with appropriate parameterization and reduced power rating.

[2] The DC link voltage is unregulated and load-dependent.
For more information, see chapter System description – Dimensioning.

Technical specifications (continued)

Line voltage 380 ... 480 V 3 AC		Basic Line Modules in booksize format		
• Internal air cooling		6SL3130-1TE22-0AA0	6SL3130-1TE24-0AA0	6SL3130-1TE31-0AA0
• Cold plate cooling		6SL3136-1TE22-0AA0	6SL3136-1TE24-0AA0	6SL3136-1TE31-0AA0
Power				
• Rated power P_{rated}				
- With 380 V 3 AC	kW	20	40	100
- With 460 V 3 AC [3]	(HP)	(25)	(50)	(125)
• For S6 duty (40 %) P_{S6}	kW	26	52	130
• P_{max}	kW	60	120	175
Braking power with external braking resistor				
• $P_{Bmax.}$ (= 2 × P_{rated})	kW	40	80	–
• Continuous braking power P_d (= 0.25 × P_{rated})	kW	5	10	–
DC link current				
• At 600 V DC	A	34	67	167
• For S6 duty (40 %)	A	43	87	217
• Maximum	A	100	200	292
Input current				
• Rated current at 380 V 3 AC	A	35	69	172
• Maximum	A	113	208	301
Activation threshold Braking module	V	774	774	–
Resistance value of the external braking resistor	Ω	≥ 14.8	≥ 7.4	–
Cable length, max. to braking resistor	m (ft)	15 (50)	15 (50)	–
Connection for braking resistor (X2)		Screw-type terminals	Screw-type terminals	–
• Conductor cross-section, max.	mm^2	0.5 … 4	0.5 … 10	
Current requirement, max. 24 V DC electronics power supply	A	1	1.4	2
Current carrying capacity				
• 24 V DC busbars	A	20	20	20
• DC link busbars	A	100	200	200
DC link capacitance				
• Basic Line Module	µF	940	1880	4100
• Drive line-up, max.	µF	20000	20000	50000
Internal air cooling				
• Power loss [1]	W	144	284	628
• Cooling air requirement	m^3/s (ft^3/s)	0.016 (0.6)	0.031 (1.1)	0.05 (1.8)
• Sound pressure level L_{pA} (1 m)	dB	< 60	< 65	< 65
Cold plate cooling				
• Power loss, int./ext. [1]	W	47/95	71/205	168/450
• Thermal resistance R_{th}	K/W	0.075	0.05	0.045
Line connection U1, V1, W1		Screw-type terminals	Screw-type terminals	M8 screw stud
• Conductor cross-section, max.	mm^2	0.5 … 16	10 … 50	1 × 35 … 120 or 2 × 50
Shield connection		Integrated into the power plug	See Accessories	See Accessories
PE connection		M5 screw	M6 screw	M6 screw
Cable length, max. (total of all motor power cables and DC link)				
• Shielded/unshielded	m (ft)	1000/1500 (3281/4921) [2]	1000/1500 (3281/4921) [2]	1000/1500 (3281/4921) [2]
Degree of protection		IP20	IP20	IP20
Dimensions				
• Width	mm (in)	100 (3.94)	150 (5.91)	200 (7.87)
• Height	mm (in)	380 (14.96)	380 (14.96)	380 (14.96)
• Depth				
- With internal air cooling	mm (in)	270 (10.63)	270 (10.63)	270 (10.63)
- With cold plate cooling	mm (in)	226 (8.90)	226 (8.90)	226 (8.90)
Weight, approx.				
- With internal air cooling	kg (lb)	6.8 (15.0)	11.3 (24.9)	15.8 (34.8)
- With cold plate cooling	kg (lb)	6.4 (14.1)	10.9 (24.0)	16.4 (36.2)

[1] Power loss of Basic Line Module at rated output including losses of 24 V DC electronics power supply.

[2] Above 630/850 m (2067/2788 ft) with Voltage Clamping Module.

[3] Nominal HP ratings are provided for ease of assigning components only. The Line Module outputs are dependent on the Motor Module loading and are to be dimensioned accordingly.

Selection and ordering data

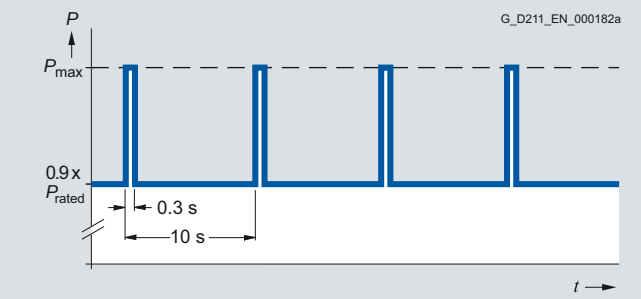
Description	Order No.
Line voltage 380 ... 480 V 3 AC	
Basic Line Modules in booksize format	
Internal air cooling	
Rated supply power	
20 kW (25 HP)	**6SL3130-1TE22-0AA0**
40 kW (50 HP)	**6SL3130-1TE24-0AA0**
100 kW (125 HP)	**6SL3130-1TE31-0AA0**
Cold plate cooling	
Rated supply power	
20 kW (25 HP)	**6SL3136-1TE22-0AA0**
40 kW (50 HP)	**6SL3136-1TE24-0AA0**
100 kW (125 HP)	**6SL3136-1TE31-0AA0**

Description	Order No.
Accessories	
Shield connection plate For Line/Motor Modules in booksize format	
• 150 mm (7.87 in) wide for internal air cooling	**6SL3162-1AF00-0AA1**
• 150 mm (7.87 in) wide for cold plate cooling	**6SL3162-1AF00-0BA1**
• 200 mm (7.87 in) wide for internal air cooling	**6SL3162-1AH01-0AA0**
• 200 mm (7.87 in) wide for cold plate cooling	**6SL3162-1AH01-0BA0**
DC link rectifier adapter For direct infeed of DC link voltage	
• Screw-type terminals 0.5 ... 10 mm^2 for Line Modules and Motor Modules in booksize format with a width of 50 mm (1.97 in) or 100 mm (3.94 in)	**6SL3162-2BD00-0AA0**
• Screw-type terminals 35 ... 95 mm^2 For Line Modules and Motor Modules in booksize format with a width of 150 mm, 200 mm and 300 mm (5.91 in, 7.87 in and 11.81 in)	**6SL3162-2BM00-0AA0**
DC link adapters (2 units) For multi-tier configuration Screw-type terminals 35 ... 95 mm^2 For all Line Modules and Motor Modules in booksize format	**6SL3162-2BM01-0AA0**
Accessories for re-ordering	
24 V terminal adapter For all Line Modules and Motor Modules in booksize format	**6SL3162-2AA00-0AA0**
24 V jumper For connection of the 24 V busbars (for booksize format)	**6SL3162-2AA01-0AA0**
Warning labels in 16 languages This set of foreign language warning signs can be placed on top of the standard English or German signs. A set of signs is supplied with the units. One sign in each of the following languages is provided in each set: Chinese Simplified, Czech, Danish, Dutch, Finnish, French, Greek, Italian, Japanese, Korean, Polish, Portuguese/Brazilian, Russian, Spanish, Swedish, Turkish.	**6SL3166-3AB00-0AA0**
Dust-proof blanking plugs (50 items) For DRIVE-CLiQ port	**6SL3066-4CA00-0AA0**

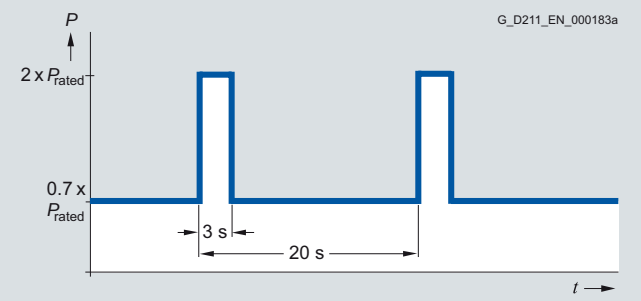
3

Characteristic curves

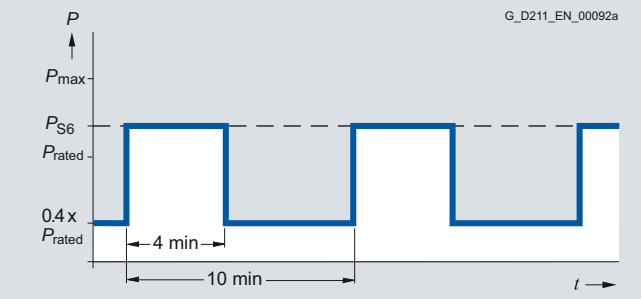
Overload capability



Load cycle with previous load

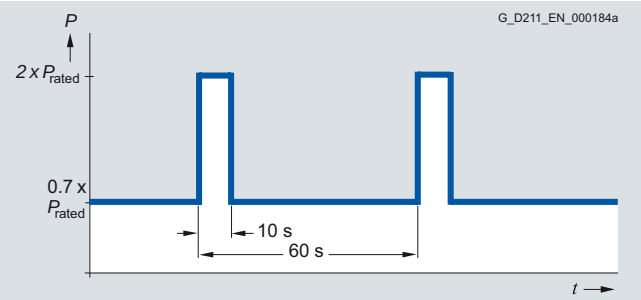


Load cycle with previous load



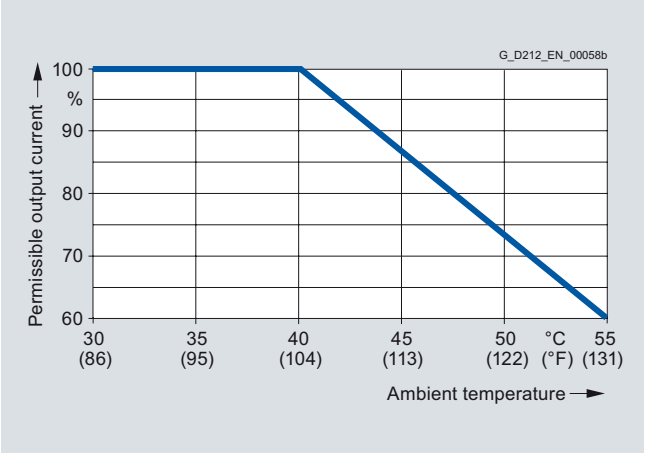
S6 load cycle with previous load

20 kW and 40 kW Basic Line Modules only

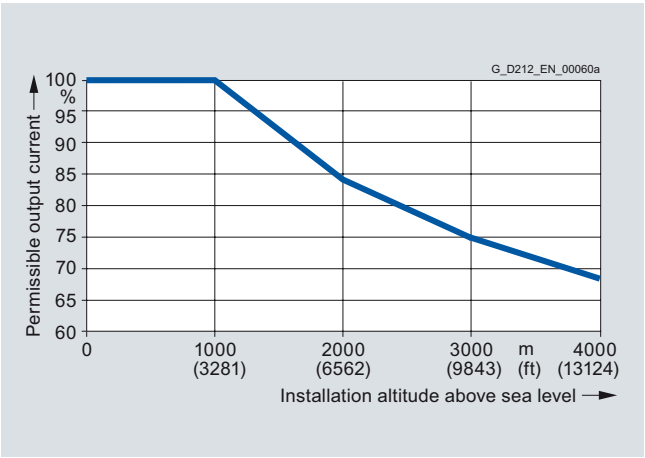


Load cycle with previous load

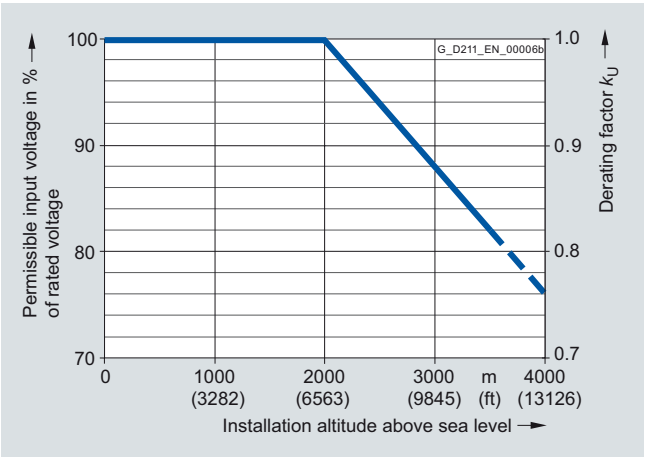
Derating characteristics



Output power dependent on ambient temperature



Output power dependent on installation altitude

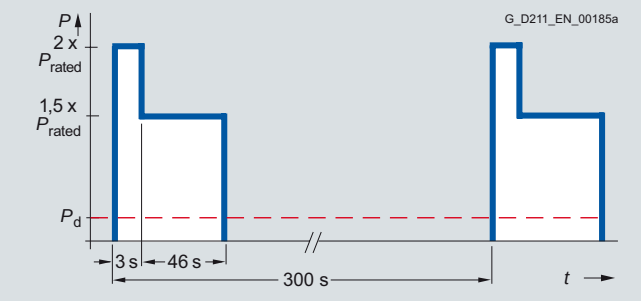


Voltage derating dependent on installation altitude

Characteristic curves (continued)

Braking power with external brake resistance

The following load cycles are defined for the braking modules of the 20 kW and 40 kW Basic Line Modules:



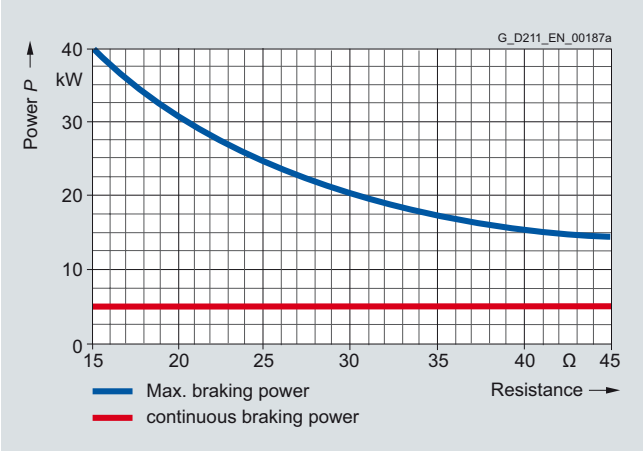
The maximum possible braking power P_{max} is calculated using the following formula:

$P_{max} = V^2/R$

V = Activation threshold

R = Resistance value of the external braking resistor

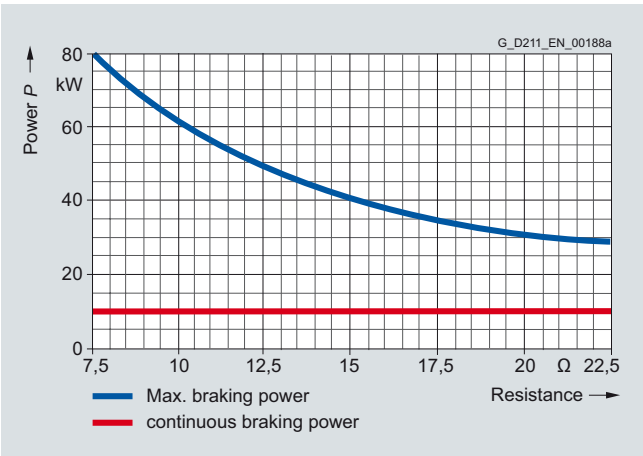
The maximum braking power is achieved with the smallest permissible resistance value. The maximum possible braking power falls at larger resistance values.



Braking power of the 20 kW Basic Line Modules depending on the connected braking resistor

When the recommended braking resistor is used, the following values result for the maximum braking power or continuous braking power:

Braking resistor 6SE7023-2ES87-2DC0
Resistance value = 20 Ω → max. braking power = 30 kW; continuous braking power = 5 kW



Braking power of the 40 kW Basic Line Modules depending on the connected braking resistor

When the recommended braking resistor is used, the following values result for the maximum braking power or continuous braking power:

Braking resistor 6SE7028-0ES87-2DC0
Resistance value = 8 Ω → max. braking power = 75 kW; continuous braking power = 10 kW (limited by braking module)

Basic Line Modules in booksize format
Line reactors

Overview

20 kW and 100 kW line reactors

Line reactors limit the low-frequency harmonic effects and reduce the load on the rectifiers of the Basic Line Module. For this reason, line reactors should always be used.

Selection and ordering data

Rated power of the Basic Line Module	Suitable for Basic Line Module in booksize format	**Line reactor**
kW (HP)		Order No.
Line voltage 380 ... 480 V 3 AC		
20 (25)	6SL3130-1TE22-0AA0 6SL3136-1TE22-0AA0	**6SL3000-0CE22-0AA0**
40 (50)	6SL3130-1TE24-0AA0 6SL3136-1TE24-0AA0	**6SL3000-0CE24-0AA0**
100 (125)	6SL3130-1TE31-0AA0 6SL3136-1TE31-0AA0	**6SL3000-0CE31-0AA0**

Technical specifications

Line voltage 380 ... 480 V 3 AC		**Line reactor**		
		6SL3000-0CE22-0AA0	6SL3000-0CE24-0AA0	6SL3000-0CE31-0AA0
Rated current	A	37	74	185
Power loss at 50/60 Hz	W	130/154	270/320	480/565
Line/load connection		Screw-type terminals	Screw-type terminals	Flat connector for M8 screw
• Conductor cross-section	mm^2	0.5 … 16	2.5 … 35	–
Degree of protection		IP20	IP20	IP00
Dimensions				
• Width	mm (in)	178 (7.01)	210 (8.27)	261 (10.28)
• Height	mm (in)	165 (6.50)	245 (9.65)	228 (8.98)
• Depth	mm (in)	100 (3.94)	93 (3.66)	137 (5.39)
Weight, approx.	kg (lb)	5.2 (11.5)	11.2 (25)	21.7 (50)
Approvals, according to		cURus	cURus	cURus
Suitable for Basic Line Module in booksize format	Type	6SL3130-1TE22-0AA0 6SL3136-1TE22-0AA0	6SL3130-1TE24-0AA0 6SL3136-1TE24-0AA0	6SL3130-1TE31-0AA0 6SL3136-1TE31-0AA0
• Rated power of the Basic Line Module	kW (HP)	20 (25)	40 (50)	100 (125)

Overview

In plants with strict EMC requirements, line filters work together with line reactors to restrict the conducted interference emanating from the power modules to the limit values of Category C2 as defined in EN 61800-3. Line filters are suited only for direct connection to TN systems with grounded star point.

Selection and ordering data

Rated power of the Basic Line Module	Suitable for Basic Line Module in booksize format	**Line filter**
kW (HP)		Order No.
Line voltage 380 ... 480 V 3 AC		
20 (25)	6SL3130-1TE22-0AA0 6SL3136-1TE22-0AA0	**6SL3000-0BE21-6DA0**
40 (50)	6SL3130-1TE24-0AA0 6SL3136-1TE24-0AA0	**6SL3000-0BE23-6DA1**
100 (125)	6SL3130-1TE31-0AA0 6SL3136-1TE31-0AA0	**6SL3000-0BE31-2DA0**

Technical specifications

Line voltage 380 ... 480 V 3 AC		**Line filter**		
		6SL3000-0BE21-6DA0	6SL3000-0BE23-6DA1	6SL3000-0BE31-2DA0
Rated current	A	36	74	192
Power loss	W	6	20	90
Line/load connection L1, L2, L3 / U, V, W		Screw-type terminals	Screw-type terminals	Screw-type terminals
• Conductor cross-section	mm^2	10	35	95
PE connection		M6 screw stud	M6 screw stud	M10 screw stud
Degree of protection		IP20	IP20	IP20
Dimensions				
• Width	mm (in)	50 (1.97)	75 (3.66)	150 (5.91)
• Height	mm (in)	429 (16.89)	433 (17.05)	479 (18.86)
• Depth	mm (in)	226 (8.90)	226 (8.90)	226 (8.90)
Weight, approx.	kg (lb)	5 (11.0)	7.5 (16.5)	18.8 (41.5)
Approvals, according to		cURus	cURus	cURus
Suitable for Basic Line Module in booksize format	Type	6SL3130-1TE22-0AA0 6SL3136-1TE22-0AA0	6SL3130-1TE24-0AA0 6SL3136-1TE24-0AA0	6SL3130-1TE31-0AA0 6SL3136-1TE31-0AA0
• Rated power of the Basic Line Module	kW (HP)	20 (25)	40 (50)	100 (125)

Basic Line Modules in booksize format
Recommended line-side components

Overview

Suitable line-side power components are assigned depending on the power rating of the Basic Line Module.

The tables below list recommended components.

Further information about the line contactors, switch disconnectors, fuses and circuit breakers specified in the tables can be found in Catalogs LV 10.1 and IC 10.

Assignment of line-side power components to Basic Line Modules in booksize format

Rated infeed power	Suitable for Basic Line Module in booksize format	**Line contactor**	**Output coupling device for line contactor**	**Main switch**
kW (HP)	Types 6SL3130- and 6SL3136-	Type	Order No.	Order No.
Line voltage 380 ... 480 V 3 AC				
20 (25)	1TE22-0AA0	**3RT1035-…**	**3TX7004-1LB00**	**3LD2504-0TK51**
40 (50)	1TE24-0AA0	**3RT1045-…**	**3TX7004-1LB00**	**3LD2704-0TK51**
100 (125)	1TE31-0AA0	**3RT1056-…**	**3TX7004-1LB00**	**3KA5530-1GE01**

Rated infeed power	Suitable for Basic Line Module in booksize format	**Circuit breaker IEC 60947**	**Circuit breaker UL489/CSA C22.2 No. 5-02**	**Fuse switch disconnector**
kW (HP)	Types 6SL3130- and 6SL3136-	Order No.	Order No.	Order No.
Line voltage 380 ... 480 V 3 AC				
20 (25)	1TE22-0AA0	**3RV1041-4JA10**	**3VL2106-2KN30-...**	**3NP1123-1CA20**
40 (50)	1TE24-0AA0	**3VL2710-1DC33-...**	**3VL2110-2KN30-...**	**3NP1123-1CA20**
100 (125)	1TE31-0AA0	**3VL3725-1DC36-...**	**3VL3125-2KN30-...**	**3NP1143-1DA10**

Rated infeed power	Suitable for Basic Line Module in booksize format	**Switch disconnector with fuse holders**	**LV HRC fuse (gL/gG)**			**UL/CSA fuse, Class J** [1] Available from: Ferraz Shawmut www.ferrazshawmut.com		
kW (HP)	Types 6SL3130- and 6SL3136-	Order No.	Rated current	Size	Order No.	Rated current	Size d × l mm	Reference No.
Line voltage 380 ... 480 V 3 AC								
20 (25)	1TE22-0AA0	**3KL5230-1GB01**	63 A	000	**3NA3822**	60 A	27 × 60	AJT60
40 (50)	1TE24-0AA0	**3KL5230-1GB01**	100 A	000	**3NA3830**	100 A	29 × 117	AJT100
100 (125)	1TE31-0AA0	**3KL5530-1GB01**	250 A	1	**3NA3144**	250 A	54 × 181	AJT250

[1] Not for use in 3NP and 3KL disconnectors.

Overview

Basic Line Modules are used for applications in which no energy is returned to the supply or where the energy exchange between motor and generator axes takes place in the DC link. The connected Motor Modules are precharged via the thyristor gate control. The thyristors are always fired at a delay angle of 0° in operation. Basic Line Modules are designed for connection to grounded TN/TT systems and non-grounded IT systems.

In a Basic Line Module in chassis format, a Braking Module of the corresponding size can be installed to support generating mode of the drive system in combination with an external braking resistor.

Design

The Basic Line Modules in chassis format feature the following connections as standard:

- 1 power connection
- 1 connection for the 24 V DC electronics power supply
- 1 DC link connection (DCP, DCN) for supplying the connected Motor Modules
- 1 DC link connection (DCPA, DCNA) for connecting a Braking Module
- 1 temperature sensor input (KTY84-130 or PTC/PT100)
- 3 DRIVE-CLiQ sockets

The status of the Basic Line Modules is indicated via two multi-color LEDs.

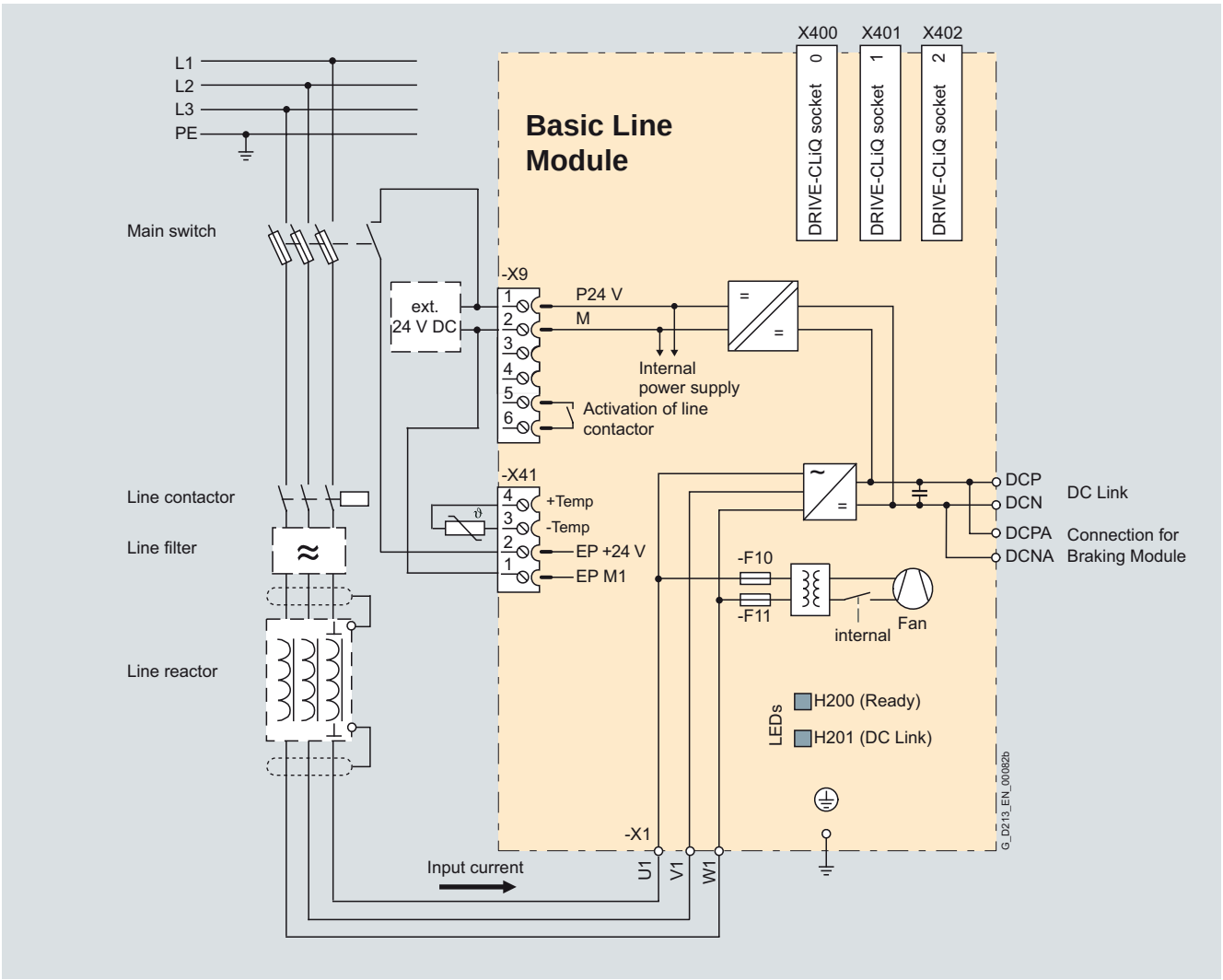
The scope of supply of the Basic Line Modules includes:

- 0.6 m (1.97 ft) DRIVE-CLiQ cable for connection to a CU320-2 or SIMOTION D4x5 Control Unit
- 1.45 m (4.76 ft) DRIVE-CLiQ cable for connection between the Control Unit and first Motor Module

3

Integration

The Basic Line Modules communicate with the higher-level Control Unit via DRIVE-CLiQ. This Control Unit can either be a CU320-2 or a SIMOTION D Control Unit. An external 24 V DC power supply is required to operate Basic Line Modules.



Connection example of Basic Line Module in chassis format

Technical specifications

Basic Line Module in chassis format 6SL3330-1T...	
Line connection voltage (up to 2000 m (6562 ft) above sea level)	380 V ... 480 V 3 AC ± 10 % (in operation -15 % < 1 min) or 500 V ... 690 V 3 AC ± 10 % (in operation -15 % < 1 min) [1]
Line frequency	47 … 63 Hz
SCCR (short-circuit current rating)	In conjunction with the recommended fuses of type 3NE1 see recommended line-side components
• Rated power 200 ... 400 kW	65 kA
• Rated power 560 kW	84 kA
• Rated power 710 ... 1100 kW	170 kA
Line power factor at rated power	
• Fundamental Power factor (cos φ_1)	> 0.96
• Total (λ)	0.75 … 0.93
Overvoltage category according to EN 60664-1	Class III
DC link voltage, approx.	1.35 × line voltage [2]
Electronics power supply	24 V DC, -15 %/+20 %
Main contactor control	
• Terminal strip X9/5-6	240 V AC/max. 8 A 30 V DC/max. 1 A
Radio interference suppression	
• Standard	Category C3 to EN 61800-3
• With line filter	Category C2 to EN 61800-3 up to 900 m (2953 ft) total cable length
Type of cooling	Internal air cooling, power units with forced air cooling by built-in fans
Permissible ambient and coolant temperature (air) during operation for line-side components, Line Modules and Motor Modules	0 … 40 °C (32 … 104 °F) without derating, > 40 … 55 °C (104 … 131 °F) see derating characteristics
Installation altitude	Up to 2000 m (3281 ft) above sea level without derating, > 2000 ... 4000 m (3281 ... 13124 ft) above sea level, see derating characteristics
Conformity	CE (low-voltage and EMC Directives)
Approvals, according to	cULus only for devices on line voltages 380 ... 480 V 3 AC and 500 ... 600 V 3 AC

[1] TT system with grounded external conductor is not permissible for line voltages > 600 V.

[2] The DC link voltage is unregulated and load-dependent.
For more information, see chapter System description – Dimensioning.

Technical specifications (continued)

Line voltage 380 ... 480 V 3 AC		Basic Line Module in chassis format				
		6SL3330-1TE34-2AA3	6SL3330-1TE35-3AA3	6SL3330-1TE38-2AA3	6SL3330-1TE41-2AA3	6SL3330-1TE41-5AA3
Infeed power						
• Rated power P_{rated}						
- With 380 V 3 AC	kW	**200**	**250**	**400**	**560**	**710**
- With 460 V 3 AC [1]	(HP)	(300)	(400)	(600)	(800)	(1000)
• P_{max}	kW (HP)	300 (402)	375 (503)	600 (805)	840 (1126)	1065 (1428)
DC link current						
• Rated current I_{rated_DC}	A	420	530	820	1200	1500
• Base-load current I_{H_DC}	A	328	413	640	936	1170
• I_{max_DC}	A	630	795	1230	1800	2250
Input current						
• At U_{line} = 400 V	A	365	460	710	1010	1265
• Maximum	A	547	690	1065	1515	1897
Current requirement 24 V DC electronics power supply, max.	A	1.1	1.1	1.1	1.1	1.1
DC link capacitance						
• Basic Line Module	µF	7200	9600	14600	23200	29000
• Drive line-up, max.	µF	57600	76800	116800	185600	232000
Power loss, max.	kW	1.9	2.1	3.2	4.6	5.5
Cooling air requirement	m^3/s (ft^3/s)	0.17 (6.0)	0.17 (6.0)	0.17 (6.0)	0.36 (12.7)	0.36 (12.7)
Sound pressure level L_{pA} (1 m) at 50/60 Hz	dB	66/68	66/68	66/68	71/73	71/73
Line connection U1, V1, W1		Flat connector for M10 screw	Flat connector for M10 screw	Flat connector for M10 screw	Flat connector for M12 screw	Flat connector for M12 screw
• Conductor cross-section, max.	mm^2	2 × 240	2 × 240	2 × 240	6 × 185	6 × 185
DC link connection DCP, DCN		Flat connector for M10 screw	Flat connector for M10 screw	Flat connector for M10 screw	Flat connector for M12 screw	Flat connector for M12 screw
• Conductor cross-section, max.	mm^2	2 × 240	2 × 240	2 × 240	6 × 185	6 × 185
PE connection		M10 screw	M10 screw	M10 screw	M10 screw	M10 screw
• Conductor cross-section, max.	mm^2	2 × 240	2 × 240	2 × 240	4 × 240	4 × 240
Cable length, max. (total of all motor power cables and DC link)						
• Shielded	m (ft)	2600 (8531)	2600 (8531)	2600 (8531)	4000 (13124)	4000 (13124)
• Unshielded	m (ft)	3900 (12796)	3900 (12796)	3900 (12796)	6000 (19686)	6000 (19686)
Degree of protection		IP00	IP00	IP00	IP00	IP00
Dimensions						
• Width	mm (in)	310 (12.20)	310 (12.20)	310 (12.20)	310 (12.20)	310 (12.20)
• Height	mm (in)	1164 (45.83)	1164 (45.83)	1164 (45.83)	1653 (65.08)	1653 (65.08)
• Depth	mm (in)	352 (13.86)	352 (13.86)	352 (13.86)	550 (21.65)	550 (21.65)
Frame size		FB	FB	FB	GB	GB
Weight, approx.	kg (lb)	96 (212)	96 (212)	96 (212)	214 (472)	214 (472)

[1] Nominal HP ratings are provided for ease of assigning components only. The Line Module outputs are dependent on the Motor Module loading and are to be dimensioned accordingly.

Technical specifications (continued)

Line voltage 500 ... 690 V 3 AC		Basic Line Module in chassis format				
		6SL3330-1TG33-0AA3	6SL3330-1TG34-3AA3	6SL3330-1TG36-8AA3	6SL3330-1TG41-1AA3	6SL3330-1TG41-4AA3
Infeed power						
• Rated power P_{rated} with 690 V 3 AC [1]	kW	**250**	**355**	**560**	**900**	**1100**
• At 500 V 3 AC	kW	180	250	400	650	800
• P_{max} with 690 V 3 AC [1]	kW	375	532.5	840	1350	1650
DC link current						
• Rated current I_{rated_DC}	A	300	430	680	1100	1400
• I_{H_DC}	A	234	335	530	858	1092
• I_{max_DC}	A	450	645	1020	1650	2100
Input current						
• At U_{line} = 690 V	A	260	375	575	925	1180
• Maximum	A	390	562.5	862.5	1387.5	1770
Current requirement 24 V DC electronics power supply, max.	A	1.1	1.1	1.1	1.1	1.1
DC link capacitance						
• Basic Line Module	µF	3200	4800	7300	11600	15470
• Drive line-up, max.	µF	25600	38400	58400	92800	123760
Power loss	kW	1.5	2.1	3.0	5.4	5.8
Cooling air requirement	m^3/s (ft^3/s)	0.17 (6.0)	0.17 (6.0)	0.17 (6.0)	0.36 (12.7)	0.36 (12.7)
Sound pressure level L_{pA} (1 m) at 50/60 Hz	dB	66/68	66/68	66/68	71/73	71/73
Line connection U1, V1, W1		Flat connector for M10 screw	Flat connector for M10 screw	Flat connector for M10 screw	Flat connector for M12 screw	Flat connector for M12 screw
• Conductor cross-section, max.	mm^2	2 × 240	2 × 240	2 × 240	6 × 185	6 × 185
DC link connection DCP, DCN		Flat connector for M10 screw	Flat connector for M10 screw	Flat connector for M10 screw	Flat connector for M12 screw	Flat connector for M12 screw
• Conductor cross-section, max.	mm^2	2 × 240	2 × 240	2 × 240	6 × 185	6 × 185
PE connection		M10 screw	M10 screw	M10 screw	M12 screw	M12 screw
• Conductor cross-section, max.	mm^2	2 × 240	2 × 240	2 × 240	4 × 240	4 × 240
Cable length, max. (total of all motor power cables and DC link)						
• Shielded	m (ft)	1500 (4921)	1500 (4921)	1500 (4921)	2250 (7382)	2250 (7382)
• Unshielded	m (ft)	2250 (7382)	2250 (7382)	2250 (7382)	3375 (11073)	3375 (11073)
Degree of protection		IP00	IP00	IP00	IP00	IP00
Dimensions						
• Width	mm (in)	310 (12.20)	310 (12.20)	310 (12.20)	310 (12.20)	310 (12.20)
• Height	mm (in)	1164 (45.83)	1164 (45.83)	1164 (45.83)	1653 (65.08)	1653 (65.08)
• Depth	mm (in)	352 (13.86)	352 (13.86)	352 (13.86)	550 (21.65)	550 (21.65)
Frame size		FB	FB	FB	GB	GB
Weight, approx.	kg (lb)	96 (212)	96 (212)	96 (212)	214 (472)	214 (472)

[1] The infeed power is proportional to the line voltage. With 500 V 3 AC, the power is reduced by a factor of 690/500 = 1.38.

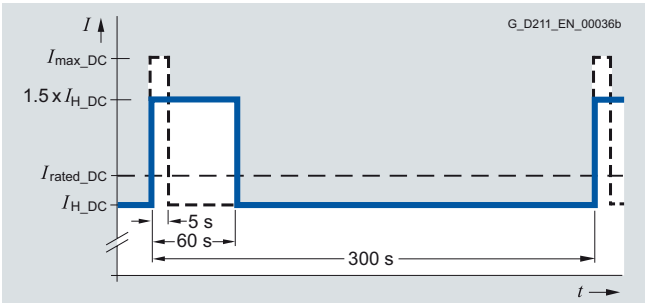
Basic Line Modules in chassis format

Selection and ordering data

Rated power	Basic Line Module in chassis format
kW (HP)	Order No.
Line voltage 380 ... 480 V 3 AC	
200 (300)	**6SL3330-1TE34-2AA3**
250 (400)	**6SL3330-1TE35-3AA3**
400 (600)	**6SL3330-1TE38-2AA3**
560 (800)	**6SL3330-1TE41-2AA3**
710 (1000)	**6SL3330-1TE41-5AA3**
Line voltage 500 ... 690 V 3 AC	
250	**6SL3330-1TG33-0AA3**
355	**6SL3330-1TG34-3AA3**
560	**6SL3330-1TG36-8AA3**
900	**6SL3330-1TG41-1AA3**
1100	**6SL3330-1TG41-4AA3**
Accessories for re-ordering	
Warning labels in 16 languages This set of foreign language warning signs can be placed on top of the standard English or German signs. A set of signs is supplied with the units. One sign in each of the following languages is provided in each set: Chinese Simplified, Czech, Danish, Dutch, Finnish, French, Greek, Italian, Japanese, Korean, Polish, Portuguese/Brazilian, Russian, Spanish, Swedish, Turkish.	**6SL3166-3AB00-0AA0**
Dust-proof blanking plugs (50 units) For DRIVE-CLiQ port	**6SL3066-4CA00-0AA0**

Characteristic curves

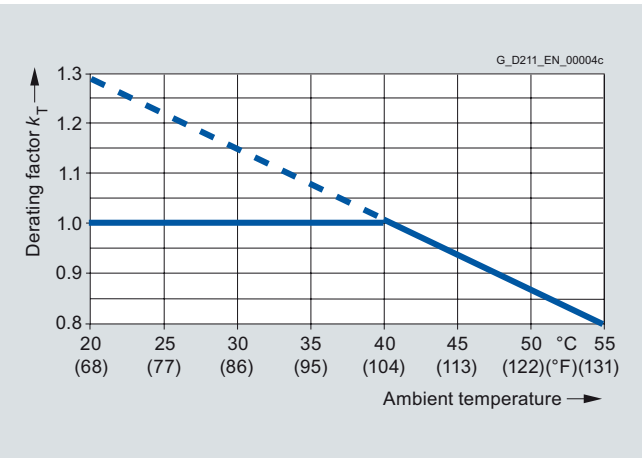
Overload capability



High overload

Characteristic curves (continued)

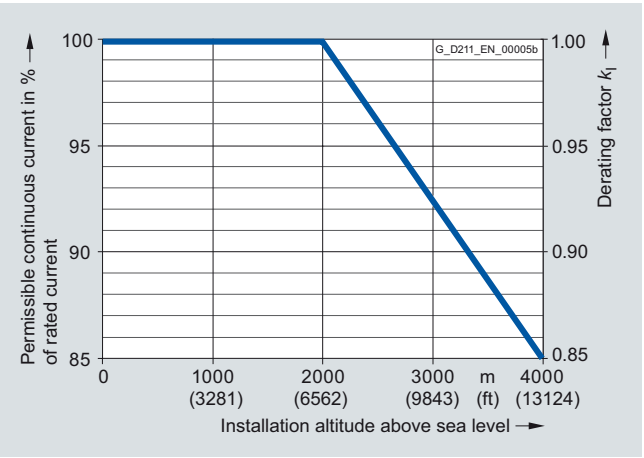
Derating characteristics



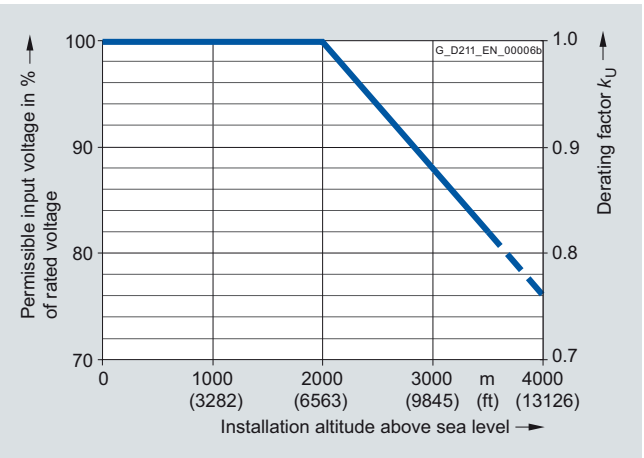
Current derating dependent on ambient temperature

Note: A derating factor $k_T > 1.0$ is to be taken into account only in conjunction with "current derating dependent on installation altitude".

See also chapter System description – Dimensioning.



Current derating dependent on installation altitude



Voltage derating dependent on installation altitude

Overview

Line reactors reduce harmonic currents on the supply system and limit commutating dips in the Basic Line Module. For this reason, line reactors should always be used.

Selection and ordering data

Rated power of the Basic Line Module	Suitable for Basic Line Module in chassis format	**Line reactor**
kW (HP)		Order No.
Line voltage 380 ... 480 V 3 AC		
200 (300)	6SL3330-1TE34-2AA3	**6SL3000-0CE35-1AA0**
250 (400)	6SL3330-1TE35-3AA3	
400 (600)	6SL3330-1TE38-2AA3	**6SL3000-0CE37-7AA0**
560 (800)	6SL3330-1TE41-2AA3	**6SL3000-0CE41-0AA0**
710 (1000)	6SL3330-1TE41-5AA3	**6SL3000-0CE41-5AA0**
Line voltage 500 ... 690 V 3 AC		
250	6SL3330-1TG33-0AA3	**6SL3000-0CH32-7AA0**
355	6SL3330-1TG34-3AA3	**6SL3000-0CH34-8AA0**
560	6SL3330-1TG36-8AA3	**6SL3000-0CH36-0AA0**
900	6SL3330-1TG41-1AA3	**6SL3000-0CH41-2AA0**
1100	6SL3330-1TG41-4AA3	

Technical specifications

Line voltage 380 ... 480 V 3 AC		Line reactor				
		6SL3000-0CE35-1AA0		6SL3000-0CE37-7AA0	6SL3000-0CE41-0AA0	6SL3000-0CE41-5AA0
Thermal current $I_{th\ max}$	A	508	508	773	1022	1485
Power loss at 50/60 Hz	kW	0.292/0.328	0.323/0.365	0.310/0.351	0.441/0.498	0.687/0.776
Line/load connection		Flat connector for M12 screw	Flat connector for M12 screw	Flat connector for M12 screw	Flat connector for M12 screw	Flat connector for M12 screw
Degree of protection		IP00	IP00	IP00	IP00	IP00
Dimensions						
• Width	mm (in)	300 (11.81)	300 (11.81)	300 (11.81)	350 (13.78)	460 (18.11)
• Height	mm (in)	269 (10.59)	269 (10.59)	269 (10.59)	321 (12.64)	435 (17.13)
• Depth	mm (in)	212.5 (8.37)	212.5 (8.37)	212.5 (8.37)	211.5 (8.33)	235 (9.25)
Weight, approx.	kg (lb)	38.0 (84)	38.0 (84)	51.3 (113)	69.6 (153)	118 (260)
Approvals, according to		cURus	cURus	cURus	cURus	cURus
Suitable for Basic Line Module in chassis format	Type	6SL3330-1TE34-2AA3	6SL3330-1TE35-3AA3	6SL3330-1TE38-2AA3	6SL3330-1TE41-2AA3	6SL3330-1TE41-5AA3
• Rated power of the Basic Line Module	kW (HP)	200 (300)	250 (400)	400 (600)	560 (800)	710 (1000)

Line voltage 500 ... 690 V 3 AC		Line reactor				
		6SL3000-0CH32-7AA0	6SL3000-0CH34-8AA0	6SL3000-0CH36-0AA0	6SL3000-0CH41-2AA0	
Thermal current $I_{th\ max}$	A	270	482	597	1167	1167
Power loss at 50/60 Hz	kW	0.245/0.277	0.424/0.478	0.430/0.485	0.620/0.697	0.693/0.783
Line/load connection		Flat connector for M10 screw	Flat connector for M12 screw	Flat connector for M12 screw	Flat connector for M12 screw	Flat connector for M12 screw
Degree of protection		IP00	IP00	IP00	IP00	IP00
Dimensions						
• Width	mm (in)	270 (10.63)	350 (13.78)	350 (13.78)	460 (18.11)	460 (18.11)
• Height	mm (in)	248 (9.76)	321 (12.64)	321 (12.64)	435 (17.13)	435 (17.13)
• Depth	mm (in)	200 (7.87)	232.5 (9.15)	232.5 (9.15)	235 (9.15)	235 (9.15)
Weight, approx.	kg (lb)	27.9 (62)	55.6 (123)	63.8 (141)	147 (324)	147 (324)
Approvals, according to [1]		cURus	cURus	cURus	cURus	cURus
Suitable for Basic Line Module in chassis format	Type	6SL3330-1TG33-0AA3	6SL3330-1TG34-3AA3	6SL3330-1TG36-8AA3	6SL3330-1TG41-1AA3	6SL3330-1TG41-4AA3
• Rated power of the Basic Line Module	kW	250	355	560	900	1100

[1] For supply voltages up to 600 V 3 AC.

Overview

In plants with strict EMC requirements, line filters work together with line reactors to restrict the conducted interference emanating from the power components to the limit values of Category C2 as defined in EN 61800-3. Line filters are suited only for direct connection to TN systems with grounded star point.

Selection and ordering data

Rated power of the Basic Line Module	Suitable for Basic Line Module in chassis format	**Line filter**
kW (HP)		Order No.
Line voltage 380 ... 480 V 3 AC		
200 (300)	6SL3330-1TE34-2AA3	**6SL3000-0BE34-4AA0**
250 (400)	6SL3330-1TE35-3AA3	**6SL3000-0BE36-0AA0**
400 (600)	6SL3330-1TE38-2AA3	**6SL3000-0BE41-2AA0**
560 (800)	6SL3330-1TE41-2AA3	
710 (1000)	6SL3330-1TE41-5AA3	**6SL3000-0BE41-6AA0**
Line voltage 500 ... 690 V 3 AC		
250	6SL3330-1TG33-0AA3	**6SL3000-0BG34-4AA0**
355	6SL3330-1TG34-3AA3	
560	6SL3330-1TG36-8AA3	**6SL3000-0BG36-0AA0**
900	6SL3330-1TG41-1AA3	**6SL3000-0BG41-2AA0**
1100	6SL3330-1TG41-4AA3	

Technical specifications

Line voltage 380 ... 480 V 3 AC		Line filter			
		6SL3000-0BE34-4AA0	6SL3000-0BE36-0AA0	6SL3000-0BE41-2AA0	6SL3000-0BE41-6AA0
Rated current	A	440	600	1200	1600
Power loss	kW	0.049	0.055	0.137	0.182
Line/load connection L1, L2, L3 / L1', L2', L3'		Flat connector for M10 screw	Flat connector for M10 screw	Flat connector for M12 screw	Flat connector for M12 screw
PE connection		M8 screw stud	M10 screw stud	M10 screw stud	M10 screw stud
Degree of protection		IP00	IP00	IP00	IP00
Dimensions					
• Width	mm (in)	360 (14.17)	400 (15.75)	425 (16.73)	505 (19.88)
• Height	mm (in)	240 (9.45)	265 (10.43)	265 (10.43)	265 (10.43)
• Depth	mm (in)	116 (4.57)	140 (5.51)	145 (5.71)	145 (5.71)
Weight, approx.	kg (lb)	12.3 (27)	19.0 (42)	25.8 (6)	28.8 (64)
Approvals, according to		cURus	cURus	cURus	cURus
Suitable for Basic Line Module in chassis format	Type (rated output)	6SL3330-1TE34-2AA3 (200 kW)	6SL3330-1TE35-3AA3 (250 kW)	6SL3330-1TE38-2AA3 (400 kW) 6SL3330-1TE41-2AA3 (560 kW)	6SL3330-1TE41-5AA3 (710 kW)

Line voltage 500 ... 690 V 3 AC		Line filter		
		6SL3000-0BG34-4AA0	6SL3000-0BG36-0AA0	6SL3000-0BG41-2AA0
Rated current	A	440	600	1200
Power loss	kW	0.049	0.055	0.137
Line/load connection L1, L2, L3 / L1', L2', L3'		Flat connector for M10 screw	Flat connector for M10 screw	Flat connector for M12 screw
PE connection		M8 screw stud	M10 screw stud	M10 screw stud
Degree of protection		IP00	IP00	IP00
Dimensions				
• Width	mm (in)	360 (14.17)	400 (15.75)	425 (16.73)
• Height	mm (in)	240 (9.45)	265 (10.43)	265 (10.43)
• Depth	mm (in)	116 (4.57)	140 (5.51)	145 (5.71)
Weight, approx.	kg (lb)	12.3 (27)	19.0 (42)	25.2 (5)
Approvals, according to		cURus	cURus	cURus
Suitable for Basic Line Module in chassis format	Type (rated output)	6SL3330-1TG33-0AA3 (250 kW) 6SL3330-1TG34-3AA3 (355 kW)	6SL3330-1TG36-8AA3 (560 kW)	6SL3330-1TG41-1AA3 (900 kW) 6SL3330-1TG41-4AA3 (1100 kW)

Overview

Suitable line-side power components are assigned depending on the power rating of the Basic Line Module.

The tables below list recommended components.

Further information about the line contactors, switch disconnectors, fuses and circuit breakers specified in the tables can be found in Catalogs LV 10.1 and IC 10.

Assignment of line-side power components to Basic Line Modules in chassis format

Rated power	Input current	Suitable for Basic Line Module in chassis format	**Line contactor**	**Fixed-mounted circuit breaker**	**Switch disconnector without handle and shaft**	**Switch disconnector with handle and shaft**
kW (HP)	A	Type 6SL3330-	Type	Order No.	Order No.	Order No.
Line voltage 380 ... 480 V 3 AC						
200 (300)	365	1TE34-2AA3	**3RT1075-...**	–	**3KL6130-1AB02**	**3KL6130-1GB02**
250 (400)	460	1TE35-3AA3	**3RT1076-...**	–	**3KL6130-1AB02**	**3KL6130-1GB02**
400 (600)	710	1TE38-2AA3	**3RT1066-...** (3 units)	–	**3KL6230-1AB02**	**3KL6230-1GB02**
560 (800)	1010	1TE41-2AA3	–	**3WL1112-2BB34-4AN2-Z C22**	–	–
710 (1000)	1265	1TE41-5AA3	–	**3WL1116-2BB34-4AN2-Z C22**	–	–
Line voltage 500 ... 690 V 3 AC						
250	260	1TG33-0AA3	**3RT1066-...**	–	**3KL5730-1AB01**	**3KL5730-1GB01**
355	375	1TG34-3AA3	**3RT1476-6AP36**	–	**3KL6130-1AB02**	**3KL6130-1GB02**
560	575	1TG36-8AA3	**3RT1476-6AP36**	–	**3KL6130-1AB02**	**3KL6130-1GB02**
900	925	1TG41-1AA3	–	**3WL1210-4BB34-4AN2-Z C22**	–	–
1100	1180	1TG41-4AA3	–	**3WL1212-4BB34-4AN2-Z C22**	–	–

Rated power	Input current	Suitable for Basic Line Module in chassis format	**Circuit breaker IEC 60947**	**Circuit breaker UL489/CSA C22.2 No. 5-02**	**Cable protection fuse**		**Cable protection fuse incl. semiconductor protection**	
kW (HP)	A	Type 6SL3330-	Order No.	Order No.	Rated current	Order No.	Rated current	Order No.
Line voltage 380 ... 480 V 3 AC								
200 (300)	365	1TE34-2AA3	**3VL4740-1DC36-0AA0**	**3VL4140-3KN30-0AA0**	400 A	**3NA3260**	450 A	**3NE1333-2**
250 (400)	460	1TE35-3AA3	**3VL5750-1DC36-0AA0**	**3VL4550-3KN30-0AA0**	500 A	**3NA3365**	500 A	**3NE1334-2**
400 (600)	710	1TE38-2AA3	–	–	800 A	**3NA3475**	800 A	**3NE1448-2** *)
560 (800)	1010	1TE41-2AA3	–	–	1250 A	**3NA3482**	2 × 560 A	**3NE1435-2** (2 units)
710 (1000)	1265	1TE41-5AA3	–	–	2 × 800 A	**3NA3475** (2 units)	2 × 710 A	**3NE1437-2** (2 units)
Line voltage 500 ... 690 V 3 AC								
250	260	1TG33-0AA3	**3VL4731-1DC36-0AA0**	**3VL4130-3KN30-0AA0**	315 A	**3NA3252-6**	315 A	**3NE1230-2**
355	375	1TG34-3AA3	–	–	500 A	**3NA3365-6**	450 A	**3NE1333-2** *)
560	575	1TG36-8AA3	–	–	2 × 315 A	**3NA3252-6** (2 units)	630 A	**3NE1436-2** *)
900	925	1TG41-1AA3	–	–	2 × 500 A	**3NA3365-6** (2 units)	2 × 500 A	**3NE1334-2** (2 units)
1100	1180	1TG41-4AA3	–	–	3 × 500 A	**3NA3365-6** (3 units)	2 × 630 A	**3NE1436-2** *) (2 units)

*) No semiconductor protection.

Smart Line Modules in booksize compact format

Overview

Smart Line Modules are non-regulated feed/feedback units (diode bridge for incoming supply; line-commutated feedback via IGBTs) with 100 % continuous regenerative feedback power. The regenerative capability of the modules can be deactivated by means of parameterization. Smart Line Modules are designed for connection to grounded TN/TT systems and non-grounded IT systems.

The DC link is pre-charged via integrated precharging resistors.

The associated line reactor is absolutely essential for operating a Smart Line Module.

Design

Smart Line Modules in booksize compact format feature the following connections and interfaces as standard:

- 1 power connection via screw-type terminals
- 1 connection for the 24 V DC electronics power supply via the 24 V terminal adapter included in the scope of supply
- 1 DC link connection via integrated DC link busbars
- 2 PE (protective earth) connections
- 3 DRIVE-CLiQ sockets

The status of the Smart Line Modules is indicated via two multi-color LEDs.

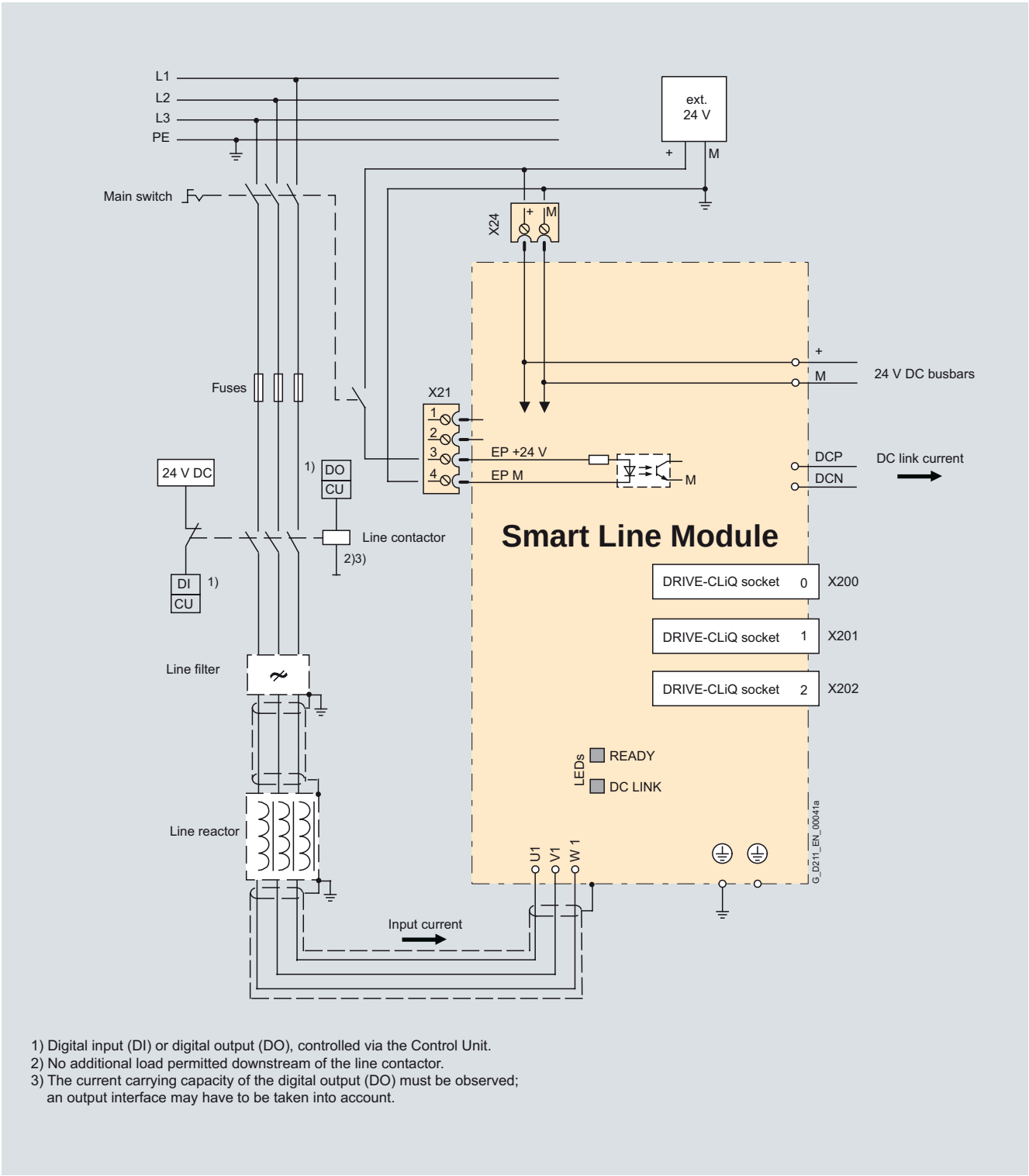
The signal cable shield can be connected to the Line Module by means of a shield connection terminal, e.g. Weidmüller type KLBÜ 3-8 SC.

The scope of supply of the Smart Line Modules includes:

- DRIVE-CLiQ cable for connection to the adjacent Control Unit on the left for drive control, length 0.11 m (4.33 in)
- 2 blanking plugs for sealing unused DRIVE-CLiQ sockets
- DRIVE-CLiQ cable for connecting to the adjacent Motor Module, length 0.21 m (8.3 in)
- Jumper for connecting the 24 V DC busbar to the adjacent Motor Module
- 24 V terminal adapter (X24)
- Connector X21 for digital inputs and outputs
- 1 set of warning signs in 16 languages
- 1 heat conducting foil

Integration

The Smart Line Module communicates with a CU320-2 or SIMOTION D4x5 Control Unit via DRIVE-CLiQ.



1) Digital input (DI) or digital output (DO), controlled via the Control Unit.
2) No additional load permitted downstream of the line contactor.
3) The current carrying capacity of the digital output (DO) must be observed; an output interface may have to be taken into account.

Connection example for Smart Line Modules in booksize compact format

Smart Line Modules in booksize compact format

Technical specifications

Smart Line Module in booksize compact format 6SL3430-6TE21-6AA0	
Line connection voltage (up to 2000 m (6562 ft) above sea level)	380 ... 480 V 3 AC ±10 % (in operation -15 % < 1 min) [1]
Line frequency	47 … 63 Hz
SCCR (short-circuit current rating)	65 kA in conjunction with the recommended fuses class J or circuit breakers in accordance with UL489 / CSA 22.2 No. 5-02 see recommended line-side components
Line power factor at rated power	
• Fundamental power factor (cos φ_1)	> 0.96
• Total (λ)	0.65 … 0.90
Overvoltage category according to EN 60664-1	Class III
DC link voltage, approx.	1.35 × line voltage[2]
Electronics power supply	24 V DC, -15 %/+20 %
Radio interference suppression	
• Standard	No radio interference suppression
• With line filter	Category C2 to EN 61800-3 Total cable length up to 350 m (1148 ft) (shielded)
Type of cooling	The devices are designed so that - internal air cooling (power units with forced air cooling through built-in fans) or - cold plate cooling is possible
Permissible ambient and coolant temperature (air) in operation for line-side components, Line Modules and Power Modules	0 … 40 °C (32 … 104 °F) without derating, > 40 … 55 °C (104 … 131 °F) see derating characteristics
Installation altitude	Up to 1000 m (3281 ft) above sea level without derating, > 1000 ... 4000 m (3281 ... 13124 ft) above sea level, see derating characteristics
Conformity	CE (low-voltage and EMC Directives)
Approvals, according to	cURus

[1] Can also be operated on supply systems with 200 ... 240 V 3 AC ±10 % with appropriate parameterization and reduced power rating.

[2] The DC link voltage is the mean value of the rectified line voltage.
For more information, see chapter System description – Dimensioning

Technical specifications (continued)

Line voltage 380 ... 480 V 3 AC	**Smart Line Module in booksize compact format**
• Internal air cooling/ cold plate cooling	6SL3430-6TE21-6AA0
Feed/feedback power	
• Rated power P_{rated}	
- With 380 V 3 AC	16 kW
- With 460 V 3 AC [3]	(18 HP)
• For S6 duty (40 %) P_{S6}	21 kW
• P_{max}	35 kW
DC link current	
• At 600 V DC	27 A
• For S6 duty (40 %)	35 A
• Maximum	59 A
Input current	
• Rated current at 380 V 3 AC	26 A
• For S6 duty (40 %)	35 A
• Maximum	59 A
Current requirement 24 V DC electronics power supply, max.	1.1 A
Current carrying capacity	
• 24 V DC busbars	20 A
• DC link busbars	100 A
DC link capacitance	
• Smart Line Module	705 µF
• Drive line-up, max.	6000 µF
Power loss [1]	
• With internal air cooling	0.19 kW
• With cold plate cooling, int./ext.	0.06 kW/0.13 kW
• Thermal resistance R_{th}	0.13 K/W
Cooling air requirement	0.016 m^3/s (0.6 ft^3/s)
Sound pressure level L_{pA} (1 m)	< 60 dB
Line connection U1, V1, W1	Screw-type terminals (X1)
• Conductor cross-section, max.	2.5 … 10 mm^2
Shield connection	Cable shield connection plate integrated into the connector
PE connection	M5 screw
Cable length, max. (total of all motor power cables and DC link) [2]	
• Shielded	350 m (1148 ft)
• Unshielded	560 m (1837 ft)
Degree of protection	IP20
Dimensions	
• Width	100 mm (3.94 in)
• Height	270 mm (10.6 in)
• Depth	226 mm (8.90 in)
Weight, approx.	5.3 kg (12 lb)

Selection and ordering data

Description	Order No.
Line voltage 380 ... 480 V 3 AC	
Smart Line Module in booksize compact format	
Internal air cooling	
Cold-Plate cooling	
Rated power	
• 16 kW (18 HP)	**6SL3430-6TE21-6AA0**
Accessories	
DC link rectifier adapter For direct infeed of DC link voltage Screw-type terminals 0.5 ... 10 mm^2 For booksize format Line Modules and Motor Modules with a width of 50 mm (1.97 in) or 100 mm (3.94 in)	**6SL3162-2BD00-0AA0**
DC link adapters (2 units) For multi-tier configuration Screw-type terminals 35 ... 95 mm^2 For all Line Modules and Motor Modules in booksize format	**6SL3162-2BM01-0AA0**
Accessories for re-ordering	
24 V terminal adapter For all Line Modules and Motor Modules in booksize format	**6SL3162-2AA00-0AA0**
24 V jumper For connection of the 24 V busbars (for booksize format)	**6SL3162-2AA01-0AA0**
Warning labels in 16 languages This set of foreign language warning signs can be placed on top of the standard English or German signs. A set of signs is supplied with the units. One sign in each of the following languages is provided in each set: Chinese Simplified, Czech, Danish, Dutch, Finnish, French, Greek, Italian, Japanese, Korean, Polish, Portuguese/Brazilian, Russian, Spanish, Swedish, Turkish.	**6SL3166-3AB00-0AA0**
Dust-proof blanking plugs (50 units) For DRIVE-CLiQ port	**6SL3066-4CA00-0AA0**

[1] Power loss of Smart Line Module at rated output including losses of 24 V DC electronics power supply.

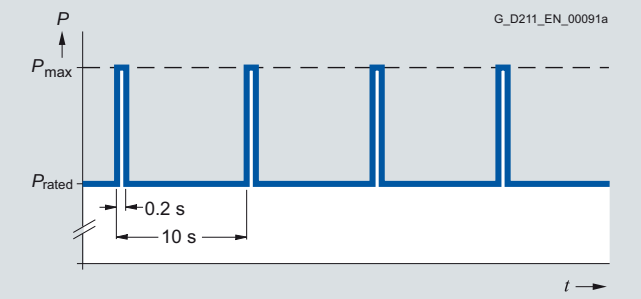
[2] Max. cable lengths in conjunction with Voltage Clamping Module, see derating characteristics.

[3] Nominal HP ratings are provided for ease of assigning components only. The Line Module outputs are dependent on the Motor Module loading and are to be dimensioned accordingly.

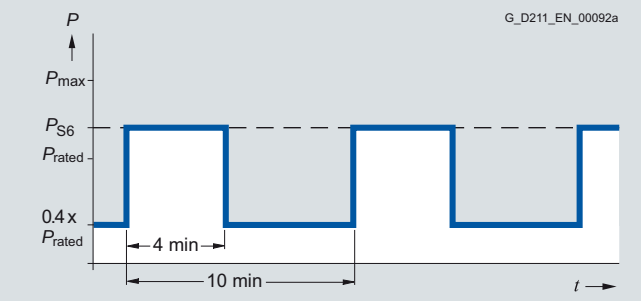
3

Characteristic curves

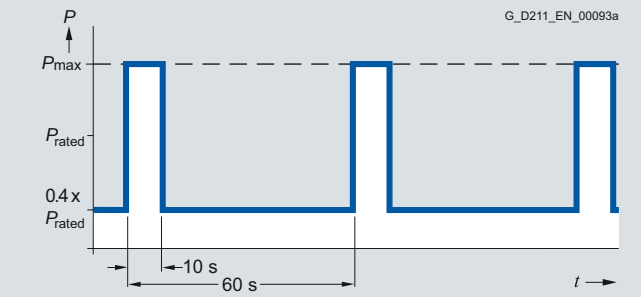
Overload capability



Load cycle with previous load

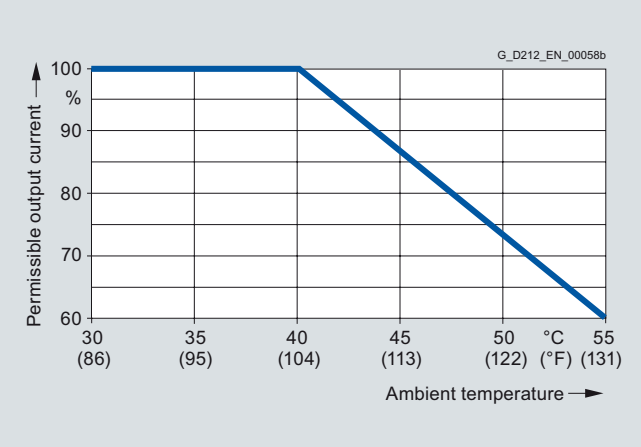


S6 load cycle with previous load

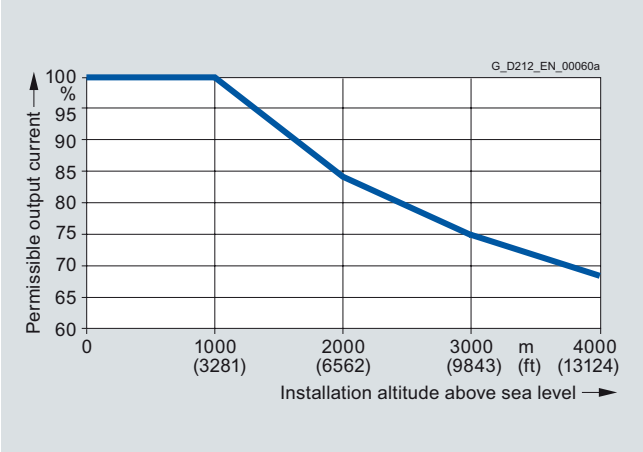


S6 load cycle with previous load

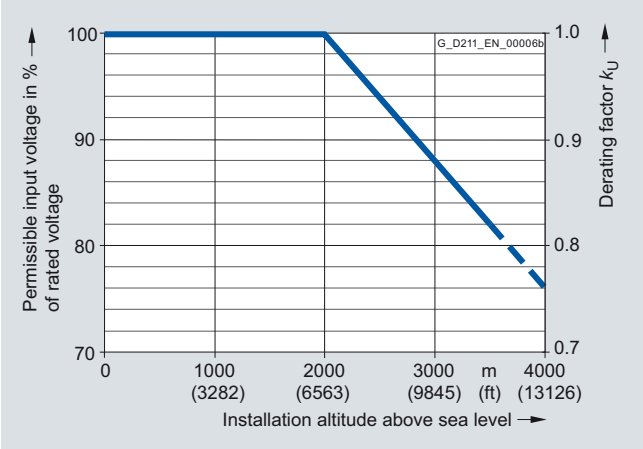
Derating characteristics



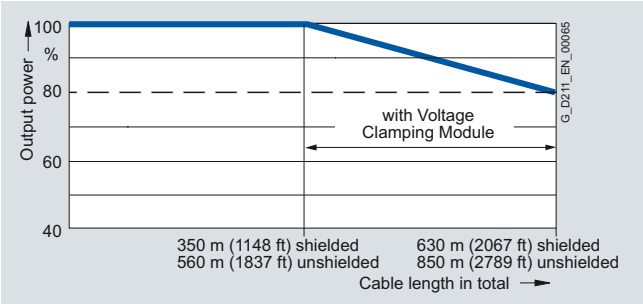
Output power dependent on ambient temperature



Output power dependent on installation altitude



Voltage derating dependent on installation altitude



Output power dependent on total cable length

Overview

Smart Line Modules are non-regulated feed/feedback units (diode bridge for incoming supply; line-commutated feedback via IGBTs) with 100 % continuous regenerative feedback power. The regenerative feedback capability of the modules can be deactivated by means of a digital input (Smart Line Modules 5 kW and 10 kW) or by parameterizing. Smart Line Modules are designed for connection to grounded TN/TT systems and non-grounded IT supply systems.

The DC link is pre-charged via integrated precharging resistors.

The associated line reactor is absolutely essential for operating a Smart Line Module.

Design

Smart Line Modules in booksize format feature the following connections and interfaces as standard:

- 1 power connection via screw-type terminals
- 1 connection for the 24 V DC electronics power supply via the 24 V terminal adapter included in the scope of supply
- 1 DC link connection via integrated DC link busbars
- 2 PE (protective earth) connections
- 2 digital inputs
  (only on 5 kW and 10 kW Smart Line Modules)
- 1 digital output
  (only on 5 kW and 10 kW Smart Line Modules)
- 3 DRIVE-CLiQ sockets
  (only on 16 kW and 36 kW Smart Line Modules)

The status of the Smart Line Modules is indicated via two multicolor LEDs.

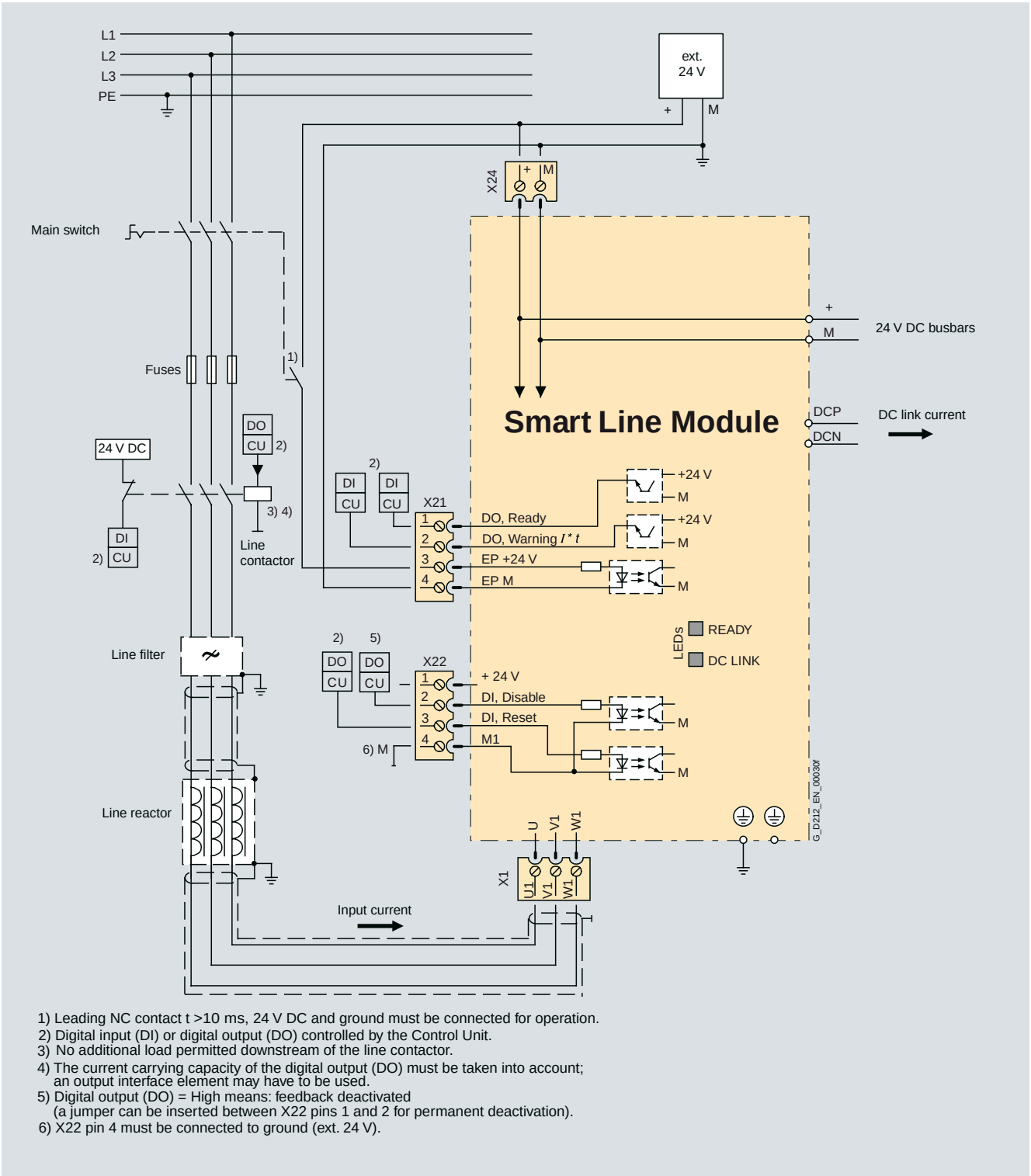
The signal cable shield can be connected to the Line Module by means of a shield connection terminal, e.g. Weidmüller type KLBÜ 3-8 SC.

The scope of supply of the Smart Line Modules includes:

- DRIVE-CLiQ cable for connection to the adjacent Control Unit on the left for drive control, length 0.11 m (4.33 in)
  (on 16 kW and 36 kW Smart Line Modules only)
- 2 blanking plugs for sealing unused DRIVE-CLiQ sockets
  (on 16 kW and 36 kW Smart Line Modules only)
- DRIVE-CLiQ cable (length depends on module width) to connect Smart Line Module to adjacent Motor Module,
  length = width of the Smart Line Module + 0.11 m (4.33 in)
- Jumper for connecting the 24 V DC busbar to the adjacent Motor Module
- 24 V terminal adapter (X24)
- Connector X21 for digital inputs and outputs
- Connector X22 for digital inputs and outputs
  (on 5 kW and 10 kW Smart Line Modules only)
- Connector X1 for line connection
  (on 5 kW and 10 kW Smart Line Modules only)
- 1 set of warning signs in 16 languages
- 1 heat conducting foil
  (for Smart Line Modules with cold plate cooling only)

3

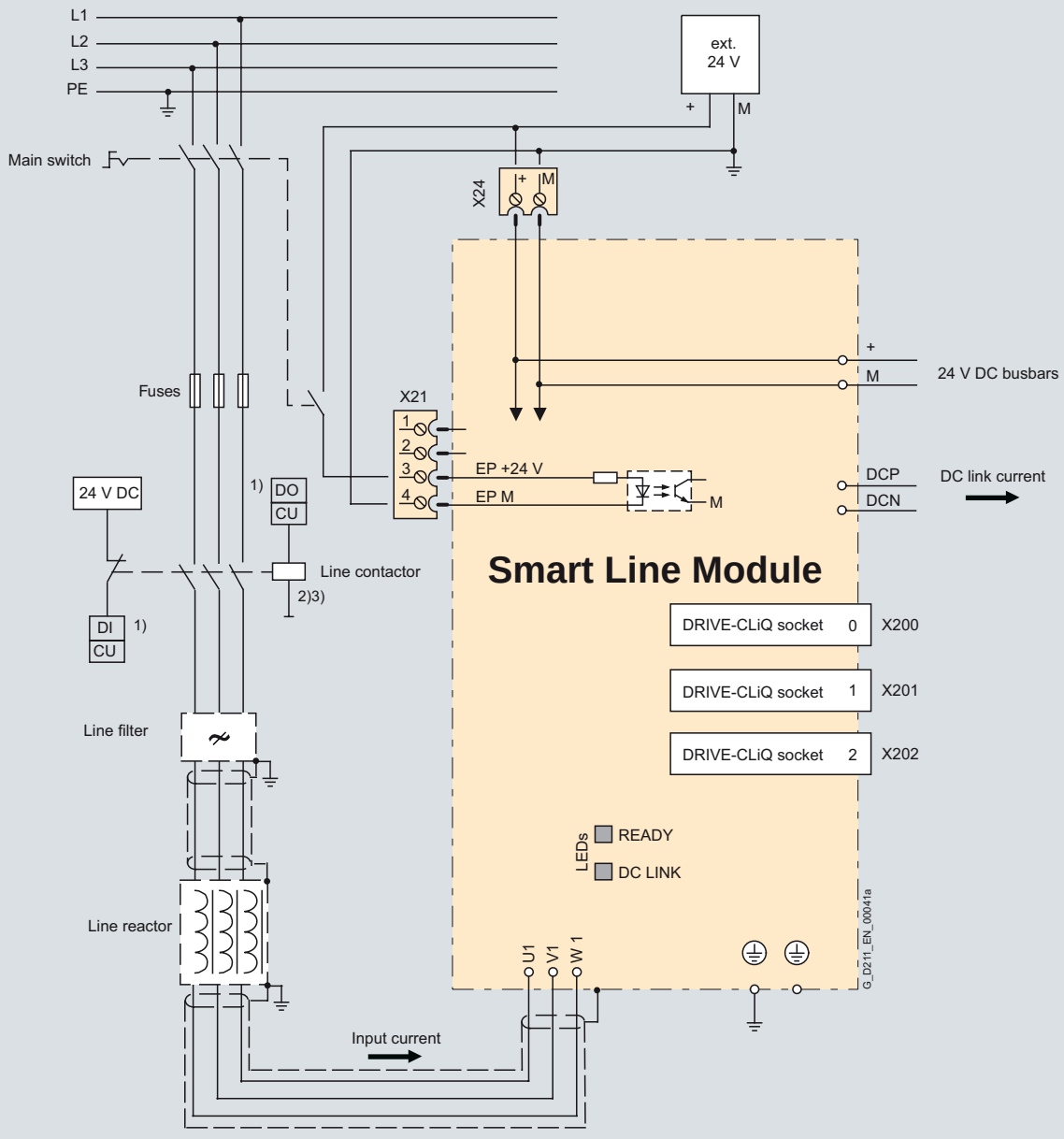
Integration



1) Leading NC contact t >10 ms, 24 V DC and ground must be connected for operation.
2) Digital input (DI) or digital output (DO) controlled by the Control Unit.
3) No additional load permitted downstream of the line contactor.
4) The current carrying capacity of the digital output (DO) must be taken into account; an output interface element may have to be used.
5) Digital output (DO) = High means: feedback deactivated (a jumper can be inserted between X22 pins 1 and 2 for permanent deactivation).
6) X22 pin 4 must be connected to ground (ext. 24 V).

Connection example of 5 kW and 10 kW Smart Line Modules in booksize format

Integration (continued)



1) Digital input (DI) or digital output (DO), controlled via the Control Unit.
2) No additional load permitted downstream of the line contactor.
3) The current carrying capacity of the digital output (DO) must be observed; an output interface may have to be taken into account.

Connection example of 16 kW and 36 kW Smart Line Modules in booksize format

Smart Line Modules in booksize format

Technical specifications

Smart Line Module in booksize format 6SL313...	
Line connection voltage (up to 2000 m (6562 ft) above sea level)	380 ... 480 V 3 AC ±10 % (in operation -15 % < 1 min) [1]
Line frequency	47 … 63 Hz
SCCR (short-circuit current rating)	65 kA in conjunction with the recommended fuses class J or circuit breakers in accordance with UL489 / CSA 22.2 No. 5-02 see recommended line-side components
Line power factor at rated power	
• Fundamental power factor (cos φ_1)	> 0.96
• Total (λ)	0.65 … 0.90
Overvoltage category according to EN 60664-1	Class III
DC link voltage, approx.	1.35 × line voltage [2]
Electronics power supply	24 V DC, -15 %/+20 %
Radio interference suppression	
• Standard	No radio interference suppression
• With line filter	Category C2 to EN 61800-3 Total cable length up to 350 m (1148 ft) (shielded)
Type of cooling	- Internal air cooling, power units with forced air cooling through built-in fans - Cold-plate cooling (5 kW (6.71 HP) and 10 kW (13.4 HP))
Permissible ambient and coolant temperature (air) during operation for line-side components, Line Modules and Motor Modules	0 … 40 °C (32 … 104 °F) without derating, > 40 … 55 °C (104 … 131 °F) see derating characteristics
Installation altitude	Up to 1000 m (3281 ft) above sea level without derating, > 1000 ... 4000 m (3281 ... 13124 ft) above sea level, see derating characteristics
Conformity	CE (low-voltage and EMC Directives)
Approvals, according to	cULus

[1] Smart Line Modules 16 kW and 36 kW in booksize format with firmware version V2.5 or higher with appropriate parameterization and reduced power rating are also operable on networks with 200 ... 240 V 3 AC ±10 %.

[2] The DC link voltage is the mean value of the rectified line voltage.
For more information, see chapter System description – Dimensioning.

Technical specifications (continued)

Line voltage 380 ... 480 V 3 AC		Smart Line Module in booksize format			
• Internal air cooling		6SL3130-6AE15-0AB0	6SL3130-6AE21-0AB0	6SL3130-6TE21-6AA3	6SL3130-6TE23-6AA3
• External air cooling		6SL3131-6AE15-0AA0	6SL3131-6AE21-0AA0	–	–
• Cold plate cooling		6SL3136-6AE15-0AA0	6SL3136-6AE21-0AA0	–	–
Feed/feedback power					
• Rated power P_{rated}					
- With 380 V 3 AC	kW	5	10	16	36
- With 460 V 3 AC [3]	(HP)	(5)	(10)	(18)	(40)
• For S6 duty (40 %) P_{S6}	kW	6.5	13	21	47
• P_{max}	kW	10	20	35	70
DC link current					
• At 540/600 V DC	A	9.3/8.3	18.5/16.6	30/27	67/60
• For S6 duty (40 %)	A	11	22	35	79
• Maximum	A	16.6	33.2	59	117
Input current					
• Rated current at 380/400/480 V 3 AC	A	8.6/8.1/6.7	17/16.2/12.8	26/25/21	58/55/46
• For S6 duty (40 %)	A	10.6	21.1	33	72
• Maximum	A	15.7	31.2	54	107
Current requirement 24 V DC electronics power supply, max.	A	1.0	1.3	1.1	1.5
Current carrying capacity					
• 24 V DC busbars	A	20	20	20	20
• DC link busbars	A	100	100	100	200
DC link capacitance					
• Smart Line Module	µF	220	330	710	1410
• Drive line-up, max.	µF	6000	6000	20000	20000
Internal/external air cooling					
• Power loss [1]					
- Internal air cooling	kW	0.11	0.2	0.19	0.41
- External air cooling, int./ext.	kW	0.06/0.05	0.1/0.1	–	–
• Cooling air requirement	m^3/s (ft^3/s)	0.008 (0.3)	0.008 (0.3)	0.016 (0.6)	0.031 (1.1)
• Sound pressure level L_{pA} (1 m)	dB	< 60	< 60	< 60	< 60
Cold plate cooling					
• Power loss, int./ext. [1]	kW	0.05/0.05	0.08/0.11	–	–
• Thermal resistance R_{th}	K/W	0.175	0.175	–	–
Line connection U1, V1, W1		Screw-type terminals (X1)	Screw-type terminals (X1)	Screw-type terminals (X1)	M6 screw studs (X1)
• Conductor cross-section	mm^2	2.5 … 6	2.5 … 6	2.5 … 10	2.5 … 50
Shield connection		Cable shield connection plate integrated into the connector	Cable shield connection plate integrated into the connector	Cable shield connection plate integrated into the connector	see Accessories
PE connection		M5 screw	M5 screw	M5 screw	M6 screw
Cable length, max. (total of all motor cables and DC link) [2]					
• Shielded	m (ft)	350 (1148)	350 (1148)	350 (1148)	350 (1148)
• Unshielded	m (ft)	560 (1837)	560 (1837)	560 (1837)	560 (1837)
Degree of protection		IP20	IP20	IP20	IP20
Dimensions					
• Width	mm (in)	50 (1.97)	50 (1.97)	100 (3.94)	150 (5.91)
• Height	mm (in)	380 (14.96)	380 (14.96)	380 (14.96)	380 (14.96)
• Depth					
- With internal air cooling	mm (in)	270 (10.63)	270 (10.63)	270 (10.63)	270 (10.63)
- With external air cooling on/behind mounting surface	mm (in)	226/66.5 (8.90/2.62)	226/66.5 (8.90/2.62)	–	–
- With cold plate cooling	mm (in)	226 (8.90)	226 (8.90)	–	–
Weight, approx.					
• With internal air cooling	kg (lb)	4.7 (10.4)	4.8 (10.6)	7 (15.4)	10.3 (22.7)
• With external air cooling	kg (lb)	5.3 (11.7)	5.4 (11.9)	–	–
• With cold plate cooling	kg (lb)	4 (8.82)	4 (8.82)	–	–

[1] Power loss of Smart Line Module at rated output including losses of 24 V DC electronics power supply.

[2] Max. cable lengths in conjunction with Voltage Clamping Module, see derating characteristics.

[3] Nominal HP ratings are provided for ease of assigning components only. The Line Module outputs are dependent on the Motor Module loading and are to be dimensioned accordingly.

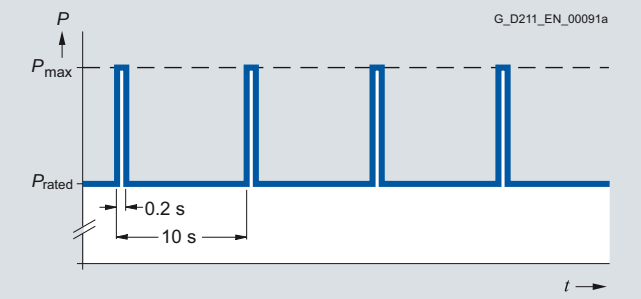
Selection and ordering data

Description	Order No.
Line voltage 380 ... 480 V 3 AC	
Smart Line Module in booksize format	
Internal air cooling	
Rated power	
• 5 kW (5 HP)	**6SL3130-6AE15-0AB0**
• 10 kW (10 HP)	**6SL3130-6AE21-0AB0**
• 16 kW (18 HP)	**6SL3130-6TE21-6AA3**
• 36 kW (40 HP)	**6SL3130-6TE23-6AA3**
External air cooling	
Rated power	
• 5 kW (5 HP)	**6SL3131-6AE15-0AA0**
• 10 kW (10 HP)	**6SL3131-6AE21-0AA0**
Cold plate cooling	
Rated power	
• 5 kW (5 HP)	**6SL3136-6AE15-0AA0**
• 10 kW (10 HP)	**6SL3136-6AE21-0AA0**

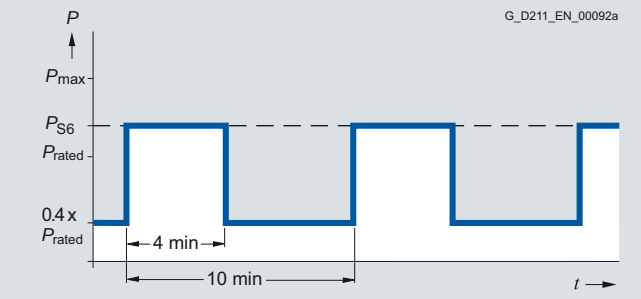
Description	Order No.
Accessories	
Shield connection plate for Line/Motor Modules in booksize format with a width of 150 mm (5.91 in)	**6SL3162-1AF00-0AA1**
DC link rectifier adapter For direct infeed of DC link voltage	
• Screw-type terminals 0.5 ... 10 mm^2 for Line Modules and Motor Modules in booksize format with a width of 50 mm (1.97 in) or 100 mm (3.94 in)	**6SL3162-2BD00-0AA0**
• Screw-type terminals 35 ... 95 mm^2 For Line Modules and Motor Modules in booksize format with a width of 150 mm, 200 mm and 300 mm (5.91 in, 7.87 in and 11.81 in)	**6SL3162-2BM00-0AA0**
DC link adapter (2 units) For multi-tier configuration Screw-type terminals 35 ... 95 mm^2 For all Line Modules and Motor Modules in booksize format	**6SL3162-2BM01-0AA0**
Accessories for re-ordering	
24 V terminal adapter For all Line Modules and Motor Modules in booksize format	**6SL3162-2AA00-0AA0**
24 V jumper For connection of the 24 V busbars (for booksize format)	**6SL3162-2AA01-0AA0**
Warning labels in 16 languages This set of foreign language warning signs can be placed on top of the standard English or German signs. A set of signs is supplied with the units. One sign in each of the following languages is provided in each set: Chinese Simplified, Czech, Danish, Dutch, Finnish, French, Greek, Italian, Japanese, Korean, Polish, Portuguese/Brazilian, Russian, Spanish, Swedish, Turkish.	**6SL3166-3AB00-0AA0**
Dust-proof blanking plugs (50 units) For DRIVE-CLiQ port	**6SL3066-4CA00-0AA0**

Characteristic curves

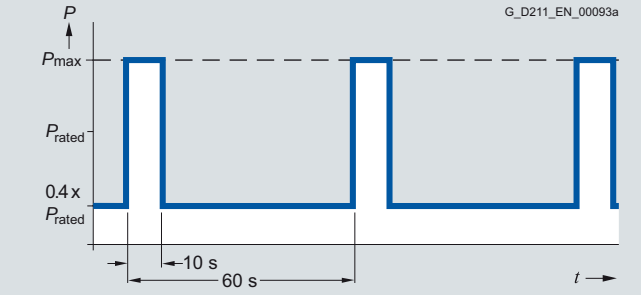
Overload capability



Load cycle with previous load

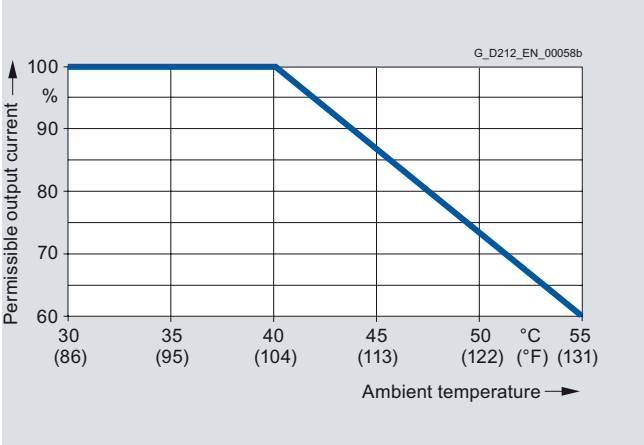


S6 load cycle with previous load

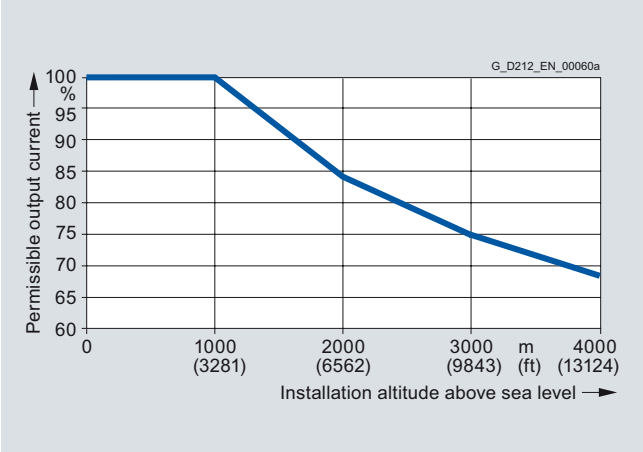


S6 load cycle with previous load

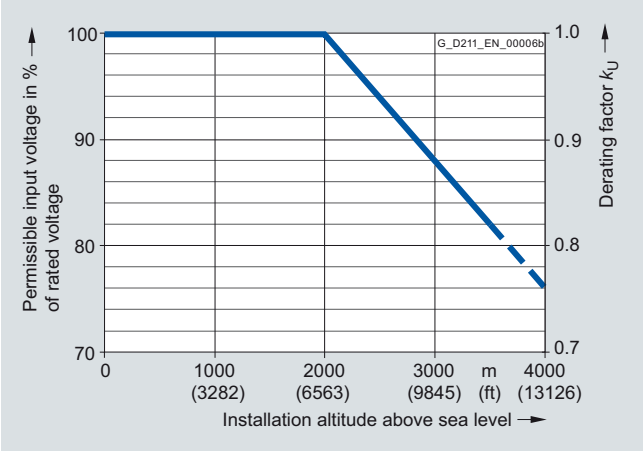
Derating characteristics



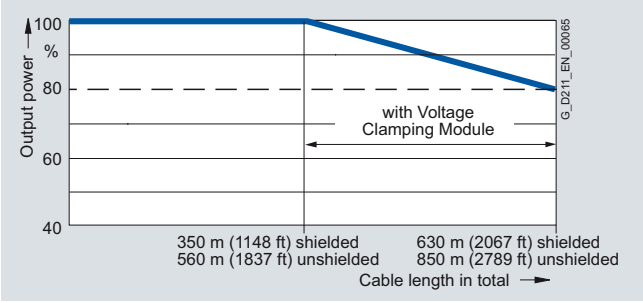
Output power dependent on ambient temperature



Output power dependent on installation altitude



Voltage derating dependent on installation altitude



Output power dependent on total cable length

Smart Line Modules in booksize format
Line reactors

Overview

Smart Line Modules are not warranted to operate without the specified line reactors. The use of other makes of line reactor can lead to malfunctions or irreparable damage to equipment.

Selection and ordering data

Rated power of the Smart Line Module	Suitable for Smart Line Module in booksize or booksize compact format	**Line reactor**
kW (HP)		Order No.
Line voltage 380 ... 480 V 3 AC		
5 (5)	6SL3130-6AE15-0AB0 6SL3131-6AE15-0AA0 6SL3136-6AE15-0AA0	**6SL3000-0CE15-0AA0**
10 (10)	6SL3130-6AE21-0AB0 6SL3131-6AE21-0AA0 6SL3136-6AE21-0AA0	**6SL3000-0CE21-0AA0**
16 (18)	6SL3130-6TE21-6AA3 6SL3430-6TE21-6AA0	**6SL3000-0CE21-6AA0**
36 (40)	6SL3130-6TE23-6AA3	**6SL3000-0CE23-6AA0**

Technical specifications

Line voltage 380 ... 480 V 3 AC		**Line reactor**			
		6SL3000-0CE15-0AA0	6SL3000-0CE21-0AA0	6SL3000-0CE21-6AA0	6SL3000-0CE23-6AA0
Rated current	A	14	28	35	69
Power loss	kW	0.062	0.116	0.11	0.17
Line/load connection 1U1, 1V1, 1W1 / 1U2, 1V2, 1W2		Screw-type terminals	Screw-type terminals	Screw-type terminals	Screw-type terminals
• Conductor cross-section	mm^2	4	10	10	16
PE connection		Screw-type terminals	Screw-type terminals	Screw-type terminals	Screw-type terminals
• Conductor cross-section	mm^2	4	10	10	16
Degree of protection		IP20	IP20	IP20	IP20
Dimensions					
• Width	mm (in)	150 (5.91)	177 (6.97)	219 (8.62)	228 (8.98)
• Height	mm (in)	175 (6.89)	196 (7.72)	180 (7.09)	235 (9.25)
• Depth	mm (in)	70 (2.76)	110 (4.33)	144 (5.67)	224 (8.82)
Weight, approx.	kg (lb)	3.7 (8)	7.5 (17)	9.5 (21)	17 (38)
Approvals, according to		cURus	cURus	cURus	cURus
Suitable for Smart Line Module in booksize or booksize compact format	Type	6SL3130-6AE15-0AB0 6SL3131-6AE15-0AA0 6SL3136-6AE15-0AA0	6SL3130-6AE21-0AB0 6SL3131-6AE21-0AA0 6SL3136-6AE21-0AA0	6SL3130-6TE21-6AA3 6SL3430-6TE21-6AA0	6SL3130-6TE23-6AA3
• Rated power of the Smart Line Module	kW	5	10	16	36

Overview

In plants with strict EMC requirements, line filters work together with line reactors to restrict the conducted interference emanating from the power modules to the limit values of Category C2 as defined in EN 61800-3. Line filters are suited only for direct connection to TN systems with grounded star point.

Selection and ordering data

Rated power of the Smart Line Module	Suitable for Smart Line Module in booksize or booksize compact format	**Line filter**
kW (HP)		Order No.
Line voltage 380 ... 480 V 3 AC		
5 (5)	6SL3130-6AE15-0AB0 6SL3131-6AE15-0AA0 6SL3136-6AE15-0AA0	**6SL3000-0HE15-0AA0**
10 (10)	6SL3130-6AE21-0AB0 6SL3131-6AE21-0AA0 6SL3136-6AE21-0AA0	**6SL3000-0HE21-0AA0**
16 (18)	6SL3130-6TE21-6AA3 6SL3430-6TE21-6AA0	**6SL3000-0BE21-6DA0**
36 (40)	6SL3130-6TE23-6AA3	**6SL3000-0BE23-6DA1**

Technical specifications

Line voltage 380 ... 480 V 3 AC		**Line filter**			
		6SL3000-0HE15-0AA0	6SL3000-0HE21-0AA0	6SL3000-0BE21-6DA0	6SL3000-0BE23-6DA1
Rated current	A	12	25	36	74
Power loss	W	20	20	16	20
Line/load connection L1, L2, L3 / U, V, W		Screw-type terminals	Screw-type terminals	Screw-type terminals	Screw-type terminals
• Conductor cross-section	mm^2	10	10	10	35
PE connection		M6 screw stud	M6 screw stud	M6 screw stud	M6 screw stud
Degree of protection		IP20	IP20	IP20	IP20
Dimensions					
• Width	mm (in)	60 (2.36)	60 (2.36)	50 (1.97)	75 (2.95)
• Height	mm (in)	285 (11.22)	285 (11.22)	420 (16.54)	433 (17.05)
• Depth	mm (in)	122 (4.80)	122 (4.80)	226 (8.90)	226 (8.90)
Weight, approx.	kg (lb)	2.1 (5)	2.3 (5)	5.0 (11)	7.5 (17)
Approvals, according to		cURus	cURus	cURus	cURus
Suitable for Smart Line Module in booksize or booksize compact format	Type	6SL3130-6AE15-0AB0 6SL3131-6AE15-0AA0 6SL3136-6AE15-0AA0	6SL3130-6AE21-0AB0 6SL3131-6AE21-0AA0 6SL3136-6AE21-0AA0	6SL3130-6TE21-6AA3 6SL3430-6TE21-6AA0	6SL3130-6TE23-6AA3
• Rated power of the Smart Line Module	kW	5	10	16	36

Smart Line Modules in booksize format
Recommended line-side components

Overview

Suitable line-side power components are assigned depending on the power rating of the Smart Line Module.

The tables below list recommended components.

Further information about the line contactors, switch disconnectors, fuses and circuit breakers specified in the tables can be found in Catalogs LV 10.1 and IC 10.

Assignment of line-side power components to Smart Line Modules in booksize or booksize compact format

Rated power	Suitable for Smart Line Module in booksize or booksize compact format	**Line contactor**	**Circuit breaker IEC 60947**	**Circuit breaker UL489/CSA C22.2 No. 5-02**	**Main switch**
kW (HP)	Type	Type	Order No.	Order No.	Order No.
Line voltage 380 ... 480 V 3 AC					
5 (5)	6SL3130-6AE15-0AB0 6SL3131-6AE15-0AA0 6SL3136-6AE15-0AA0	**3RT1023-...**	**3RV1031-4BA10**	**3VL1102-2KM30-...**	**3LD2003-0TK51**
10 (10)	6SL3130-6AE21-0AB0 6SL3131-6AE21-0AA0 6SL3136-6AE21-0AA0	**3RT1026-...**	**3RV1031-4FA10**	**3VL1135-2KM30-...**	**3LD2203-0TK51**
16 (18)	6SL3130-6TE21-6AA3 6SL3430-6TE21-6AA0	**3RT1035-...**	**3RV1031-4FA10**	**3VL2105-2KN30-...**	**3LD2504-0TK51**
36 (40)	6SL3130-6TE23-6AA3	**3RT1045-...**	**3RV1041-4LA10**	**3VL2108-2KN30-...**	**3LD2704-0TK51**

Rated power	Suitable for Smart Line Module in booksize or booksize compact format	**Fuse switch disconnector**	**Switch disconnector with fuse holders**	**LV HRC fuse (gL/gG)**			**UL/CSA fuse, Class J** [1] Available from: Ferraz Shawmut www.ferrazshawmut.com		
kW (HP)	Type	Order No.	Order No.	Rated current	Size	Reference No.	Rated current	Size d × l mm	Reference No.
Line voltage 380 ... 480 V 3 AC									
5 (5)	6SL3130-6AE15-0AB0 6SL3131-6AE15-0AA0 6SL3136-6AE15-0AA0	**3NP1123-1CA20**	**3KL5030-1GB01**	16 A	000	**3NA3805**	17.5 A	21 × 57	AJT17-1/2
10 (10)	6SL3130-6AE21-0AB0 6SL3131-6AE21-0AA0 6SL3136-6AE21-0AA0	**3NP1123-1CA20**	**3KL5030-1GB01**	35 A	000	**3NA3814**	35 A	27 × 60	AJT35
16 (18)	6SL3130-6TE21-6AA3 6SL3430-6TE21-6AA0	**3NP1123-1CA20**	**3KL5030-1GB01**	35 A	000	**3NA3814**	35 A	27 × 60	AJT35
36 (40)	6SL3130-6TE23-6AA3	**3NP1123-1CA20**	**3KL5230-1GB01**	80 A	000	**3NA3824**	80 A	29 × 117	AJT80

[1] Not for use in 3NP and 3KL disconnectors.

Overview

Smart Line Modules are non-regulated feed/feedback units with 100 % continuous regenerative feedback power. The regenerative feedback capability of the modules can be deactivated by parameterizing.
Smart Line Modules are designed for connection to grounded TN/TT systems and non-grounded IT systems.

The DC link is pre-charged via integrated precharging resistors.

The associated line reactor is absolutely essential for operating a Smart Line Module.

Design

Smart Line Modules in chassis format feature the following connections and interfaces as standard:

- 1 power connection
- 1 connection for the 24 V DC electronics power supply
- 1 DC link connection (DCPA, DCNA) for connecting a Braking Module
- 3 DRIVE-CLiQ sockets
- 1 PE/protective conductor connection (2 connections for sizes HX and JX)

The status of the Smart Line Modules is indicated via two multi-color LEDs.

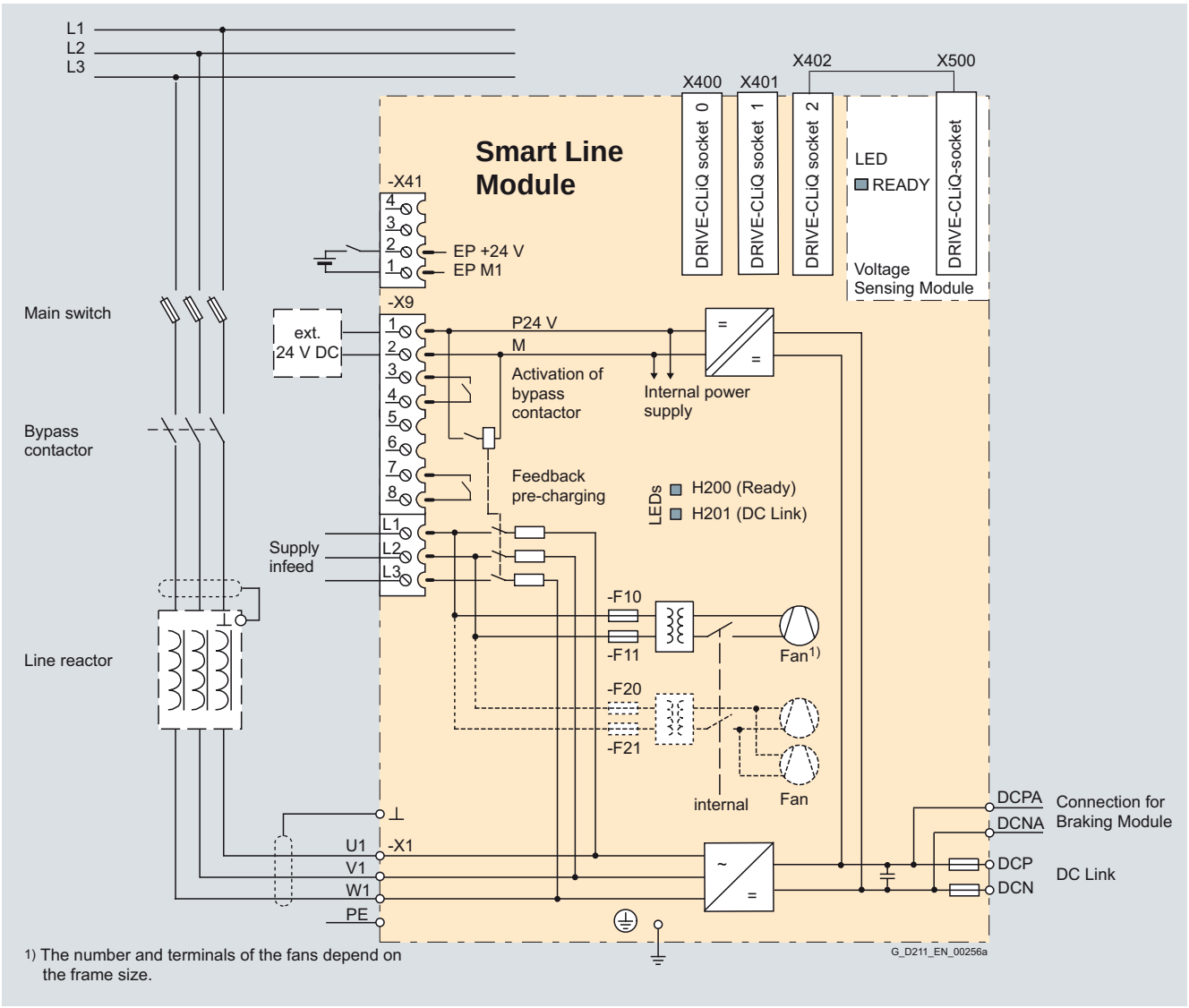
The scope of supply of the Smart Line Modules includes:

- DRIVE-CLiQ cable for connection to a CU320-2 or SIMOTION D4x5 Control Unit
- DRIVE-CLiQ cable for connection between the Control Unit and first Motor Module (type dependent)

3

Integration

The Smart Line Module communicates with a higher level Control Unit via DRIVE-CLiQ. This Control Unit can be a CU320-2 Control Unit or a SIMOTION D Control Unit



Connection example of a Smart Line Module in chassis format

Technical specifications

Smart Line Modules in chassis format 6SL3330-6T...	
Line connection voltage (up to 2000 m (6562 ft) above sea level)	380 V ... 480 V 3 AC ± 10 % (in operation -15 % < 1 min) or 500 V ... 690 V 3 AC ± 10 % (in operation -15 % < 1 min) [1]
Line frequency	47 … 63 Hz
Line power factor at rated output	
• Fundamental power factor (cos φ_1)	> 0.96
• Total (λ)	0.75 … 0.93
Overvoltage category according to EN 60664-1	Class III
DC link voltage, approx. [2]	1.32 × line voltage under partial load 1.30 × line voltage under full load
Main contactor control	
• Terminal strip X9/5-6	240 V AC/max. 8 A 30 V DC/max. 1 A
Radio interference suppression	
• Standard	Category C3 to EN 61800-3 up to 300 m (984 ft) total cable length
Type of cooling	Internal air cooling, power units with forced air cooling by built-in fans
Permissible ambient and coolant temperature (air) during operation for line-side components, Line Modules and Motor Modules	0 … 40 °C (32 … 104 °F) without derating, > 40 … 55 °C (104 … 131 °F) see derating characteristics
Installation altitude	Up to 2000 m (3281 ft) above sea level without derating, > 2000 ... 4000 m (3281 ... 13124 ft) above sea level, see derating characteristics
Conformity	CE (low-voltage and EMC Directives)
Approvals, according to	cULus

[1] TT system with grounded external conductor is not permissible for line voltages > 600 V.

[2] The DC link voltage is unregulated and load-dependent.
For more information, see SINAMICS Low-Voltage Engineering Manual.

3

Technical specifications (continued)

Line voltage 380 ... 480 V 3 AC		Smart Line Modules in chassis format				
		6SL3330-6TE35-5AA3	6SL3330-6TE37-3AA3	6SL3330-6TE41-1AA3	6SL3330-6TE41-3AA3	6SL3330-6TE41-7AA3
Rated power						
• At $I_{rated\ DC}$ (50 Hz 400 V)	kW	**250**	**355**	**500**	**630**	**800**
• At $I_{H\ DC}$ (50 Hz 400 V)	kW	235	315	450	555	730
• At $I_{rated\ DC}$ (60 Hz 460 V)	HP	385	545	770	970	1230
• At $I_{H\ DC}$ (60 Hz 460 V)	HP	360	485	695	855	1125
DC link current						
• Rated current $I_{rated\ DC}$	A	550	730	1050	1300	1700
• Base-load current $I_{H\ DC}$ [1]	A	490	650	934	1157	1513
• Maximum current $I_{max\ DC}$	A	825	1095	1575	1950	2550
Rectifier/regenerative current						
• Rated current $I_{rated\ E}$	A	463	614	883	1093	1430
• Maximum current $I_{max\ E}$	A	694	921	1324	1639	2145
Current requirement						
• 24 V DC auxiliary power supply	A	1.35	1.35	1.4	1.5	1.7
• 400 V AC	A	1.8	1.8	3.6	5.4	5.4
DC link capacitance						
• Smart Line Module	µF	8400	12000	16800	18900	28800
• Drive line-up, max.	µF	42000	60000	67200	75600	115200
Power loss, max. [2]						
• At 50 Hz 400 V	kW	3.7	4.7	7.1	11	11.5
• At 60 Hz 460 V	kW	3.7	4.7	7.1	11	11.5
Cooling air requirement	m^3/s (ft^3/s)	0.36 (12.7)	0.36 (12.7)	0.78 (27.5)	1.08 (38.1)	1.08 (38.1)
Sound pressure level L_{pA} (1 m) at 50/60 Hz	dB	69/73	69/73	70/73	70/73	70/73
Line connection U1, V1, W1		M10 screw	M10 screw	2 × M12 screw	3 × M12 screw	3 × M12 screw
• Conductor cross-section, max. (acc. to DIN VDE)	mm^2	2 × 240	2 × 240	4 × 240	6 × 240	6 × 240
DC link connection DCP, DCN		M10 screw	M10 screw	4 × hole for M12	4 × hole for M12	4 × hole for M12
• Conductor cross-section, max. (acc. to DIN VDE)	mm^2	2 × 240	2 × 240	Busbar	Busbar	Busbar
PE/GND connection		Hole for M10	Hole for M10	–	–	–
• Conductor cross-section, max. (acc. to DIN VDE)	mm^2	2 × 240	2 × 240	–	–	–
PE1/GND connection		–	–	M12 screw	M12 screw	M12 screw
• Conductor cross-section, max. (acc. to DIN VDE)	mm^2	–	–	240	240	240
PE2/GND connection		–	–	2 × M12 screw	2 × M12 screw	2 × M12 screw
• Conductor cross-section, max. (acc. to DIN VDE)	mm^2	–	–	2 × 240	2 × 240	2 × 240
Cable length, max. [3]						
• Shielded	m (ft)	4000 (13124)	4000 (13124)	4800 (15749)	4800 (15749)	4800 (15749)
• Unshielded	m (ft)	6000 (19686)	6000 (19686)	7200 (23623)	7200 (23623)	7200 (23623)
Degree of protection		IP00	IP00	IP00	IP00	IP00
Dimensions						
• Width	mm (in)	310 (12.20)	310 (12.20)	503 (19.80)	704 (27.72)	704 (27.72)
• Height	mm (in)	1413 (55.6)	1413 (55.6)	1475 (58.1)	1480 (58.3)	1480 (58.3)
• Depth	mm (in)	550 (21.65)	550 (21.65)	548 (21.57)	550 (21.65)	550 (21.65)
Weight, approx.	kg (lb)	150 (331)	150 (331)	294 (648)	458 (1010)	458 (1010)
Frame size		GX	GX	HX	JX	JX

[1] The base-load current $I_{H\ DC}$ is based on a duty cycle of 150 % for 60 s or Imax DC for 5 s with a duty cycle duration of 300 s.

[2] The specified power loss is the maximum value at 100 % capacity utilization. The value is lower under normal operating conditions.

[3] Total of all motor cables and DC link. Longer cable lengths for specific configurations are available on request.
See also SINAMICS Low-Voltage Engineering Manual.

Technical specifications (continued)

Line voltage 500 ... 690 V 3 AC		Smart Line Modules in chassis format			
		6SL3330-6TG35-5AA3	6SL3330-6TG38-8AA3	6SL3330-6TG41-2AA3	6SL3330-6TG41-7AA3
Rated power					
• At $I_{rated\ DC}$ (50 Hz 690 V)	kW	**450**	**710**	**1000**	**1400**
• At $I_{H\ DC}$ (50 Hz 690 V)	kW	405	665	885	1255
• At $I_{rated\ DC}$ (50 Hz 500 V)	kW	320	525	705	995
• At $I_{H\ DC}$ (50 Hz 500 V)	kW	295	480	640	910
• At $I_{rated\ DC}$ (60 Hz 575 V)	HP	500	790	1115	1465
• At $I_{H\ DC}$ (60 Hz 575 V)	HP	450	740	990	1400
DC link current					
• Rated current $I_{rated\ DC}$	A	550	900	1200	1700
• Base-load current $I_{H\ DC}$ [1]	A	490	800	1068	1513
• Maximum current $I_{max\ DC}$	A	825	1350	1800	2550
Rectifier/regenerative current					
• Rated current $I_{rated\ E}$	A	463	757	1009	1430
• Maximum current $I_{max\ E}$	A	694	1135	1513	2145
Current requirement					
• 24 V DC auxiliary power supply	A	1.35	1.4	1.5	1.7
• 500 V AC		1.4	2.9	4.3	4.3
• 690 V AC	A	1.0	2.1	3.1	3.1
DC link capacitance					
• Smart Line Module	µF	5600	7400	11100	14400
• Drive line-up, max.	µF	28000	29600	44400	57600
Power loss, max. [2]					
• At 50 Hz 690 V	kW	4.3	6.5	12	13.8
• At 60 Hz 575 V	kW	4.3	6.5	12	13.8
Cooling air requirement	m^3/s (ft^3/s)	0.36 (12.7)	0.78 (27.5)	1.08 (38.1)	1.08 (38.1)
Sound pressure level L_{pA} (1 m) at 50/60 Hz	dB	69/73	70/73	70/73	70/73
Line connection U1, V1, W1		M10 screw	2 × M12 screw	3 × M12 screw	3 × M12 screw
• Conductor cross-section, max.	mm^2	2 × 240	4 × 240	6 × 240	6 × 240
DC link connection DCP, DCN		M10 screw	4 × hole for M12	4 × hole for M12	4 × hole for M12
• Conductor cross-section, max.	mm^2	2 × 240	Busbar	Busbar	Busbar
PE/GND connection		Hole for M10	–	–	–
• Conductor cross-section, max.	mm^2	2 × 240	–	–	–
PE1/GND connection		–	M12 screw	M12 screw	M12 screw
• Conductor cross-section, max.	mm^2	–	240	240	240
PE2/GND connection		–	2 × M12 screw	2 × M12 screw	2 × M12 screw
• Conductor cross-section, max.	mm^2	–	2 × 240	2 × 240	2 × 240
Cable length, max. [3]					
• Shielded	m (ft)	2250 (7382)	2750 (9023)	2750 (9023)	2750 (9023)
• Unshielded	m (ft)	3375 (11073)	4125 (13534)	4125 (13534)	4125 (13534)
Degree of protection		IP00	IP00	IP00	IP00
Dimensions					
• Width	mm (in)	310 (12.20)	503 (19.80)	704 (27.72)	704 (27.72)
• Height	mm (in)	1413 (55.63)	1475 (58.07)	1480 (58.27)	1480 (58.27)
• Depth	mm (in)	550 (21.65)	548 (21.57)	550 (21.65)	550 (21.65)
Weight, approx.	kg (lb)	150 (331)	294 (648)	458 (1010)	458 (1010)
Frame size		GX	HX	JX	JX

[1] The base-load current $I_{H\ DC}$ is based on a duty cycle of 150 % for 60 s or $I_{max\ DC}$ for 5 s with a duty cycle duration of 300 s.

[2] The specified power loss is the maximum value at 100 % capacity utilization. The value is lower under normal operating conditions.

[3] Total of all motor cables and DC link. Longer cable lengths for specific configurations are available on request.
See also SINAMICS Low-Voltage Engineering Manual.

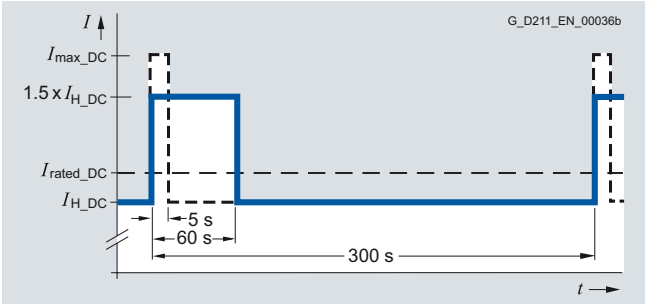
Smart Line Modules in chassis format

Selection and ordering data

Rated power	Smart Line Modules in chassis format
kW (HP)	Order No.
Line voltage 380 ... 480 V 3 AC	
250 (400)	**6SL3330-6TE35-5AA3**
355 (500)	**6SL3330-6TE37-3AA3**
500 (700)	**6SL3330-6TE41-1AA3**
630 (800)	**6SL3330-6TE41-3AA3**
800 (1000)	**6SL3330-6TE41-7AA3**
Line voltage 500 ... 690 V 3 AC	
450	**6SL3330-6TG35-5AA3**
710	**6SL3330-6TG38-8AA3**
1000	**6SL3330-6TG41-2AA3**
1400	**6SL3330-6TG41-7AA3**
Accessories for re-ordering	
Warning labels in 16 languages This set of foreign language warning signs can be placed on top of the standard English or German signs. A set of signs is supplied with the units. One sign in each of the following languages is provided in each set: Chinese Simplified, Czech, Danish, Dutch, Finnish, French, Greek, Italian, Japanese, Korean, Polish, Portuguese/Brazilian, Russian, Spanish, Swedish, Turkish.	**6SL3166-3AB00-0AA0**
Dust-proof blanking plugs (50 units) For DRIVE-CLiQ port	**6SL3066-4CA00-0AA0**

Characteristic curves

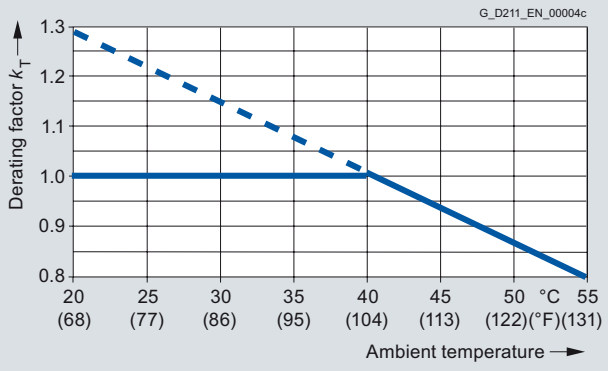
Overload capability



Overload capability

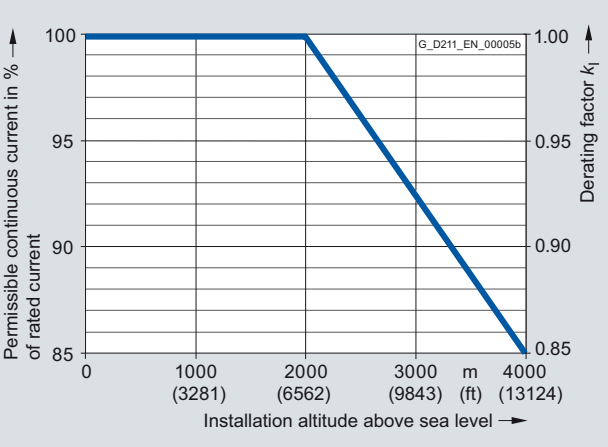
Characteristic curves (continued)

Derating characteristics

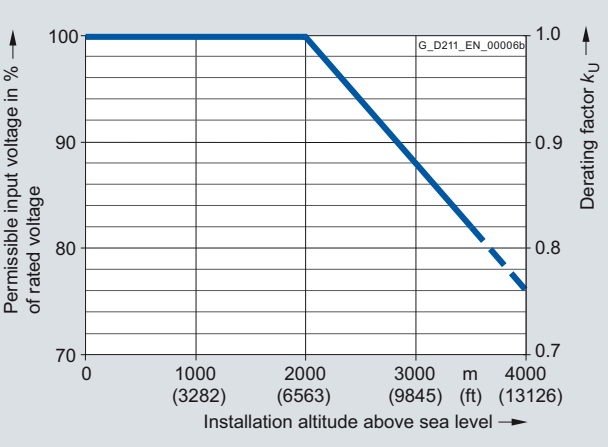


Current derating dependent on ambient temperature

Note: A derating factor k_T > 1.0 must be applied only in conjunction with current derating dependent on installation altitude.
See also chapter System description – Dimensioning.



Current derating dependent on installation altitude



Voltage derating dependent on installation altitude

Overview

Smart Line Modules are not warranted to operate without the specified line reactors. The use of other makes of line reactor can lead to malfunctions or irreparable damage to equipment.

Selection and ordering data

Rated power of the Smart Line Module	Suitable for Smart Line Module in chassis format	**Line reactor**
kW (HP)		Order No.
Line voltage 380 ... 480 V 3 AC		
250 (400)	6SL3330-6TE35-5AA3	**6SL3000-0EE36-2AA0**
355 (500)	6SL3330-6TE37-3AA3	
500 (700)	6SL3330-6TE41-1AA3	**6SL3000-0EE38-8AA0**
630 (800)	6SL3330-6TE41-3AA3	**6SL3000-0EE41-4AA0**
800 (1000)	6SL3330-6TE41-7AA3	
Line voltage 500 ... 690 V 3 AC		
450	6SL3330-6TG35-5AA3	**6SL3000-0EH34-7AA0**
710	6SL3330-6TG38-8AA3	**6SL3000-0EH37-6AA0**
1000	6SL3330-6TG41-2AA3	**6SL3000-0EH41-4AA0**
1400	6SL3330-6TG41-7AA3	

Technical specifications

Line voltage 380 ... 480 V 3 AC		Line reactor		
		6SL3000-0EE36-2AA0	6SL3000-0EE38-8AA0	6SL3000-0EE41-4AA0
Rated current	A	615	885	1430
Nominal inductance L_{rated}	µH	55	35	25
Power loss at 50/60 Hz	kW	0.56	0.81	1.08
Line/load connection		1 × hole for M10 Provided for busbar connection	1 × hole for M10 Provided for busbar connection	1 × hole for M10 Provided for busbar connection
PE connection		M6 thread	M6 thread	M6 thread
Degree of protection		IP00	IP00	IP00
Dimensions				
• Width	mm (in)	300 (11.81)	442 (17.40)	544 (21.42)
• Height	mm (in)	264 (10.39)	376 (14.80)	386 (15.20)
• Depth	mm (in)	203 (7.99)	263 (10.35)	232 (9.13)
Weight, approx.	kg (lb)	57 (126)	85.5 (189)	220 (485)
Conformity		CE	CE	CE
Approvals, according to		–	–	–
Suitable for Smart Line Module in chassis format	Type (rated infeed power)	6SL3330-6TE35-5AA3 (250 kW) 6SL3330-6TE37-3AA3 (355 kW)	6SL3330-6TE41-1AA3 (500 kW)	6SL3330-6TE41-3AA3 (630 kW) 6SL3330-6TE41-7AA3 (800 kW)

Line voltage 500 ... 690 V 3 AC		Line reactor		
		6SL3000-0EH34-7AA0	6SL3000-0EH37-6AA0	6SL3000-0EH41-4AA0
Rated current	A	465	760	1430
Nominal inductance L_{rated}	µH	115	70	40
Power loss at 50/60 Hz	kW	0.82	0.95	1.85
Line/load connection		1 × hole for M10 Provided for busbar connection	1 × hole for M10 Provided for busbar connection	1 × hole for M10 Provided for busbar connection
PE connection		M6 nut	M6 nut	M6 nut
Degree of protection		IP00	IP00	IP00
Dimensions				
• Width	mm (in)	360 (14.17)	442 (17.40)	655 (25.79)
• Height	mm (in)	325 (12.80)	370 (14.57)	383 (15.08)
• Depth	mm (in)	229 (9.02)	303 (11.93)	288 (11.34)
Weight, approx.	kg (lb)	58 (128)	145 (320)	239 (527.00)
Conformity		CE	CE	CE
Approvals, according to		–	–	–
Suitable for Smart Line Module in chassis format	Type (rated infeed power)	6SL3330-6TG35-5AA3 (450 kW)	6SL3330-6TG38-8AA3 (710 kW)	6SL3330-6TG41-2AA3 (1000 kW) 6SL3330-6TG41-7AA3 (1400 kW)

Overview

Suitable line-side power components are assigned depending on the power rating of the Smart Line Module.

The tables below list recommended components.

Further information about the line contactors, switch disconnectors, fuses and circuit breakers specified in the tables can be found in Catalogs LV 10.1 and IC 10.

Assignment of line-side power components to Smart Line Modules in chassis format

Infeed power	Input current	Suitable for Smart Line Module	**Line contactor**	**Fixed-mounted circuit breaker**
kW (HP)	A	Type 6SL3330-	Order No.	Order No.
Line voltage 380 … 480 V 3 AC				
250 (400)	463	6TE35-5AA3	**3RT1476-6AP36**	–
355 (500)	614	6TE37-3AA3	**3RT1476-6AP36**	–
500 (700)	883	6TE41-1AA3	–	**3WL1210-4CB34-4AN2-Z C22**
630 (800)	1093	6TE41-3AA3	–	**3WL1212-4CB34-4AN2-Z C22**
800 (1000)	1430	6TE41-7AA3	–	**3WL1216-4CB34-4AN2-Z C22**
Line voltage 500 … 690 V 3 AC				
450	463	6TG35-5AA3	**3RT1466-6AP36**	–
710	757	6TG38-8AA3	**3RT1466-6AP36** (3 units)	–
1000	1009	6TG41-2AA3	–	**3WL1212-4CB34-4AN2-Z C22**
1400	1430	6TG41-7AA3	–	**3WL1216-4CB34-4AN2-Z C22**

Infeed power	Input current	Suitable for Smart Line Module	**Switch disconnector without handle and shaft**	**Switch disconnector with handle and shaft**	**Cable protection fuse**		**Cable protection fuse incl. semiconductor protection**	
kW (HP)	A	Type 6SL3330-	Order No.	Order No.	Rated current	Order No.	Rated current	Order No.
Line voltage 380 … 480 V 3 AC								
250 (400)	463	6TE35-5AA3	**3KL6130-1AB02**	**3KL6130-1GB02**	500 A	**3NA3365**	560 A	**3NE1435-2**
355 (500)	614	6TE37-3AA3	**3KL6230-1AB02**	**3KL6230-1GB02**	630 A	**3NA3372**	710 A	**3NE1437-2**
500 (700)	883	6TE41-1AA3	–	–	1000 A	**3NA3480**	2 × 500 A	**3NE1334-2** (2 units)
630 (800)	1093	6TE41-3AA3	–	–	1250 A	**3NA3482**	2 × 630 A	**3NE1436-2** (2 units)
800 (1000)	1430	6TE41-7AA3	–	–	2 × 800 A	**3NA3475** (2 units)	2 × 850 A	**3NE1448-2** (2 units)
Line voltage 500 … 690 V 3 AC								
450	463	6TG35-5AA3	**3KL6130-1AB02**	**3KL6130-1GB02**	500 A	**3NA3365-6**	560 A	**3NE1435-2**
710	757	6TG38-8AA3	**3KL6230-1AB02**	**3KL6230-1GB02**	2 × 400 A	**3NA3360-6** (2 units)	850 A	**3NE1448-2**
1000	1009	6TG41-2AA3	–	–	3 × 355 A	**3NA3354-6** (3 units)	2 × 560 A	**3NE1435-2** (2 units)
1400	1430	6TG41-7AA3	–	–	3 × 500 A	**3NA3365-6** (3 units)	2 × 850 A	**3NE1448-2** (2 units)

Active Line Modules in booksize format

Overview

The self-commutated feed/feedback units (with IGBTs in infeed and regenerative feedback directions) generate a regulated DC link voltage. This means that the connected Motor Modules are decoupled from the line voltage. Line voltage fluctuations within the permissible supply tolerances have no effect on the motor voltage. Active Line Modules are designed for connection to grounded TN/TT systems and non-grounded IT supply systems.

The DC link is pre-charged via integrated precharging resistors.

In order to operate an Active Line Module, it is absolutely essential to use the appropriate Active Interface Module or matching line reactor.

Design

The Active Line Modules in booksize format feature the following connections and interfaces as standard:

- 1 power connection via screw-type terminals
- 1 connection for the 24 V DC electronics power supply via the 24 V terminal adapter included in the scope of supply
- 1 DC link connection via integrated DC link busbars
- 1 temperature sensor input (KTY84-130 or PTC/PT100)
- 3 DRIVE-CLiQ sockets
- 2 PE (protective earth) connections

The status of the Active Line Modules is indicated via two multi-color LEDs.

On the 100 mm (3.94 in) wide Active Line Module, the shield for the power supply cable can be connected to the integrated shield connection plate via shield connection element or tube clip, e.g. Weidmüller type KLBÜ CO 4. The shield connection terminal must not be used for strain relief. Shield connection kits are available for the 150 mm (5.91 in), 200 mm (7.87 in) and 300 mm (11.81 in) wide Active Line Modules.

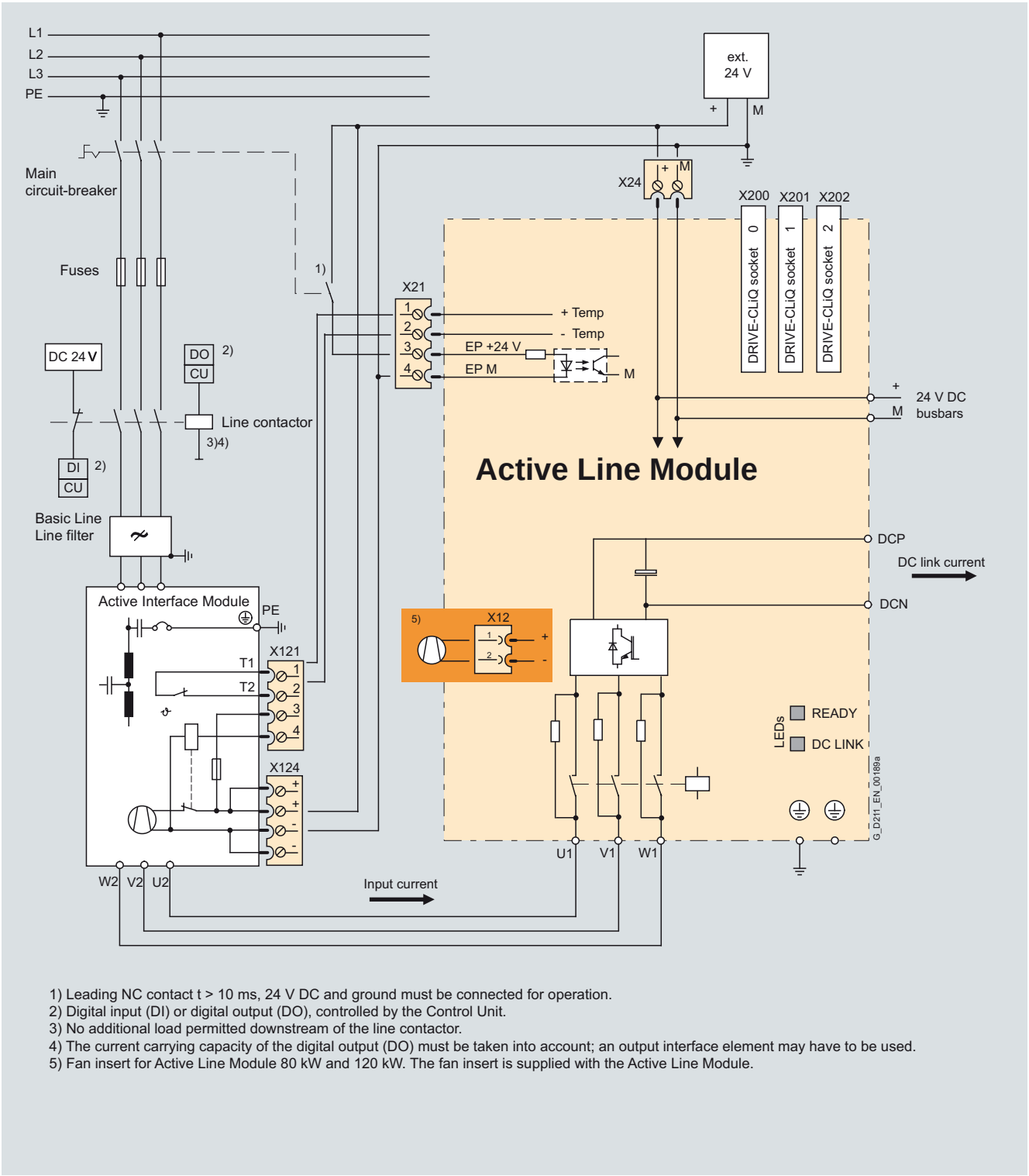
The signal cable shield can be connected to the Active Line Module by means of a shield connection terminal, e.g. Weidmüller type KLBÜ 3-8 SC.

The scope of supply of the Active Line Modules includes:

- DRIVE-CLiQ cable for connection to the adjacent Control Unit on the left for drive control, length 0.11 m (4.33 in)
- DRIVE-CLiQ cable (length depends on module width) to connect Active Line Module to adjacent Motor Module, length = width Active Line Module + 0.11 m (4.33 in)
- 2 blanking plugs for sealing unused DRIVE-CLiQ sockets
- Jumper for connecting the 24 V DC busbar to the adjacent Motor Module
- 24 V terminal adapter (X24)
- Connector X21 for digital inputs
- Fan insert for Active Line Modules of 80 kW and 120 kW (the voltage for the fan unit is supplied by the Active Line Module)
- 1 set of warning signs in 16 languages
- 1 heat conducting foil
  (for Active Line Modules with cold plate cooling only)

Integration

The Active Line Module communicates with the CU320-2 or SIMOTION D Control Unit via DRIVE-CLiQ.



1) Leading NC contact t > 10 ms, 24 V DC and ground must be connected for operation.
2) Digital input (DI) or digital output (DO), controlled by the Control Unit.
3) No additional load permitted downstream of the line contactor.
4) The current carrying capacity of the digital output (DO) must be taken into account; an output interface element may have to be used.
5) Fan insert for Active Line Module 80 kW and 120 kW. The fan insert is supplied with the Active Line Module.

Connection example of Active Line Module in booksize format

Active Line Modules in booksize format

Technical specifications

Active Line Module in booksize format 6SL313...	
Line connection voltage (up to 2000 m (6562 ft) above sea level)	380 ... 480 V 3 AC ±10 % (in operation -15 % < 1 min) [1]
Line frequency	47 … 63 Hz
SCCR (short-circuit current rating)	65 kA in conjunction with the recommended fuses class J or circuit breakers in accordance with UL489 / CSA 22.2 No. 5-02 see recommended line-side components
Line power factor	
• Active mode	
- Fundamental power factor (cos φ_1)	1.0 (factory setting), can be altered by input of a reactive current setpoint
- Total (λ)	1.0 (factory setting)
• Smart Mode	
- Fundamental power factor	> 0.96
- Overall	0.65 … 0.90
Overvoltage category to EN 60664-1	Class III
DC link voltage U_d	In Active Mode, the DC link voltage is regulated and can be adjusted as a voltage decoupled from the line voltage. In Smart Mode, the DC link voltage is kept in proportion to the line voltage at the mean rectified line voltage value. Factory setting for DC link voltage: 380 … 400 V 3 AC: 600 V (Active Mode) 400 … 415 V 3 AC: 625 V (Active Mode) 416 … 480 V 3 AC: 1.35 × line voltage (Smart Mode) [2]
Electronics power supply	24 V DC, -15 %/+20 %
Radio interference suppression	
• Standard (Active Line Module + Active Interface Module)	Category C3 to EN 61800-3 up to 350 m (1148 ft) total cable length
• With line filter	Category C2 according to EN 61800-3 up to 350 m (1148 ft) total cable length Category C3 according to EN 61800-3 from 350 m to 1000 m (1148 ... 3281 ft) total cable length
Type of cooling	- Internal air cooling, external air cooling Power units with forced air cooling by built-in fans - Cold plate cooling - Liquid cooling
Permissible ambient and coolant temperature (air) during operation for line-side components, Line Modules and Motor Modules	0 … 40 °C (32 … 104 °F) without derating, > 40 … 55 °C (104 … 131 °F) see derating characteristics
Installation altitude	Up to 1000 m (3281 ft) above sea level without derating, > 1000 ... 4000 m (3281 ... 13124 ft) above sea level, see derating characteristics
Conformity	CE (low-voltage and EMC Directives)
Approvals, according to	cULus

[1] Active Line Modules 16 kW to 55 kW as of firmware version V2.5 with appropriate parameterization and reduced power rating also operable on networks with 200 ... 240 V 3 AC ±10 %.

[2] Active Mode can also be selected if the connected motors are suitable for > 650 V DC.

Technical specifications (continued)

Line voltage 380 … 480 V 3 AC		Active Line Module in booksize format				
• Internal air cooling	6SL3130-	7TE21-6AA3	7TE23-6AA3	7TE25-5AA3	7TE28-0AA3	7TE31-2AA3
• External air cooling	6SL3131-	7TE21-6AA3	7TE23-6AA3	7TE25-5AA3	7TE28-0AA3	7TE31-2AA3
• Cold plate cooling	6SL3136-	7TE21-6AA3	7TE23-6AA3	7TE25-5AA3	7TE28-0AA3	7TE31-2AA3
• Liquid cooling	6SL3135-	–	–	–	–	7TE31-2AA3
Feed/feedback power						
• Rated power P_{rated}						
- With 380 V 3 AC	kW	**16**	**36**	**55**	**80 (64 [1])**	**120 (84 [1])**
- With 460 V 3 AC [7]	(HP)	(18)	(40)	(60)	(100) (75 [1])	(150) (100 [1])
• For S6 duty P_{S6} (40 %)	kW	21	47	71	106 (85 [1])	145 (116 [1])
• P_{max}	kW	35	70	91 (110 [2])	131	175
DC link current						
• At 600 V DC	A	27	60	92	134	200
• For S6 duty (40 %)	A	35	79	121	176	244
• Maximum	A	59	117	152 (176 [2])	218	292
Input current						
• Rated current at 380/400/480 V 3 AC	A	26/25/21	58/55/46	88/84/70	128/122/102	192/182/152
• For S6 duty (40 %) at 400 V	A	32	71	108	161	220
• At 400 V max.	A	54	107	139 (168 [2])	200	267
Current requirement 24 V DC electronics power supply, max.	A	1.1	1.5	1.9	2.0	2.5 (2.1 [3])
Current carrying capacity						
• 24 V DC busbars	A	20	20	20	20	20
• DC link busbars	A	100	200	200	200	200
DC link capacitance						
• Active Line Module	µF	710	1410	1880	2820	3995
• Drive line-up, max.	µF	20000	20000	20000	20000	20000
Internal air cooling						
• Power loss [4]	kW	0.29	0.67	0.95	1.39	2.26
External air cooling						
• Power loss, int./ext. [4]	kW	0.09/0.2	0.17/0.5	0.25/0.7	0.3/1.0	0.55/1.71
• Cooling air requirement	m^3/s (ft^3/s)	0.016 (0.6)	0.031 (1.1)	0.044 (1.6)	0.144 (5.1)	0.144 (5.1)
• Sound pressure level L_{pA} (1 m)	dB	< 60	< 65	< 60	< 75	< 75
Cold plate cooling						
• Power loss, int./ext. [4]	kW	0.07/0.21	0.13/0.52	0.19/0.74	0.3/1.1	0.46/1.8
• Thermal resistance R_{th}	K/W	0.075	0.055	0.05	0.028	0.028
Liquid cooling [5]						
• Power loss, int./ext. [4]	kW	–	–	–	–	0.46/1.8
• Rated volumetric flow for water at 70 kPa pressure drop [6]	l/min (US gal/min)	–	–	–	–	8 (2.1)
• Volume of liquid, internal	ml	–	–	–	–	100
• Max. coolant temperature, with/without derating	°C (°F)	–	–	–	–	45/50 (113/122)
• Sound pressure level L_{pA} (1 m)	dB	–	–	–	–	< 73

[1] In the case of cold-plate cooling, derating is necessary due to heat transfer to the external heat sink. For further information, see chapter System description – Dimensioning.

[2] The higher peak output applies only in the case of a specific duty cycle, see characteristic curves.

[3] For 6SL3135-7TE31-2AA3.

[4] Power loss of Active Line Module at rated output including losses of 24 V DC electronics power supply.

[5] The coolant connections are located on the lower side of the components. All connection elements can be accessed using an appropriate tool. Thread type of water connections: Pipe thread ISO 228 G ½ B.

[6] This value applies to water as coolant; for other coolants, refer to the Equipment Manual 05/2009.

[7] Nominal HP ratings are provided for ease of assigning components only. The Line Module outputs are dependent on the Motor Module loading and are to be dimensioned accordingly.

3

Technical specifications (continued)

Line voltage 380 … 480 V 3 AC		Active Line Module in booksize format				
• Internal air cooling	6SL3130-	7TE21-6AA3	7TE23-6AA3	7TE25-5AA3	7TE28-0AA3	7TE31-2AA3
• External air cooling	6SL3131-	7TE21-6AA3	7TE23-6AA3	7TE25-5AA3	7TE28-0AA3	7TE31-2AA3
• Cold plate cooling	6SL3136-	7TE21-6AA3	7TE23-6AA3	7TE25-5AA3	7TE28-0AA3	7TE31-2AA3
• Liquid cooling	6SL3135-	–	–	–	–	7TE31-2AA3
Feed/feedback power						
• Rated power P_{rated}						
- With 380 V 3 AC	kW	**16**	**36**	**55**	**80 (64 [1])**	**120 (84 [1])**
- With 460 V 3 AC [5]	(HP)	(18)	(40)	(60)	(100) (75 [1])	(150) (100 [1])
Line connection U1, V1, W1		Screw-type terminals (X1)	M6 screw studs (X1)	Screw studs M8 (X1)	Screw studs M8 (X1)	Screw studs M8 (X1)
• Conductor cross-section, max.	mm^2	2.5 … 10	2.5 … 50	2.5 … 95. 2 × 35	2.5 … 120. 2 × 50	2.5 … 120. 2 × 50
Shield connection		Integrated in the connector	See Accessories	See Accessories	See Accessories	See Accessories
PE connection		M5 screw	M6 screw	M6 screw	M8 screw	M8 screw
Cable length, max. Total of all motor cables and DC link						
• Shielded	m (ft)	630 (2067) [2]	630 (2067) [2]	1000 (3281)	1000 (3281)	1000 (3281)
Degree of protection		IP20	IP20	IP20	IP20	IP20
Dimensions						
• Width	mm (in)	100 (3.94)	150 (5.91)	200 (7.87)	300 (11.81)	300 (11.81)
• Height	mm (in)	380 (14.96)	380 (14.96)	380 (14.96)	380 (14.96)	380 (14.96)
- With fan [3]	mm (in)	–	–	–	629 (24.76)	629 (24.76)
- With screwed fitting	mm (in)	–	–	–	–	553 (21.77) [4]
• Depth						
- With internal air cooling	mm (in)	270 (10.63)	270 (10.63)	270 (10.63)	270 (10.63)	270 (10.63)
- With external air cooling on/behind mounting surface	mm (in)	226/66.5 (8.90/2.62)	226/71 (8.90/2.80)	226/92 (8.90/3.62)	226/82 (8.90/3.23)	226/82 (8.90/3.23)
- With cold plate cooling	mm (in)	226 (8.90)	226 (8.90)	226 (8.90)	226 (8.90)	226 (8.90)
- With liquid cooling	mm (in)	–	–	–	–	226 (8.90)
Weight, approx.						
• With internal air cooling	kg (lb)	7 (15.4)	10.3 (22.7)	17 (37.5)	23 (50.7)	23 (50.7)
• With external air cooling	kg (lb)	8.8 (19.4)	13.8 (30.4)	18.5 (40.8)	27.7 (61.1)	30.7 (67.7)
• With cold plate cooling	kg (lb)	6.1 (13.5)	10.2 (22.5)	13.8 (30.4)	20.3 (44.8)	20.4 (45.0)
• With liquid cooling	kg (lb)	–	–	–	–	23 (50.7)

[1] In the case of cold-plate cooling, derating is necessary due to heat transfer to the external heat sink. For further information, see chapter System description – Dimensioning.

[2] Max. cable lengths in conjunction with Active Interface Module and Basic Line Filter (Category C3 in accordance with EN 61800-3).

[3] The fan is supplied with the Active Line Module and must be installed before the Active Line Module is commissioned.

[4] This value applies to water as coolant; for other coolants, refer to the Equipment Manual 05/2009.

[5] Nominal HP ratings are provided for ease of assigning components only. The Line Module outputs are dependent on the Motor Module loading and are to be dimensioned accordingly.

Selection and ordering data

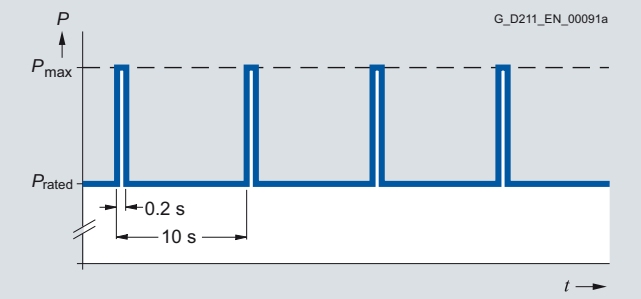
Description	Order No.
Line voltage 380 ... 480 V 3 AC	
Active Line Module in booksize format	
Internal air cooling	
Rated power:	
• 16 kW (18 HP)	**6SL3130-7TE21-6AA3**
• 36 kW (40 HP)	**6SL3130-7TE23-6AA3**
• 55 kW (60 HP)	**6SL3130-7TE25-5AA3**
• 80 kW (100 HP)	**6SL3130-7TE28-0AA3**
• 120 kW (150 HP)	**6SL3130-7TE31-2AA3**
External air cooling	
Rated power:	
• 16 kW (18 HP)	**6SL3131-7TE21-6AA3**
• 36 kW (40 HP)	**6SL3131-7TE23-6AA3**
• 55 kW (60 HP)	**6SL3131-7TE25-5AA3**
• 80 kW (100 HP)	**6SL3131-7TE28-0AA3**
• 120 kW (150 HP)	**6SL3131-7TE31-2AA3**
Cold plate cooling	
Rated power:	
• 16 kW (18 HP)	**6SL3136-7TE21-6AA3**
• 36 kW (40 HP)	**6SL3136-7TE23-6AA3**
• 55 kW (60 HP)	**6SL3136-7TE25-5AA3**
• 80 kW (100 HP)	**6SL3136-7TE28-0AA3**
• 120 kW (150 HP)	**6SL3136-7TE31-2AA3**
Liquid cooling	
Rated power:	
• 120 kW (150 HP)	**6SL3135-7TE31-2AA3**

Description	Order No.
Accessories	
Shield connection plate For Line and Motor Modules in booksize format	
• 150 mm (5.91 in) wide for internal air cooling	**6SL3162-1AF00-0AA1**
• 150 mm (5.91 in) wide for external air cooling and cold plate cooling	**6SL3162-1AF00-0BA1**
• 200 mm (7.87 in) wide for internal air cooling	**6SL3162-1AH01-0AA0**
• 200 mm (7.87 in) wide for external air cooling and cold plate cooling	**6SL3162-1AH01-0BA0**
• 300 mm (11.81 in) wide for all cooling types	**6SL3162-1AH00-0AA0**
DC link rectifier adapter For direct infeed of DC link voltage	
• Screw-type terminals 0.5 ... 10 mm^2 for Line Modules and Motor Modules in booksize format with a width of 50 mm (1.97 in) or 100 mm (3.94 in)	**6SL3162-2BD00-0AA0**
• Screw-type terminals 35 ... 95 mm^2 For Line Modules and Motor Modules in booksize format with a width of 150 mm, 200 mm and 300 mm (5.91 in, 7.87 in and 11.81 in)	**6SL3162-2BM00-0AA0**
DC link adapter (2 units) For multi-tier configuration Screw-type terminals 35 ... 95 mm^2 For all Line Modules and Motor Modules in booksize format	**6SL3162-2BM01-0AA0**
Accessories for re-ordering	
24 V terminal adapter For all Line Modules and Motor Modules in booksize format	**6SL3162-2AA00-0AA0**
24 V jumper For connection of the 24 V busbars (for booksize format)	**6SL3162-2AA01-0AA0**
Warning labels in 16 languages This set of foreign language warning signs can be placed on top of the standard English or German signs. A set of signs is supplied with the units. One sign in each of the following languages is provided in each set: Chinese Simplified, Czech, Danish, Dutch, Finnish, French, Greek, Italian, Japanese, Korean, Polish, Portuguese/Brazilian, Russian, Spanish, Swedish, Turkish.	**6SL3166-3AB00-0AA0**
Dust-proof blanking plugs (50 units) For DRIVE-CLiQ port	**6SL3066-4CA00-0AA0**

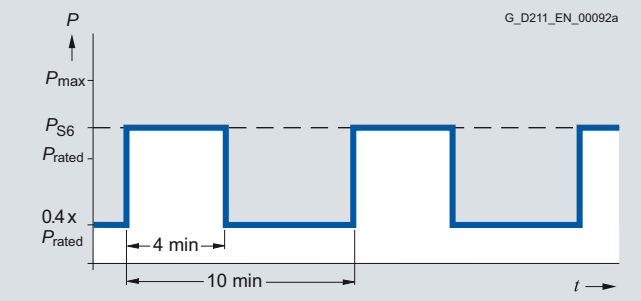
3

Characteristic curves

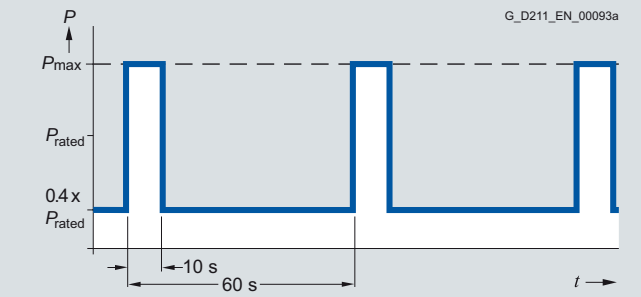
Overload capability



Load cycle with previous load

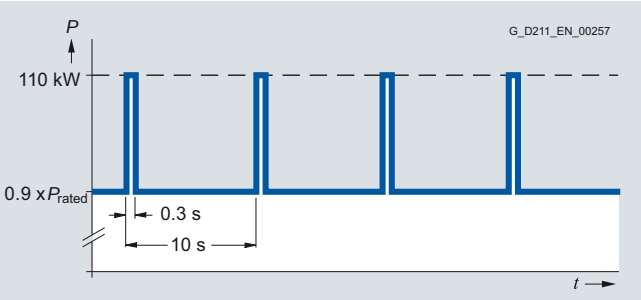


S6 load cycle with previous load



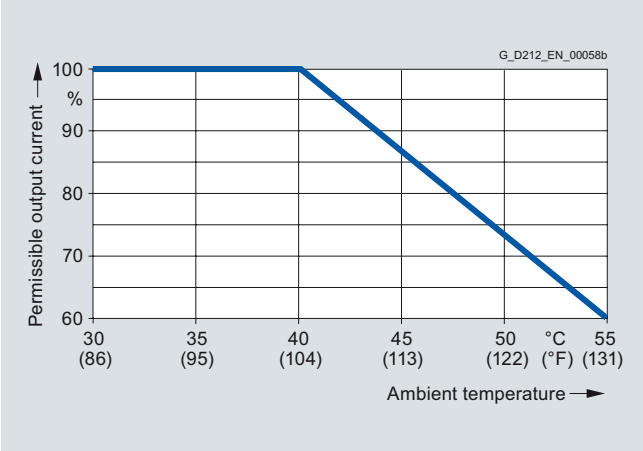
S6 load cycle with previous load

55 kW Active Line Module only:

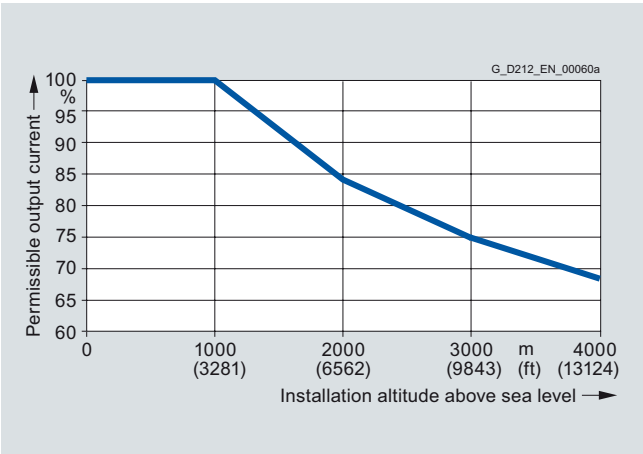


Peak power load duty cycle with previous load

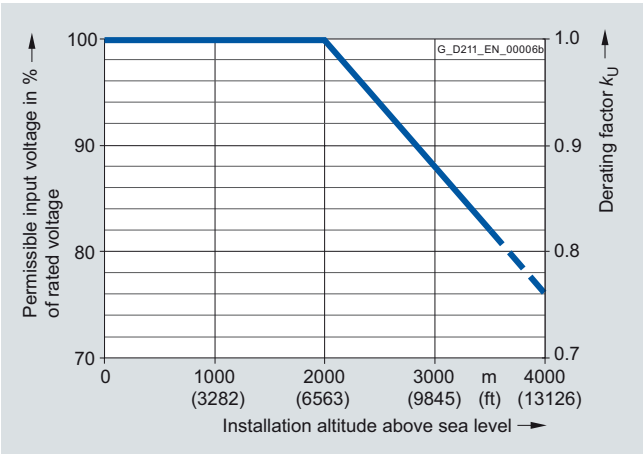
Derating characteristics



Output power dependent on ambient temperature



Output power dependent on installation altitude



Voltage derating dependent on installation altitude

Overview

Active Interface Modules for 16 kW, 36 kW, 55 kW and 80 kW/120 kW

The Active Interface Modules combine with the Active Line Modules form a functional unit and are essential for operation of the associated Active Line Module. The Active Interface Modules contain a reactor, Clean Power Filter and basic interference suppression to ensure compliance with Category C3 in accordance with EN 61800-3 regarding emitted interference.

The Clean Power Filter protects the line supply from switching-frequency harmonics. The drive system therefore draws a sinusoidal current from the supply and causes almost no harmonics.

The Active Line Modules in combination with the Active Interface Module can also be operated with supply systems with an isolated star point (IT systems).

Design

The scope of supply of the Active Interface Modules includes:

- Connector X21 for temperature evaluation and fan control
- Connector X24 for connecting the 24 V supply for the integrated fan
- DRIVE-CLiQ cable for connecting the Control Unit to the Active Interface Module; length of the DRIVE-CLiQ cable = width of the Active Interface Module + 0.11 m (4.33 in)
- Shield connection plate for Active Interface Module 16 kW
- 1 set of warning signs in 16 languages

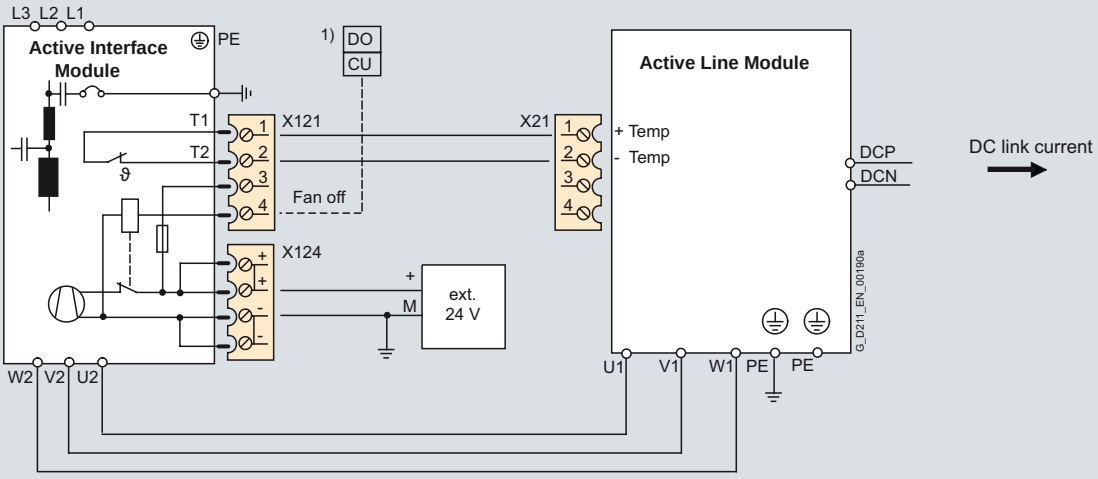
Selection and ordering data

Rated power of the Active Line Module	Suitable for Active Line Module in booksize format	**Active Interface Module**
kW (HP)		Order No.
Line voltage 380 ... 480 V 3 AC		
16 (18)	6SL3130-7TE21-6AA3 6SL3131-7TE21-6AA3 6SL3136-7TE21-6AA3	**6SL3100-0BE21-6AB0**
36 (40)	6SL3130-7TE23-6AA3 6SL3131-7TE23-6AA3 6SL3136-7TE23-6AA3	**6SL3100-0BE23-6AB0**
55 (60)	6SL3130-7TE25-5AA3 6SL3131-7TE25-5AA3 6SL3136-7TE25-5AA3	**6SL3100-0BE25-5AB0**
80 (100)	6SL3130-7TE28-0AA3 6SL3131-7TE28-0AA3 6SL3136-7TE28-0AA3	**6SL3100-0BE28-0AB0**
120 (150)	6SL3130-7TE31-2AA3 6SL3131-7TE31-2AA3 6SL3136-7TE31-2AA3	**6SL3100-0BE31-2AB0**
Accessories		
Shield connection plate [1]		
• For Active Interface Module 36 kW		**6SL3163-1AF00-0AA0**
• For Active Interface Module 55 kW		**6SL3163-1AH00-0AA0**
• For Active Interface Module 80 kW and 120 kW		**6SL3163-1AM00-0AA0**
DRIVE-CLiQ cable, pre-assembled Degree of protection of connector IP20/IP20		
• For Active Interface Module 16 kW, 0.31 m (1.02 ft) in length		**6SL3060-4AK00-0AA0**
• For Active Interface Module 36 kW, 0.41 m (1.35 ft) in length		**6SL3060-4AP00-0AA0**
• For Active Interface Module 55 kW, 0.6 m (1.97 ft) in length		**6SL3060-4AU00-0AA0**
• For Active Interface Modules 80 kW and 120 kW, 0.95 m (3.12 ft) in length		**6SL3060-4AA10-0AA0**

[1] For Active Interface Module 16 kW, included in scope of supply.

3

Integration



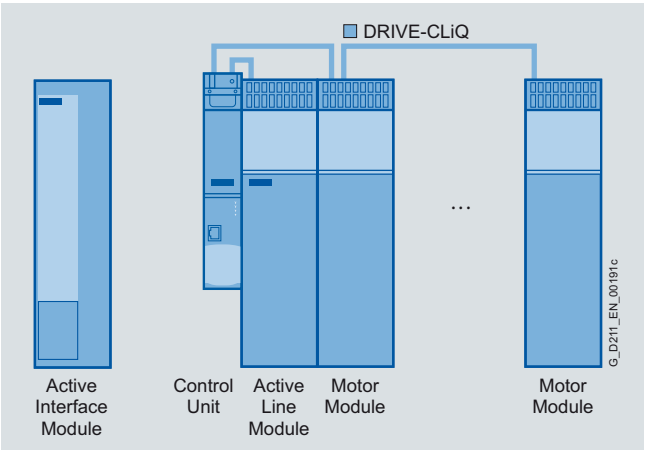
1) Digital input (DI) or digital output (DO), controlled via Control Unit.

Connection example for Active Interface Module

The Active Interface Module requires a 24 V DC supply for operation of the integral fan.
The fan rotates after the 24 V DC supply is applied and can, if necessary (service life, noise), be shut off from the Control Unit over the "Fan off" input. It is only permitted to switch off the fan when the infeed of the drive system is not operating, otherwise the Active Interface Module will overheat.

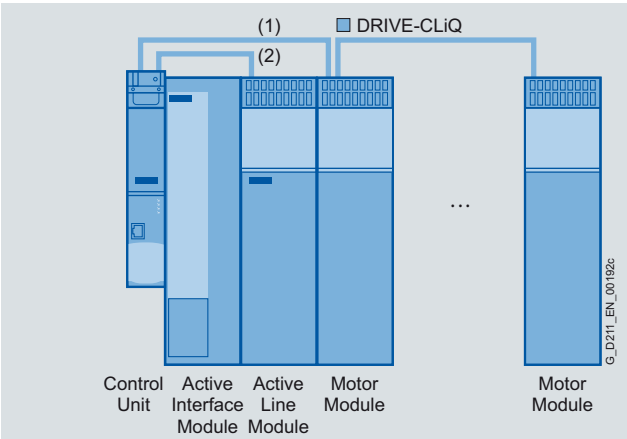
The thermostatic switch installed in the Active Interface Module is evaluated over the connected Active Line Module.

The power cables between the Active Interface Module and Active Line Module must be shielded if limit values for interference suppression are to be complied with. The cable shield can be routed over the shield connection plate (option) to the Active Interface Module or Active Line Module.



Separate Active Interface Module

Depending on the position of the Active Interface Module in the drive system, additional DRIVE-CLiQ cables may be required. If it is separately installed next to the left side of the Control Unit and Active Line Module, no additional DRIVE-CLiQ cables are required. If the Active Interface Module is placed between the Control Unit and Active Line Module, the DRIVE-CLiQ cables supplied with the Active Line Modules are suitable for setting up a line topology, i.e. Active Line Module and all Motor Modules in series on one DRIVE-CLiQ line. If the Active Line Module is connected over a separate DRIVE-CLiQ line, the DRIVE-CLiQ cable marked with (1) must be ordered. A DRIVE-CLiQ cable suitable for connection (2) is included in the scope of supply of the Active Line Module.
For DRIVE-CLiQ cables for different configurations, see chapter Connection system MOTION-CONNECT.



(1) DRIVE-CLiQ cable between Control Unit and Motor Module
Active Interface Module 16 kW: 0.31 m (see Accessories)
Active Interface Module 36 kW: 0.41 m (see Accessories)
Active Interface Module 55 kW: 0.60 m (see Accessories)
Active Interface Module 80 kW and 120 kW: 0.95 m (see Accessories)
(2) Included in scope of supply of Active Line Modules

Active Interface Module integrated in the drive line-up

Technical specifications

Line supply voltage 380 … 480 V 3 AC		Active Interface Module				
• Internal air cooling		6SL3100-0BE21-6AB0	6SL3100-0BE23-6AB0	6SL3100-0BE25-5AB0	6SL3100-0BE28-0AB0	6SL3100-0BE31-2AB0
Rated current	A	27	60	88	132	200
Current requirement 24 V DC electronics power supply, max.	A	0.25	0.5	0.6	1.2	1.2
Internal resistance Digital input "Fan off" (X121/Pin 4)	Ω	1440 ±10 %	1440 ±10 %	1440 ±10 %	1440 ±10 %	1440 ±10 %
Power loss	W	270	340	380	490	585
Cooling air requirement	m^3/s (ft^3/s)	0.03 (1.1)	0.04 (1.4)	0.075 (2.6)	0.15 (5.3)	0.15 (5.3)
Sound pressure level L_{pA} (1 m)	dB	57	60	66	68	68
Line/load connection L1, L2, L3/U2, V2, W2		Screw-type terminals	Screw-type terminals	Screw-type terminals	M8 screw stud	M8 screw stud
• Conductor cross-section	mm^2	16	50	50	2.5 … 120 or 2 × 50	2.5 … 120 or 2 × 50
Thermostatic switch (NC contact)						
• Switching capacity		250 V AC/1.6 A 60 V DC/0.75 A	250 V AC/1.6 A 60 V DC/0.75 A	250 V AC/1.6 A 60 V DC/0.75 A	250 V AC/1.6 A 60 V DC/0.75 A	250 V AC/1.6 A 60 V DC/0.75 A
PE connection		M5 screw	M5 screw	M6 screw	M8 screw	M8 screw
Degree of protection		IP20	IP20	IP20	IP20	IP20
Dimensions						
• Width	mm (in)	100 (3.94)	150 (5.91)	200 (7.87)	300 (11.81)	300 (11.81)
• Height	mm (in)	380 (14.96)	380 (14.96)	380 (14.96)	380 (14.96)	380 (14.96)
• Depth	mm (in)	270 (10.63)	270 (10.63)	270 (10.63)	270 (10.63)	270 (10.63)
Weight, approx.	kg (lb)	11 (24.3)	18.5 (40.8)	21 (46.3)	29 (63.9)	36 (79.4)
Approvals, according to		cURus	cURus	cURus	cURus	cURus
Suitable for Active Line Module in booksize format	Type	6SL3130-7TE21-6AA3 6SL3131-7TE21-6AA3 6SL3136-7TE21-6AA3	6SL3130-7TE23-6AA3 6SL3131-7TE23-6AA3 6SL3136-7TE23-6AA3	6SL3130-7TE25-5AA3 6SL3131-7TE25-5AA3 6SL3136-7TE25-5AA3	6SL3130-7TE28-0AA3 6SL3131-7TE28-0AA3 6SL3136-7TE28-0AA3	6SL3130-7TE31-2AA3 6SL3131-7TE31-2AA3 6SL3136-7TE31-2AA3 6SL3135-7TE31-2AA3
• Rated power of the Active Line Module	kW	16	36	55	80	120

Characteristic curves

Refer to Active Line Modules in booksize format.

Overview

In plants with strict EMC requirements, line filters work together with Active Interface Modules to restrict the conducted interference emanating from the power modules to the limit values of Category C2 as defined in EN 61800-3. Line filters are suited only for direct connection to TN systems with grounded star point.

Selection and ordering data

Rated power of the Active Line Module	Suitable for Active Line Module in booksize format	**Line filter**
kW (HP)		Order No.
16 (18)	6SL3130-7TE21-6AA3 6SL3131-7TE21-6AA3 6SL3136-7TE21-6AA3	**6SL3000-0BE21-6DA0**
36 (40)	6SL3130-7TE23-6AA3 6SL3131-7TE23-6AA3 6SL3136-7TE23-6AA3	**6SL3000-0BE23-6DA1**
55 (60)	6SL3130-7TE25-5AA3 6SL3131-7TE25-5AA3 6SL3136-7TE25-5AA3	**6SL3000-0BE25-5DA0**
80 (100)	6SL3130-7TE28-0AA3 6SL3131-7TE28-0AA3 6SL3136-7TE28-0AA3	**6SL3000-0BE28-0DA0**
120 (150)	6SL3130-7TE31-2AA3 6SL3131-7TE31-2AA3 6SL3136-7TE31-2AA3 6SL3135-7TE31-2AA3	**6SL3000-0BE31-2DA0**

Technical specifications

Line supply voltage 380 … 480 V 3 AC		**Basic Line Filters**				
		6SL3000-0BE21-6DA0	6SL3000-0BE23-6DA1	6SL3000-0BE25-5DA0	6SL3000-0BE28-0DA0	6SL3000-0BE31-2DA0
Rated current	A	36	74	105	132	192
Power loss	kW	0.016	0.02	0.041	0.048	0.086
Line/load connection L1, L2, L3 / U, V, W		Screw-type terminals	Screw-type terminals	Screw-type terminals	Screw-type terminals	Screw-type terminals
• Conductor cross-section	mm^2	10	35	50	95	95
PE connection		M6 screw studs according to DIN 46234	M6 screw studs according to DIN 46234	M8 screw studs according to DIN 46234	M10 screw studs according to DIN 46234	M10 screw studs according to DIN 46234
Degree of protection		IP20	IP20	IP20	IP20	IP20
Dimensions						
• Width	mm (in)	50 (1.97)	75 (2.95)	100 (3.94)	150 (5.91)	150 (5.91)
• Height	mm (in)	429 (16.89)	433 (17.05)	466 (18.35)	479 (18.86)	479 (18.86)
• Depth	mm (in)	226 (8.90)	226 (8.90)	226 (8.90)	226 (8.90)	226 (8.90)
Weight, approx.	kg (lb)	5 (11.0)	7.5 (16.5)	11.5 (25.4)	18.2 (40.1)	18.8 (41.5)
Approvals, according to		cURus	cURus	cURus	cURus	cURus
Suitable for Active Line Module in booksize format	Type	6SL3130-7TE21-6AA3 6SL3131-7TE21-6AA3 6SL3136-7TE21-6AA3	6SL3130-7TE23-6AA3 6SL3131-7TE23-6AA3 6SL3136-7TE23-6AA3	6SL3130-7TE25-5AA3 6SL3131-7TE25-5AA3 6SL3136-7TE25-5AA3	6SL3130-7TE28-0AA3 6SL3131-7TE28-0AA3 6SL3136-7TE28-0AA3	6SL3130-7TE31-2AA3 6SL3131-7TE31-2AA3 6SL3136-7TE31-2AA3 6SL3135-7TE31-2AA3
• Rated power of the Active Line Module	kW	16	36	55	80	120

Overview

Suitable line-side power components are assigned depending on the power rating of the Active Line Modules.

The tables below list recommended components.

Further information about the line contactors, switch disconnectors, fuses and circuit breakers specified in the tables can be found in Catalogs LV 10.1 and IC 10.

Assignment of line-side power components to Active Line Modules in booksize format

Rated power	Suitable for Active Line Module in booksize format	**Line contactor**	**Output coupling device for line contactor**	**Main switch**	**Leading auxiliary switch for main switch**
kW (HP)	Type 6SL3130-... 6SL3131-...	Type	Order No.	Order No.	Order No.
16 (18)	7TE21-6AA3	**3RT1035-...**	**3TX7004-1LB00**	**3LD2504-0TK51**	**3LD9200-5B**
36 (40)	7TE23-6AA3	**3RT1045-...**	**3TX7004-1LB00**	**3LD2704-0TK51**	**3LD9200-5B**
55 (60)	7TE25-5AA3	**3RT1054-...**	**3TX7004-1LB00**	**3KA5330-1GE01**	**3KX3552-3EA01**
80 (100)	7TE28-0AA3	**3RT1056-...**	**3TX7004-1LB00**	**3KA5330-1GE01**	**3KX3552-3EA01**
120 (150)	7TE31-2AA3	**3RT1065-...**	**3TX7004-1LB00**	**3KA5730-1GE01**	**3KX3552-3EA01**

Rated power	Suitable for Active Line Module in booksize format	**Circuit breaker IEC 60947**	**Circuit breaker UL489/CSA C22.2 No. 5-02**	**Fuse switch disconnector**	**Switch disconnector with fuse holders**	**Leading auxiliary switch for switch disconnector with fuse holders**
kW (HP)	Type 6SL3130-... 6SL3131-... 6SL3136-... 6SL3135-...	Order No.	Order No.	Order No.	Order No.	Order No.
16 (18)	7TE21-6AA3	**3RV1031-4FA10**	**3VL2105-2KN30-....**	**3NP1123-1CA20**	**3KL5230-1GB01**	**3KX3552-3EA01**
36 (40)	7TE23-6AA3	**3RV1041-4LA10**	**3VL2108-2KN30-....**	**3NP1123-1CA20**	**3KL5230-1GB01**	**3KX3552-3EA01**
55 (60)	7TE25-5AA3	**3VL2712-1DC33-....**	**3VL2112-2KN30-....**	**3NP1143-1DA20**	**3KL5530-1GB01**	**3KX3552-3EA01**
80 (100)	7TE28-0AA3	**3VL3720-1DC33-....**	**3VL3117-2KN30-....**	**3NP1143-1DA20**	**3KL5530-1GB01**	**3KX3552-3EA01**
120 (150)	7TE31-2AA3	**3VL3725-1DC36-....**	**3VL3125-2KN30-....**	**3NP1153-1DA20**	**3KL5730-1GB01**	**3KX3552-3EA01**

Rated power	Suitable for Active Line Module in booksize format	**NEOZED fuse (gL/gG)**			**DIAZED fuse (gL/gG)**			**LV HRC fuse (gL/gG)**			**UL/CSA fuse, Class J** [1] Available from: Ferraz Shawmut www.ferrazshawmut.com		
kW (HP)	Type 6SL3130-... 6SL3131-... 6SL3136-... 6SL3135-...	Rated current	Size	Order No.	Rated current	Size	Order No.	Rated current	Size	Order No.	Rated current	Size d × l mm	Reference No.
16 (18)	7TE21-6AA3	35 A	D02	**5SE2335**	35 A	DIII	**5SB411**	35 A	000	**3NA3814**	35 A	27 × 60	AJT35
36 (40)	7TE23-6AA3	–	–	–	80 A	DIV	**5SC211**	80 A	000	**3NA3824**	80 A	29 × 117	AJT80
55 (60)	7TE25-5AA3	–	–	–	–	–	–	125 A	1	**3NA3132**	125 A	41 × 146	AJT125
80 (100)	7TE28-0AA3	–	–	–	–	–	–	160 A	1	**3NA3136**	175 A	41 × 146	AJT175
120 (150)	7TE31-2AA3	–	–	–	–	–	–	250 A	1	**3NA3144**	250 A	54 × 181	AJT250

[1] Not suitable for 3NP and 3KL switch disconnectors.

Active Line Modules in chassis format

Overview

The self-commutated feed/feedback units (with IGBTs in infeed and regenerative feedback directions) generate a regulated DC link voltage. This means that the connected Motor Modules are decoupled from the line voltage. Line voltage fluctuations within the permissible supply tolerances have no effect on the motor voltage.

Active Line Modules can if necessary feed a prespecified fundamental reactive current (capacitive or inductive) to the supply system so as to support simple compensation tasks.

Active Line Modules are designed for connection to grounded TN/TT systems and non-grounded IT systems.

In order to operate an Active Line Module, it is absolutely essential to use the appropriate Active Interface Module.

Design

The Active Line Modules in chassis format feature the following connections and interfaces as standard:

- 1 power connection
- 1 connection for the 24 V DC electronics power supply
- 1 DC link connection (DCP, DCN) for supplying the connected Motor Modules
- 1 DC link connection (DCPA, DCNA) for connecting a Braking Module
- 1 temperature sensor input (KTY84-130 or PTC/PT100)
- 3 DRIVE-CLiQ sockets
- 2 PE (protective earth) connections

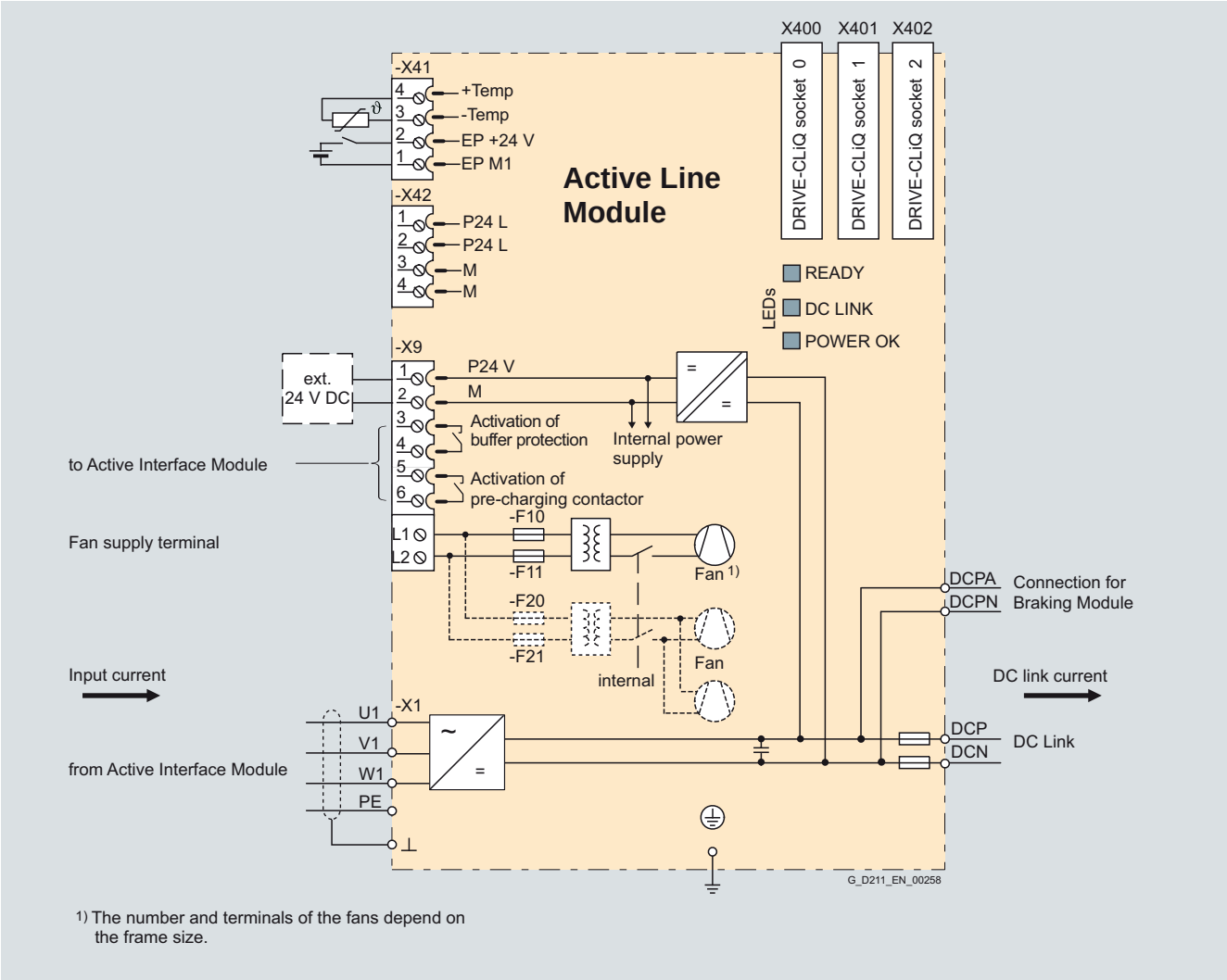
The status of the Active Line Modules is indicated via two multi-color LEDs.

The scope of supply of the Active Line Modules includes:

- Types FX and GX:
  - 0.60 m (23 in) DRIVE-CLiQ cable for connection to the CU320-2 or SIMOTION D4x5 Control Unit
- Types HX and JX
  - 0.35 m (23 in) DRIVE-CLiQ cable for connection to the CU320-2 or SIMOTION D4x5 Control Unit
  - 2.10 m (6.89 ft) DRIVE-CLiQ cable for connection to the first Motor Module

Integration

The Active Line Module communicates with the CU320-2 or SIMOTION D4x5 Control Unit via DRIVE-CLiQ.



1) The number and terminals of the fans depend on the frame size.

Connection example of Active Line Module in chassis format

Active Line Modules in chassis format

Technical specifications

Active Line Module in chassis format 6SL3330-7T...	
Line connection voltage (up to 2000 m (6562 ft) above sea level)	380 V ... 480 V 3 AC ± 10 % (in operation -15 % < 1 min) or 500 V ... 690 V 3 AC ± 10 % (in operation -15 % < 1 min) [1]
Line frequency	47 … 63 Hz
SCCR (short-circuit current rating)	In conjunction with the recommended fuses of type 3NE1 see line-side components
• Rated power 132 ... 380 kW	65 kA
• Rated power 500 ... 630 kW	84 kA
• Rated power 800 ... 1100 kW	170 kA
• Rated power 1400 kW	200 kA
Line power factor	
• Fundamental power factor (cos φ_1)	1.0 (factory setting) can be altered by input of a reactive current setpoint
• Total (λ)	1.0 (factory setting)
Overvoltage category according to EN 60664-1	Class III
DC link voltage U_d	The DC link voltage is regulated and can be adjusted as a voltage decoupled from the line voltage. Factory setting for DC link voltage: 1.5 × line voltage
Electronics power supply	24 V DC, -15 %/+20 %
Radio interference suppression	
• Standard (with Active Interface Module)	Category C3 to EN 61800-3
Type of cooling	Forced air cooling by means of built-in fan
Permissible ambient and coolant temperature (air) during operation for line-side components, Line Modules and Motor Modules	0 … 40 °C (32 … 104 °F) without derating, > 40 … 55 °C (104 … 131 °F) see derating characteristics
Installation altitude	Up to 2000 m (3281 ft) above sea level without derating, > 2000 ... 4000 m (3281 ... 13124 ft) above sea level, see derating characteristics
Conformity	CE (low-voltage and EMC Directives)
Approvals, according to	cULus only for devices on line voltages 380 ... 480 V 3 AC and 500 ... 600 V 3 AC

[1] TT system with grounded external conductor is not permissible for line voltages > 600 V.

Technical specifications (continued)

Line voltage 380 … 480 V 3 AC		Active Line Module in chassis format			
		6SL3330-7TE32-1AA3	6SL3330-7TE32-6AA3	6SL3330-7TE33-8AA3	6SL3330-7TE35-0AA3
Feed/feedback power					
• Rated power P_{rated}					
- With 400 V 3 AC	kW	**132**	**160**	**235**	**300**
- With 460 V 3 AC [3]	(HP)	(200)	(225)	(350)	(450)
• P_{max}	kW	198	240	352.5	450
DC link current [1]					
• Rated current I_{rated_DC}	A	235	291	425	549
• I_{H_DC}	A	209	259	378	489
• I_{max_DC}	A	352	436	637	823
Input current					
• Rated current at 400 V 3 AC	A	210	260	380	490
• Maximum	A	315	390	570	735
Current requirement					
• 24 V DC electronics power supply, max.	A	1.1	1.1	1.35	1.35
• Fan supply with 400 V 2 AC, 50/60 Hz, max.	A	0.63/0.95	1.13/1.7	1.8/2.7	1.8/2.7
DC link capacitance	µF	4200	5200	7800	9600
Power loss, max.	kW	2.3	2.9	4.2	5.1
Cooling air requirement	m^3/s (ft^3/s)	0.17 (6.0)	0.23 (8.1)	0.36 (12.7)	0.36 (12.7)
Sound pressure level [2] L_{pA} (1 m) at 50/60 Hz	dB	74/76	75/77	76/78	76/78
Line connection U1, V1, W1		Flat connector for M10 screw	Flat connector for M10 screw	Flat connector for M10 screw	Flat connector for M10 screw
• Conductor cross-section, max.	mm^2	2 × 185	2 × 185	2 × 185	2 × 185
DC link connection DCP, DCN		Flat connector for M10 screw	Flat connector for M10 screw	Flat connector for M10 screw	Flat connector for M10 screw
• Conductor cross-section, max.	mm^2	2 × 185	2 × 185	2 × 185	2 × 185
PE connection		M10 screw	M10 screw	M10 screw	M10 screw
• Conductor cross-section, max.					
- PE1/GND	mm^2	1 × 185	1 × 185	1 × 185	1 × 185
- PE2/GND	mm^2	2 × 185	2 × 185	2 × 185	2 × 185
Cable length, max. (total of all motor power cables and DC link)					
• Shielded	m (ft)	2700 (8859)	2700 (8859)	2700 (8859)	2700 (8859)
• Unshielded	m (ft)	4050 (13288)	4050 (13288)	4050 (13288)	4050 (13288)
Degree of protection		IP20	IP20	IP20	IP20
Dimensions					
• Width	mm (in)	326 (12.83)	326 (12.83)	326 (12.83)	326 (12.83)
• Height	mm (in)	1400 (55.12)	1400 (55.12)	1533 (60.35)	1533 (60.35)
• Depth	mm (in)	356 (14.02)	356 (14.02)	543 (21.38)	543 (21.38)
Frame size		FX	FX	GX	GX
Weight, approx.	kg (lb)	88 (194)	88 (194)	152 (335)	152 (335)

[1] With a rated DC link voltage = 1.5 × $U_{line\ rated}$ (example: 600 V = 1.5 × 400 V).

[2] Total sound pressure level of Active Interface Module and Active Line Module.

[3] Nominal HP ratings are provided for ease of assigning components only.
The Line Module outputs are dependent on the Motor Module loading and are to be dimensioned accordingly.

3

Technical specifications (continued)

Line voltage 380 … 480 V 3 AC		Active Line Module in chassis format			
		6SL3330-7TE36-1AA3	6SL3330-7TE38-4AA3	6SL3330-7TE41-0AA3	6SL3330-7TE41-4AA3
Feed/feedback power					
• Rated power P_{rated}					
- With 400 V 3 AC	kW	**380**	**500**	**630**	**900**
- With 460 V 3 AC [3]	(HP)	(550)	(700)	(800)	(1150)
• P_{max}	kW	570	750	945	1350
DC link current [1]					
• Rated current I_{rated_DC}	A	678	940	1103	1574
• I_{H_DC}	A	603	837	982	1401
• I_{max_DC}	A	1017	1410	1654	2361
Input current					
• At 400 V 3 AC	A	605	840	985	1405
• Maximum	A	907	1260	1477	2107
Current requirement					
• 24 V DC electronics power supply, max.	A	1.4	1.4	1.5	1.7
• Fan supply with 400 V 2 AC, max.	A	5.2	5.2	7.8	7.8
DC link capacitance	µF	12600	16800	18900	28800
Power loss	kW	6.2	7.7	10.1	13.3
Cooling air requirement	m^3/s (ft^3/s)	0.78 (27.5)	0.78 (27.5)	1.08 (38.1)	1.08 (38.1)
Sound pressure level [2] L_{pA} (1 m) at 50/60 Hz	dB	78/80	78/80	78/80	78/80
Line connection U1, V1, W1		Flat connector for M12 screw	Flat connector for M12 screw	Flat connector for M12 screw	Flat connector for M12 screw
• Conductor cross-section, max.	mm^2	4 × 240	4 × 240	6 × 240	6 × 240
DC link connection DCP, DCN		Flat connector for busbar connection	Flat connector for busbar connection	Flat connector for busbar connection	Flat connector for busbar connection
PE connection		M12 screw	M12 screw	M12 screw	M12 screw
• Conductor cross-section, max.					
- PE1/GND	mm^2	1 × 240	1 × 240	1 × 240	1 × 240
- PE2/GND	mm^2	2 × 240	2 × 240	2 × 240	2 × 240
Cable length, max. (total of all motor power cables and DC link)					
• Shielded	m (ft)	3900 (12796)	3900 (12796)	3900 (12796)	3900 (12796)
• Unshielded	m (ft)	5850 (19194)	5850 (19194)	5850 (19194)	5850 (19194)
Degree of protection		IP00	IP00	IP00	IP00
Dimensions					
• Width	mm (in)	503 (19.80)	503 (19.80)	704 (27.72)	704 (27.72)
• Height	mm (in)	1475 (58.07)	1475 (58.07)	1475 (58.07)	1475 (58.07)
• Depth	mm (in)	540 (21.26)	540 (21.26)	540 (21.26)	540 (21.26)
Frame size		HX	HX	JX	JX
Weight, approx.	kg (lb)	290 (639)	290 (639)	450 (992)	450 (992)

[1] With a rated DC link voltage = 1.5 × $U_{line\ rated}$ (example: 600 V = 1.5 × 400 V).

[2] Total sound pressure level of Active Interface Module and Active Line Module.

[3] Nominal HP ratings are provided for ease of assigning components only.
The Line Module outputs are dependent on the Motor Module loading and are to be dimensioned accordingly.

Technical specifications (continued)

Line voltage 500 ... 690 V 3 AC		Active Line Module in chassis format			
		6SL3330-7TG35-8AA3	6SL3330-7TG37-4AA3	6SL3330-7TG41-0AA3	6SL3330-7TG41-3AA3
Feed/feedback power					
• Rated power P_{rated} with 690 V 3 AC	kW	**560**	**800**	**1100**	**1400**
• At 500 V 3 AC [3]	kW	400	560	800	1000
• P_{max} with 690 V 3 AC [3]	kW	840	1200	1650	2100
DC link current [1]					
• Rated current I_{rated_DC}	A	644	823	1148	1422
• I_{H_DC}	A	573	732	1022	1266
• I_{max_DC}	A	966	1234	1722	2133
Input current					
• At 690 V 3 AC	A	575	735	1025	1270
• Maximum	A	862	1102	1537	1905
Current requirement					
• 24 V DC electronics power supply, max.	A	1.4	1.5	1.7	1.7
• Fan supply with 690 V 2 AC, max.	A	3	4.5	4.5	4.5
DC link capacitance	µF	7400	11100	14400	19200
Power loss	kW	6.8	10.2	13.6	16.5
Cooling air requirement	m^3/s (ft^3/s)	0.78 (27.5)	1.1 (38.8)	1.1 (38.8)	1.1 (38.8)
Sound pressure level [2] L_{pA} (1 m) at 50/60 Hz	dB	78/80	78/80	78/80	78/80
Line connection U1, V1, W1		Flat connector for M12 screw	Flat connector for M12 screw	Flat connector for M12 screw	Flat connector for M12 screw
• Conductor cross-section, max.	mm^2	4 × 240	6 × 240	6 × 240	6 × 240
DC link connection DCP, DCN		Flat connector for busbar connection	Flat connector for busbar connection	Flat connector for busbar connection	Flat connector for busbar connection
PE connection		M12 screw	M12 screw	M12 screw	M12 screw
• Conductor cross-section, max.					
- PE1/GND	mm^2	1 × 240	1 × 240	1 × 240	1 × 240
- PE2/GND	mm^2	2 × 240	2 × 240	2 × 240	2 × 240
Cable length, max. (total of all motor power cables and DC link)					
• Shielded	m (ft)	2250 (7382)	2250 (7382)	2250 (7382)	2250 (7382)
• Unshielded	m (ft)	3375 (11073)	3375 (11073)	3375 (11073)	3375 (11073)
Degree of protection		IP00	IP00	IP00	IP00
Dimensions					
• Width	mm (in)	503 (19.80)	704 (27.72)	704 (27.72)	704 (27.72)
• Height	mm (in)	1475 (58.07)	1475 (58.07)	1475 (58.07)	1475 (58.07)
• Depth	mm (in)	540 (21.26)	540 (21.26)	540 (21.26)	540 (21.26)
Frame size		HX	JX	JX	JX
Weight, approx.	kg (lb)	290 (639)	450 (992)	450 (992)	450 (992)

[1] With a rated DC link voltage = 1.5 × $U_{line\ rated}$ (example: 600 V = 1.5 × 400 V).
[2] Total sound pressure level of Active Interface Module and Active Line Module.
[3] The infeed power is proportional to the line voltage. With 500 V 3 AC, the power is reduced by a factor of 690/500 = 1.38.

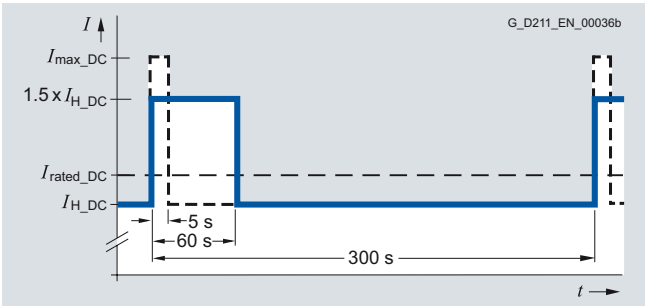
Active Line Modules in chassis format

Selection and ordering data

Rated power	Active Line Module in chassis format
kW (HP)	Order No.
Line voltage 380 ... 480 V 3 AC	
132 (200)	**6SL3330-7TE32-1AA3**
160 (225)	**6SL3330-7TE32-6AA3**
235 (350)	**6SL3330-7TE33-8AA3**
300 (450)	**6SL3330-7TE35-0AA3**
380 (550)	**6SL3330-7TE36-1AA3**
500 (700)	**6SL3330-7TE38-4AA3**
630 (800)	**6SL3330-7TE41-0AA3**
900 (1150)	**6SL3330-7TE41-4AA3**
Line voltage 500 ... 690 V 3 AC	
560	**6SL3330-7TG35-8AA3**
800	**6SL3330-7TG37-4AA3**
1100	**6SL3330-7TG41-0AA3**
1400	**6SL3330-7TG41-3AA3**
Accessories for re-ordering	
Warning labels in 16 languages This set of foreign language warning signs can be placed on top of the standard English or German signs. A set of signs is supplied with the units. One sign in each of the following languages is provided in each set: Chinese Simplified, Czech, Danish, Dutch, Finnish, French, Greek, Italian, Japanese, Korean, Polish, Portuguese/Brazilian, Russian, Spanish, Swedish, Turkish.	**6SL3166-3AB00-0AA0**
Dust-proof blanking plugs (50 units) For DRIVE-CLiQ port	**6SL3066-4CA00-0AA0**

Characteristic curves

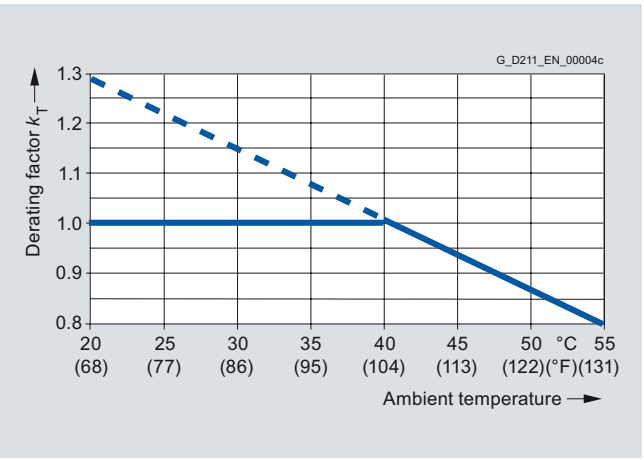
Overload capability



High overload

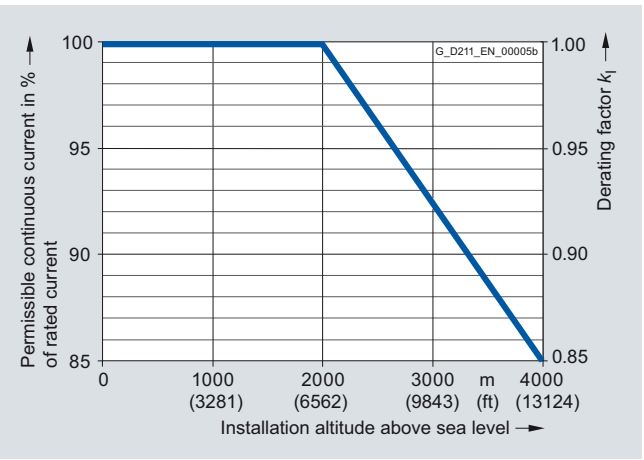
Characteristic curves (continued)

Derating characteristics

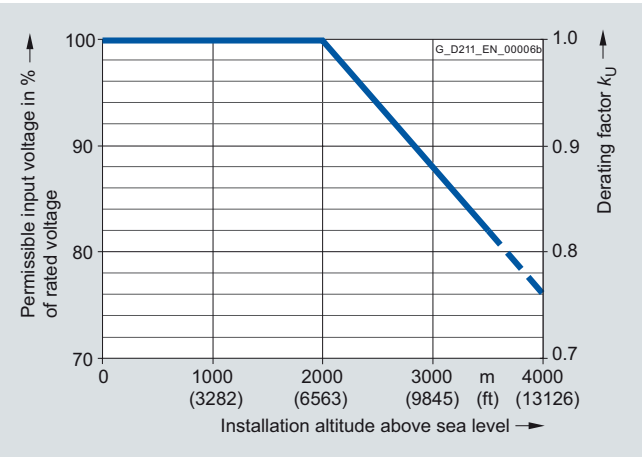


Current derating dependent on ambient temperature

Note: A derating factor k_T > 1.0 must be applied only in conjunction with current derating dependent on installation altitude.
See also chapter System description – Dimensioning.



Current derating dependent on installation altitude



Voltage derating dependent on installation altitude

Overview

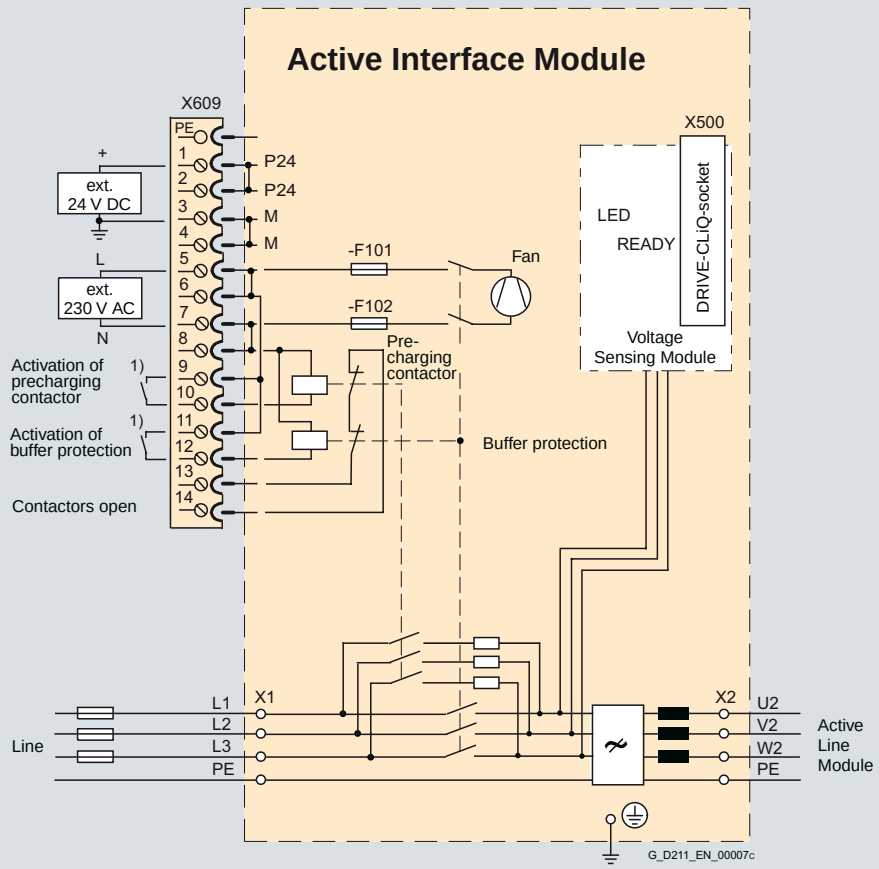
Active Interface Modules are used in combination with Active Line Modules in chassis format. Active Interface Modules contain a clean power filter with basic RI suppression, the precharging circuit for the Active Line Module, the line voltage sensing circuit and monitoring sensors. The bypass contactor is an integral component in types FI and GI, thereby making the module very compact. The bypass contactor must be provided separately for types HI and JI.

The vast majority of line harmonics are suppressed by the clean power filter.

The scope of supply of the Active Interface Modules includes:

- Type FI:
  - 0.60 m (1.97 ft) DRIVE-CLiQ cable for connection between Active Interface Module and Active Line Module
  - 1.45 m (4.76 ft) DRIVE-CLiQ cable for connection between the Control Unit and first Motor Module
- Type GI:
  - 0.95 m (3.12 ft) DRIVE-CLiQ cable for connection between Active Interface Module and Active Line Module
  - 1.45 m (4.76 ft) DRIVE-CLiQ cable for connection between the Control Unit and first Motor Module
- Types HI and JI:
  - 2.40 m (7.87 ft) DRIVE-CLiQ cable for connection between Active Interface Module and Active Line Module

Integration

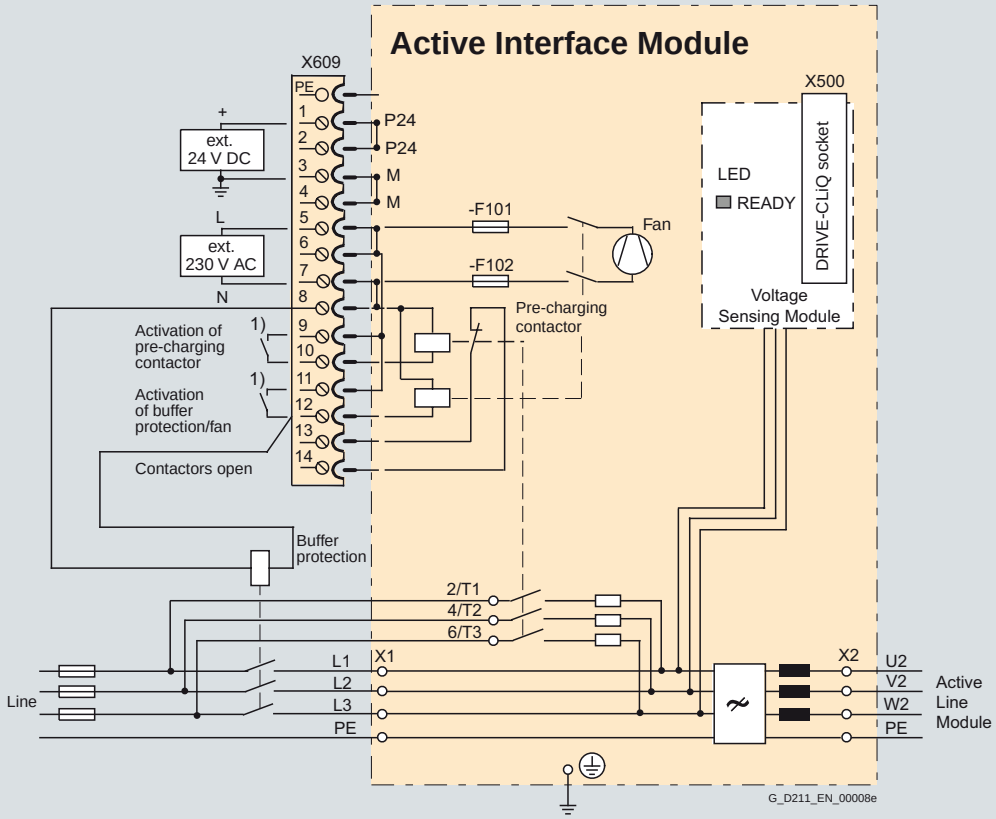


1) Activation by Active Line Module.

Connection example of Active Interface Module in chassis format with integrated bypass connector (frame sizes FI and GI)

3

Integration (continued)



1) Activation by Active Line Module.

Connection example of Active Interface Module in chassis format with externally mounted bypass connector (frame sizes HI and JI)

Technical specifications

Line voltage 380 … 480 V 3 AC		Active Interface Module in chassis format			
		6SL3300-7TE32-6AA0		6SL3300-7TE33-8AA0	6SL3300-7TE35-0AA0
Rated current	A	210	260	380	490
Bypass contactor		Included	Included	Included	Included
DC link capacitance of the drive line-up, max.	µF	41600	41600	76800	76800
Current requirement					
• 24 V DC electronics power supply, max.	A	0.17	0.17	0.17	0.17
• Fan supply with 230 V 2 AC, 50/60 Hz, max.	A	0.45/0.6	0.45/0.6	0.9/1.2	0.9/1.2
Power loss	kW	2.1	2.2	3.0	3.9
Cooling air requirement	m^3/s (ft^3/s)	0.24 (8.5)	0.24 (8.5)	0.47 (16.6)	0.47 (16.6)
Sound pressure level [1] L_{pA} (1 m) at 50/60 Hz	dB	74/76	75/77	76/78	76/78
Line/load connection L1, L2, L3/U2, V2, W2		Flat connector for M10 screw	Flat connector for M10 screw	Flat connector for M10 screw	Flat connector for M10 screw
• Conductor cross-section, max.	mm^2	2 × 185	2 × 185	2 × 185	2 × 185
PE connection		M10 screw	M10 screw	M10 screw	M10 screw
• Conductor cross-section, max.	mm^2	2 × 185	2 × 185	2 × 185	2 × 185
Degree of protection		IP20	IP20	IP20	IP20
Dimensions					
• Width	mm (in)	325 (12.8)	325 (12.8)	325 (12.8)	325 (12.8)
• Height	mm (in)	1400 (55.12)	1400 (55.12)	1533 (60.35)	1533 (60.35)
• Depth	mm (in)	355 (13.98)	355 (13.98)	542 (21.34)	542 (21.34)
Frame size		FI	FI	GI	GI
Weight, approx.	kg (lb)	135 (298)	135 (298)	190 (419)	190 (419)
Approvals, according to		cURus	cURus	cURus	cURus
Suitable for Active Line Module in chassis format	Type	6SL3330-7TE32-1AA3	6SL3330-7TE32-6AA3	6SL3330-7TE33-8AA3	6SL3330-7TE35-0AA3
• Rated power of the Active Line Module	kW (HP)	132 (200)	160 (225)	235 (350)	300 (450)

[1] Total sound pressure level of Active Interface Module and Active Line Module.

Technical specifications (continued)

Line voltage 380 … 480 V 3 AC		Active Interface Module in chassis format			
		6SL3300-7TE38-4AA0		6SL3300-7TE41-4AA0	
Rated current	A	605	840	985	1405
Bypass contactor		3RT1476-6AP36	3WL1110-2BB34-4AN2-Z C22	3WL1112-2BB34-4AN2-Z C22	3WL1116-2BB34-4AN2-Z C22
DC link capacitance of the drive line-up, max.	µF	134400	134400	230400	230400
Current requirement					
• 24 V DC electronics power supply, max.	A	0.17	0.17	0.17	0.17
• Fan supply with 230 V 2 AC, 50/60 Hz, max.	A	3.6/4.6	3.6/4.6	3.8/4.9	3.8/4.9
Power loss	kW	5.5	6.1	7.5	8.5
Cooling air requirement	m^3/s (ft^3/s)	0.4 (14.1)	0.4 (14.1)	0.4 (14.1)	0.4 (14.1)
Sound pressure level [1] L_{pA} (1 m) at 50/60 Hz	dB	78/80	78/80	78/80	78/80
Line/load connection L1, L2, L3/U2, V2, W2		Flat connector for M12 screw	Flat connector for M12 screw	Flat connector for M12 screw	Flat connector for M12 screw
• Conductor cross-section, max.	mm^2	4 × 240	4 × 240	6 × 240	6 × 240
PE connection		M12 screw	M12 screw	M12 screw	M12 screw
• Conductor cross-section, max.	mm^2	2 × 240	2 × 240	4 × 240	4 × 240
Degree of protection		IP00	IP00	IP00	IP00
Dimensions					
• Width	mm (in)	305 (12.01)	305 (12.01)	505 (19.88)	505 (19.88)
• Height	mm (in)	1750 (68.90)	1750 (68.90)	1750 (68.90)	1750 (68.90)
• Depth	mm (in)	544 (21.4)	544 (21.4)	544 (21.4)	544 (21.4)
Frame size		HI	HI	JI	JI
Weight, approx.	kg (lb)	390 (860)	390 (860)	620 (1367)	620 (1367)
Approvals, according to		cURus	cURus	cURus	cURus
Suitable for Active Line Module in chassis format	Type	6SL3330-7TE36-1AA3	6SL3330-7TE38-4AA3	6SL3330-7TE41-0AA3	6SL3330-7TE41-4AA3
• Rated power of the Active Line Module	kW (HP)	380 (550)	500 (700)	630 (800)	900 (1150)

[1] Total sound pressure level of Active Interface Module and Active Line Module.

Technical specifications (continued)

Line voltage 500 ... 690 V 3 AC		Active Interface Module in chassis format			
		6SL3300-7TG35-8AA0	6SL3300-7TG37-4AA0	6SL3300-7TG41-3AA0	
Rated current	A	575	735	1025	1270
Bypass contactor		3RT1476-6AP36	3WL1210-4BB34-4AN2-Z C22 *)	3WL1212-4BB34-4AN2-Z C22	3WL1216-4BB34-4AN2-Z C22
DC link capacitance of the drive line-up, max.	µF	59200	153600	153600	153600
Current requirement					
• 24 V DC electronics power supply, max.	A	0.17	0.17	0.17	0.17
• 230 V AC, max.	A	4.6	4.9	4.9	4.9
Power loss	kW	6.8	9.0	9.6	9.6
Cooling air requirement	m^3/s (ft^3/s)	0.4 (14.1)	0.4 (14.1)	0.4 (14.1)	0.4 (14.1)
Sound pressure level 1) L_{pA} (1 m) at 50/60 Hz	dB	78/80	78/80	78/80	78/80
Line/load connection L1, L2, L3/U2, V2, W2		Flat connector for M12 screw	Flat connector for M12 screw	Flat connector for M12 screw	Flat connector for M12 screw
• Conductor cross-section, max.	mm^2	4 × 240 per connection	6 × 240 per connection	6 × 240 per connection	6 × 240 per connection
PE connection		M10 screw	M10 screw	M10 screw	M10 screw
• Conductor cross-section, max.	mm^2	2 × 240	4 × 240	4 × 240	4 × 240
Degree of protection		IP00	IP00	IP00	IP00
Dimensions					
• Width	mm (in)	305 (12.01)	505 (19.88)	505 (19.88)	505 (19.88)
• Height	mm (in)	1750 (68.90)	1750 (68.90)	1750 (68.90)	1750 (68.90)
• Depth	mm (in)	544 (21.4)	544 (21.4)	544 (21.4)	544 (21.4)
Frame size		HI	JI	JI	JI
Weight, approx.	kg (lb)	390 (860)	620 (1367)	620 (1367)	620 (1367)
Suitable for Active Line Module in chassis format	Type	6SL3330-7TG35-8AA3	6SL3330-7TG37-4AA3	6SL3330-7TG41-0AA3	6SL3330-7TG41-3AA3
• Rated power of the Active Line Module	kW	560	800	1100	1400

Selection and ordering data

Rated power of the Active Line Module	Suitable for Active Line Module in chassis format	**Active Interface Module**
kW (HP)		Order No.
Line voltage 380 ... 480 V 3 AC		
132 (200)	6SL3330-7TE32-1AA3	**6SL3300-7TE32-6AA0**
160 (225)	6SL3330-7TE32-6AA3	**6SL3300-7TE32-6AA0**
235 (350)	6SL3330-7TE33-8AA3	**6SL3300-7TE33-8AA0**
300 (450)	6SL3330-7TE35-0AA3	**6SL3300-7TE35-0AA0**
380 (550)	6SL3330-7TE36-1AA3	**6SL3300-7TE38-4AA0**
500 (700)	6SL3330-7TE38-4AA3	**6SL3300-7TE38-4AA0**
630 (800)	6SL3330-7TE41-0AA3	**6SL3300-7TE41-4AA0**
900 (1150)	6SL3330-7TE41-4AA3	**6SL3300-7TE41-4AA0**
Line voltage 500 ... 690 V 3 AC		
560	6SL3330-7TG35-8AA3	**6SL3300-7TG35-8AA0**
800	6SL3330-7TG37-4AA3	**6SL3300-7TG37-4AA0**
1100	6SL3330-7TG41-0AA3	**6SL3300-7TG41-3AA0**
1400	6SL3330-7TG41-3AA3	**6SL3300-7TG41-3AA0**

1) Total sound pressure level of Active Interface Module and Active Line Module.

*) Alternatively 3 units 3RT1466-6AP36.

3

Overview

Suitable line-side power components are assigned depending on the power rating of the Active Line Modules.

The tables below list recommended components.

Further information about the line contactors, switch disconnectors, fuses and circuit breakers specified in the tables can be found in Catalogs LV 10.1 and IC 10.

Assignment of line-side power components to Active Line Modules in chassis format

Rated power	Input current	Suitable for Active Interface Module	Suitable for Active Line Module	**Bypass contactor**	**Fixed-mounted circuit breaker**
kW (HP)	A	Type 6SL3300-	Type 6SL3330-	Order No.	Order No.
Line voltage 380 … 480 V 3 AC					
132 (200)	210	7TE32-6AA0	7TE32-1AA3	included in Active Interface Module	–
160 (225)	260	7TE32-6AA0	7TE32-6AA3	included in Active Interface Module	–
235 (350)	380	7TE33-8AA0	7TE33-8AA3	included in Active Interface Module	–
300 (450)	490	7TE35-0AA0	7TE35-0AA3	included in Active Interface Module	–
380 (550)	605	7TE38-4AA0	7TE36-1AA3	**3RT1476-6AP36**	–
500 (700)	840	7TE38-4AA0	7TE38-4AA3	**3WL1110-2BB34-4AN2**	**3WL1110-2BB34-4AN2-Z C22**
630 (800)	985	7TE41-4AA0	7TE41-0AA3	**3WL1112-2BB34-4AN2**	**3WL1112-2BB34-4AN2-Z C22**
900 (1150)	1405	7TE41-4AA0	7TE41-4AA3	**3WL1116-2BB34-4AN2**	**3WL1116-2BB34-4AN2-Z C22**
Line voltage 500 … 690 V 3 AC					
560	575	7TG35-8AA0	7TG35-8AA3	**3RT1476-6AP36**	–
800	735	7TG37-4AA0	7TG37-4AA3	**3WL1210-4BB34-4AN2**	**3WL1210-4BB34-4AN2-Z C22**
1100	1025	7TG41-3AA0	7TG41-0AA3	**3WL1212-4BB34-4AN2**	**3WL1212-4BB34-4AN2-Z C22**
1400	1270	7TG41-3AA0	7TG41-3AA3	**3WL1216-4BB34-4AN2**	**3WL1216-4BB34-4AN2-Z C22**

Rated power	Input current	Suitable for Active Interface Module	**Switch disconnector without handle and shaft**	**Switch disconnector with handle and shaft**	**Cable protection fuse**		**Cable protection fuse incl. semiconductor protection**	
kW (HP)	A	Type 6SL3300-	Order No.	Order No.	Rated current	Order No.	Rated current	Order No.
Line voltage 380 … 480 V 3 AC								
132 (200)	210	7TE32-6AA0	**3KL5530-1AB01**	**3KL5530-1GB01**	250 A	**3NA3144**	315 A	**3NE1230-2**
160 (225)	260	7TE32-6AA0	**3KL5730-1AB01**	**3KL5730-1GB01**	315 A	**3NA3252**	350 A	**3NE1331-2**
235 (350)	380	7TE33-8AA0	**3KL5730-1AB01**	**3KL5730-1GB01**	500 A	**3NA3365**	500 A	**3NE1334-2**
300 (450)	490	7TE35-0AA0	**3KL6130-1AB02**	**3KL6130-1GB02**	630 A	**3NA3372**	630 A	**3NE1436-2**
380 (550)	605	7TE38-4AA0	**3KL6230-1AB02**	**3KL6230-1GB02**	630 A	**3NA3372**	800 A	**3NE1438-2**
500 (700)	840	7TE38-4AA0	–	–	2 × 425 A	**3NA3362** (2 units)	2 × 500 A	**3NE1334-2** (2 units)
630 (800)	985	7TE41-4AA0	–	–	2 × 500 A	**3NA3365** (2 units)	2 × 630 A	**3NE1436-2** (2 units)
900 (1150)	1405	7TE41-4AA0	–	–	3 × 500 A	**3NA3365** (3 units)	2 × 850 A	**3NE1448-2** (2 units)
Line voltage 500 … 690 V 3 AC								
560	575	7TG35-8AA0	**3KL6130-1AB02**	**3KL6130-1GB02**	2 × 315 A	**3NA3352-6** (2 units)	670 A	**3NE1447-2**
800	735	7TG37-4AA0	**3KL6230-1AB02**	**3KL6230-1GB02**	2 × 400 A	**3NA3360-6** (2 units)	850 A	**3NE1448-2**
1100	1025	7TG41-3AA0	–	–	3 × 355 A	**3NA3354-6** (3 units)	2 × 630 A	**3NE1436-2** (2 units)
1400	1270	7TG41-3AA0	–	–	3 × 500 A	**3NA3365-6** (3 units)	2 × 800 A	**3NE1438-2** (2 units)

Overview

In principle, all Single and Double Motor Modules can be operated on Basic Line Modules, Smart Line Modules or Active Line Modules for the appropriate voltage range.

A wide range of single-axis and two-axis Motor Modules with graded current/power ratings can be supplied:

- **Single Motor Modules**: Single-axis variant
  - Booksize compact format
    with rated output currents of 3 A to 18 A
  - Booksize format
    with rated output currents of 3 A to 200 A
  - Chassis format
    with rated output currents of 85 A to 1405 A
- **Double Motor Modules**: Two-axis variant
  - Booksize compact format
    with rated output currents of 1.7 A to 5 A
  - Booksize format
    with rated output currents of 3 A to 18 A

Examples for Motor Modules

Single Motor Module in booksize compact format

Double Motor Module in booksize compact format

Single Motor Module in booksize format
Internal cooling, external cooling, cold plate cooling

Double Motor Module in booksize format

Single Motor Module in chassis format Frame sizes FX/GX and HX/JX

Single Motor Modules in booksize compact format

Design

The Single Motor Modules in booksize compact format feature the following connections and interfaces as standard:

- 2 DC link connections via integrated DC link busbars
- 1 electronics power supply connection via integrated 24 V DC bars
- 3 DRIVE-CLiQ sockets
- 1 motor connection via connector
- 1 safe standstill input (enable pulses)
- 1 safe motor brake control
- 1 temperature sensor input (KTY84-130 or PTC)
- 2 PE (protective earth) connections

The status of the Motor Modules is indicated via two multi-color LEDs.

The shield of the motor cable is routed over the connector to the motor connection.

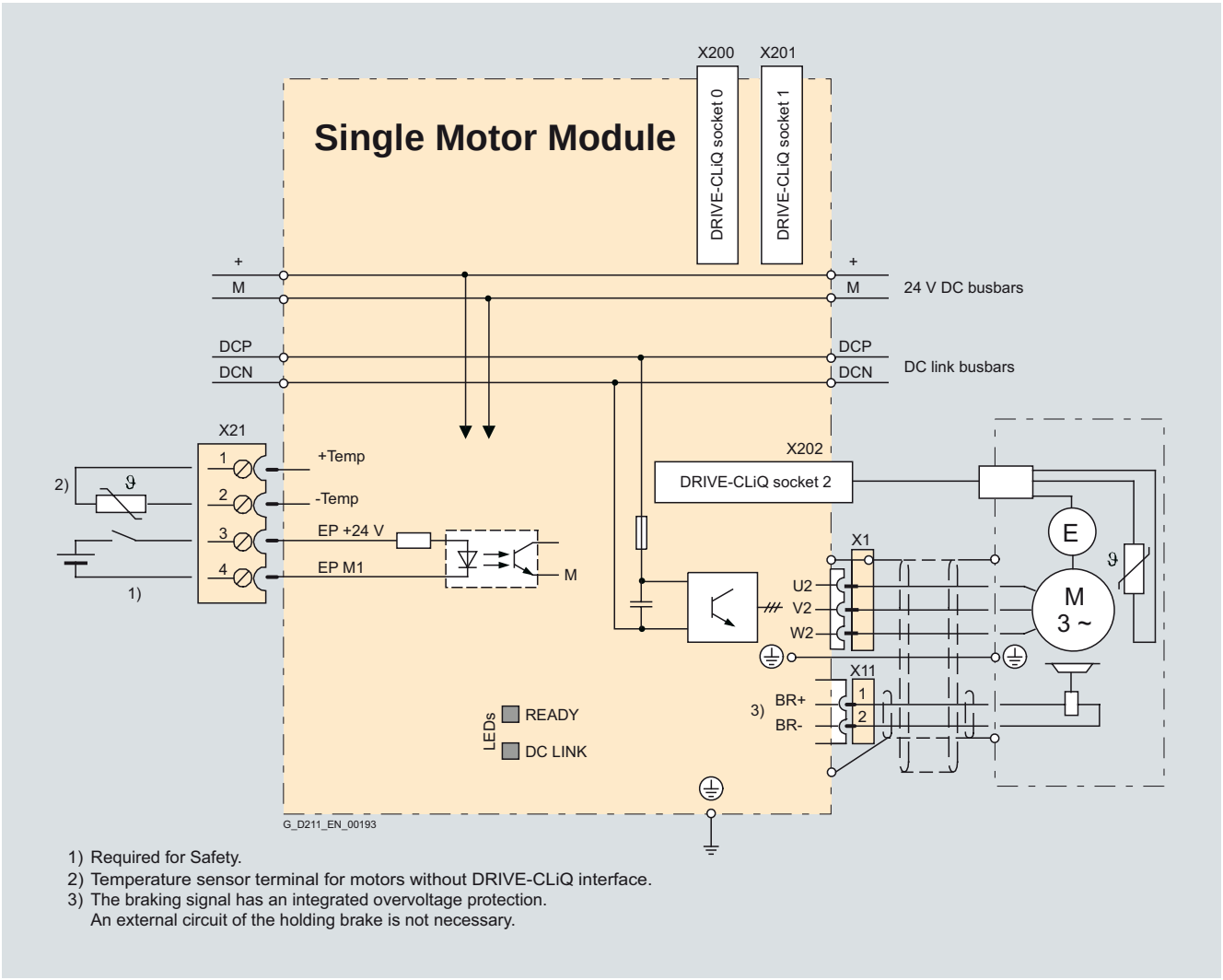
The signal cable shield can be connected to the Motor Module by means of a terminal element, e.g. Weidmüller type KLBÜ 3-8 SC.

The scope of supply of the Motor Modules includes:

- DRIVE-CLiQ cable (length depends on module width) to connect Motor Module to adjacent Motor Module, length 0.11 m (4.33 in) for 50 mm (1.97 in) wide Motor Modules or length 0.16 m (6.3 in) for 75 mm (2.95 in) wide Motor Modules.
- 2 blanking plugs for sealing unused DRIVE-CLiQ sockets
- Jumper for connecting the 24 V DC busbar to the adjacent Motor Module
- Connector X21
- Connector X11 for motor brake connection
- Connector X1 for motor connection
- 1 set of warning signs in foreign languages
- 1 heat conducting foil

Integration

Single Motor Modules communicate with the Control Unit via DRIVE-CLiQ.



1) Required for Safety.
2) Temperature sensor terminal for motors without DRIVE-CLiQ interface.
3) The braking signal has an integrated overvoltage protection.
An external circuit of the holding brake is not necessary.

Connection example of Single Motor Module in booksize compact format

Technical specifications

Single Motor Module in booksize compact format 6SL3420-1TE...	
DC link voltage (up to 2000 m (6562 ft) above sea level)	510 ... 720 V DC (line voltage 380 ... 480 V 3 AC) [1]
Output frequency	
• Control type Servo	0 … 650 Hz [2]
• Control type Vector	0 … 300 Hz [2]
• Control type *V/f*	0 … 600 Hz [2]
Electronics power supply	24 V DC -15 %/+20 %
Type of cooling	The devices are designed so that - Internal air cooling (power units with forced air cooling through built-in fans) or - Cold plate cooling is possible.
Permissible ambient and coolant temperature (air) during operation for line-side components, Line Modules and Motor Modules	0 … 40 °C (32 … 104 °F) without derating, > 40 … 55 °C (104 … 131 °F) see derating characteristics
Installation altitude	Up to 1000 m (3281 ft) above sea level without derating, > 1000 ... 4000 m (3281 ... 13124 ft) above sea level, see derating characteristics
Conformity	CE (low-voltage and EMC Directives)
Approvals, according to	cURus
Safety Integrated	Safety Integrity Level 2 (SIL2) acc. to IEC 61508, Performance Level d (PLd) acc. to ISO 13849-1 and Control Category 3 acc. to ISO 13849-1 or EN 954-1 For further information see chapter Safety Integrated.

[1] With firmware version V2.5 and higher with appropriate parameterization and reduced power rating also operable on 200 ... 240 V 3 AC networks in accordance with a DC link voltage of 270 ... 360 V DC.

[2] Note the correlation between max. output frequency, pulse frequency and current derating.
For further information see chapter System description – Dimensioning.

Technical specifications (continued)

DC link voltage 510 ... 720 V DC		Single Motor Module in booksize compact format			
• Internal air cooling/ cold plate cooling		6SL3420-1TE13-0AA0	6SL3420-1TE15-0AA0	6SL3420-1TE21-0AA0	6SL3420-1TE21-8AA0
Output current					
• Rated current I_{rated}	A	3	5	9	18
• Base-load current I_H	A	2.6	4.3	7.7	15.3
• For S6 duty (40 %) I_{S6}	A	3.5	6	10	24
• I_{max}	A	9	15	27	54
Type rating [1]					
• Based on I_{rated}	kW (HP)	1.6 (1.5)	2.7 (3)	4.8 (5)	9.7 (10)
• Based on I_H	kW (HP)	1.4 (1)	2.3 (2.5)	4.1 (5)	8.2 (10)
Rated pulse frequency	kHz	8	8	4	4
DC link current I_d [2]	A	3.6	6	11	22
Current carrying capacity					
• DC link busbars	A	100	100	100	100
• 24 V DC busbars [3]	A	20	20	20	20
DC link capacitance	µF	110	110	110	235
Current requirement At 24 V DC, max.	A	0.85	0.85	0.85	0.85
Power loss					
• With internal air cooling in control cabinet [4]	kW	0.07	0.1	0.1	0.18
• With cold plate cooling, int./ext.	kW	0.026/0.04	0.031/0.065	0.031/0.065	0.051/0.095
• Thermal resistance R_{th}	K/W	0.265	0.265	0.265	0.23
Cooling air requirement	m^3/s (ft^3/s)	0.008 (0.3)	0.008 (0.3)	0.008 (0.3)	0.008 (0.3)
Sound pressure level L_{pA} (1 m)	dB	< 60	< 60	< 60	< 60
Motor connection U2, V2, W2		Connector (X1) with screw-type terminals	Connector (X1) with screw-type terminals	Connector (X1) with screw-type terminals	Connector (X1) with screw-type terminals
• Conductor cross-section	mm^2	0.2 … 6	0.2 … 6	0.2 … 6	0.2 … 6
Shield connection		Integrated in connector (X1)	Integrated in connector (X1)	Integrated in connector (X1)	Integrated in connector (X1)
PE connection		M5 screw	M5 screw	M5 screw	M5 screw
Motor brake connection		Connector (X11). 24 V DC. 2 A	Connector (X11). 24 V DC. 2 A	Connector (X11). 24 V DC. 2 A	Connector (X11). 24 V DC. 2 A
Motor cable length, max.					
• Shielded	m (ft)	50 (164)	50 (164)	50 (164)	70 (230)
• Unshielded	m (ft)	75 (246)	75 (246)	75 (246)	100 (328)
Degree of protection		IP20	IP20	IP20	IP20
Dimensions					
• Width	mm (in)	50 (1.97)	50 (1.97)	50 (1.97)	75 (2.95)
• Height	mm (in)	270 (10.63)	270 (10.63)	270 (10.63)	270 (10.63)
• Depth	mm (in)	226 (8.90)	226 (8.90)	226 (8.90)	226 (8.90)
Weight, approx.	kg (lb)	2.7 (6)	2.7 (6)	2.7 (6)	3.4 (7.50)

[1] Rated power of a standard asynchronous (induction) motor at 600 V DC link voltage.

[2] Rated DC link current for dimensioning an external DC connection.
For DC link current calculation for dimensioning the Line Module, see chapter System description – Dimensioning.

[3] If, due to a number of Line and Motor Modules being mounted side-by-side, the current carrying capacity exceeds 20 A, an additional 24-V-DC connection using a 24-V terminal adapter is required (max. cross section 6 mm^2, max. fuse protection 20 A).

[4] Power loss of Motor Module at rated power including losses of 24 V DC electronics power supply.

Single Motor Modules in booksize compact format

Selection and ordering data

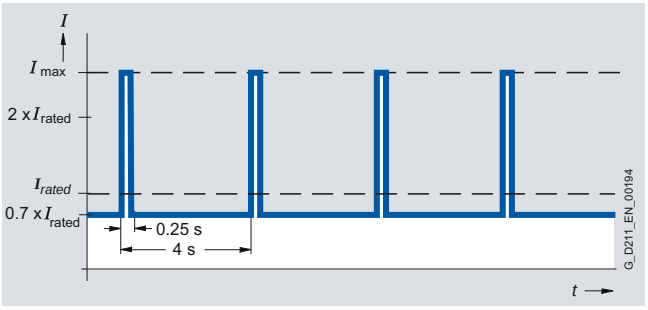
Rated output current	Type rating	**Single Motor Module in booksize compact format** (Internal air cooling)
A	kW (HP) [1]	Order No.
DC link voltage 510 ... 720 V DC		
3	1.6 (1.5)	**6SL3420-1TE13-0AA0**
5	2.7 (3)	**6SL3420-1TE15-0AA0**
9	4.8 (5)	**6SL3420-1TE21-0AA0**
18	9.7 (10)	**6SL3420-1TE21-8AA0**

Description	Order No.
Accessories	
DC link rectifier adapter For direct infeed of DC link voltage • Screw-type terminals 0.5 ... 10 mm^2 for booksize format Line Modules and Motor Modules with a width of 50 mm (1.97 in) or 100 mm (3.94 in)	**6SL3162-2BD00-0AA0**
DC link adapter (2 units) For multi-tier configuration • Screw-type terminals 35 ... 95 mm^2 • For all Line Modules and Motor Modules in booksize format	**6SL3162-2BM01-0AA0**
24 V terminal adapter For all Line Modules and Motor Modules in booksize format	**6SL3162-2AA00-0AA0**
Accessories for re-ordering	
24 V jumper For connection of the 24 V busbars (for booksize format)	**6SL3162-2AA01-0AA0**
Spacing bolt (4 units) The mounting depth of modules in booksize compact format is increased when it is mounted on these spacing bolts by such an amount that it can be integrated into a drive line-up in booksize format. 2 spacing bolts are required to mount 50 mm (1.97 in) wide modules, and 4 spacing bolts for 75 mm (2.95 in) modules.	**6SL3462-1CC00-0AA0**
Warning labels in 16 languages This set of foreign language warning signs can be placed on top of the standard English or German signs. A set of signs is supplied with the units. One sign in each of the following languages is provided in each set: Chinese Simplified, Czech, Danish, Dutch, Finnish, French, Greek, Italian, Japanese, Korean, Polish, Portuguese/Brazilian, Russian, Spanish, Swedish, Turkish.	**6SL3166-3AB00-0AA0**
Dust-proof blanking plugs (50 units) For DRIVE-CLiQ port	**6SL3066-4CA00-0AA0**

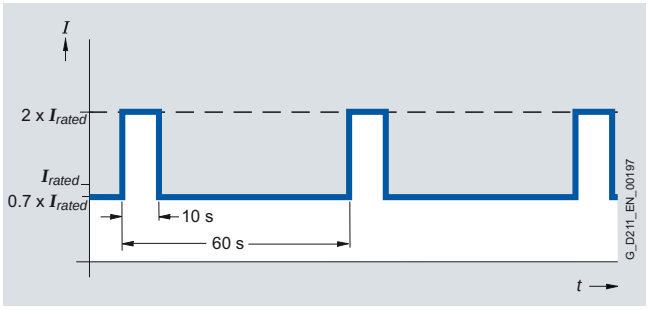
[1] Nominal HP rating based on Asynchrounous motors (induction motors). Match the motor nameplate current for specific sizing.

Characteristic curves

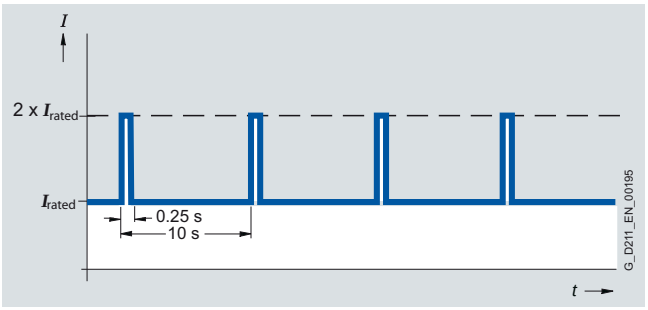
Overload capability



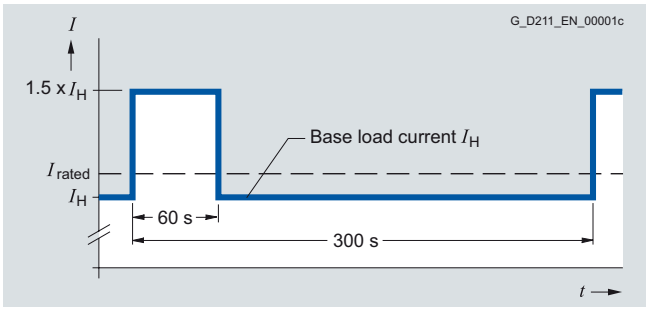
Maximum current duty cycle with previous load



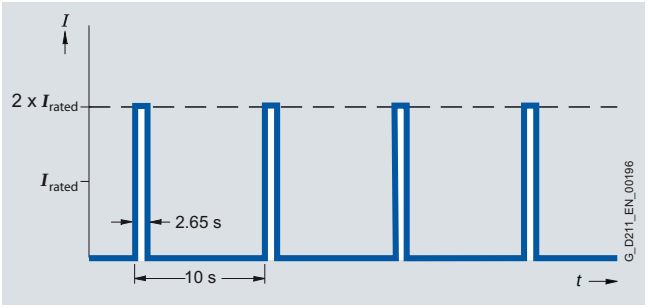
S6 load cycle with previous load with a load cycle period of 60 s



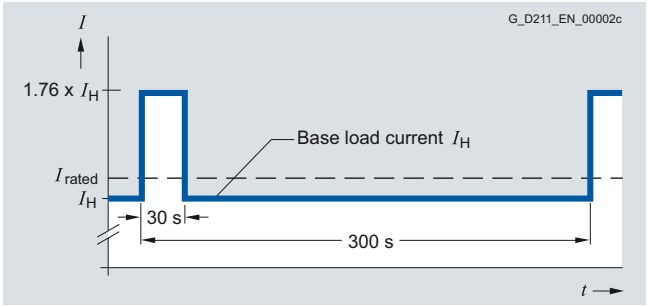
Load cycle with previous load



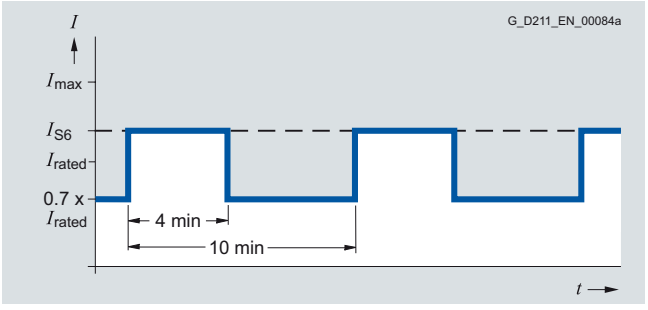
Load cycle with 60 s overload with a load cycle period of 300 s



Load cycle without previous load



Load cycle with 30 s overload with a load cycle period of 300 s



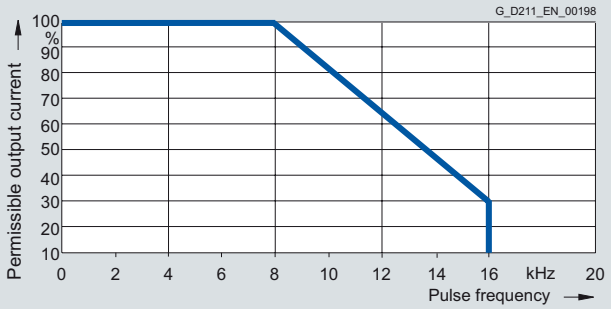
S6 load cycle with previous load with a load cycle period of 600 s

3

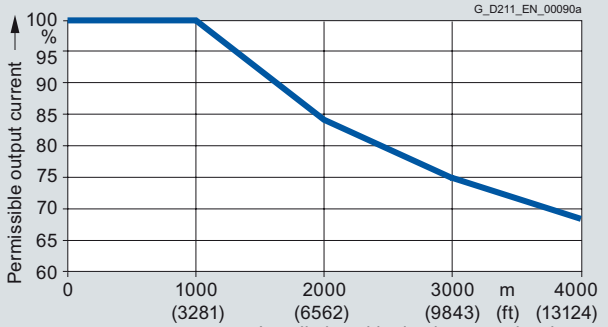
Characteristic curves (continued)

Derating characteristics

3 A and 5 A Single Motor Modules in booksize compact format

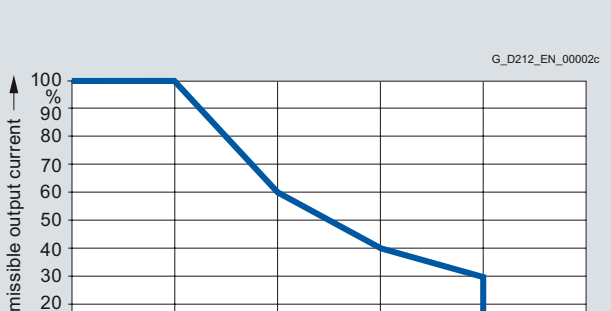


Output current dependent on pulse frequency

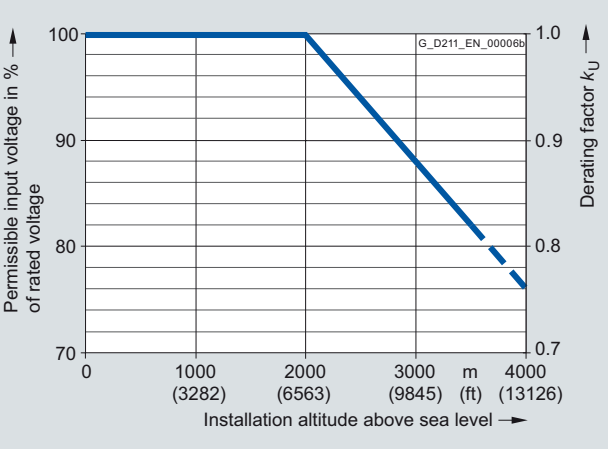


Output current dependent on installation altitude

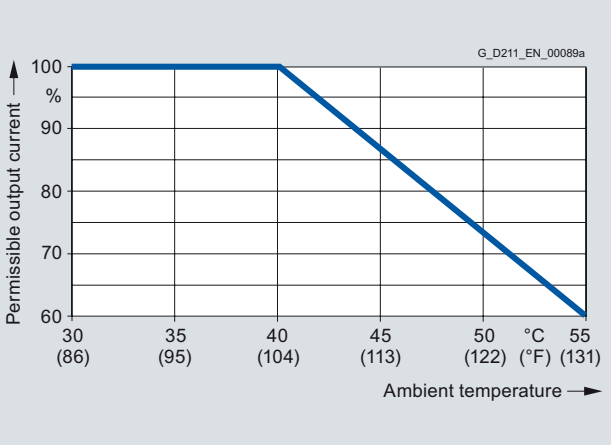
9 A and 18 A Single Motor Modules in booksize compact format



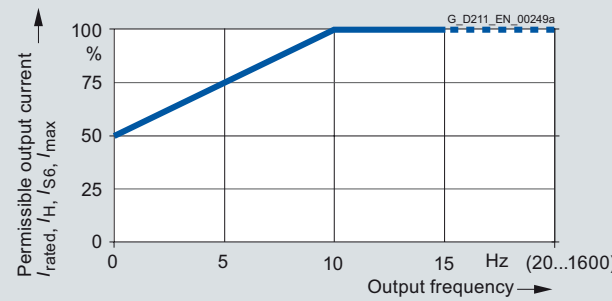
Output current dependent on pulse frequency



Voltage derating dependent on installation altitude



Output current dependent on ambient temperature



Output current dependent on output frequency

Design

The Single Motor Modules in booksize format feature the following connections and interfaces as standard:

- 2 DC link connections via integrated DC link busbars
- 1 electronics power supply connection via integrated 24 V DC bars
- 3 DRIVE-CLiQ sockets
- 1 motor connection, plug-in (not included in scope of supply) or screw-stud depending on rated output current
- 1 safe standstill input (enable pulses)
- 1 safe motor brake control
- 1 temperature sensor input (KTY84-130 or PTC)
- 2 PE (protective earth) connections

The status of the Motor Modules is indicated via two multi-color LEDs.

The motor cable shield is inside the connector on 50 mm (1.97 in) and 100 mm (3.94 in) wide modules. A shield connection plate can be supplied for 150 mm (5.91 in), 200 mm (7.87 in) and 300 mm (11.81 in) wide motor modules. On these modules, the motor cable shield can be connected using a tube clip.

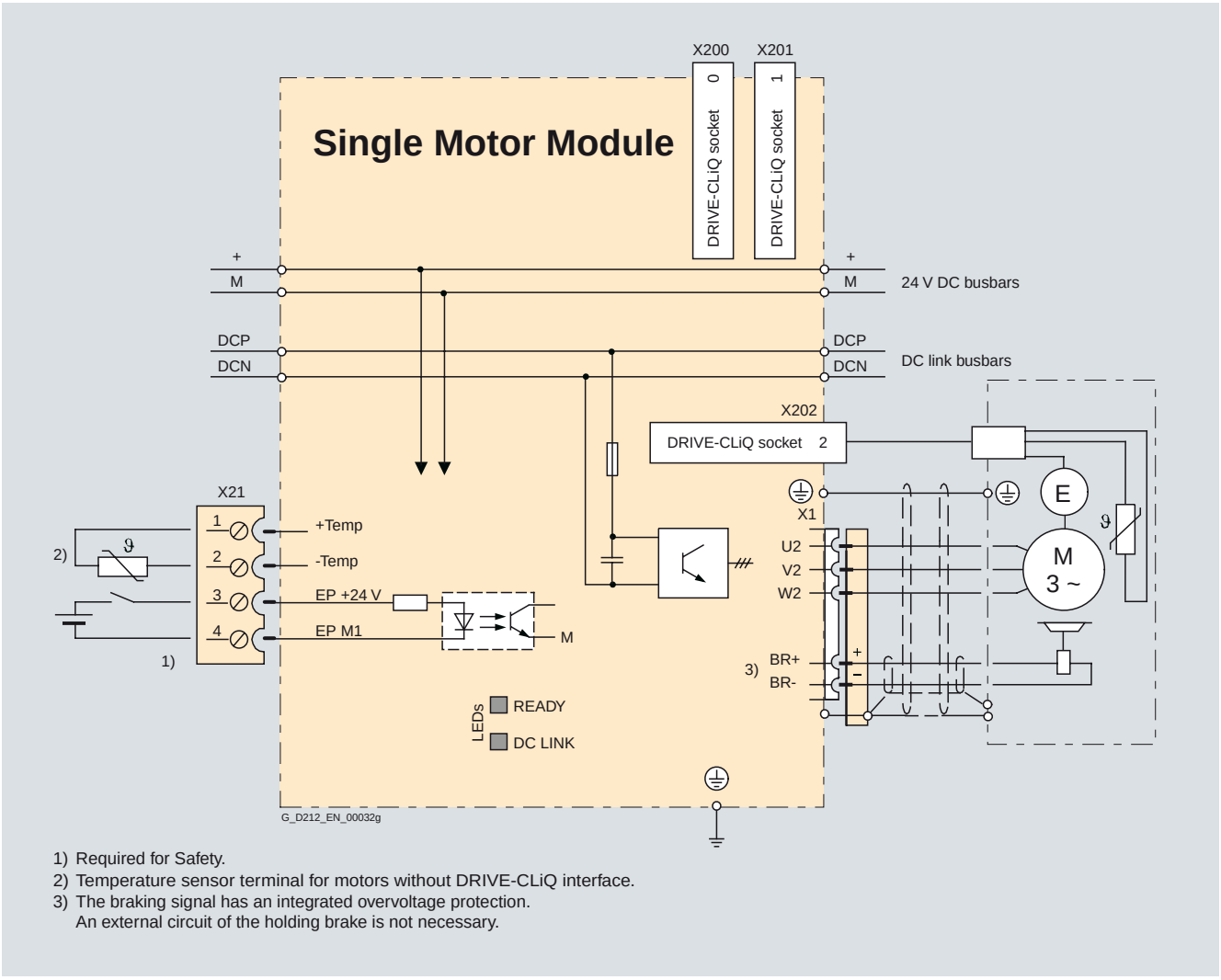
The signal cable shield can be connected to the Motor Module by means of a shield connection terminal, e.g. Weidmüller type KLBÜ 3-8 SC.

The scope of supply of the Motor Modules includes:

- DRIVE-CLiQ cable (length depends on module width) to connect Motor Module to adjacent Motor Module, length = motor module width + 0.06 m (2.4 in)
- Jumper for connecting the 24 V DC busbar to the adjacent Motor Module
- Connector X21
- Connector X11 for the motor brake connection (for Motor Modules with a rated output current of 45 A to 200 A)
- 2 blanking plugs for sealing unused DRIVE-CLiQ sockets
- Fan insert for the 132 A and 200 A Motor Modules (the voltage for the fan insert is supplied by the Motor Module)
- 1 set of warning signs in foreign languages
- 1 heat conducting foil (for Motor Modules with cold plate cooling only)

Integration

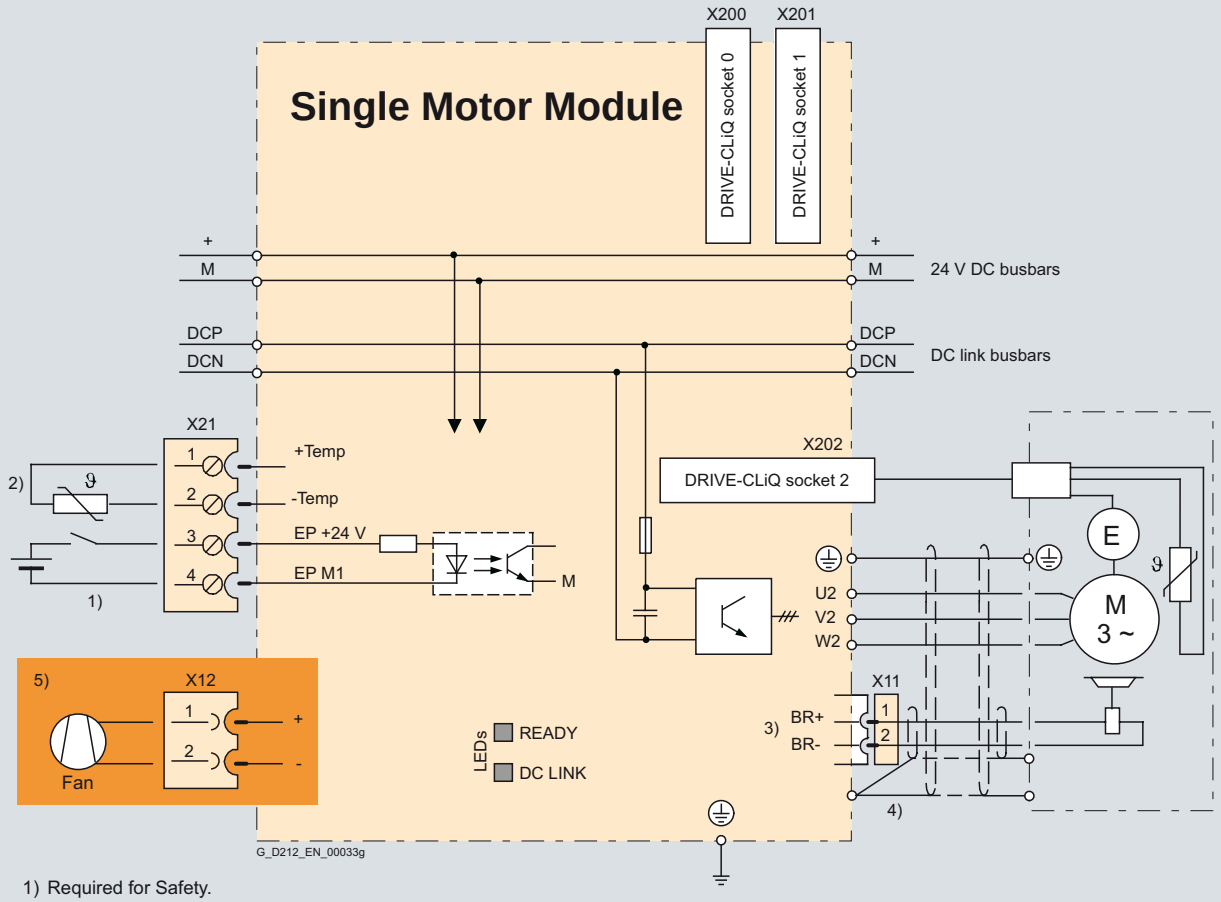
Single Motor Modules communicate with the Control Unit via DRIVE-CLiQ.



1) Required for Safety.
2) Temperature sensor terminal for motors without DRIVE-CLiQ interface.
3) The braking signal has an integrated overvoltage protection.
An external circuit of the holding brake is not necessary.

Connection example of Single Motor Modules in booksize format 3 A to 30 A

Integration (continued)



1) Required for Safety.
2) Temperature sensor terminal for motors without DRIVE-CLiQ interface.
3) The braking signal has an integrated overvoltage protection.
An external circuit of the holding brake is not necessary.
4) Contacting via shield plate.
5) Fan insert for 132 A and 200 A Single Motor Modules.
The fan insert is supplied with the Single Motor Module.

Connection example of Single Motor Modules in booksize format 45 A to 200 A

Technical specifications

Single Motor Module in booksize format 6SL312...	
DC link voltage (up to 2000 m (6562 ft) above sea level)	510 ... 720 V DC (line voltage 380 ... 480 V 3 AC) [1]
Output frequency	
• Control type Servo	0 … 650 Hz [2]
• Control type Vector	0 … 300 Hz [2]
• Control type *V/f*	0 … 600 Hz [2]
Electronics power supply	24 V DC -15 %/+20 %
Type of cooling	- Internal air cooling, external air cooling Power units with forced air cooling by built-in fans - Cold plate cooling
Permissible ambient and coolant temperature (air) during operation for line-side components, Line Modules and Motor Modules	0 … 40 °C (32 … 104 °F) without derating, > 40 … 55 °C (104 … 131 °F) see derating characteristics
Installation altitude	Up to 1000 m (3281 ft) above sea level without derating, > 1000 ... 4000 m (3281 ... 13124 ft) above sea level, see derating characteristics
Conformity	CE (low-voltage and EMC Directives)
Approvals, according to	cULus
Safety Integrated	Safety Integrity Level 2 (SIL2) acc. to IEC 61508, Performance Level d (PLd) acc. to ISO 13849-1 and Control Category 3 acc. to ISO 13849-1 or EN 954-1 For further information see chapter Safety Integrated.

[1] 3 A ... 85 A Single Motor Modules with firmware version V2.5 and higher with appropriate parameterization and reduced power rating also operable on 200 ... 240 V 3 AC networks in accordance with a DC link voltage of 270 ... 360 V DC.

[2] Note the correlation between max. output frequency, pulse frequency and current derating.
For further information see chapter System description – Dimensioning.

Technical specifications (continued)

DC link voltage 510 … 720 V DC		Single Motor Module in booksize format				
• Internal air cooling	6SL3120-	1TE13-0AA3	1TE15-0AA3	1TE21-0AA3	1TE21-8AA3	1TE23-0AA3
• External air cooling	6SL3121-	1TE13-0AA3	1TE15-0AA3	1TE21-0AA3	1TE21-8AA3	1TE23-0AA3
• Cold plate cooling	6SL3126-	1TE13-0AA3	1TE15-0AA3	1TE21-0AA3	1TE21-8AA3	1TE23-0AA3
Output current						
• Rated current I_{rated}	A	3	5	9	18	30
• Base-load current I_H	A	2.6	4.3	7.7	15.3	25.5
• For S6 duty (40 %) I_{S6}	A	3.5	6	10	24	40
• I_{max}	A	6	10	18	36	56
Type rating [1]						
• Based on I_{rated}	kW (HP)	1.6 (1.5)	2.7 (3)	4.8 (5)	9.7 (10)	16.0 (20)
• Based on I_H	kW (HP)	1.4 (1)	2.3 (2.5)	4.1 (5)	8.2 (10)	13.7 (18)
Rated pulse frequency	kHz	4	4	4	4	4
DC link current I_d [2]	A	3.6	6	11	22	36
Current carrying capacity						
• DC link busbars	A	100	100	100	100	100
• 24 V DC busbars [3]	A	20	20	20	20	20
DC link capacitance	µF	110	110	110	220	705
Current requirement At 24 V DC, max.	A	0.85	0.85	0.85	0.85	0.9
Internal/external air cooling						
• Power loss [4]						
- With internal air cooling in control cabinet	kW	0.05	0.07	0.1	0.19	0.31
- With external air cooling, int./ext.	kW	0.035/0.015	0.04/0.03	0.055/0.045	0.1/0.09	0.1/0.21
• Cooling air requirement	m^3/s (ft^3/s)	0.008 (0.3)	0.008 (0.3)	0.008 (0.3)	0.008 (0.3)	0.016 (0.6)
• Sound pressure level L_{pA} (1 m)	dB	< 60	< 60	< 60	< 60	< 60
Cold plate cooling						
• Power loss, int./ext. [4]	kW	0.025/0.02	0.035/0.035	0.045/0.05	0.08/0.1	0.085/0.22
• Thermal resistance R_{th}	K/W	0.175	0.175	0.175	0.175	0.075
Motor connection U2, V2, W2		Connector (X1) [5], max. 30 A	Connector (X1) [5], max. 30 A	Connector (X1) [5], max. 30 A	Connector (X1) [5], max. 30 A	Connector (X1) [5], max. 30 A
Shield connection		Integrated in connector (X1)	Integrated in connector (X1)	Integrated in connector (X1)	Integrated in connector (X1)	Integrated in connector (X1)
PE connection		M5 screw	M5 screw	M5 screw	M5 screw	M5 screw
Motor brake connection		Integrated into the plug-in motor connector (X1), 24 V DC, 2 A	Integrated into the plug-in motor connector (X1), 24 V DC, 2 A	Integrated into the plug-in motor connector (X1), 24 V DC, 2 A	Integrated into the plug-in motor connector (X1), 24 V DC, 2 A	Integrated into the plug-in motor connector (X1), 24 V DC, 2 A
Motor cable length, max.						
• Shielded/Unshielded	m (ft)	50 /75 (164/246)	50 /75 (164/246)	50 /75 (164/246)	70/100 (230/328)	100/150 (328/492)
Degree of protection		IP20	IP20	IP20	IP20	IP20
Dimensions						
• Width	mm (in)	50 (1.97)	50 (1.97)	50 (1.97)	50 (1.97)	100 (3.94)
• Height	mm (in)	380 (14.96)	380 (14.96)	380 (14.96)	380 (14.96)	380 (14.96)
• Depth						
- With internal air cooling	mm (in)	270 (10.63)	270 (10.63)	270 (10.63)	270 (10.63)	270 (10.63)
- With external air cooling, on/behind mounting surface	mm (in)	226/66.5 (8.90/2.63)	226/66.5 (8.90/2.63)	226/66.5 (8.90/2.63)	226/66.5 (8.90/2.63)	226/66.5 (8.90/2.63)
- With cold plate cooling	mm (in)	226 (8.90)	226 (8.90)	226 (8.90)	226 (8.90)	226 (8.90)
Weight, approx.						
• With internal air cooling	kg (lb)	5.0 (11.0)	5.0 (11.0)	5.0 (11.0)	5.0 (11.0)	6.9 (15.2)
• With external air cooling	kg (lb)	5.7 (12.6)	5.7 (12.6)	5.7 (12.6)	5.7 (12.6)	8.5 (18.7)
• With cold plate cooling	kg (lb)	4.2 (9.26)	4.2 (9.26)	4.5 (9.92)	4.5 (9.92)	6.1 (13.5)

1) Rated power of a standard asynchronous (induction) motor at 600 V DC link voltage..

2) Rated DC link current for dimensioning an external DC connection.
For DC link current calculation for dimensioning the Line Module, see chapter System description – Dimensioning.

3) If, due to a number of Line and Motor Modules being mounted side-by-side, the current carrying capacity exceeds 20 A, an additional 24-V-DC connection using a 24-V terminal adapter is required (max. cross section 6 mm^2, max. fuse protection 20 A).

4) Power loss of Motor Module at rated power including losses of 24 V DC electronics power supply.

5) Connector not included in scope of supply, see Accessories.

Technical specifications (continued)

DC link voltage 510 … 720 V DC		Single Motor Module in booksize format				
• Internal air cooling	6SL3120-	1TE24-5AA3	1TE26-0AA3	1TE28-5AA3	1TE31-3AA3	1TE32-0AA4
• External air cooling	6SL3121-	1TE24-5AA3	1TE26-0AA3	1TE28-5AA3	1TE31-3AA3	1TE32-0AA4
• Cold plate cooling	6SL3126-	1TE24-5AA3	1TE26-0AA3	1TE28-5AA3	1TE31-3AA3	1TE32-0AA4
• Liquid cooling	6SL3125-	–	–	–	–	1TE32-0AA4
Output current						
• Rated current I_{rated}	A	45	60	85	132 (105 [6])	200 (140 [6])
• Base-load current I_H	A	38	52	68	105 (84)	141 (99)
• For S6 duty (40 %) I_{S6}	A	60	80	110	150 (120)	230 (161)
• I_{max}	A	85	113	141	210	282
Rated pulse frequency	kHz	4	4	4	4	4
Type rating [1]						
• Based on I_n	kW (HP)	24 (30)	32 (40)	46 (60)	71 (100)	107 (150)
• Based on I_H	kW (HP)	21 (25)	28 (40)	37 (50)	57 (75)	76 (100)
DC link current I_d [2]	A	54	72	102	158	200
Current carrying capacity						
• DC link busbars	A	200	200	200	200	200
• 24 V DC busbars [3]	A	20	20	20	20	20
DC link capacitance	µF	1175	1410	1880	2820	3995
Current requirement At 24 V DC, max.	A	1.2	1.2	1.5	1.5	1.5
Internal/external air cooling						
• Power loss [4]						
- With internal air cooling in control cabinet	kW	0.46	0.62	0.79	1.29	2.09
- With ext. air cooling, int./ext.	kW	0.14/0.32	0.16/0.46	0.2/0.59	0.29/1.0	0.47/1.62
• Cooling air requirement	m^3/s (ft^3/s)	0.031 (1.1)	0.031 (1.1)	0.044 (1.6)	0.144 (5.1)	0.144 (5.1)
• Sound pressure level L_{pA} (1 m)	dB	< 65	< 65	< 60	< 73	< 73
Cold plate cooling						
• Power loss, int./ext. [4]	kW	0.11/0.34	0.13/0.48	0.15/0.62	0.24/1.05	0.39/1.7
• Thermal resistance R_{th}	K/W	0.055	0.055	0.05	0.028	0.028
Motor connection U2, V2, W2		M6 screw studs (X1)	M6 screw studs (X1)	M8 screw studs (X1)	M8 screw studs (X1)	M8 screw studs (X1)
• Conductor cross-section, max.	mm^2	2.5 … 50	2.5 … 50	2.5 … 95, 2 × 35	2.5 … 120, 2 × 50	2.5 … 120, 2 × 50
Shield connection		See Accessories	See Accessories	See Accessories	See Accessories	See Accessories
PE connection		M6 screw	M6 screw	M6 screw	M8 screw	M8 screw
Motor brake connection		Plug-in connector (X11), 24 V DC, 2 A	Plug-in connector (X11), 24 V DC, 2 A	Plug-in connector (X11), 24 V DC, 2 A	Plug-in connector (X11), 24 V DC, 2 A	Plug-in connector (X11), 24 V DC, 2 A
Motor cable length, max.						
• Shielded/unshielded	m (ft)	100/150 (328/492)	100/150 (328/492)	100/150 (328/492)	100/150 (328/492)	100/150 (328/492)
Degree of protection		IP20	IP20	IP20	IP20	IP20
Dimensions						
• Width	mm (in)	150 (5.91)	150 (5.91)	200 (7.87)	300 (11.81)	300 (11.81)
• Height	mm (in)	380 (14.96)	380 (14.96)	380 (14.96)	380 (14.96)	380 (14.96)
- With fan [5]		–	–	–	629 (24.76)	629 (24.76)
• Depth						
- With internal air cooling	mm (in)	270 (10.63)	270 (10.63)	270 (10.63)	270 (10.63)	270 (10.63)
- With external air cooling, on/behind mounting surface	mm (in)	226/71 (8.90/2.80)	226/71 (8.90/2.80)	226/92 (8.90/3.62)	226/82 (8.90/3.23)	226/82 (8.90/3.23)
- With cold plate cooling	mm (in)	226 (8.90)	226 (8.90)	226 (8.90)	226 (8.90)	226 (8.90)
Weight, approx.						
• With internal air cooling	kg (lb)	9 (19.8)	9 (19.8)	15 (33.1)	21 (46.3)	21 (46.3)
• With external air cooling	kg (lb)	13.2 (29.1)	13.4 (29.5)	17.2 (37.9)	27.2 (60.0)	30 (66.2)
• With cold plate cooling	kg (lb)	9.1 (20.1)	9.1 (20.1)	12.5 (27.6)	18 (39.7)	18 (39.7)

1) Rated power of a standard asynchronous (induction) motor at 600 V DC link voltage.

2) Rated DC link current for dimensioning an external DC connection.
For DC link current calculation for dimensioning the Line Module, see chapter System description – Dimensioning.

3) If, due to a number of Line and Motor Modules being mounted side-by-side, the current carrying capacity exceeds 20 A, an additional 24-V-DC connection using a 24-V terminal adapter is required (max. cross section 6 mm^2, max. fuse protection 20 A).

4) Power loss of Motor Module at rated power including losses of 24 V DC electronics power supply.

5) The fan is supplied with the Motor Module and must be installed before the Motor Module is commissioned.

6) In the case of cold-plate cooling, derating is necessary due to heat transfer to the external heat sink.
For further information, see chapter System description – Dimensioning.

Selection and ordering data

Rated output current	Type rating	Single Motor Module in booksize format			
		Internal air cooling	External air cooling	Cold plate cooling	Liquid cooling
A	kW (HP) [1]	Order No.	Order No.	Order No.	Order No.
DC link voltage 510 ... 720 V DC					
3	1.6 (1.5)	**6SL3120-1TE13-0AA3**	**6SL3121-1TE13-0AA3**	**6SL3126-1TE13-0AA3**	–
5	2.7 (3)	**6SL3120-1TE15-0AA3**	**6SL3121-1TE15-0AA3**	**6SL3126-1TE15-0AA3**	–
9	4.8 (5)	**6SL3120-1TE21-0AA3**	**6SL3121-1TE21-0AA3**	**6SL3126-1TE21-0AA3**	–
18	9.7 (10)	**6SL3120-1TE21-8AA3**	**6SL3121-1TE21-8AA3**	**6SL3126-1TE21-8AA3**	–
30	16 (20)	**6SL3120-1TE23-0AA3**	**6SL3121-1TE23-0AA3**	**6SL3126-1TE23-0AA3**	–
45	24 (30)	**6SL3120-1TE24-5AA3**	**6SL3121-1TE24-5AA3**	**6SL3126-1TE24-5AA3**	–
60	32 (40)	**6SL3120-1TE26-0AA3**	**6SL3121-1TE26-0AA3**	**6SL3126-1TE26-0AA3**	–
85	46 (60)	**6SL3120-1TE28-5AA3**	**6SL3121-1TE28-5AA3**	**6SL3126-1TE28-5AA3**	–
132	71 (100)	**6SL3120-1TE31-3AA3**	**6SL3121-1TE31-3AA3**	**6SL3126-1TE31-3AA3**	–
200	107 (150)	**6SL3120-1TE32-0AA4**	**6SL3121-1TE32-0AA4**	**6SL3126-1TE32-0AA4**	**6SL3125-1TE32-0AA4**

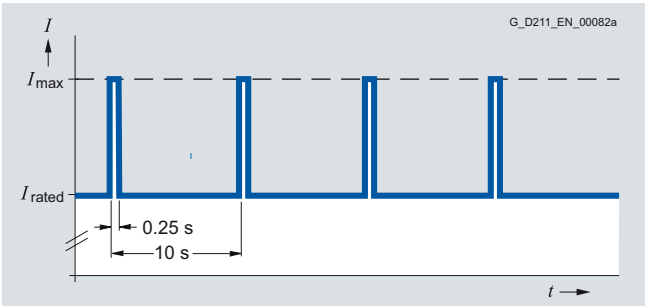
Description	Order No.
Accessories	
Power connector (X1) At Motor Module end, with screw-type terminals 1.5 ... 10 mm^2 For Motor Modules with a rated output current of 3 ... 30 A	**6SL3162-2MA00-0AA0**
Shield connection plate For Line/Motor Modules in booksize format	
• 150 mm (5.91 in) wide for internal air cooling	**6SL3162-1AF00-0AA1**
• 150 mm (5.91 in) wide for external air cooling and cold plate cooling	**6SL3162-1AF00-0BA1**
• 200 mm (7.87 in) wide for internal air cooling	**6SL3162-1AH01-0AA0**
• 200 mm (7.87 in) wide for external air cooling and cold plate cooling	**6SL3162-1AH01-0BA0**
• 300 mm (11.81 in) wide for all cooling types	**6SL3162-1AH00-0AA0**
DC link rectifier adapter For direct infeed of DC link voltage	
• Screw-type terminals 0.5 … 10 mm^2 for Line/Motor Modules in booksize format with a width of 50 mm (1.97 in) or 100 mm (3.94 in)	**6SL3162-2BD00-0AA0**
• Screw-type terminals 35 … 95 mm^2 for Line/Motor Modules in booksize format with a width of 150 mm, 200 mm and 300 mm (5.91 in, 7.87 in and 11.81 in)	**6SL3162-2BM00-0AA0**
DC link adapters (2 units) For multi-tier configuration Screw-type terminals 35 ... 95 mm^2 For all Line Modules and Motor Modules in booksize format	**6SL3162-2BM01-0AA0**
24 V terminal adapter For all Line Modules and Motor Modules in booksize format	**6SL3162-2AA00-0AA0**
DC link busbar kit (reinforced) For replacement of DC link busbars for 5 modules in booksize format	
• 50 mm (1.97 in) wide	**6SL3162-2DB00-0AA0**
• 100 mm (3.94 in) wide	**6SL3162-2DD00-0AA0**

Description	Order No.
Accessories for re-ordering	
24 V jumper For connection of the 24 V busbars (for booksize format)	**6SL3162-2AA01-0AA0**
Warning labels in 16 languages This set of foreign language warning signs can be placed on top of the standard English or German signs. A set of signs is supplied with the units. One sign in each of the following languages is provided in each set: Chinese Simplified, Czech, Danish, Dutch, Finnish, French, Greek, Italian, Japanese, Korean, Polish, Portuguese/Brazilian, Russian, Spanish, Swedish, Turkish.	**6SL3166-3AB00-0AA0**
Dust-proof blanking plugs (50 units) For DRIVE-CLiQ port	**6SL3066-4CA00-0AA0**

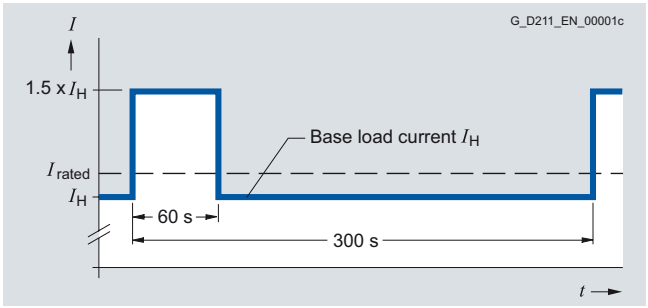
[1] Nominal HP based on Asynchronous motors (induction motors). Match the motor nameplate current for specific sizing.

Characteristic curves

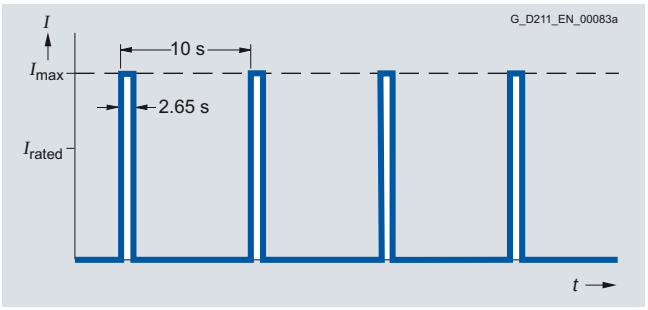
Overload capability



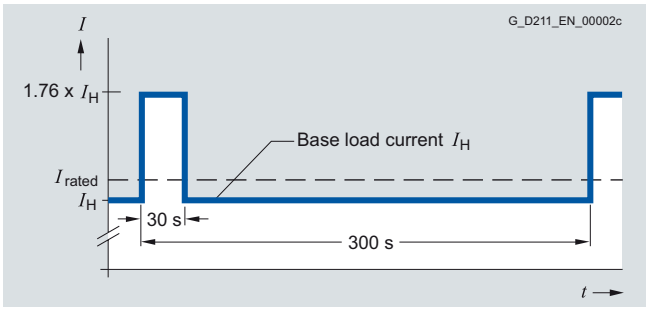
Load cycle with previous load



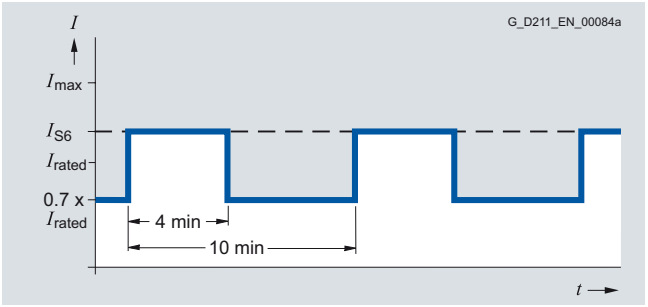
Load cycle with 60 s overload with a load cycle period of 300 s



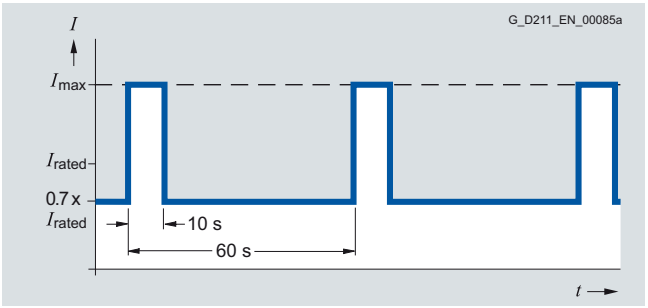
Load cycle without previous load



Load cycle with 30 s overload with a load cycle period of 300 s



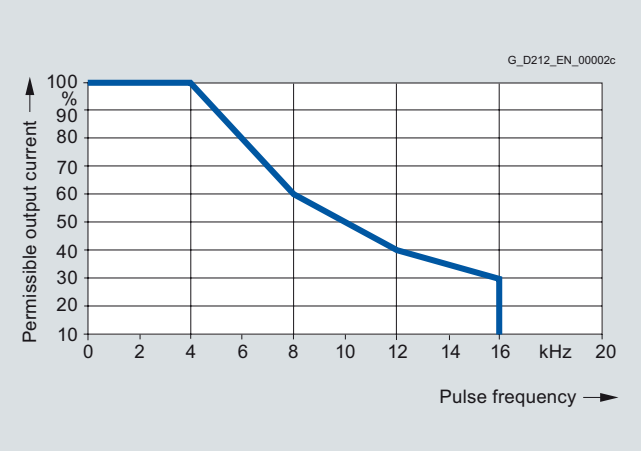
S6 load cycle with previous load with a load cycle period of 600 s



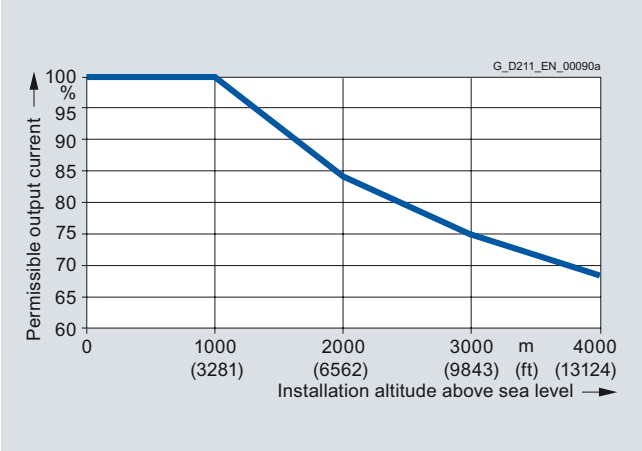
S6 load cycle with previous load with a load cycle period of 60 s

Characteristic curves (continued)

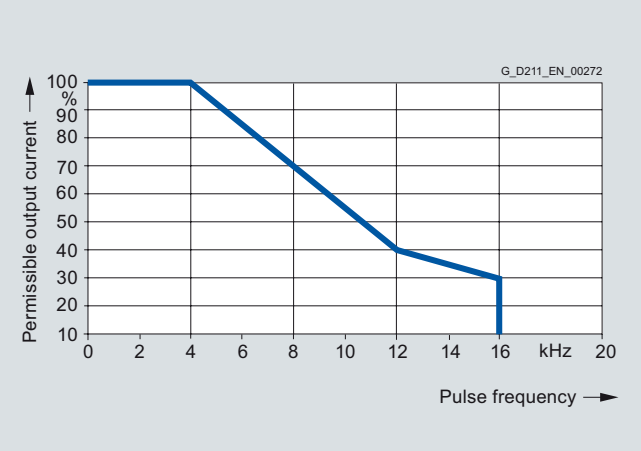
Derating characteristics



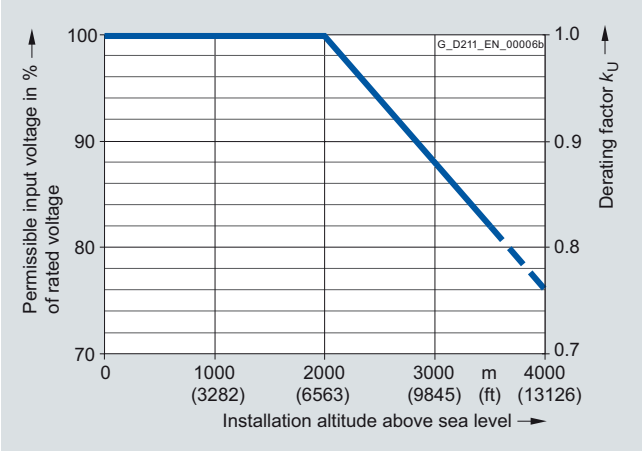
Output current dependent on pulse frequency
(rated current up to 132 A for Single Motor Modules in booksize format)



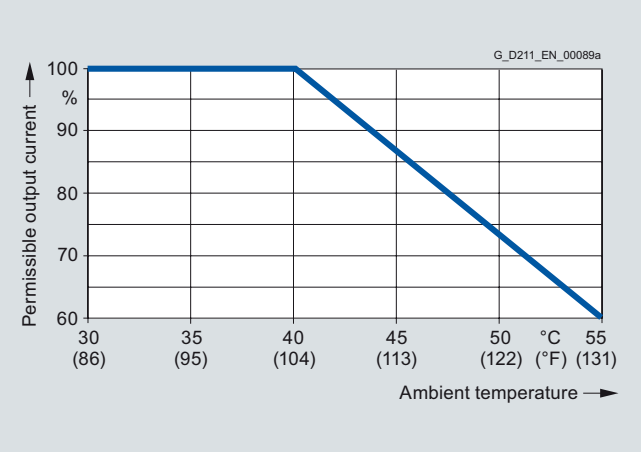
Output current dependent on installation altitude



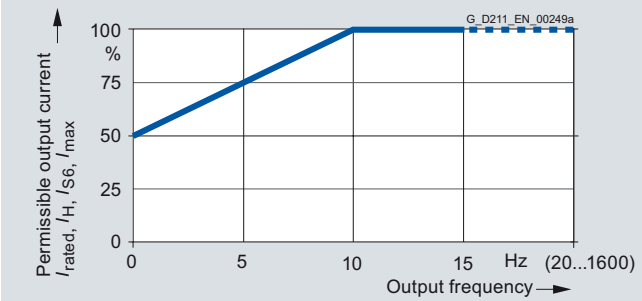
Output current dependent on pulse frequency
(rated current up to 200 A for Single Motor Modules in booksize format)



Voltage derating dependent on installation altitude



Output current dependent on ambient temperature



Current derating dependent on output frequency

Single Motor Modules in chassis format

Design

The Single Motor Modules in chassis format feature the following connections and interfaces as standard:

- 1 DC link connection (DCP, DCN) for connecting to the supply DC busbar
- 1 DC link connection (DCPA, DCNA) for connecting a Braking Module
- 1 electronics power supply connection
- 3 DRIVE-CLiQ sockets
- 1 motor connection
- 1 safe standstill input (enable pulses)
- 1 temperature sensor input (KTY84-130 or PTC100 two-wire, or PTC)
- 1 PE (protective earth) connection

The status of the Motor Modules is indicated via two multi-color LEDs.

The scope of supply of the Motor Modules includes:

- Types FX and GX:
  - 0.60 m (1.97 ft) DRIVE-CLiQ cable for connection to the adjacent Motor Module
- Types HX and JX:
  - 0.35 m (14 in) DRIVE-CLiQ cable for connection to the CU320-2 or SIMOTION D4x5 Control Unit
  - 2.10 m (6.89 ft) DRIVE-CLiQ cable for connection to the adjacent Motor Module

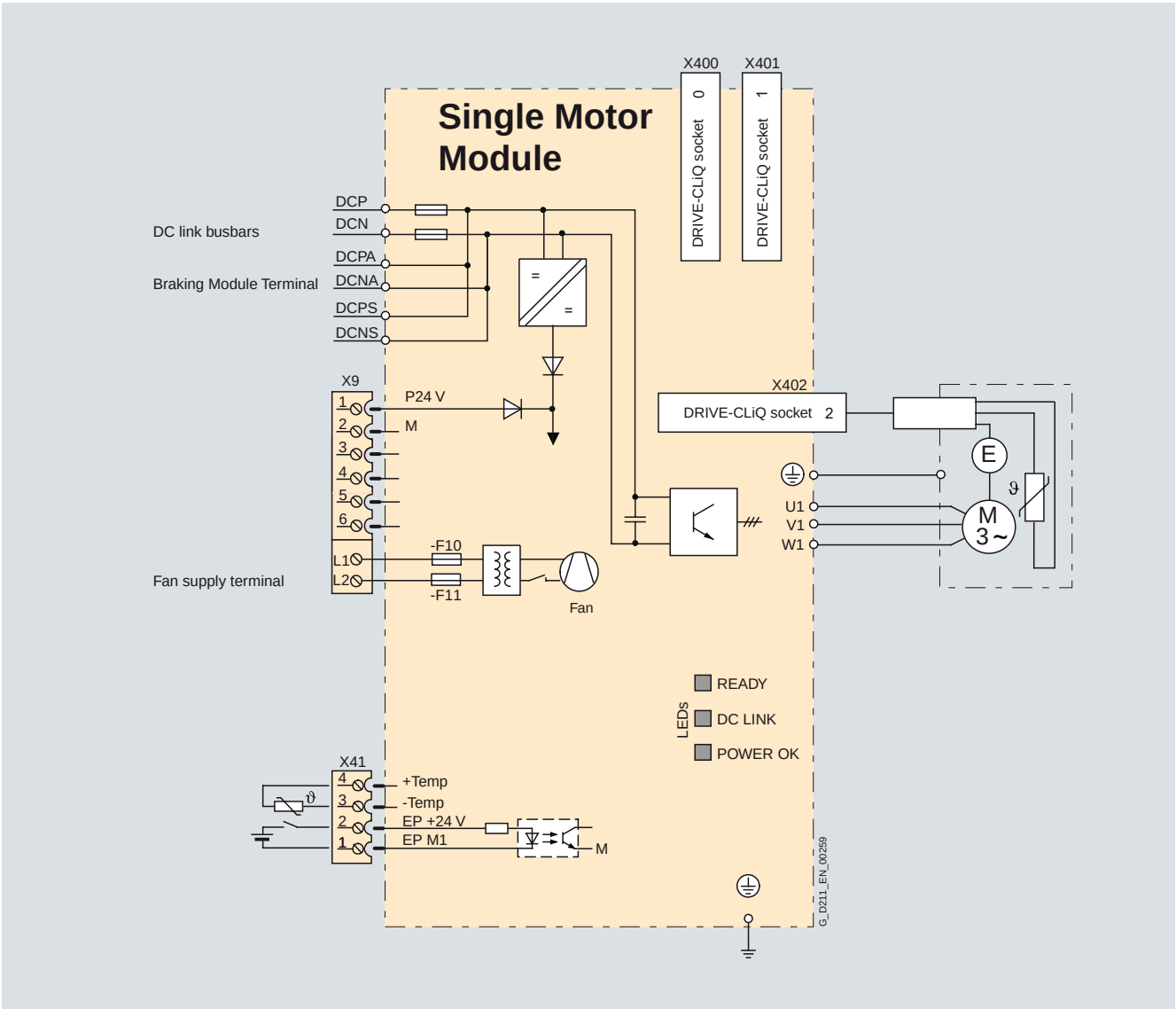
Selection and ordering data

Rated output current	Type rating	Single Motor Module in chassis format
A	kW (HP) [1]	Order No.
DC link voltage 510 ... 720 V DC		
210	110 (150)	**6SL3320-1TE32-1AA3**
260	132 (200)	**6SL3320-1TE32-6AA3**
310	160 (250)	**6SL3320-1TE33-1AA3**
380	200 (300)	**6SL3320-1TE33-8AA3**
490	250 (400)	**6SL3320-1TE35-0AA3**
605	315 (500)	**6SL3320-1TE36-1AA3**
745	400 (600)	**6SL3320-1TE37-5AA3**
840	450 (700)	**6SL3320-1TE38-4AA3**
985	560 (800)	**6SL3320-1TE41-0AA3**
1260	710 (1000)	**6SL3320-1TE41-2AA3**
1405	800 (1150)	**6SL3320-1TE41-4AA3**
DC link voltage 675 ... 1035 V DC		
85	75	**6SL3320-1TG28-5AA3**
100	90	**6SL3320-1TG31-0AA3**
120	110	**6SL3320-1TG31-2AA3**
150	132	**6SL3320-1TG31-5AA3**
175	160	**6SL3320-1TG31-8AA3**
215	200	**6SL3320-1TG32-2AA3**
260	250	**6SL3320-1TG32-6AA3**
330	315	**6SL3320-1TG33-3AA3**
410	400	**6SL3320-1TG34-1AA3**
465	450	**6SL3320-1TG34-7AA3**
575	560	**6SL3320-1TG35-8AA3**
735	710	**6SL3320-1TG37-4AA3**
810	800	**6SL3320-1TG38-1AA3**
910	900	**6SL3320-1TG38-8AA3**
1025	1000	**6SL3320-1TG41-0AA3**
1270	1200	**6SL3320-1TG41-3AA3**
Accessories for re-ordering		
Warning labels in 16 languages This set of foreign language warning signs can be placed on top of the standard English or German signs. A set of signs is supplied with the units. One sign in each of the following languages is provided in each set: Chinese Simplified, Czech, Danish, Dutch, Finnish, French, Greek, Italian, Japanese, Korean, Polish, Portuguese/Brazilian, Russian, Spanish, Swedish, Turkish.		**6SL3166-3AB00-0AA0**

[1] Nominal HP based on Asynchronous motors (induction motors). Match the motor nameplate current for specific sizing.

Integration

The Single Motor Module communicates with the Control Unit via DRIVE-CLiQ.



Connection example of Single Motor Module in chassis format

Technical specifications

Single Motor Module in chassis format 6SL3320-1T...	
DC link voltage (up to 2000 m (6562 ft) above sea level)	510 V … 720 V DC (line voltage 380 V … 480 V 3 AC) or 675 V … 1035 V DC (line voltage 500 V … 690 V 3 AC)
Output frequency	
• Control type Servo	0 … 650 Hz [1]
• Control type Vector	0 … 300 Hz [1]
• Control type *V/f*	0 … 300 Hz [1]
Electronics power supply	24 V DC -15 %/+20 %
Type of cooling	Internal air cooling, power units with forced air cooling by built-in fans
Permissible ambient and coolant temperature (air) during operation for line-side components, Line Modules and Motor Modules	0 … 40 °C (32 … 104 °F) without derating, > 40 … 55 °C (104 … 131 °F) see derating characteristics
Installation altitude	Up to 2000 m (3281 ft) above sea level without derating, > 2000 ... 4000 m (3281 ... 13124 ft) above sea level, see derating characteristics
Conformity	CE (low-voltage and EMC Directives)
Approvals, according to	cULus 510 ... 720 V DC Motor Modules only
Safety Integrated	Safety Integrity Level 2 (SIL2) acc. to IEC 61508, Performance Level d (PLd) acc. to ISO 13849-1 and Control Category 3 acc. to ISO 13849-1 or EN 954-1 For further information see chapter Safety Integrated

[1] Note the correlation between max. output frequency, pulse frequency and current derating.
For further information see chapter System description – Dimensioning.

Technical specifications (continued)

DC link voltage 510 … 720 V DC		Single Motor Module in chassis format				
		6SL3320-1TE32-1AA3	6SL3320-1TE32-6AA3	6SL3320-1TE33-1AA3	6SL3320-1TE33-8AA3	6SL3320-1TE35-0AA3
Output current						
• Rated current I_{rated}	A	210	260	310	380	490
• Base-load current I_L	A	205	250	302	370	477
• Base-load current I_H	A	178	233	277	340	438
• For S6 duty (40 %) I_{S6}	A	230	285	340	430	540
• I_{max}	A	307	375	453	555	715
Type rating [1]						
• Based on I_{rated}	kW (HP)	110 (150)	132 (200)	160 (250)	200 (300)	250 (400)
• Based on I_H	kW (HP)	90 (125)	110 (150)	132 (200)	160 (250)	200 (350)
Rated pulse frequency	kHz	2	2	2	2	2
Rated DC link current I_d [2] when supplied via						
• Basic/Smart Line Module	A	252	312	372	456	588
• Active Line Module	A	227	281	335	411	530
DC link capacitance	µF	4200	5200	6300	7800	9600
Current requirement						
• At 24 V DC, max.	A	0.9	0.9	1.2	1.2	1.2
• Fan supply with 400 V 2 AC, 50/60 Hz, max.	A	0.63/0.95	1.13/1.7	1.8/2.7	1.8/2.7	1.8/2.7
Power loss, max.	kW	1.94	2.6	3.1	3.8	4.5
Cooling air requirement	m^3/s (ft^3/s)	0.17 (6.0)	0.23 (8.1)	0.36 (12.7)	0.36 (12.7)	0.36 (12.7)
Sound pressure level L_{pA} (1 m) at 50/60 Hz	dB	< 67	< 69	< 69	< 69	< 69
DC link connection DCP, DCN		Flat connector for M10 screw	Flat connector for M10 screw	Flat connector for M10 screw	Flat connector for M10 screw	Flat connector for M10 screw
• Conductor cross-section, max.	mm^2	2 × 185	2 × 185	2 × 185	2 × 185	2 × 185
Motor connection U2, V2, W2		Flat connector for M10 screw	Flat connector for M10 screw	Flat connector for M10 screw	Flat connector for M10 screw	Flat connector for M10 screw
• Conductor cross-section, max.	mm^2	2 × 185	2 × 185	2 × 185	2 × 185	2 × 185
PE connection		M10 screw	M10 screw	M10 screw	M10 screw	M10 screw
• Conductor cross-section, max.	mm^2	2 × 185	2 × 185	2 × 185	2 × 185	2 × 185
Motor brake connection		–	–	–	–	–
Motor cable length, max. (without external options)						
• Shielded	m (ft)	300 (984)	300 (984)	300 (984)	300 (984)	300 (984)
• Unshielded	m (ft)	450 (1476)	450 (1476)	450 (1476)	450 (1476)	450 (1476)
Degree of protection		IP20	IP20	IP20	IP20	IP20
Dimensions						
• Width	mm (in)	326 (12.83)	326 (12.83)	326 (12.83)	326 (12.83)	326 (12.83)
• Height	mm (in)	1400 (55.12)	1400 (55.12)	1533 (60.35)	1533 (60.35)	1533 (60.35)
• Depth	mm (in)	356 (14.02)	356 (14.02)	545 (21.46)	545 (21.46)	545 (21.46)
Frame size		FX	FX	GX	GX	GX
Weight, approx.	kg (lb)	88 (194)	88 (194)	152 (335)	152 (335)	152 (335)

[1] Rated power of a standard asynchronous (induction) motor at 600 V DC link voltage.

[2] Rated DC link current for dimensioning an external DC connection.
For DC link current calculation for dimensioning the Line Module, see chapter System description – Dimensioning.

Technical specifications (continued)

DC link voltage 510 … 720 V DC		Single Motor Module in chassis format		
		6SL3320-1TE36-1AA3	6SL3320-1TE37-5AA3	6SL3320-1TE38-4AA3
Output current				
• Rated current I_{rated}	A	605	745	840
• Base-load current I_L	A	590	725	820
• Base-load current I_H	A	460	570	700
• I_{max}	A	885	1087	1230
Type rating [1]				
• Based on I_{rated}	kW (HP)	315 (500)	400 (600)	450 (700)
• Based on I_H	kW (HP)	250 (350)	315 (450)	400 (500)
Rated pulse frequency	kHz	1.25	1.25	1.25
DC link current I_d [2]	A	726	894	1008
DC link capacitance	µF	12600	15600	16800
Current requirement				
• At 24 V DC, max.	A	1.0	1.0	1.0
• Fan supply with 400 V 2 AC, max.	A	3.2	3.2	3.2
Power loss	kW	5.84	6.68	7.15
Cooling air requirement	m^3/s (ft^3/s)	0.78 (27.5)	0.78 (27.5)	0.78 (27.5)
Sound pressure level L_{pA} (1 m)	dB	< 72	< 72	< 72
DC link connection DCP, DCN		Flat connector for busbar connection	Flat connector for busbar connection	Flat connector for busbar connection
Motor connection U2, V2, W2		Flat connector for M12 screw	Flat connector for M12 screw	Flat connector for M12 screw
• Conductor cross-section, max.	mm^2	4 × 240	4 × 240	4 × 240
PE connection		M12 screw	M12 screw	M12 screw
• Conductor cross-section, max.				
- PE1/GND	mm^2	1 × 240	1 × 240	1 × 240
- PE2/GND	mm^2	2 × 240	2 × 240	2 × 240
Motor brake connection		–	–	–
Motor cable length, max. (without external options)				
• Shielded	m (ft)	300 (984)	300 (984)	300 (984)
• Unshielded	m (ft)	450 (1476)	450 (1476)	450 (1476)
Degree of protection		IP00	IP00	IP00
Dimensions				
• Width	mm (in)	503 (19.80)	503 (19.80)	503 (19.80)
• Height	mm (in)	1475 (58.07)	1475 (58.07)	1475 (58.07)
• Depth	mm (in)	540 (21.26)	540 (21.26)	540 (21.26)
Frame size		HX	HX	HX
Weight, approx.	kg (lb)	290 (639)	290 (639)	290 (639)

[1] Rated power of a standard asynchronous (induction) motor at 600 V DC link voltage.

[2] Rated DC link current for dimensioning an external DC connection.
For DC link current calculation for dimensioning the Line Module, see chapter System description – Dimensioning.

Technical specifications (continued)

DC link voltage 510 … 720 V DC		Single Motor Module in chassis format		
		6SL3320-1TE41-0AA3	6SL3320-1TE41-2AA3	6SL3320-1TE41-4AA3
Output current				
• Rated current I_{rated}	A	985	1260	1405
• Base-load current I_L	A	960	1230	1370
• Base-load current I_H	A	860	1127	1257
• I_{max}	A	1440	1845	2055
Type rating [1]				
• Based on I_{rated}	kW (HP)	560 (800)	710 (1000)	800 (1150)
• Based on I_H	kW (HP)	450 (700)	560 (900)	710 (1000)
Rated pulse frequency	kHz	1.25	1.25	1.25
DC link current I_d [2]	A	1182	1512	1686
DC link capacitance	µF	18900	26100	28800
Current requirement				
• At 24 V DC, max.	A	1.25	1.40	1.40
• Fan supply with 400 V 2 AC, max.	A	4.7	4.7	4.7
Power loss	kW	9.5	11.1	12.0
Cooling air requirement	m^3/s (ft^3/s)	1.08 (38.1)	1.08 (38.1)	1.08 (38.1)
Sound pressure level L_{pA} (1 m)	dB	< 72	< 72	< 72
DC link connection DCP, DCN		Flat connector for busbar connection	Flat connector for busbar connection	Flat connector for busbar connection
Motor connection U2, V2, W2		Flat connector for M12 screw	Flat connector for M12 screw	Flat connector for M12 screw
• Conductor cross-section, max.	mm^2	6 × 240	6 × 240	6 × 240
PE connection		M12 screw	M12 screw	M12 screw
• Conductor cross-section, max.				
- PE1/GND	mm^2	1 × 240	1 × 240	1 × 240
- PE2/GND	mm^2	2 × 240	2 × 240	2 × 240
Motor brake connection		–	–	–
Motor cable length, max. (without external options)				
• Shielded	m (ft)	300 (984)	300 (984)	300 (984)
• Unshielded	m (ft)	450 (1476)	450 (1476)	450 (1476)
Degree of protection		IP00	IP00	IP00
Dimensions				
• Width	mm (in)	704 (27.72)	704 (27.72)	704 (27.72)
• Height	mm (in)	1475 (58.07)	1475 (58.07)	1475 (58.07)
• Depth	mm (in)	540 (21.26)	540 (21.26)	540 (21.26)
Frame size		JX	JX	JX
Weight, approx.	kg (lb)	450 (992)	450 (992)	450 (992)

[1] Rated power of a standard asynchronous (induction) motor at 600 V DC link voltage.

[2] Rated DC link current for dimensioning an external DC connection.
For DC link current calculation for dimensioning the Line Module, see chapter System description – Dimensioning.

Technical specifications (continued)

DC link voltage 675 … 1035 V DC		Single Motor Module in chassis format			
		6SL3320-1TG28-5AA3	6SL3320-1TG31-0AA3	6SL3320-1TG31-2AA3	6SL3320-1TG31-5AA3
Output current					
• Rated current I_{rated}	A	85	100	120	150
• Base-load current I_L	A	80	95	115	142
• Base-load current I_H	A	76	89	107	134
• I_{max}	A	120	142	172	213
Type rating [1]					
• Based on I_{rated}	kW	75	90	110	132
• Based on I_H	kW	55	75	90	110
Rated pulse frequency	kHz	1.25	1.25	1.25	1.25
Rated DC link current I_d [2] When supplied via					
• Basic/Smart Line Module	A	102	120	144	180
• Active Line Module	A	92	108	130	162
DC link capacitance	µF	1200	1200	1600	2800
Current requirement					
• At 24 V DC, max.	A	1	1	1	1
• Fan supply with 690 V 2 AC, 50/60 Hz, max.	A	0.4/0.5	0.4/0.5	0.4/0.5	0.4/0.5
Power loss	kW	1.17	1.43	1.89	1.80
Cooling air requirement	m^3/s (ft^3/s)	0.17 (6.0)	0.17 (6.0)	0.17 (6.0)	0.17 (6.0)
Sound pressure level L_{pA} (1 m) at 50/60 Hz	dB	< 67	< 67	< 67	< 67
DC link connection DCP, DCN		Flat connector for M10 screw	Flat connector for M10 screw	Flat connector for M10 screw	Flat connector for M10 screw
• Conductor cross-section, max.	mm^2	2 × 185	2 × 185	2 × 185	2 × 185
Motor connection U2, V2, W2		Flat connector for M10 screw	Flat connector for M10 screw	Flat connector for M10 screw	Flat connector for M10 screw
• Conductor cross-section, max.	mm^2	2 × 185	2 × 185	2 × 185	2 × 185
PE connection		M12 screw	M12 screw	M12 screw	M12 screw
• Conductor cross-section, max.					
- PE1/GND	mm^2	2 × 185	2 × 185	2 × 185	2 × 185
- PE2/GND	mm^2	2 × 185	2 × 185	2 × 185	2 × 185
Motor brake connection		–	–	–	–
Motor cable length, max. (without external options)					
• Shielded	m (ft)	300 (984)	300 (984)	300 (984)	300 (984)
• Unshielded	m (ft)	450 (1476)	450 (1476)	450 (1476)	450 (1476)
Degree of protection		IP20	IP20	IP20	IP20
Dimensions					
• Width	mm (in)	326 (12.83)	326 (12.83)	326 (12.83)	326 (12.83)
• Height	mm (in)	1400 (55.12)	1400 (55.12)	1400 (55.12)	1400 (55.12)
• Depth	mm (in)	356 (14.02)	356 (14.02)	356 (14.02)	356 (14.02)
Frame size		FX	FX	FX	FX
Weight, approx.	kg (lb)	88 (194)	88 (194)	88 (194)	88 (194)

[1] Rated power of a standard asynchronous (induction) motor at 690 V 3 AC.

[2] Rated DC link current for dimensioning an external DC connection.
For DC link current calculation for dimensioning the Line Module, see chapter System description – Dimensioning.

Technical specifications (continued)

DC link voltage 675 … 1035 V DC		Single Motor Module in chassis format			
		6SL3320-1TG31-8AA3	6SL3320-1TG32-2AA3	6SL3320-1TG32-6AA3	6SL3320-1TG33-3AA3
Output current					
• Rated current I_{rated}	A	175	215	260	330
• Base-load current I_L	A	170	208	250	320
• Base-load current I_H	A	157	192	233	280
• I_{max}	A	255	312	375	480
Type rating [1]					
• Based on I_{rated}	kW	160	200	250	315
• Based on I_H	kW	132	160	200	250
Rated pulse frequency	kHz	1.25	1.25	1.25	1.25
Rated DC link current I_d [2] When supplied via					
• Basic/Smart Line Module	A	210	258	312	396
• Active Line Module	A	189	232	281	356
DC link capacitance	µF	2800	2800	3900	4200
Current requirement					
• At 24 V DC, max.	A	1.2	1.2	1.2	1.2
• Fan supply with 690 V 2 AC, 50/60 Hz, max.	A	0.94/1.4	0.94/1.4	0.94/1.4	0.94/1.4
Power loss	kW	2.67	3.09	3.62	4.34
Cooling air requirement	m^3/s (ft^3/s)	0.36 (12.7)	0.36 (12.7)	0.36 (12.7)	0.36 (12.7)
Sound pressure level L_{pA} (1 m) at 50/60 Hz	dB	< 69	< 69	< 69	< 69
DC link connection DCP, DCN		Flat connector for M10 screw	Flat connector for M10 screw	Flat connector for M10 screw	Flat connector for M10 screw
• Conductor cross-section, max.	mm^2	2 × 185	2 × 185	2 × 185	2 × 185
Motor connection U2, V2, W2		Flat connector for M10 screw	Flat connector for M10 screw	Flat connector for M10 screw	Flat connector for M10 screw
• Conductor cross-section, max.	mm^2	2 × 185	2 × 185	2 × 185	2 × 185
PE connection		M12 screw	M12 screw	M12 screw	M12 screw
• Conductor cross-section, max.					
- PE1/GND	mm^2	2 × 185	2 × 185	2 × 185	2 × 185
- PE2/GND	mm^2	2 × 185	2 × 185	2 × 185	2 × 185
Motor brake connection		–	–	–	–
Motor cable length, max. (without external options)					
• Shielded	m (ft)	300 (984)	300 (984)	300 (984)	300 (984)
• Unshielded	m (ft)	450 (1476)	450 (1476)	450 (1476)	450 (1476)
Degree of protection		IP20	IP20	IP20	IP20
Dimensions					
• Width	mm (in)	326 (12.83)	326 (12.83)	326 (12.83)	326 (12.83)
• Height	mm (in)	1533 (60.35)	1533 (60.35)	1533 (60.35)	1533 (60.35)
• Depth	mm (in)	545 (21.46)	545 (21.46)	545 (21.46)	545 (21.46)
Frame size		GX	GX	GX	GX
Weight, approx.	kg (lb)	152 (335)	152 (335)	152 (335)	152 (335)

[1] Rated power of a standard asynchronous (induction) motor at 690 V 3 AC.

[2] Rated DC link current for dimensioning an external DC connection.
For DC link current calculation for dimensioning the Line Module, see chapter System description – Dimensioning.

Technical specifications (continued)

DC link voltage 675 … 1035 V DC		Single Motor Module in chassis format			
		6SL3320-1TG34-1AA3	6SL3320-1TG34-7AA3	6SL3320-1TG35-8AA3	6SL3320-1TG37-4AA3
Output current					
• Rated current I_{rated}	A	410	465	575	735
• Base-load current I_L	A	400	452	560	710
• Base-load current I_H	A	367	416	514	675
• I_{max}	A	600	678	840	1065
Type rating [1]					
• Based on I_{rated}	kW	400	450	560	710
• Based on I_H	kW	315	400	450	630
Rated pulse frequency	kHz	1.25	1.25	1.25	1.25
DC link current I_d [2]	A	492	558	690	882
DC link capacitance	µF	7400	7400	7400	11100
Current requirement					
• At 24 V DC, max.	A	1.0	1.0	1.0	1.25
• Fan supply with 690 V 2 AC, max.	A	1.84	1.84	2.74	2.74
Power loss	kW	6.13	6.80	10.3	10.9
Cooling air requirement	m^3/s (ft^3/s)	0.78 (27.5)	0.78 (27.5)	0.78 (27.5)	1.08 (38.1)
Sound pressure level L_{pA} (1 m)	dB	< 72	< 72	< 72	< 72
DC link connection DCP, DCN		Flat connector for busbar connection	Flat connector for busbar connection	Flat connector for busbar connection	Flat connector for busbar connection
Motor connection U2, V2, W2		Flat connector for M12 screw	Flat connector for M12 screw	Flat connector for M12 screw	Flat connector for M12 screw
• Conductor cross-section, max.	mm^2	4 × 240	4 × 240	4 × 240	4 × 240
PE connection		M12 screw	M12 screw	M12 screw	M12 screw
• Conductor cross-section, max.					
- PE1/GND	mm^2	1 × 240	1 × 240	1 × 240	1 × 240
- PE2/GND	mm^2	2 × 240	2 × 240	2 × 240	2 × 240
Motor brake connection		–	–	–	–
Motor cable length, max. (without external options)					
• Shielded	m (ft)	300 (984)	300 (984)	300 (984)	300 (984)
• Unshielded	m (ft)	450 (1476)	450 (1476)	450 (1476)	450 (1476)
Degree of protection		IP00	IP00	IP00	IP00
Dimensions					
• Width	mm (in)	503 (19.80)	503 (19.80)	503 (19.80)	704 (27.72)
• Height	mm (in)	1475 (58.07)	1475 (58.07)	1475 (58.07)	1475 (58.07)
• Depth	mm (in)	540 (21.26)	540 (21.26)	540 (21.26)	540 (21.26)
Frame size		HX	HX	HX	JX
Weight, approx.	kg (lb)	290 (639)	290 (639)	290 (639)	450 (992)

[1] Rated power of a standard asynchronous (induction) motor at 690 V 3 AC.

[2] Rated DC link current for dimensioning an external DC connection.
For DC link current calculation for dimensioning the Line Module, see chapter System description – Dimensioning.

Technical specifications (continued)

DC link voltage 675 … 1035 V DC		Single Motor Module in chassis format			
		6SL3320-1TG38-1AA3	6SL3320-1TG38-8AA3	6SL3320-1TG41-0AA3	6SL3320-1TG41-3AA3
Output current					
• Rated current I_{rated}	A	810	910	1025	1270
• Base-load current I_L	A	790	880	1000	1230
• Base-load current I_H	A	724	814	917	1136
• I_{max}	A	1185	1320	1500	1845
Type rating [1]					
• Based on I_{rated}	kW	800	900	1000	1200
• Based on I_H	kW	710	800	900	1000
Rated pulse frequency	kHz	1.25	1.25	1.25	1.25
DC link current I_d [2]	A	972	1092	1230	1524
DC link capacitance	µF	11100	14400	14400	19200
Current requirement					
• At 24 V DC, max.	A	1.25	1.4	1.4	1.4
• Fan supply with 690 V 2 AC, max.	A	2.74	2.74	2.74	2.74
Power loss	kW	11.5	11.7	13.2	16.0
Cooling air requirement	m^3/s (ft^3/s)	1.08 (38.1)	1.08 (38.1)	1.08 (38.1)	1.08 (38.1)
Sound pressure level L_{pA} (1 m)	dB	< 72	< 72	< 72	< 72
DC link connection DCP, DCN		Flat connector for busbar connection	Flat connector for busbar connection	Flat connector for busbar connection	Flat connector for busbar connection
Motor connection U2, V2, W2		Flat connector for M12 screw	Flat connector for M12 screw	Flat connector for M12 screw	Flat connector for M12 screw
• Conductor cross-section, max.	mm^2	4 × 240	4 × 240	4 × 240	6 × 240
PE connection		M12 screw	M12 screw	M12 screw	M12 screw
• Conductor cross-section, max.					
- PE1/GND	mm^2	1 × 240	1 × 240	1 × 240	1 × 240
- PE2/GND	mm^2	2 × 240	2 × 240	2 × 240	2 × 240
Motor brake connection		–	–	–	–
Motor cable length, max. (without external options)					
• Shielded	m (ft)	300 (984)	300 (984)	300 (984)	300 (984)
• Unshielded	m (ft)	450 (1476)	450 (1476)	450 (1476)	450 (1476)
Degree of protection		IP00	IP00	IP00	IP00
Dimensions					
• Width	mm (in)	704 (27.72)	704 (27.72)	704 (27.72)	704 (27.72)
• Height	mm (in)	1475 (58.07)	1475 (58.07)	1475 (58.07)	1475 (58.07)
• Depth	mm (in)	540 (21.26)	540 (21.26)	540 (21.26)	540 (21.26)
Frame size		JX	JX	JX	JX
Weight, approx.	kg (lb)	450 (992)	450 (992)	450 (992)	450 (992)

[1] Rated power of a standard asynchronous (induction) motor at 690 V 3 AC.

[2] Rated DC link current for dimensioning an external DC connection.
For DC link current calculation for dimensioning the Line Module, see chapter System description – Dimensioning.

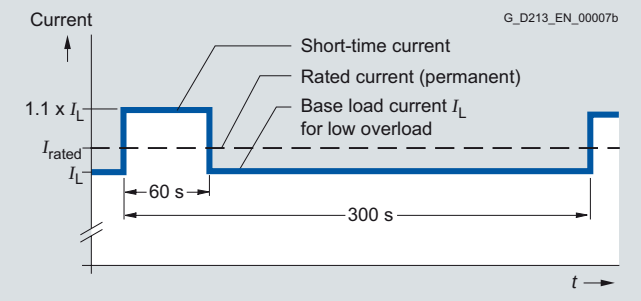
3

Characteristic curves

Overload capability

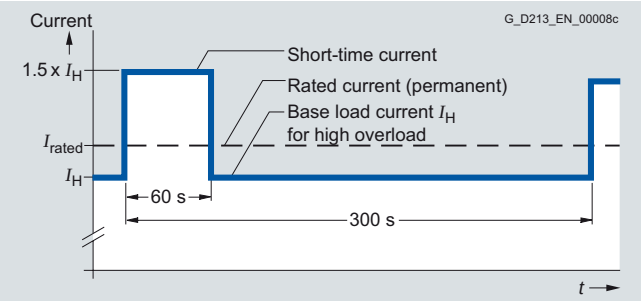
Load cycle data for Single Motor Modules in chassis format

The base-load current I_L is based on a load cycle of 110 % for 60 s with a load cycle period of 300 s.

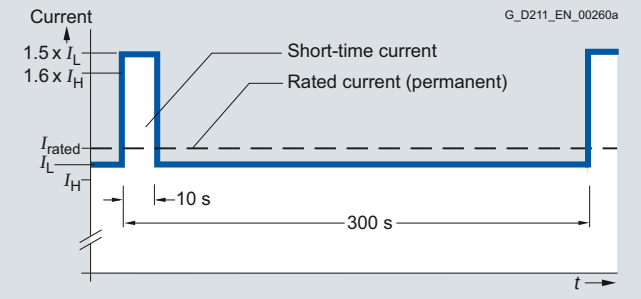


Low overload

The base-load current I_H is based on a load cycle of 150 % for 60 s or 160 % for 10 s with a load cycle period of 300 s.



High overload with 60 s peak load



High overload with 10 s peak load

Derating factors

When the pulse frequency is increased, the derating factor of the output current must be taken into account.

This derating factor must be applied to the currents specified in the technical specifications.

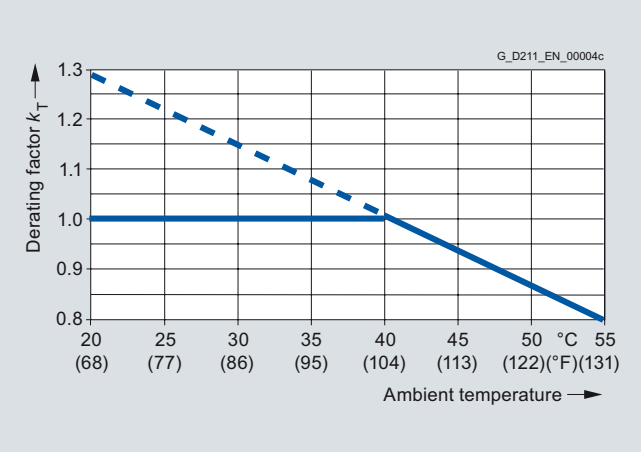
Derating factor of the output current dependent on pulse frequency for devices with a rated pulse frequency of 2 kHz

Single Motor Module in chassis format	Type rating	Output current	**Derating factor**	
Type		for a pulse frequency of 2 kHz	for a pulse frequency of 2.5 kHz	for a pulse frequency of 4 kHz
6SL3320- ...	kW (HP)	A		
DC link voltage 510 ... 720 V DC				
1TE32-1AA3	110 (150)	210	**0.95**	**0.82**
1TE32-6AA3	132 (200)	260	**0.95**	**0.83**
1TE33-1AA3	160 (250)	310	**0.97**	**0.88**
1TE33-8AA3	200 (300)	380	**0.96**	**0.87**
1TE35-0AA3	250 (400)	490	**0.94**	**0.78**

Derating factor of the output current dependent on pulse frequency for devices with a rated pulse frequency of 1.25 kHz

Single Motor Module in chassis format	Type rating	Output current	**Derating factor**
Type		for a pulse frequency of 1.25 kHz	for a pulse frequency of 2.5 kHz
6SL3320- ...	kW (HP)	A	
DC link voltage 510 ... 720 V DC			
1TE36-1AA3	315 (500)	605	**0.72**
1TE37-5AA3	400 (600)	745	**0.72**
1TE38-4AA3	450 (700)	840	**0.79**
1TE41-0AA3	560 (800)	985	**0.87**
1TE41-2AA3	710 (1000)	1260	**0.87**
1TE41-4AA3	800 (1150)	1405	**0.95**
DC link voltage 675 ... 1035 V DC			
1TG28-5AA3	75	85	**0.89**
1TG31-0AA3	90	100	**0.88**
1TG31-2AA3	110	120	**0.88**
1TG31-5AA3	132	150	**0.84**
1TG31-8AA3	160	175	**0.87**
1TG32-2AA3	200	215	**0.87**
1TG32-6AA3	250	260	**0.88**
1TG33-3AA3	315	330	**0.82**
1TG34-1AA3	400	410	**0.82**
1TG34-7AA3	450	465	**0.87**
1TG35-8AA3	560	575	**0.85**
1TG37-4AA3	710	735	**0.79**
1TG38-1AA3	800	810	**0.95**
1TG38-8AA3	900	910	**0.87**
1TG41-0AA3	1000	1025	**0.86**
1TG41-3AA3	1200	1270	**0.79**

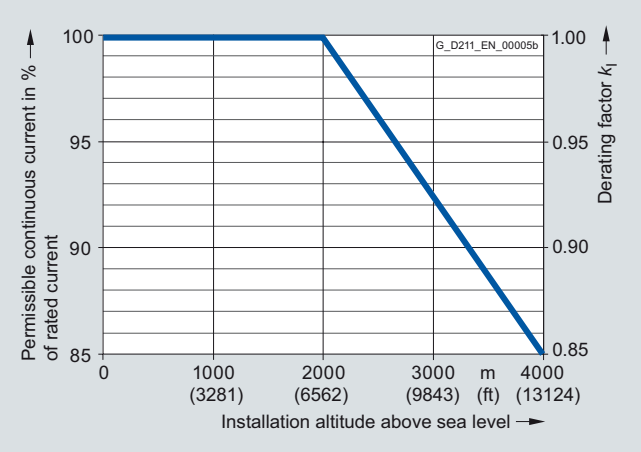
Characteristic curves (continued)



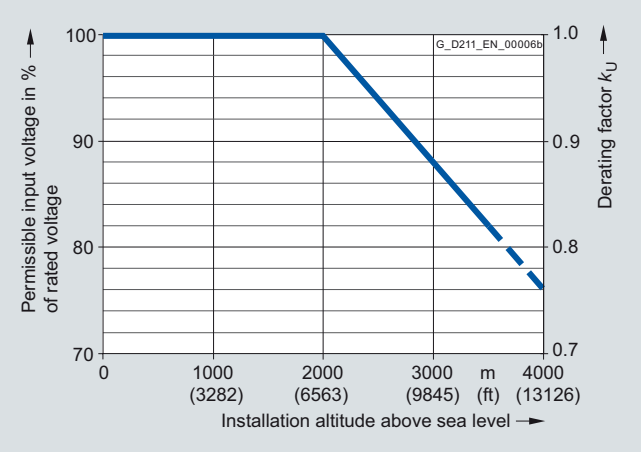
Current derating dependent on ambient temperature

Note: A derating factor k_T > 1.0 is to be taken into account only in conjunction with "current derating dependent on installation altitude".

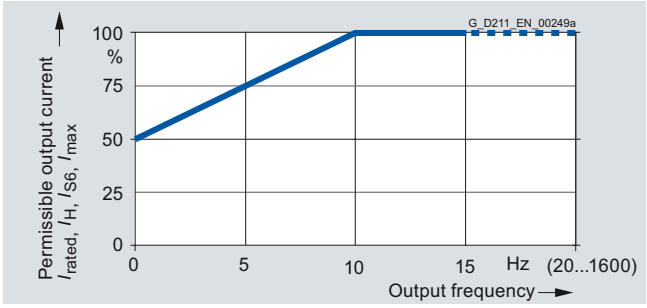
See also chapter System description – Dimensioning.



Current derating dependent on installation altitude



Voltage derating dependent on installation altitude



Current derating dependent on output frequency

Double Motor Modules in booksize compact format

Design

Double Motor Modules feature the following connections and interfaces as standard:

- 2 DC link connections via integrated DC link busbars
- 2 electronics power supply connections via integrated 24 V DC busbars
- 4 DRIVE-CLiQ sockets
- 2 motor connections via connector
- 2 safe standstill inputs (1 input per axis)
- 2 safe motor brake controllers
- 2 temperature sensor inputs (KTY84-130 or PTC)
- 3 PE (protective earth) connections

The status of the Motor Modules is indicated via two multi-color LEDs.

The shield of the motor cables is routed over the connectors to the motor connection.

The signal cable shield can be connected to the Motor Module by means of a shield connection terminal, e.g. Weidmüller type KLBÜ 3-8 SC.

The scope of supply of the Motor Modules includes:

- DRIVE-CLiQ cable for connecting to the adjacent Motor Module, length 0.16 m (6.3 in)
- 2 blanking plugs for sealing unused DRIVE-CLiQ sockets
- Jumper for connecting the 24 V DC busbar to the adjacent Motor Module
- Connectors X21 and X22
- Connectors X1 and X2 for motor connection
- 1 set of warning signs in 16 languages
- 1 heat conducting foil

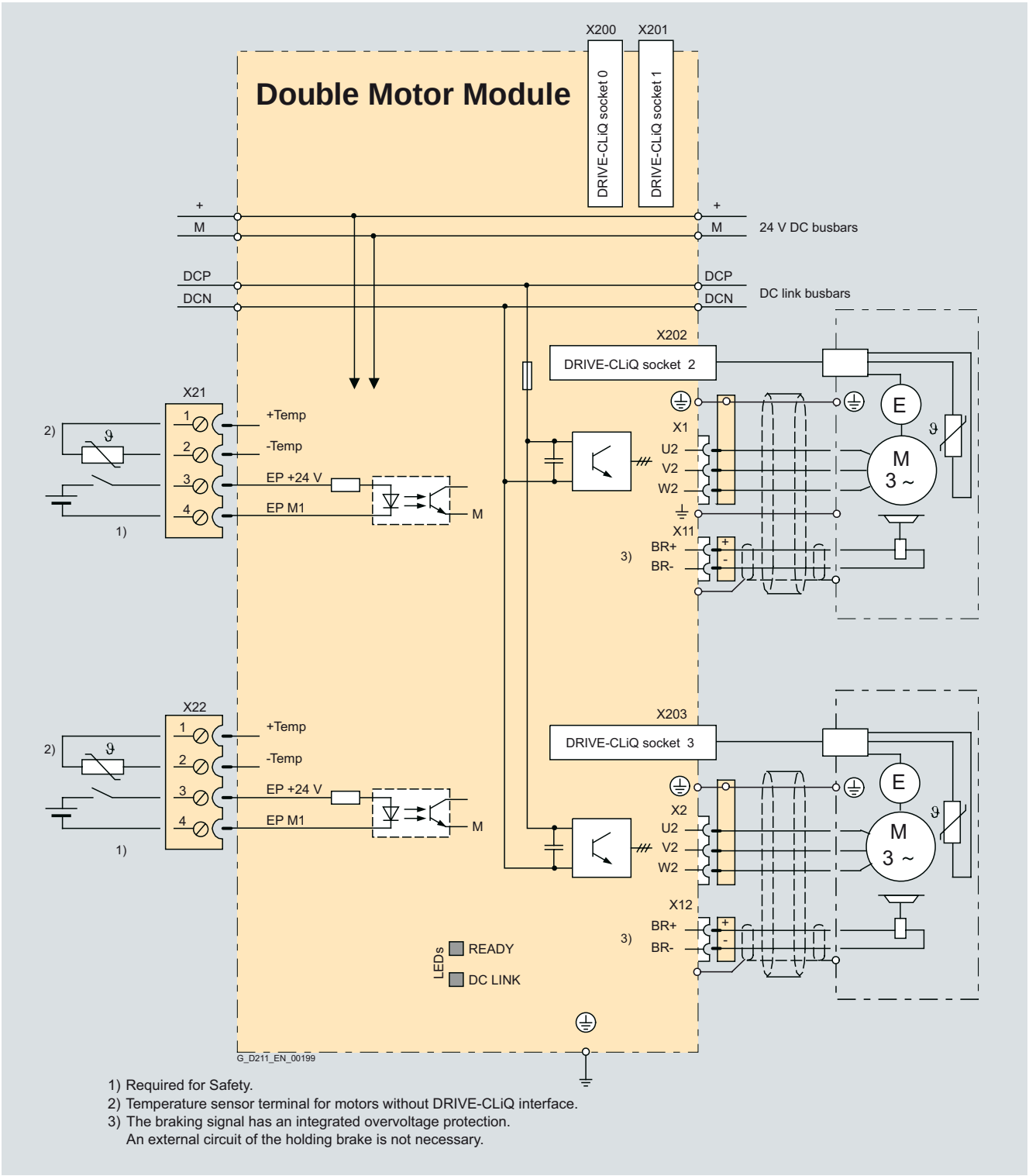
Selection and ordering data

Rated output current	Type rating	**Double Motor Module in booksize compact format** (Internal air cooling)
A	kW (HP) [1]	Order No.
DC link voltage 510 ... 720 V DC		
2 × 1.7 A	2 × 0.9 kW (2 × 0.75 HP)	**6SL3420-2TE11-7AA0**
2 × 3 A	2 × 1.6 kW (2 × 1.5 HP)	**6SL3420-2TE13-0AA0**
2 × 5 A	2 × 2.7 kW (2 × 3 HP)	**6SL3420-2TE15-0AA0**
Accessories		
DC link rectifier adapter For direct infeed of DC link voltage Screw-type terminals 0.5 ... 10 mm^2 For booksize format Line Modules and Motor Modules with a width of 50 mm (1.97 in) or 100 mm (3.94 in)		**6SL3162-2BD00-0AA0**
DC link adapter (2 units) For multi-tier configuration Screw-type terminals 35 ... 95 mm^2 For all Line Modules and Motor Modules in booksize format		**6SL3162-2BM01-0AA0**
24 V terminal adapter For all Line Modules and Motor Modules in booksize format		**6SL3162-2AA00-0AA0**
Accessories for re-ordering		
24 V jumper For connection of the 24 V busbars (for booksize format)		**6SL3162-2AA01-0AA0**
Spacing bolt (4 units) The mounting depth of modules in booksize compact format is increased when it is mounted on these spacing bolts by such an amount that it can be integrated into a drive line-up in booksize format. 2 spacing bolts are required to mount 50 mm (1.97 In) wide modules, and 4 spacing bolts for 75 mm (2.95 in) modules.		**6SL3462-1CC00-0AA0**
Warning labels in 16 languages This set of foreign language warning signs can be placed on top of the standard English or German signs. A set of signs is supplied with the units. One sign in each of the following languages is provided in each set: Chinese Simplified, Czech, Danish, Dutch, Finnish, French, Greek, Italian, Japanese, Korean, Polish, Portuguese/Brazilian, Russian, Spanish, Swedish, Turkish.		**6SL3166-3AB00-0AA0**
Dust-proof blanking plugs (50 units) For DRIVE-CLiQ port		**6SL3066-4CA00-0AA0**

[1] Nominal HP based on Asynchronous motors (induction motors). Match the motor nameplate current for specific sizing.

Integration

The Double Motor Module communicates with the Control Unit via DRIVE-CLiQ.



Connection example of Double Motor Modules in booksize compact format 2 × 3 A to 2 × 18 A

Double Motor Modules in booksize compact format

Technical specifications

Double Motor Module in booksize compact format 6SL3420-2TE1...	
DC link voltage (up to 2000 m (6562 ft) above sea level)	510 ... 720 V DC (line connection voltage 380 ... 480 V 3 AC) [1]
Output frequency	
• Control type Servo	0 … 650 Hz [2]
• Control type Vector	0 … 300 Hz [2]
• Control type *V/f*	0 … 600 Hz [2]
Electronics power supply	24 V DC -15 %/+20 %
Type of cooling	The devices are designed so that - Internal air cooling (power units with forced air cooling through built-in fans) or - Cold plate cooling is possible
Permissible ambient and coolant temperature (air) during operation for line-side components, Line Modules and Motor Modules	0 … 40 °C (32 … 104 °F) without derating, > 40 … 55 °C (104 … 131 °F) see derating characteristics
Installation altitude	Up to 1000 m (3281 ft) above sea level without derating, > 1000 ... 4000 m (3281 ... 13124 ft) above sea level, see derating characteristics
Conformity	CE (low-voltage and EMC Directives)
Approvals, according to	cURus
Safety Integrated	Safety Integrity Level 2 (SIL2) acc. to IEC 61508, Performance Level d (PLd) acc. to ISO 13849-1 and Control Category 3 acc. to ISO 13849-1 or EN 954-1 For further information see chapter Safety Integrated

[1] With firmware version V2.5 and higher with appropriate parameterization and reduced power rating also operable on 200 ... 240 V 3 AC networks in accordance with a DC link voltage of 270 ... 360 V DC.

[2] Note the correlation between max. output frequency, pulse frequency and current derating.
For further information see chapter System description – Dimensioning.

Technical specifications (continued)

DC link voltage 510 ... 720 V DC		Double Motor Module in booksize compact format		
• Internal air cooling/ cold plate cooling		6SL3420-2TE11-7AA0	6SL3420-2TE13-0AA0	6SL3420-2TE15-0AA0
Output current				
• Rated current I_{rated}	A	2 × 1.7	2 × 3	2 × 5
• For S6 duty (40 %) I_{S6}	A	2 × 2	2 × 3.5	2 × 6
• Base-load current I_H	A	2 × 1.5	2 × 2.6	2 × 4.3
• I_{max}	A	2 × 5.1	2 × 9	2 × 15
Type rating [1]				
• Based on I_{rated}	kW (HP)	2 × 0.9 (0.75)	2 × 1.6 (1.5)	2 × 2.7 (3)
• Based on I_H	kW (HP)	2 × 0.8 (0.5)	2 × 1.4 (1)	2 × 2.3 (2.5)
Rated pulse frequency	kHz	8	8	8
DC link current I_d [2]	A	4.1	7.2	12
Current carrying capacity				
• DC link busbars	A	100	100	100
• 24 V DC busbars [3]	A	20	20	20
DC link capacitance	µF	110	110	220
Current requirement At 24 V DC, max.	A	1	1	1
Power loss [4]				
• With internal air cooling in control cabinet	kW	0.11	0.13	0.19
• With cold plate cooling, int./ext.	kW	0.04/0.07	0.04/0.09	0.06/0.135
• Thermal resistance R_{th}	K/W	0.22	0.22	0.22
Cooling air requirement	m^3/s (ft^3/s)	0.008 (0.3)	0.008 (0.3)	0.008 (0.3)
Sound pressure level L_{pA} (1 m)	dB	< 60	< 60	< 60
Motor connection U2, V2, W2		2 connectors (X1, X2) with screw-type terminals	2 connectors (X1, X2) with screw-type terminals	2 connectors (X1, X2) with screw-type terminals
• Conductor cross-section	mm^2	0.2 … 6	0.2 … 6	0.2 … 6
Shield connection		Integrated in connector (X1, X2)	Integrated in connector (X1, X2)	Integrated in connector (X1, X2)
PE connection		M5 screw	M5 screw	M5 screw
Motor brake connection		Connector (X11, X12), 24 V DC, 2 A	Connector (X11, X12), 24 V DC, 2 A	Connector (X11, X12), 24 V DC, 2 A
Motor cable length, max.				
• Shielded	m (ft)	50 (164)	50 (164)	50 (164)
• Unshielded	m (ft)	75 (246)	75 (246)	75 (246)
Degree of protection		IP20	IP20	IP20
Dimensions				
• Width	mm (in)	50 (1.97)	75 (2.95)	75 (2.95)
• Height	mm (in)	270 (10.63)	270 (10.63)	270 (10.63)
• Depth		226 (8.90)	226 (8.90)	226 (8.90)
Weight, approx.	kg (lb)	3.4 (7.50)	3.4 (7.50)	3.4 (7.50)

[1] Rated power of a standard asynchronous (induction) motor at 600 V DC link voltage.

[2] Rated DC link current for dimensioning an external DC connection.
For DC link current calculation for dimensioning the Line Module, see chapter System description – Dimensioning.

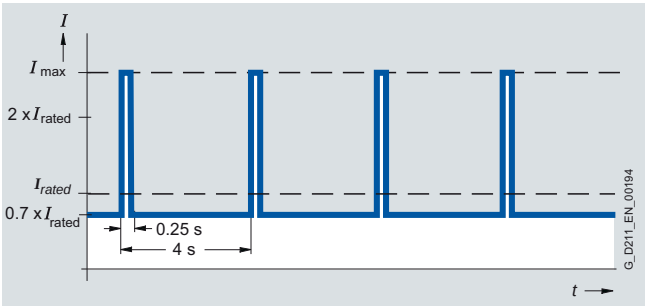
[3] If, due to a number of Line and Motor Modules being mounted side-by-side, the current carrying capacity exceeds 20 A, an additional 24-V-DC connection using a 24-V terminal adapter is required (max. cross section 6 mm^2, max. fuse protection 20 A).

[4] Power loss of Motor Module at rated power including losses of 24 V DC electronics power supply.

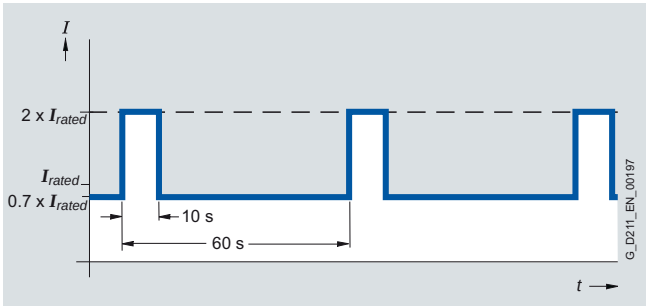
3

Characteristic curves

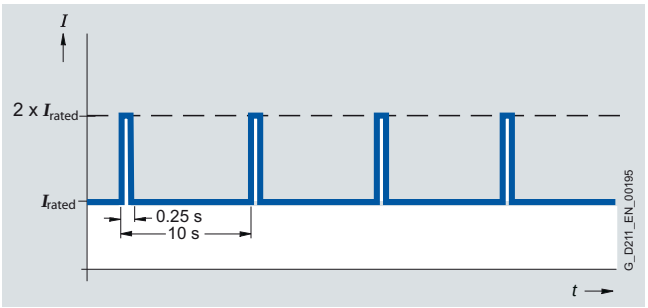
Overload capability



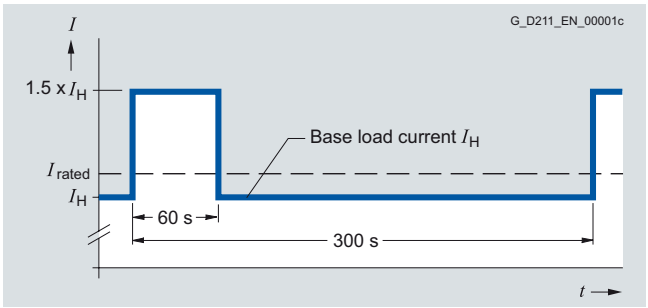
Maximum current duty cycle with previous load



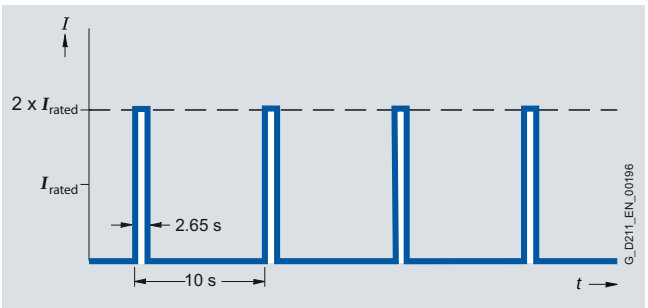
S6 load cycle with previous load with a load cycle period of 60 s



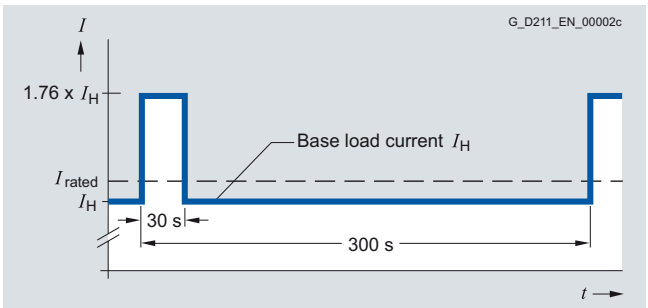
Load cycle with previous load



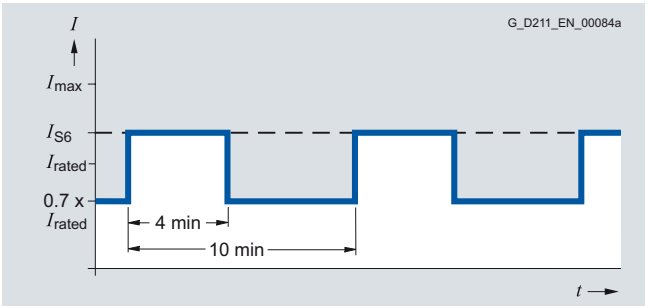
Load cycle with 60 s overload with a load cycle period of 300 s



Load cycle without previous load



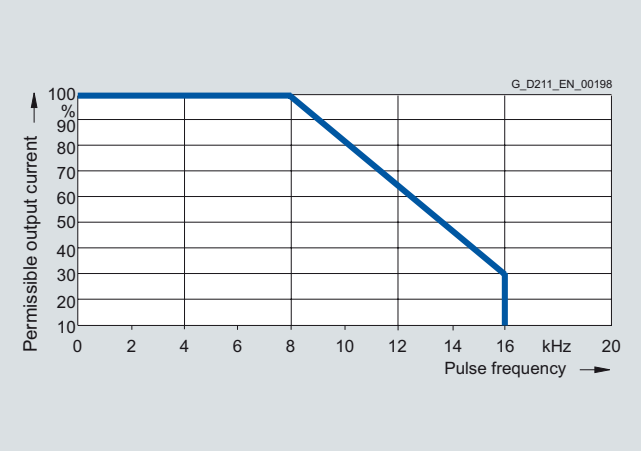
Load cycle with 30 s overload with a load cycle period of 300 s



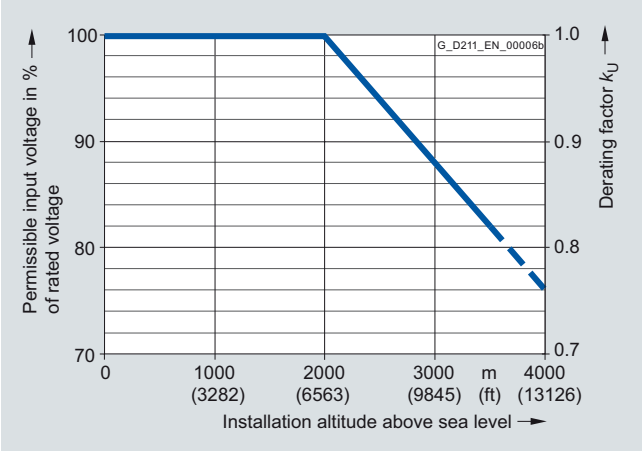
S6 load cycle with previous load with a load cycle period of 600 s

Characteristic curves (continued)

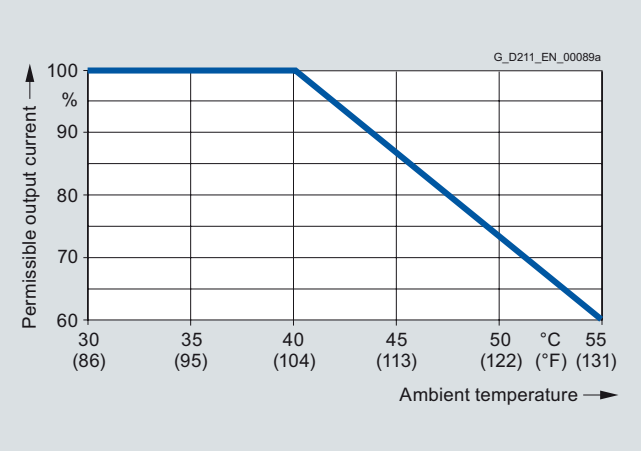
Derating characteristics



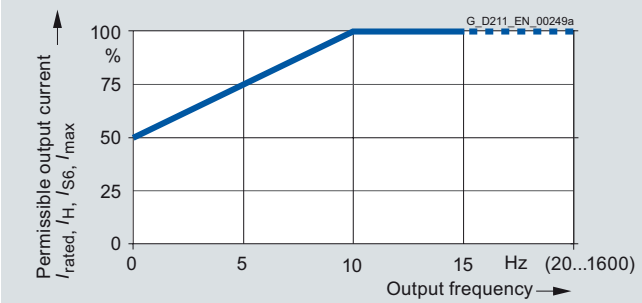
Output current dependent on pulse frequency



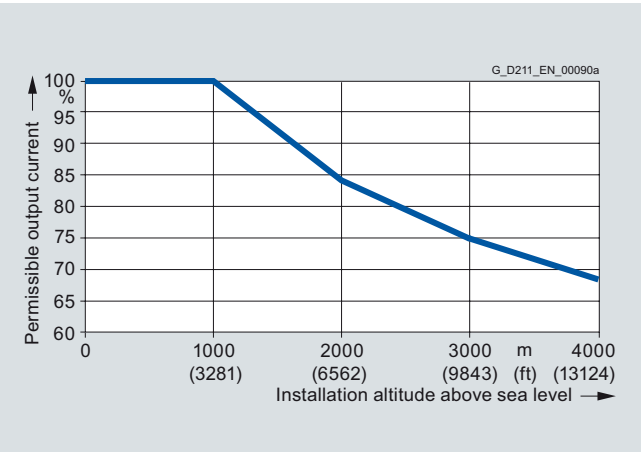
Voltage derating dependent on installation altitude



Output current dependent on ambient temperature



Current derating dependent on output frequency



Output current dependent on installation altitude

Double Motor Modules in booksize format

Design

Double Motor Modules feature the following connections and interfaces as standard:

- 2 DC link connections via integrated DC link busbars
- 2 electronics power supply connections via integrated 24 V DC busbars
- 4 DRIVE-CLiQ sockets
- 2 plug-in motor connections (not included in scope of supply)
- 2 safe standstill inputs (1 input per axis)
- 2 safe motor brake controllers
- 2 temperature sensor inputs (KTY84-130 or PTC)
- 3 PE (protective earth) connections

The status of the Motor Modules is indicated via two multi-color LEDs.

On Double Motor Modules, the motor cable shield can be connected in the connector.

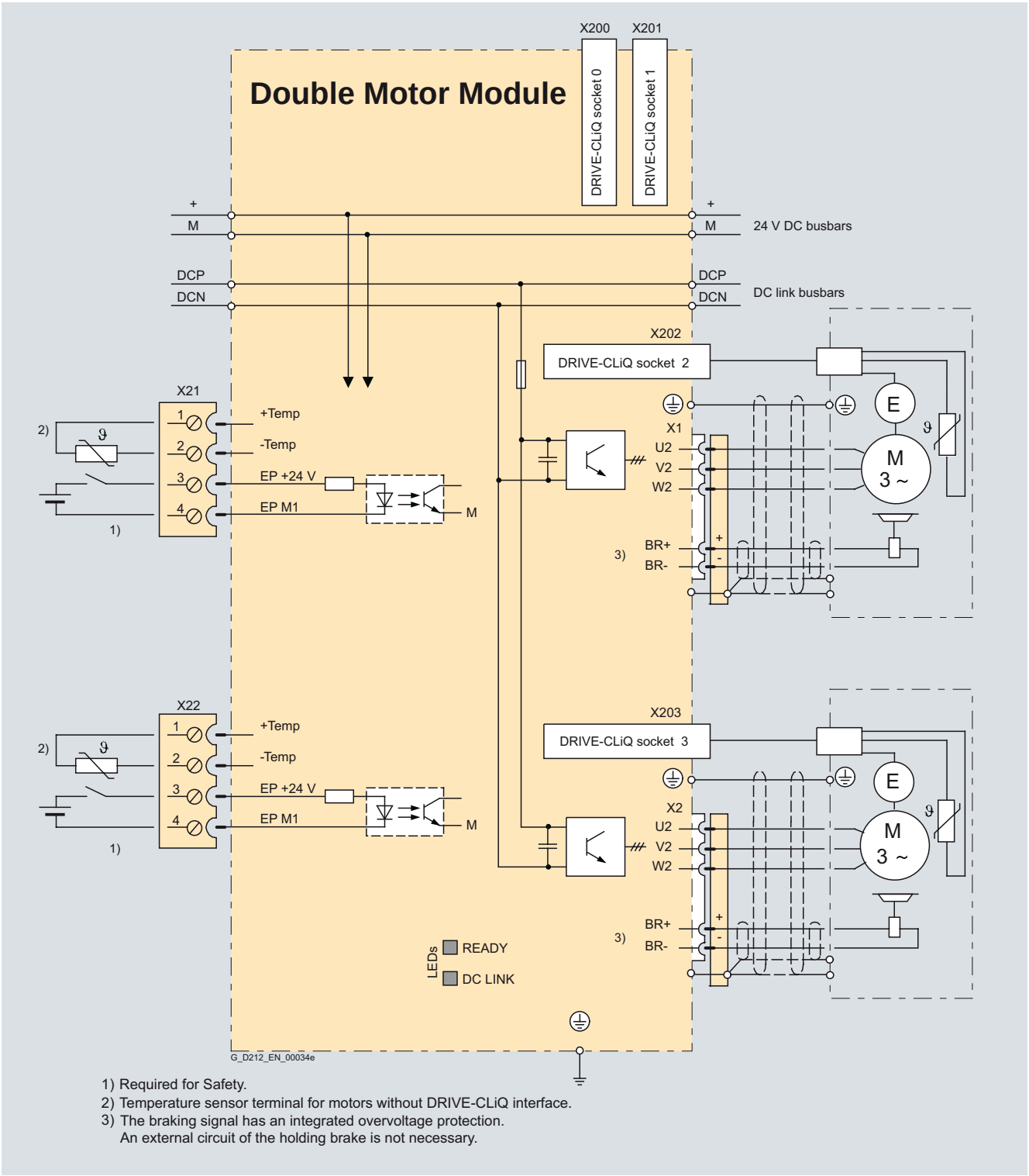
The signal cable shield can be connected to the Motor Module by means of a shield connection terminal, e.g. Weidmüller type KLBÜ 3-8 SC.

The scope of supply of the Motor Modules includes:

- DRIVE-CLiQ cable (length depends on module width) to connect Motor Module to adjacent Motor Module, length = motor module width + 0.06 m (2.4 in)
- 2 blanking plugs for sealing unused DRIVE-CLiQ sockets
- Jumper for connecting the 24 V DC busbar to the adjacent Motor Module
- Connectors X21 and X22
- 1 set of warning signs in foreign languages
- 1 heat conducting foil (for Double Motor Modules with cold plate cooling only)

Integration

The Double Motor Module communicates with the Control Unit via DRIVE-CLiQ.



Connection example of Double Motor Modules in booksize format 2 × 3 A to 2 × 18 A

Double Motor Modules in booksize format

Technical specifications

Double Motor Module in booksize format 6SL312...	
DC link voltage (up to 2000 m (6562 ft) above sea level)	510 ... 720 V DC (line connection voltage 380 ... 480 V 3 AC) [1]
Output frequency	
• Control type Servo	0 … 650 Hz [2]
• Control type Vector	0 … 300 Hz [2]
• Control type *V/f*	0 … 600 Hz [2]
Electronics power supply	24 V DC -15 %/+20 %
Type of cooling	- Internal air cooling, external air cooling, Power units with forced air cooling by built-in fans - Cold plate cooling
Permissible ambient and coolant temperature (air) during operation for line-side components, Line Modules and Motor Modules	0 … 40 °C (32 … 104 °F) without derating, > 40 … 55 °C (104 … 131 °F) see derating characteristics
Installation altitude	Up to 1000 m (3281 ft) above sea level without derating, > 1000 ... 4000 m (3281 ... 13124 ft) above sea level, see derating characteristics
Conformity	CE (low-voltage and EMC Directives)
Approvals, according to	cULus
Safety Integrated	Safety Integrity Level 2 (SIL2) acc. to IEC 61508, Performance Level d (PLd) acc. to ISO 13849-1 and Control Category 3 acc. to ISO 13849-1 or EN 954-1 For further information see chapter Safety Integrated.

[1] With firmware version V2.5 and higher with appropriate parameterization and reduced power rating also operable on 200 ... 240 V 3 AC networks in accordance with a DC link voltage of 270 ... 360 V DC.

[2] Note the correlation between max. output frequency, pulse frequency and current derating.
For further information see chapter System description – Dimensioning.

Technical specifications (continued)

DC link voltage 510 ... 720 V DC		Double Motor Module in booksize format			
• Internal air cooling	6SL3120-	2TE13-0AA3	2TE15-0AA3	2TE21-0AA3	2TE21-8AA3
• External air cooling	6SL3121-	2TE13-0AA3	2TE15-0AA3	2TE21-0AA3	2TE21-8AA3
• Cold plate cooling	6SL3126-	2TE13-0AA3	2TE15-0AA3	2TE21-0AA3	2TE21-8AA3
Output current					
• Rated current I_{rated}	A	2 × 3	2 × 5	2 × 9	2 × 18
• For S6 duty (40 %) I_{S6}	A	2 × 3.5	2 × 6	2 × 10	2 × 24
• Base-load current I_H	A	2 × 2.6	2 × 4.3	2 × 7.7	2 × 15.3
• I_{max}	A	2 × 6	2 × 10	2 × 18	2 × 36
Type rating [1]					
• Based on I_{rated}	kW (HP)	2 × 1.6 (1.5)	2 × 2.7 (3)	2 × 4.8 (5)	2 × 9.7 (10)
• Based on I_H	kW (HP)	2 × 1.4 (1)	2 × 2.3 (2.5)	2 × 4.1 (5)	2 × 8.2 (10)
DC link current I_d [2]	A	7.2	12	22	43
Current carrying capacity					
• DC link busbars	A	100	100	100	100
• 24 V DC busbars [3]	A	20	20	20	20
DC link capacitance	µF	110	220	220	705
Current requirement At 24 V DC, max.	A	1.0	1.0	1.0	1.0
Internal/external air cooling					
• Power loss [4]					
- With internal air cooling in control cabinet	kW	0.095	0.13	0.185	0.345
- With external air cooling, int./ext.	kW	0.06/0.035	0.07/0.06	0.09/0.095	0.105/0.24
• Cooling air requirement	m^3/s (ft^3/s)	0.008 (0.3)	0.008 (0.3)	0.008 (0.3)	0.016 (0.6)
• Sound pressure level L_{pA} (1 m)	dB	< 60	< 60	< 60	< 60
Cold plate cooling					
• Power loss, int./ext. [4]	kW (HP)	0.055/0.035	0.06/0.065	0.08/0.1	0.095/0.25
• Thermal resistance R_{th}	K/W	0.185	0.185	0.185	0.075
Motor connection U2, V2, W2		2 × connectors (X1, X2)[5], max. 30 A	2 × connectors (X1, X2)[5], max. 30 A	2 × connectors (X1, X2)[5], max. 30 A	2 × connectors (X1, X2)[5], max. 30 A
Shield connection		Integrated in connector (X1, X2)	Integrated in connector (X1, X2)	Integrated in connector (X1, X2)	Integrated in connector (X1, X2)
PE connection		M5 screw	M5 screw	M5 screw	M5 screw
Motor brake connection		Integrated into the plug-in motor connector (X1, X2), 24 V DC, 2 A	Integrated into the plug-in motor connector (X1, X2), 24 V DC, 2 A	Integrated into the plug-in motor connector (X1, X2), 24 V DC, 2 A	Integrated into the plug-in motor connector (X1, X2), 24 V DC, 2 A
Motor cable length, max.					
• Shielded/Unshielded	m (ft)	50/75 (164/246)	50/75 (164/246)	50/75 (164/246)	70/100 (230/328)
Degree of protection		IP20	IP20	IP20	IP20
Dimensions					
• Width	mm (in)	50 (1.97)	50 (1.97)	50 (1.97)	100 (3.94)
• Height	mm (in)	380 (14.96)	380 (14.96)	380 (14.96)	380 (14.96)
• Depth					
- With internal air cooling	mm (in)	270 (10.63)	270 (10.63)	270 (10.63)	270 (10.63)
- With external air cooling, on/behind mounting surface	mm (in)	226/66.5 (8.90/2.63)	226/66.5 (8.90/2.63)	226/66.5 (8.90/2.63)	226/66.5 (8.90/2.63)
- With cold plate cooling	mm (in)	226 (8.90)	226 (8.90)	226 (8.90)	226 (8.90)
Weight, approx.					
• With internal air cooling	kg (lb)	5.3 (11.7)	5.3 (11.7)	5.3 (11.7)	6.8 (15)
• With external air cooling	kg (lb)	5.8 (12.8)	5.8 (12.8)	5.8 (12.8)	8.6 (19)
• With cold plate cooling	kg (lb)	4.5 (9.92)	4.5 (9.92)	4.5 (9.92)	5.9 (13)

[1] Rated power of a standard asynchronous (induction) motor at 600 V DC link voltage.

[2] Rated DC link current for dimensioning an external DC connection.
For DC link current calculation for dimensioning the Line Module, see chapter System description – Dimensioning.

[3] If, due to a number of Line and Motor Modules being mounted side-by-side, the current carrying capacity exceeds 20 A, an additional 24 V DC connection using a 24 V terminal adapter is required (max. cross section 6 mm^2, max. fuse protection 20 A).

[4] Power loss of Motor Module at rated power including losses of 24 V DC electronics power supply.

[5] Connector not included in scope of supply, see Accessories.

Double Motor Modules in booksize format

Selection and ordering data

Rated output current	Type rating	Double Motor Module in booksize format		
		Internal air cooling	External air cooling	Cold plate cooling
A	kW (HP) [1]	Order No.	Order No.	Order No.
DC link voltage 510 ... 720 V DC				
2 × 3	2 × 1.6 (2 × 1.5)	**6SL3120-2TE13-0AA3**	**6SL3121-2TE13-0AA3**	**6SL3126-2TE13-0AA3**
2 × 5	2 × 2.7 (2 × 3)	**6SL3120-2TE15-0AA3**	**6SL3121-2TE15-0AA3**	**6SL3126-2TE15-0AA3**
2 × 9	2 × 4.8 (2 × 5)	**6SL3120-2TE21-0AA3**	**6SL3121-2TE21-0AA3**	**6SL3126-2TE21-0AA3**
2 × 18	2 × 9.7 (2 × 10)	**6SL3120-2TE21-8AA3**	**6SL3121-2TE21-8AA3**	**6SL3126-2TE21-8AA3**

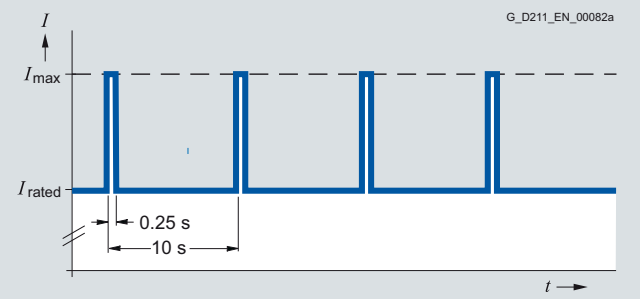
Description	Order No.
Accessories	
Power connector (X1/X2) At Motor Module end, with screw-type terminals 1.5 ... 10 mm^2 For Motor Modules with a rated output current of 3 ... 30 A	**6SL3162-2MA00-0AA0**
DC link rectifier adapter For direct infeed of DC link voltage Screw-type terminals 0.5 ... 10 mm^2 For booksize format Line/Motor Modules with a width of 50 mm (1.97 in) or 100 mm (3.94 in)	**6SL3162-2BD00-0AA0**
DC link adapter (2 units) For multi-tier configuration Screw-type terminals 35 ... 95 mm^2 For all Line Modules and Motor Modules in booksize format	**6SL3162-2BM01-0AA0**
24 V terminal adapter For all Line Modules and Motor Modules in booksize format	**6SL3162-2AA00-0AA0**

Description	Order No.
Accessories for re-ordering	
24 V jumper For connection of the 24 V busbars (for booksize format)	**6SL3162-2AA01-0AA0**
DC link busbar kit (reinforced) For replacement of DC link busbars for 5 modules in booksize format	
• 50 mm (3.94 in) wide	**6SL3162-2DB00-0AA0**
• 100 mm (3.94 in) wide	**6SL3162-2DD00-0AA0**
Warning labels in 16 languages This set of foreign language warning signs can be placed on top of the standard English or German signs. A set of signs is supplied with the units. One sign in each of the following languages is provided in each set: Chinese Simplified, Czech, Danish, Dutch, Finnish, French, Greek, Italian, Japanese, Korean, Polish, Portuguese/Brazilian, Russian, Spanish, Swedish, Turkish.	**6SL3166-3AB00-0AA0**
Dust-proof blanking plugs (50 units) For DRIVE-CLiQ port	**6SL3066-4CA00-0AA0**

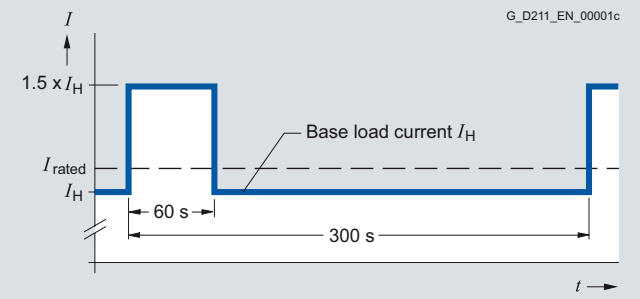
[1] Nominal HP based on Asynchronous motors (induction motors). Match the motor nameplate current for specific sizing.

Characteristic curves

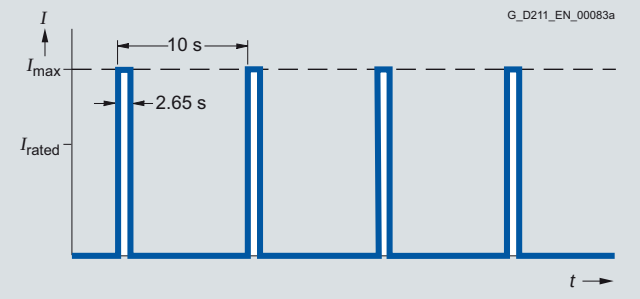
Overload capability



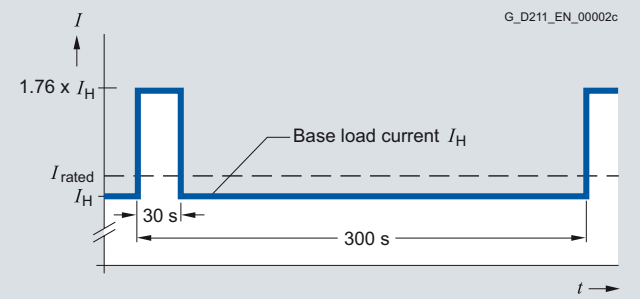
Load cycle with previous load



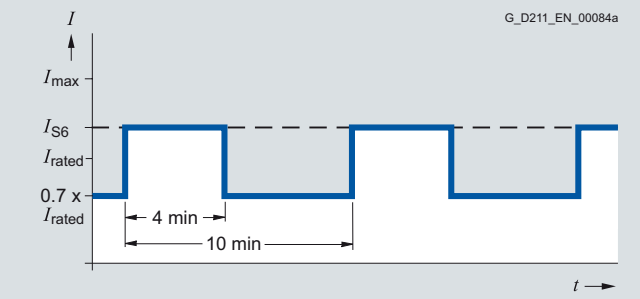
Load cycle with 60 s overload with a load cycle period of 300 s



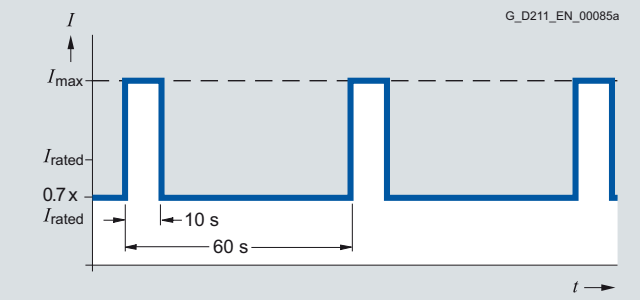
Load cycle without previous load



Load cycle with 30 s overload with a load cycle period of 300 s



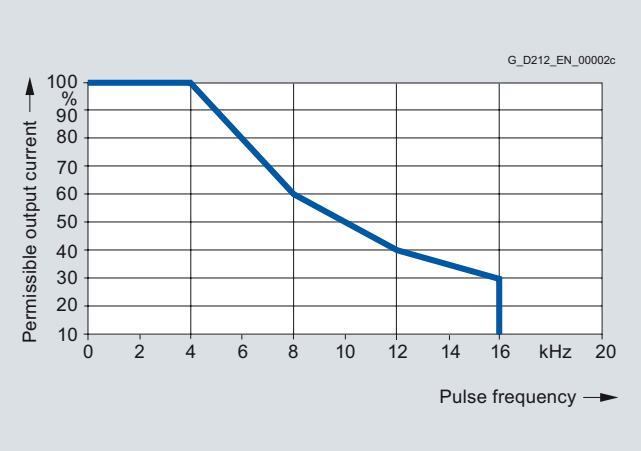
S6 load cycle with previous load with a load cycle period of 600 s



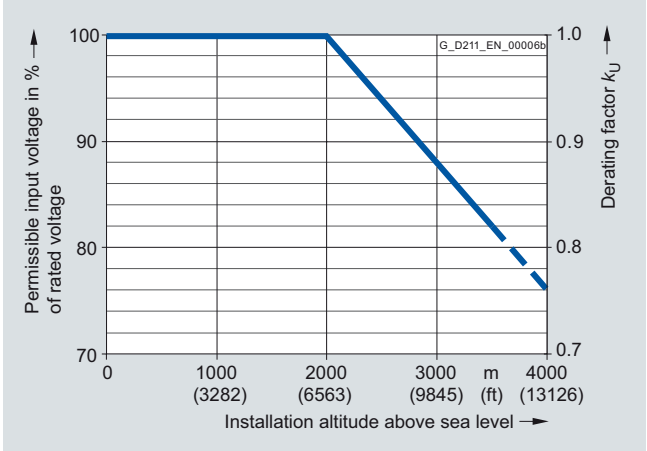
S6 load cycle with previous load with a load cycle period of 60 s

Characteristic curves (continued)

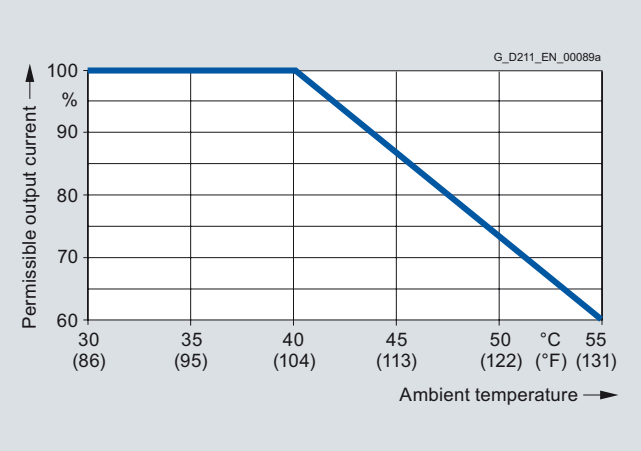
Derating characteristics



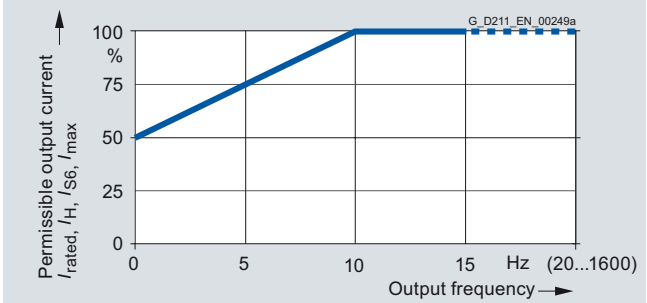
Output current dependent on pulse frequency



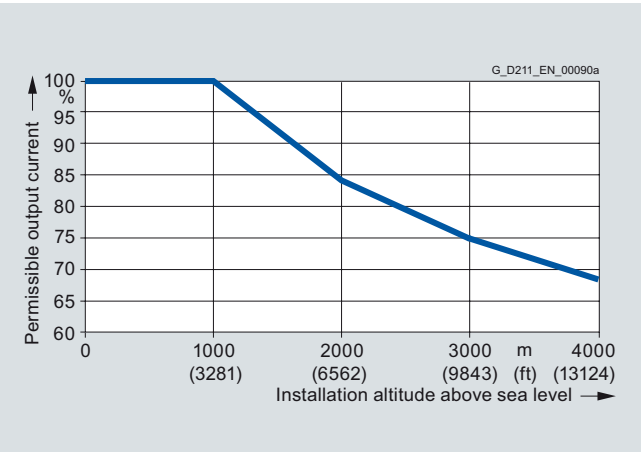
Voltage derating dependent on installation altitude



Output current dependent on ambient temperature



Current derating dependent on output frequency



Output current dependent on installation altitude

Braking Module in booksize compact format

Overview

A Braking Module and the matching external braking resistor are required to bring drives to a controlled standstill in the event of a power failure (e.g. emergency retraction or EMERGENCY STOP category 1) or limit the DC link voltage for brief periods of generator operation, e.g. when the regenerative feedback capability of the Line Module is deactivated. The Braking Module includes the power electronics and the associated control circuit. During operation, the DC link energy is converted to heat loss in an external braking resistor. Braking Modules function autonomously. A number of Braking Modules can be operated in parallel. In this case, each Braking Module must have its own braking resistor. Braking Modules in booksize compact format can also be used for rapid discharge of the DC link.

Design

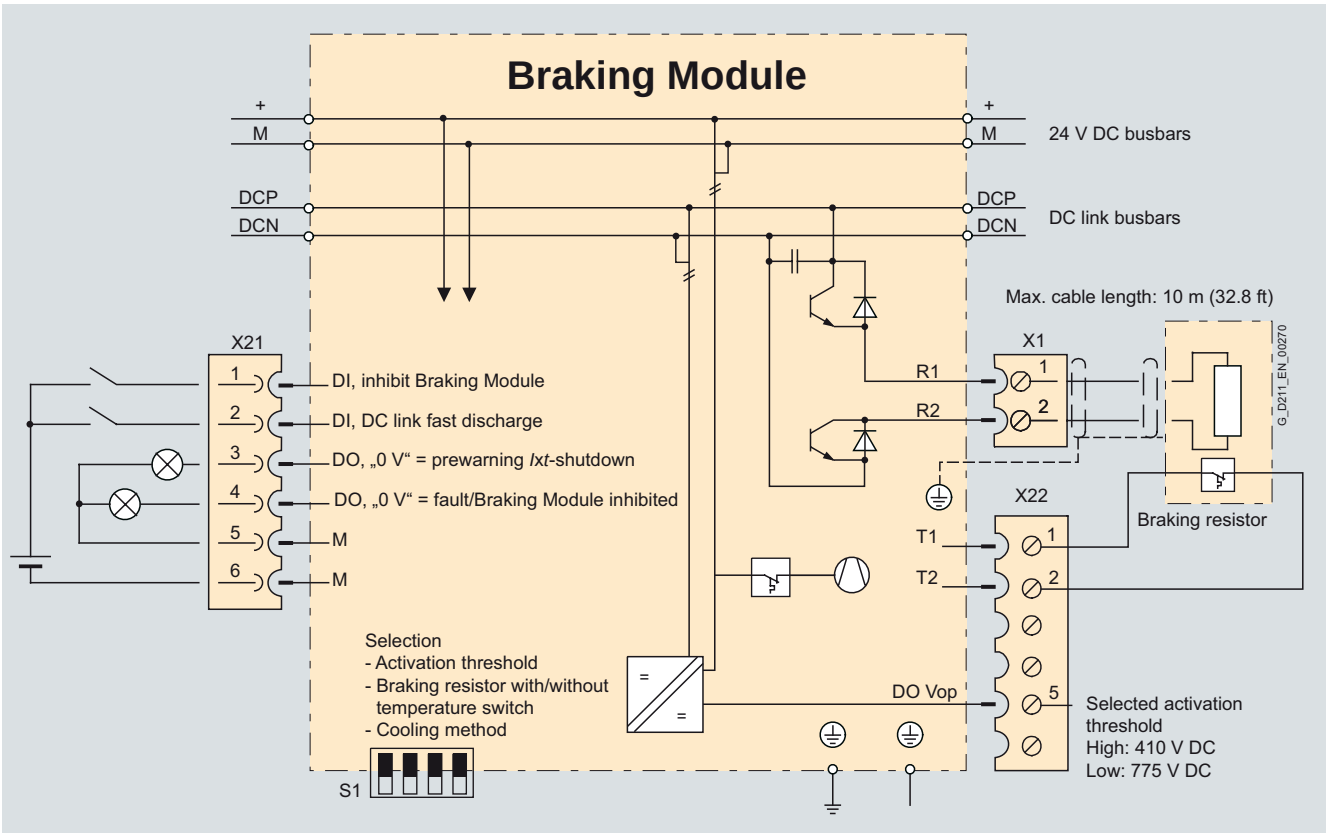
The Braking Modules in booksize compact format can be integrated in drive line-ups in booksize and booksize compact formats with internal air cooling and cold plate cooling.

The Braking Module in booksize compact format features the following connections and interfaces as standard:

- 2 DC link connections via integrated DC link busbars
- 2 electronics power supply connections via integrated 24 V DC busbars
- Connector X1 for connecting the braking resistor
- Connection for thermostatic switch for monitoring the braking resistor
- 4 DIP switches for setting the operating threshold, selecting the braking resistor and the cooling method for the Braking Module
- 2 digital inputs (disable Braking Module/acknowledge faults and rapid discharge of DC link)
- 3 digital outputs (Braking Module disabled, prewarning from $I \times t$ monitor and set activation threshold)
- 2 PE (protective earth) connections

The status of the Braking Module is indicated via two 2-color LEDs.

Integration



Connection example of Braking Module in booksize compact format

Braking Module in booksize compact format

Technical specifications

DC link voltage 510 … 720 V DC	**Braking Module in booksize compact format** (Internal air cooling)
	6SL3100-1AE23-5AA0
Rated power P_{DB}	5 kW (2.5 kW) [1) 2)]
Peak output P_{max}	100 kW (50 kW) [1) 2)]
Activation threshold	775 V (410 V) [1)]
Cable length to braking resistor, max.	10 m (32.8 ft)
DC link capacitance	6 µF
Current requirement with 24 V DC, max.	0.5 A
Digital inputs In accordance with IEC 61131-2 Type 1	
• Voltage	-3 V … +30 V
• Low level (an open digital input is interpreted as "low")	-3 V … +5 V
• High level	15 … 30 V
• Current consumption at 24 V DC, typ.	10 mA
• Conductor cross-section, max.	1.5 mm^2
Digital outputs (sustained-short-circuit-proof)	
• Voltage	24 V DC
• Load current per digital output, max.	100 mA
• Conductor cross-section, max.	1.5 mm^2
Current carrying capacity	
• 24 V DC busbars	20 A
• DC link busbars	100 A
PE connection	M5 screw
Dimensions	
• Width	50 mm (1.97 in)
• Height	270 mm (10.63 in)
• Depth	226 mm (8.90 in)
Weight, approx.	5 kg (11 lb)
Approvals, according to	cURus

Selection and ordering data

Description	Order No.
DC link voltage 510 … 720 V DC	
Braking Module in booksize compact format	**6SL3100-1AE23-5AA0**
Accessories for re-ordering	
Warning labels in 16 languages This set of foreign language warning signs can be placed on top of the standard English or German signs. A set of signs is supplied with the units. One sign in each of the following languages is provided in each set: Chinese Simplified, Czech, Danish, Dutch, Finnish, French, Greek, Italian, Japanese, Korean, Polish, Portuguese/Brazilian, Russian, Spanish, Swedish, Turkish.	**6SL3166-3AB00-0AA0**
Spacing bolt (4 units) The mounting depth of modules in booksize compact format is increased when it is mounted on these spacing bolts by such an amount that it can be integrated into a drive line-up in booksize format. 2 spacing bolts are needed to mount 50 mm (1.97 in) wide modules	**6SL3462-1CC00-0AA0**

1) The activation threshold of the Braking Module in booksize compact format can be set on a DIP switch. The higher values for peak or rated braking power apply in operation at the upper activation threshold 775 V DC (factory setting). The outputs specified in parentheses are possible at the lower activation threshold 410 V DC.

2) Several Braking Modules can be operated in parallel, typically up to 4 Modules.

Braking Module in booksize format

Overview

A Braking Module and the matching external braking resistor are required to bring drives to a controlled standstill in the event of a power failure (e.g. emergency retraction or EMERGENCY OFF category 1) or limit the DC link voltage for brief periods of generator operation, e.g. when the regenerative feedback capability of the Line Module is deactivated. The Braking Module houses the power electronics and the associated control circuit. During operation, the DC link energy is converted to heat loss in an external braking resistor. Braking Modules function autonomously. A number of braking modules can be operated in parallel. In this case, each Braking Module must have its own braking resistor.

Braking Modules in booksize format can also be used for rapid discharge of the DC link.

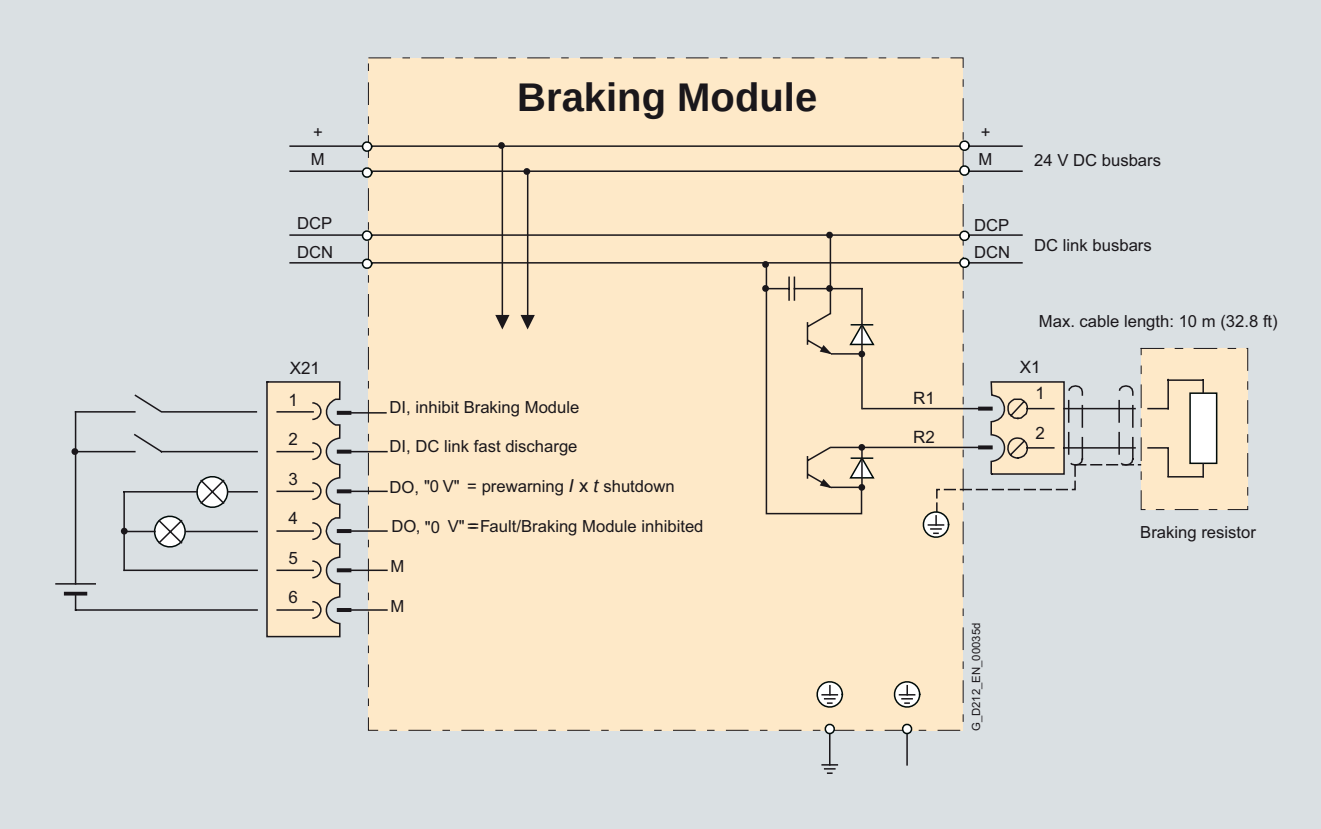
Design

The Braking Module in booksize format features the following connections and interfaces as standard:

- 2 DC link connections via integrated DC link busbars
- 2 electronics power supply connections via integrated 24 V DC bars
- Terminals for connecting the braking resistor
- 2 digital inputs (disable Braking Module/acknowledge faults and rapid discharge of DC link)
- 2 digital outputs (Braking Module disabled and prewarning – $I \times t$ monitoring)
- 2 PE (protective earth) connections

The status of the Braking Module is indicated via two 2-color LEDs.

Integration



Connection example of Braking Module in booksize format

Braking Module in booksize format

Technical specifications

DC link voltage 510 ... 720 V DC	**Braking Module in booksize format** (Internal air cooling)
	6SL3100-1AE31-0AB0
Rated power P_{DB}	1.5 kW [1]
Peak output P_{max}	100 kW [1]
Activation threshold	770 V
Cable length to braking resistor, max.	10 m (32.81 ft)
DC link capacitance	110 µF
Current requirement with 24 V DC, max.	0.5 A
Digital inputs In accordance with IEC 61131-2 Type 1	
• Voltage	-3 V … +30 V
• Low level (an open digital input is interpreted as "low")	-3 V … +5 V
• High level	15 … 30 V
• Current consumption at 24 V DC, typ.	10 mA
• Conductor cross-section, max.	1.5 mm^2
Digital outputs (sustained-short-circuit-proof)	
• Voltage	24 V DC
• Load current per digital output, max.	100 mA
• Conductor cross-section, max.	1.5 mm^2
Current carrying capacity	
• 24 V DC busbars	20 A
• DC link busbars	100 A
PE connection	M5 screw
Dimensions	
• Width	50 mm (1.97 in)
• Height	380 mm (14.96 in)
• Depth, with spacer (included in scope of supply)	270 mm (10.63 in)
Weight, approx.	4.1 kg (9 lb)
Approvals, according to	cURus

Selection and ordering data

Description	Order No.
DC link voltage 510 ... 720 V DC	
Braking Module in booksize format 1.5 kW/100 kW	**6SL3100-1AE31-0AB0**
Accessories for re-ordering	
Warning labels in 16 languages This set of foreign language warning signs can be placed on top of the standard English or German signs. A set of signs is supplied with the units. One sign in each of the following languages is provided in each set: Chinese Simplified, Czech, Danish, Dutch, Finnish, French, Greek, Italian, Japanese, Korean, Polish, Portuguese/Brazilian, Russian, Spanish, Swedish, Turkish.	**6SL3166-3AB00-0AA0**

[1] Several Braking Modules can be operated in parallel, typically up to 4 Modules.

Overview

A Braking Module and the matching external braking resistor are required to bring drives to a controlled standstill in the event of a power failure (e.g. emergency retraction or EMERGENCY STOP) or limit the DC link voltage for brief periods of generator operation, e.g. when the regenerative feedback capability of the Line Module is deactivated. The Braking Module houses the power electronics and the associated control circuit. During operation, the DC link energy is converted to power loss in an external braking resistor. Braking Modules function autonomously. A number of braking modules can be operated in parallel. In this case, each Braking Module must have its own braking resistor.

Braking Modules in chassis format are inserted in a mounting location inside the Motor Modules, Line Modules or Power Modules and are cooled by the fans on these modules. The supply voltage for the electronics is drawn from the DC link. The Braking Modules are connected to the DC link by means of the busbar sets and flexible cables, which are supplied as standard, and in the case of the Basic Line Modules of frame size GB, by means of a separate molded cable set (see accessories).

The activation threshold of the Braking Module can be adjusted by means of a DIP switch. The braking power values specified in the technical specifications apply to the upper activation threshold.

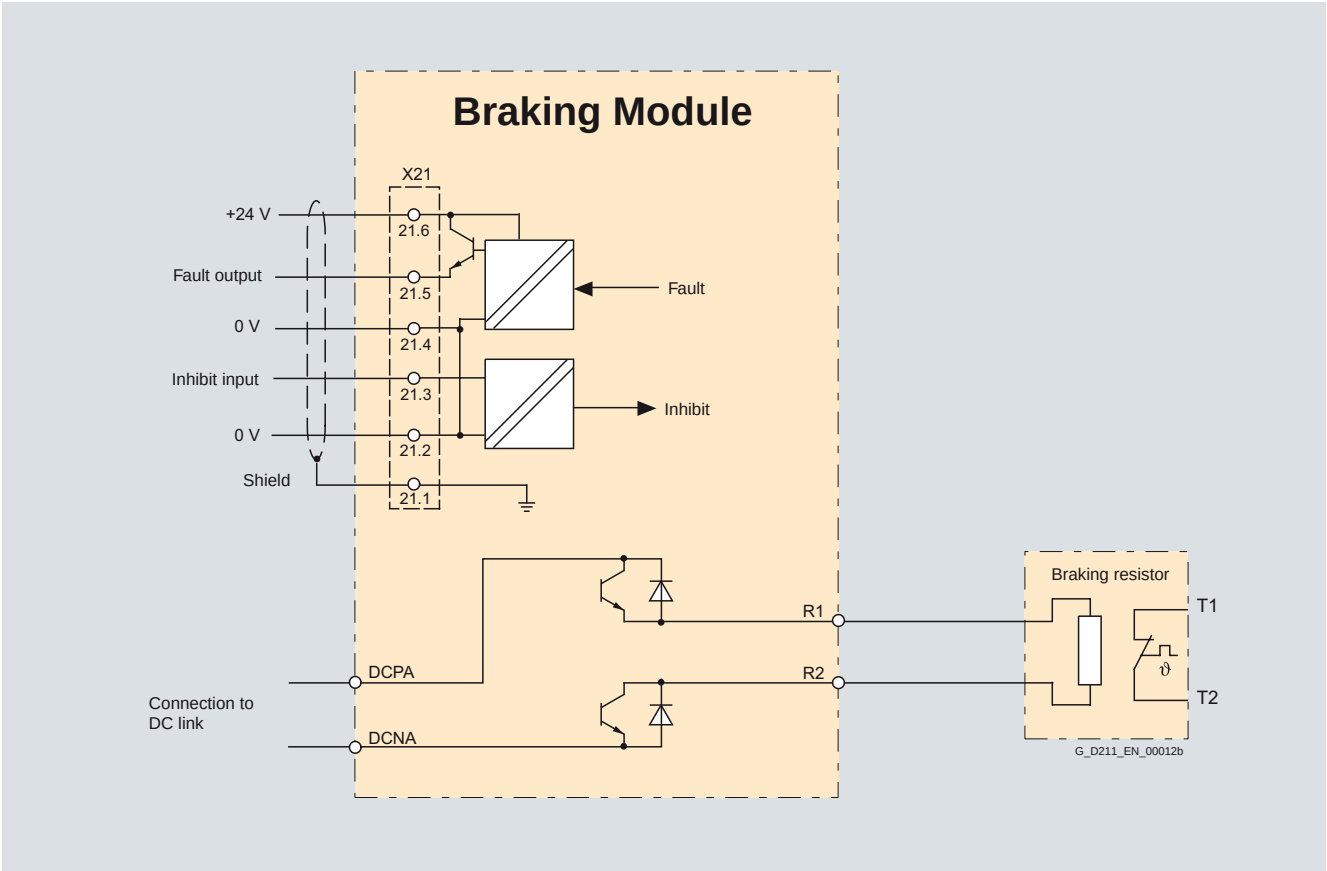
Design

The Braking Modules in chassis format feature the following connections and interfaces as standard:

- 1 DC link connection
- 1 braking resistor connection
- 1 digital input (inhibit Braking Module/acknowledge error)
- 1 digital output (Braking Module inhibited)
- 1 DIP switch for adjusting the application threshold

Integration

Braking Modules in chassis format are designed for mounting in air-cooled units in chassis format. The fan of the Line Module, Motor Module or Power Module in which the Braking Module is mounted also cools the Braking Module. Braking Modules cannot operate autonomously because they are not equipped with cooling fans.



Connection example of chassis format Braking Module

Braking Modules in chassis format

Technical specifications

DC link voltage 510 ... 720 V DC		Braking Module in chassis format		
		6SL3300-1AE31-3AA0	6SL3300-1AE32-5AA0	6SL3300-1AE32-5BA0
Power				
• Rated power P_{DB}	kW	25	50	50
• Peak output P_{15}	kW	125	250	250
• Power P_{20}	kW	100	200	200
• Power P_{40}	kW	50	100	100
Activation thresholds (adjustable via DIP switch)	V	774 (factory setting) or 673	774 (factory setting) or 673	774 (factory setting) or 673
Cable length to braking resistor, max.	m (ft)	100 (328)	100 (328)	100 (328)
Digital inputs In accordance with IEC 61131-2 Type 1				
• Voltage	V	-3 … +30	-3 … +30	-3 … +30
• Low level (an open digital input is interpreted as "low")	V	-3 … +5	-3 … +5	-3 … +5
• High level	V	15 … 30	15 … 30	15 … 30
• Current consumption at 24 V DC, typ.	mA	10	10	10
• Conductor cross-section, max.	mm^2	1.5	1.5	1.5
Digital outputs (sustained-short-circuit-proof)				
• Voltage	V	DC 24	DC 24	DC 24
• Load current per digital output, max.	mA	500	500	500
• Conductor cross-section, max.	mm^2	1.5	1.5	1.5
Connection R1/R2		M8 screw	M8 screw	M8 screw
• Conductor cross-section, max.	mm^2	35	50	50
Weight, approx.	kg (lb)	3.6 (8)	7.3 (16)	7.5 (17)
Approvals, according to		cURus	cURus	cURus
Suitable for installation in an air-cooled Motor Module Power Module, Active Line Module or Basic Line Module	Frame size	FX/FB	GX/GB [1)]	HX/JX

[1)] Cable harness set 6SL3366-2NG00-0AA0 is required to connect the Braking Module to a Basic Line Module of frame size GB.

Technical specifications (continued)

DC link voltage 675 ... 900 V DC		Braking Module in chassis format		
		6SL3300-1AF31-3AA0	6SL3300-1AF32-5AA0	6SL3300-1AF32-5BA0
Power				
• Rated power P_{DB}	kW	25	50	50
• Peak output P_{15}	kW	125	250	250
• Power P_{20}	kW	100	200	200
• Power P_{40}	kW	50	100	100
Activation thresholds (adjustable via DIP switch)	V	967 (factory setting) or 841	967 (factory setting) or 841	967 (factory setting) or 841
Cable length to braking resistor, max.	m (ft)	100 (328)	100 (328)	100 (328)
Digital inputs In accordance with IEC 61131-2 Type 1				
• Voltage	V	-3 … +30	-3 … +30	-3 … +30
• Low level (an open digital input is interpreted as "low")	V	-3 … +5	-3 … +5	-3 … +5
• High level	V	15 … 30	15 … 30	15 … 30
• Current consumption at 24 V DC, typ.	mA	10	10	10
• Conductor cross-section, max.	mm^2	1.5	1.5	1.5
Digital outputs (sustained-short-circuit-proof)				
• Voltage	V	DC 24	DC 24	DC 24
• Load current per digital output, max.	mA	500	500	500
• Conductor cross-section, max.	mm^2	1.5	1.5	1.5
Connection R1/R2		M8 screw	M8 screw	M8 screw
• Conductor cross-section, max.	mm^2	35	50	50
Weight, approx.	kg (lb)	3.6 (8)	7.3 (16)	7.5 (17)
Approvals, according to		cURus	cURus	cURus
Suitable for installation in an air-cooled Motor Module, Active Line Module or Basic Line Module	Frame size	FX/FB	GX/GB [1)]	HX/JX

[1)] Cable harness set 6SL3366-2NG00-0AA0 is required to connect the Braking Module to a Basic Line Module of frame size GB.

Braking Modules in chassis format

Technical specifications (continued)

DC link voltage 890 ... 1035 V DC		Braking Module in chassis format		
		6SL3300-1AH31-3AA0	6SL3300-1AH32-5AA0	6SL3300-1AH32-5BA0
Power				
• Rated power P_{DB}	kW	25	50	50
• Peak output P_{15}	kW	125	250	250
• Power P_{20}	kW	100	200	200
• Power P_{40}	kW	50	100	100
Activation thresholds (adjustable via DIP switch)	V	1153 (factory setting) or 1070	1153 (factory setting) or 1070	1153 (factory setting) or 1070
Cable length to braking resistor, max.	m (ft)	100 (328)	100 (328)	100 (328)
Digital inputs In accordance with IEC 61131-2 Type 1				
• Voltage	V	-3 … +30	-3 … +30	-3 … +30
• Low level (an open digital input is interpreted as "low")	V	-3 … +5	-3 … +5	-3 … +5
• High level	V	15 … 30	15 … 30	15 … 30
• Current consumption at 24 V DC, typ.	mA	10	10	10
• Conductor cross-section, max.	mm^2	1.5	1.5	1.5
Digital outputs (sustained-short-circuit-proof)				
• Voltage	V	DC 24	DC 24	DC 24
• Load current per digital output, max.	mA	500	500	500
• Conductor cross-section, max.	mm^2	1.5	1.5	1.5
R1/R2 connection		M8 screw	M8 screw	M8 screw
• Conductor cross-section, max.	mm^2	35	50	50
Weight, approx.	kg (lb)	3.6 (8)	7.3 (16)	7.5 (17)
Approvals, according to		–	–	–
Suitable for installation in an air-cooled Motor Module, Active Line Module or Basic Line Module	Frame size	FX/FB	GX/GB [1]	HX/JX

Selection and ordering data

Description	Braking Module in chassis format Order No.
DC link voltage 510 ... 720 V DC	
Frame size FX, 25 kW/125 kW	**6SL3300-1AE31-3AA0**
Frame size GX, 50 kW/250 kW	**6SL3300-1AE32-5AA0**
Frame sizes HX and JX, 50 kW/250 kW	**6SL3300-1AE32-5BA0**
DC link voltage 675 ... 900 V DC	
Frame size FX, 25 kW/125 kW	**6SL3300-1AF31-3AA0**
Frame size GX, 50 kW/250 kW	**6SL3300-1AF32-5AA0**
Frame sizes HX and JX, 50 kW/250 kW	**6SL3300-1AF32-5BA0**
DC link voltage 890 ... 1035 V DC	
Frame size FX, 25 kW/125 kW	**6SL3300-1AH31-3AA0**
Frame size GX, 50 kW/250 kW	**6SL3300-1AH32-5AA0**
Frame sizes HX and JX, 50 kW/250 kW	**6SL3300-1AH32-5BA0**

Description	Order No.
Accessories	
Cable harness set For mounting a Braking Module of frame size GX into a Basic Line Module of frame size GB	**6SL3366-2NG00-0AA0**
Accessories for re-ordering	
Warning labels in 16 languages This set of foreign language warning signs can be placed on top of the standard English or German signs. A set of signs is supplied with the units. One sign in each of the following languages is provided in each set: Chinese Simplified, Czech, Danish, Dutch, Finnish, French, Greek, Italian, Japanese, Korean, Polish, Portuguese/Brazilian, Russian, Spanish, Swedish, Turkish.	**6SL3166-3AB00-0AA0**

[1] Cable harness set 6SL3366-2NG00-0AA0 is required to connect the Braking Module to a Basic Line Module of frame size GB.

Overview

Braking resistor for blocksize format, frame sizes FSA and FSC

The PM340 Power Modules cannot regenerate into the line supply. For regenerative operation, e.g. the braking of a rotating mass, a braking resistor must be connected to convert the resulting energy into heat.

The braking resistor is connected at terminals DCP/R1 and R2.

The braking resistors can be installed at the side next to the PM340 Power Modules. The braking resistors for the FSA and FSB frame sizes are designed as base components. If the PM340 Power Modules of the FSA or FSB frame sizes are operated without line reactor, the braking resistors can also be installed under the Power Modules.

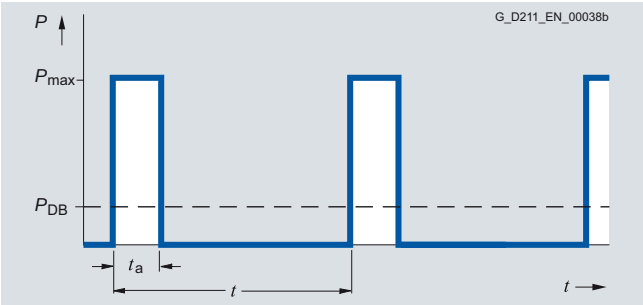
The braking resistors for the Power Modules of the FSC to FSF frame sizes should be placed outside the control cabinet or the switchgear room in order to direct the resulting heat loss away from the Power Modules, thereby allowing a corresponding reduction in the level of air conditioning required.

The braking resistors are designed with a temperature switch. The temperature switch must be evaluated to prevent consequential damage if the braking resistor overheats.

Selection and ordering data

Description	Suitable for Power Module in blocksize format	**Braking resistor** Order No.
DC link voltage 240 ... 360 V DC (line voltage 200 ... 240 V 1 AC)		
180 Ω	Frame size FSA	**6SE6400-4BC05-0AA0**
DC link voltage 510 ... 720 V DC (line voltage 380 ... 480 V 3 AC)		
390 Ω	Frame size FSA	**6SE6400-4BD11-0AA0**
160 Ω	Frame size FSB	**6SL3201-0BE12-0AA0**
56 Ω	Frame size FSC	**6SE6400-4BD16-5CA0**
27 Ω	Frame size FSD	**6SE6400-4BD21-2DA0**
15 Ω	Frame size FSE	**6SE6400-4BD22-2EA1**
8.2 Ω	Frame size FSF	**6SE6400-4BD24-0FA0**

Characteristic curves



Load diagram for braking resistors in blocksize format

t_a = 12 s

t = 240 s

Braking resistors for blocksize format

Technical specifications

DC link voltage 240 ... 360 V DC	Braking resistor
	6SE6400-4BC05-0AA0
Resistor	180 Ω
Rated power P_{DB}	0.05 kW
Peak output P_{max}	1 kW
Degree of protection [1]	IP20
Power connections	3 × 1.5 mm² (shielded)
• Length	0.5 m (1.64 ft)
Thermostatic switch (NC contact)	
• Switching capacity	250 V AC/max. 2.5 A
• Conductor cross-section	0.5 … 2.5 mm²
Dimensions	
• Width	72 mm (2.83 in)
• Height	230 mm (9.06 in)
• Depth	43.5 mm (1.71 in)
Weight, approx.	1.0 kg (2.21 lb)
Approvals, according to	cURus
Suitable for Power Module in blocksize format	Frame size FSA

DC link voltage 510 ... 720 V DC		Braking resistor					
		6SE6400-4BD11-0AA0	6SL3201-0BE12-0AA0	6SE6400-4BD16-5CA0	6SE6400-4BD21-2DA0	6SE6400-4BD22-2EA1	6SE6400-4BD24-0FA0
Resistor	Ω	390	160	56	27	15	8,2
Rated power P_{DB}	kW	0.1	0.2	0.65	1.2	2.2	4.0
Peak output P_{max}	kW	1.7	4.1	12	24	44	80
Degree of protection [1]		IP20	IP20	IP20	IP20	IP20	IP20
Power connections		3 × 1.5 mm² (shielded)	3 × 1.5 mm² (shielded)	3 × 1.5 mm² (shielded)	M6 screw stud	M6 screw stud	M6 screw stud
• Length	m (ft)	0.5 (1.64)	0.5 (1.64)	0.9 (2.95)	–	–	–
Thermostatic switch (NC contact)							
• Switching capacity		250 V AC/ max. 2.5 A	250 V AC/ max. 2.5 A	250 V AC/ max. 2.5 A	250 V AC/ max. 2.5 A	250 V AC/ max. 2.5 A	250 V AC/ max. 2.5 A
• Conductor cross-section	mm²	0.5 … 2.5	0.5 … 2.5	0.5 … 2.5	0.5 … 2.5	0.5 … 2.5	0.5 … 2.5
Dimensions							
• Width	mm (in)	72 (2.83)	153 (6.02)	185 (7.28)	270 (10.63)	301 (11.85)	400 (15.75)
• Height	mm (in)	230 (9.06)	329 (12.95)	285 (11.22)	515 (20.28)	483 (19.02)	650 (25.59)
• Depth	mm (in)	43.5 (1.71)	43.5 (1.71)	150 (5.91)	175 (6.89)	326 (12.83)	315 (12.4)
Weight, approx.	kg (lb)	1.0 (2.21)	1.6 (3.53)	3.8 (8.38)	7.4 (16.3)	10.6 (23.4)	16.7 (36.8)
Approvals, according to		cURus	cURus	cURus	cURus	cURus	cURus
Suitable for Power Module in blocksize format	Frame size	FSA	FSB	FSC	FSD	FSE	FSF

[1] With correctly connected load connection cable.

Overview

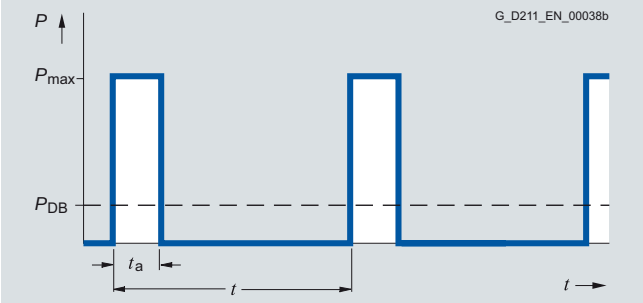
The excess energy of the DC link is dissipated via the braking resistor.

The corresponding braking resistor is connected to a Braking Module or Basic Line Module. The braking resistor is positioned outside the cabinet or switchgear room. This arrangement enables the resulting heat loss to be dissipated, thereby allowing a corresponding reduction in the level of air conditioning required.

Selection and ordering data

Description	Suitable for	Braking resistor Order No.
DC link voltage 510 ... 720 V DC		
0.3 kW/25 kW	Braking Module 6SL3100-1AE31-0AB0	**6SN1113-1AA00-0DA0**
1.5 kW/100 kW	Braking Module 6SL3100-1AE31-0AB0	**6SL3100-1BE31-0AA0**
5 kW/30 kW	Basic Line Module 20 kW 6SL3130-1TE22-0AA0	**6SE7023-2ES87-2DC0**
12.5 kW/75 kW	Basic Line Module 40 kW 6SL3130-1TE24-0AA0	**6SE7028-0ES87-2DC0**

Characteristic curves



Load diagram for Braking Module in booksize format and braking resistors for booksize format

Braking resistors for booksize format

Technical specifications

DC link voltage 510 ... 720 V DC		**Braking resistor** for Braking Module in booksize format and booksize compact format			
		6SN1113-1AA00-0DA0		6SL3100-1BE31-0AA0	
Resistor	Ω	17		5.7	
Rated power P_{DB}	kW	0.3		1.5	
Peak output P_{max}	kW	25		100	
Load duration for peak output t_a	s	0.1	0.4	1	2
Cycle duration of braking duty cycle t	s	11.5	210	68	460
Degree of protection		IP54 Braking resistor with connected 1.5 mm^2 cable (shielded), 3 m (9.84 ft) long		IP20	
Dimensions					
• Width	mm (in)	80 (3.15)		193 (7.60)	
• Height	mm (in)	210 (8.27)		410 (16.14)	
• Depth	mm (in)	53 (2.09)		240 (9.45)	
Weight, approx.	kg (lb)	3.4 (7.50)		5.6 (12.4)	
Approvals, according to		cULus		–	

DC link voltage 510 V ... 720 V DC		**Braking resistor**	
		6SE7023-2ES87-2DC0	6SE7028-0ES87-2DC0
Resistor	Ω	20	8
Rated power P_{DB}	kW	5	12.5
Peak output P_{max}	kW	30	75
Load duration for peak output t_a	s	15	15
Cycle duration of braking duty cycle t	s	90	90
Degree of protection		IP20	IP20
Power connections		M6 screw stud	M6 screw stud
PE connection		M6 screw stud	M8 screw stud
Thermostatic switch (NC contact)		Screw-type terminals	Screw-type terminals
• Switching capacity		250 V AC/ max. 10 A 42 V DC/0.2 A	250 V AC/ max. 10 A 42 V DC/0.2 A
• Conductor cross-section	mm^2	2.5	2.5
Dimensions			
• Width	mm (in)	430 (16.93)	740 (29.13)
• Height	mm (in)	485 (19.09)	485 (19.09)
• Depth	mm (in)	305 (12.01)	305 (12.01)
Weight, approx.	kg (lb)	14 (30.9)	22 (48.5)
Approvals, according to		UL, CSA	UL, CSA
Suitable for			
Basic Line Modules in booksize format	Type	6SL3130-1TE22-0AA0	6SL3130-1TE24-0AA0
Braking Module in booksize compact format	Type	6SL3100-1AE23-5AA0	–

Overview

The excess energy of the DC link is dissipated via the braking resistor.

The braking resistor is connected to a Braking Module. The braking resistor is positioned outside the cabinet or switchgear room. This arrangement enables the resulting heat loss to be dissipated, thereby allowing a corresponding reduction in the level of air conditioning required.

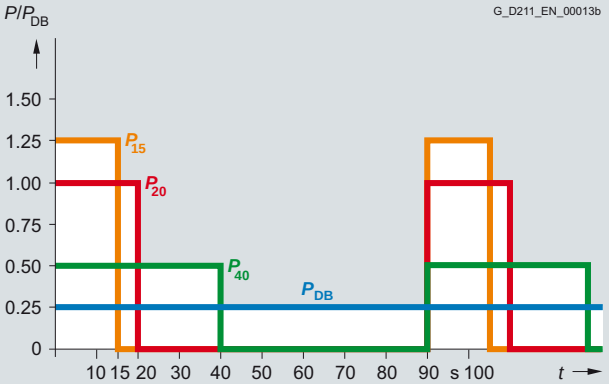
2 braking resistors with different rated and peak power values are available for chassis format units.

The braking resistor is monitored on the basis of the mark-space ratio. A temperature switch (NC contact) is also fitted. This responds when the maximum permissible temperature is exceeded and can be evaluated by a controller.

Selection and ordering data

Description	Suitable for Braking Module in chassis format	**Braking resistor** Order No.
DC link voltage 510 ... 720 V DC		
25 kW/125 kW	6SL3300-1AE31-3AA0	**6SL3000-1BE31-3AA0**
50 kW/250 kW	6SL3300-1AE32-5 **.** A0	**6SL3000-1BE32-5AA0**
DC link voltage 675 ... 900 V DC		
25 kW/125 kW	6SL3300-1AF31-3AA0	**6SL3000-1BF31-3AA0**
50 kW/250 kW	6SL3300-1AF32-5 **.** A0	**6SL3000-1BF32-5AA0**
DC link voltage 890 ... 1035 V DC		
25 kW/125 kW	6SL3300-1AH31-3AA0	**6SL3000-1BH31-3AA0**
50 kW/250 kW	6SL3300-1AH32-5 **.** A0	**6SL3000-1BH32-5AA0**

Characteristic curves



P_{DB} = Rated power
P_{15} = 5 x P_{DB} = Power which is permissible every 90 s for 15 s
P_{20} = 4 x P_{DB} = Power which is permissible every 90 s for 20 s
P_{40} = 2 x P_{DB} = Power which is permissible every 90 s for 40 s

Load diagram for Braking Module and braking resistor in chassis format

Braking resistors for chassis format

Technical specifications

DC link voltage 510 ... 720 V DC		Braking resistor	
		6SL3000-1BE31-3AA0	6SL3000-1BE32-5AA0
Resistor	Ω	4.4	2.2
Rated power P_{DB}	kW	25	50
Peak output P_{max}	kW	125	250
Load duration for peak output	s	15	15
Cycle duration of braking duty cycle	s	90	90
Current, max.	A	189	378
Cable entry		Via cable gland M50	Via cable gland M50
Power connection		Via stud M10	Via stud M10
• Conductor cross-section, max.	mm^2	50	70
Degree of protection		IP20	IP20
Dimensions			
• Width	mm (in)	740 (29.13)	810 (31.89)
• Height	mm (in)	605 (23.82)	1325 (52.17)
• Depth	mm (in)	485 (19.09)	485 (19.09)
Weight, approx.	kg (lb)	50 (110)	120 (265)
Approvals, according to		cURus	cURus
Suitable for Braking Module in chassis format	Type	6SL3300-1AE31-3AA0	6SL3300-1AE32-5 . A0

DC link voltage 675 ... 900 V DC		Braking resistor	
		6SL3000-1BF31-3AA0	6SL3000-1BF32-5AA0
Resistor	Ω	6.8	3.4
Rated power P_{DB}	kW	25	50
Peak output P_{max}	kW	125	250
Load duration for peak output	s	15	15
Cycle duration of braking duty cycle	s	90	90
Current, max.	A	153	306
Cable entry		Via cable gland M50	Via cable gland M50
Power connection		Via stud M10	Via stud M10
• Conductor cross-section, max.	mm^2	50	70
Degree of protection		IP20	IP20
Dimensions			
• Width	mm (in)	740 (29.13)	810 (31.89)
• Height	mm (in)	605 (23.82)	1325 (52.17)
• Depth	mm (in)	485 (19.09)	485 (19.09)
Weight, approx.	kg (lb)	50 (110)	120 (265)
Approvals, according to		cURus	cURus
Suitable for Braking Module in chassis format	Type	6SL3300-1AF31-3AA0	6SL3300-1AF32-5 . A0

Technical specifications (continued)

DC link voltage 890 ... 1035 V DC		Braking resistor	
		6SL3000-1BH31-3AA0	6SL3000-1BH32-5AA0
Resistor	Ω	9.8	4.9
Rated power P_{DB}	kW	25	50
Peak output P_{max}	kW	125	250
Load duration for peak output	s	15	15
Cycle duration of braking duty cycle	s	90	90
Current, max.	A	125	255
Cable entry		Via cable gland M50	Via cable gland M50
Power connection		Via stud M10	Via stud M10
• Conductor cross-section, max.	mm^2	50	70
Degree of protection		IP20	IP20
Dimensions			
• Width	mm (in)	740 (29.13)	810 (31.89)
• Height	mm (in)	605 (23.82)	1325 (52.17)
• Depth	mm (in)	485 (19.09)	485 (19.09)
Weight, approx.	kg (lb)	50 (110)	120 (265)
Approvals, according to		–	–
Suitable for Braking Module in chassis format	Type	6SL3300-1AH31-3AA0	6SL3300-1AH32-5 . A0

Capacitor Module in booksize format

Overview

Capacitor Modules are used to increase the DC link capacitance to bridge momentary power failures.

Capacitor Modules are connected to the DC link voltage via the integrated DC link busbars. Capacitor Modules function autonomously.

Several Capacitor Modules can be operated in parallel.

Design

Capacitor Modules feature the following connections and interfaces as standard:

- 2 DC link connections via integrated DC link busbars
- 2 PE (protective earth) connections

Technical specifications

DC link voltage 510 ... 720 V DC	**Capacitor Module** (Internal air cooling)
	6SL3100-1CE14-0AA0
Capacitance	4000 µF
Current carrying capacity	
• 24 V DC busbars	20 A
• DC link busbars	100 A
PE connection	M5 screw
Dimensions	
• Width	100 mm (3.94 in)
• Height	380 mm (14.96 in)
• Depth, with spacer (included in scope of supply)	270 mm (10.63 in)
Weight, approx.	7.2 kg (16 lb)
Approvals, according to	cULus

Selection and ordering data

Description	Order No.
Capacitor Module	**6SL3100-1CE14-0AA0**
Accessories for re-ordering	
Warning labels in 16 languages This set of foreign language warning signs can be placed on top of the standard English or German signs. A set of signs is supplied with the units. One sign in each of the following languages is provided in each set: Chinese Simplified, Czech, Danish, Dutch, Finnish, French, Greek, Italian, Japanese, Korean, Polish, Portuguese/ Brazilian, Russian, Spanish, Swedish, Turkish.	**6SL3166-3AB00-0AA0**

Control Supply Module in booksize format

Overview

The Control Supply Module in booksize format provides a 24 V DC power supply via the line or DC link. This makes it possible, for example, to make emergency retraction movements in the event of a supply failure, provided that the DC link voltage is available.

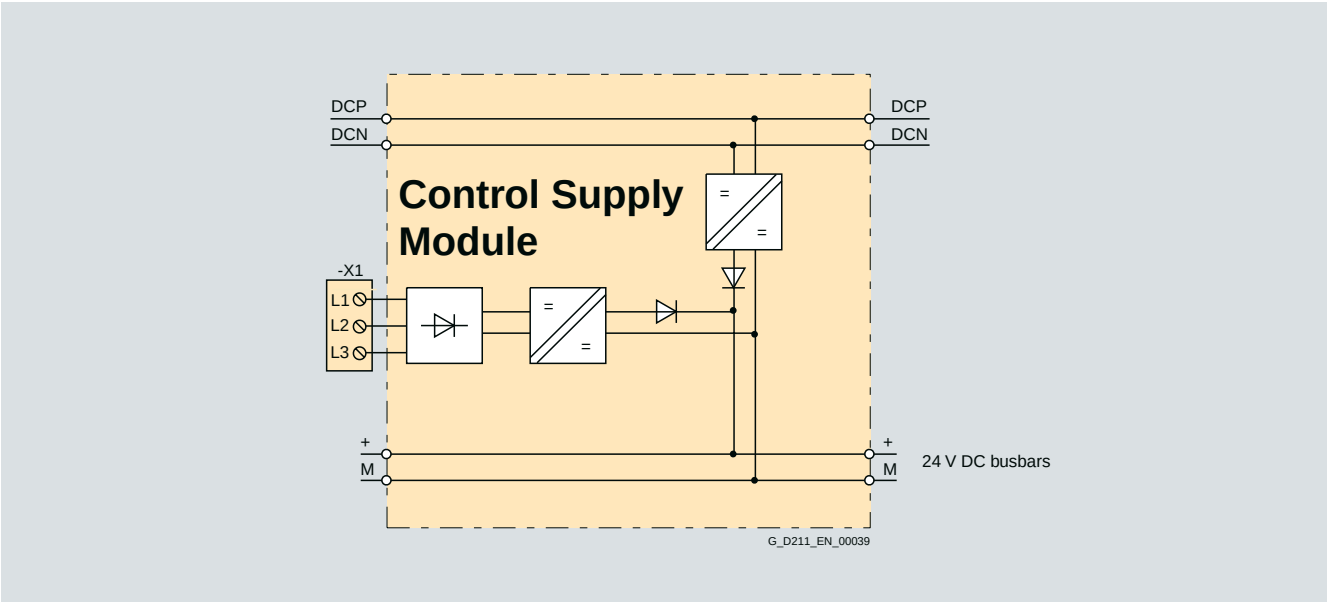
Design

Control Supply Modules feature the following connections and interfaces as standard:

- 1 line connection
- 2 DC link connections via integrated DC link busbars
- 2 electronics power supply connections via integrated 24 V DC bars
- 1 connection for the electronics power supply for Control Units, Terminal Modules, Sensor Modules, etc., via the 24 V terminal adapter provided in the scope of supply (max. cross-section 6 mm^2, max. fuse protection 20 A)
- 2 PE (protective earth) connections

The status of the Control Supply Modules is indicated via two multi-color LEDs.

Integration



Connection example of Control Supply Module

Control Supply Module in booksize format

Technical specifications

DC link voltage 510 ... 720 V DC *Line voltage 380 ... 480 V 3 AC*	**Control Supply Module in booksize format** (Internal air cooling) 6SL3100-1DE22-0AA0
Rated input current	
• At 400 V 3 AC	2.2 A
• At 600 V DC	1.1 A
DC link voltage range	300 … 882 V DC (operation in 300 … 430 V DC range is permitted temporarily for < 1 min)
Radio interference suppression (standard)	Category C2 to EN 61800-3
Rated output voltage	26 V DC
Rated output current	20 A
Current carrying capacity	
• 24 V DC busbars	20 A
• DC link busbars	100 A
Line connection L1, L2, L3 (X1)	Screw-type terminals
• Conductor cross-section	0.2 … 4.0 mm^2
PE connection	M5 screw
Dimensions	
• Width	50 mm (1.97 in)
• Height	380 mm (14.96 in)
• Depth, with spacer (included in scope of supply)	270 mm (10.63 in)
Weight, approx.	4.8 kg (10.6 lb)
Approvals, according to	cULus

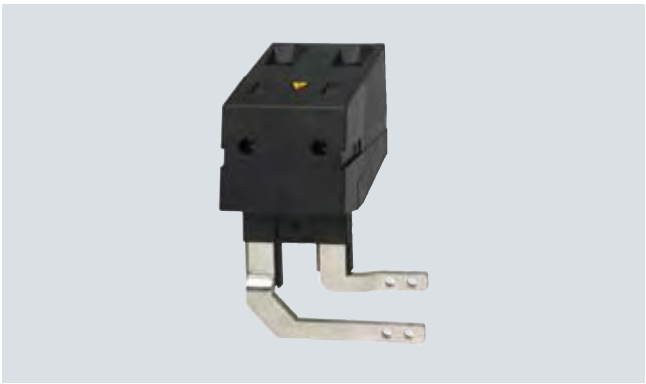
Selection and ordering data

Description	Order No.
Control Supply Module in booksize format	**6SL3100-1DE22-0AA0**
Accessories for re-ordering	
Warning labels in 16 languages This set of foreign language warning signs can be placed on top of the standard English or German signs. A set of signs is supplied with the units. One sign in each of the following languages is provided in each set: Chinese Simplified, Czech, Danish, Dutch, Finnish, French, Greek, Italian, Japanese, Korean, Polish, Portuguese/Brazilian, Russian, Spanish, Swedish, Turkish.	**6SL3166-3AB00-0AA0**

Overview

DC link rectifier adapter

DC link rectifier adapter for unit widths of 50 mm ... 100 mm (1.97 in ... 3.94 in)



DC link rectifier adapter for unit widths of 150 mm ... 300 mm (5.91 in ... 11.8 in)

If the internal DC link busbars of the Motor Modules are not used, the DC link voltage must be supplied externally through a DC link rectifier adapter, e.g. when devices of booksize format are coupled with devices of chassis format over an external DC busbar. The DC link rectifier adapter is mounted on the DC link busbars of the Motor Module. The DC link cables are routed from above.

DC link adapter

DC link adapter (multi-tier) for all unit widths

If a multi-tier Motor Module configuration is used, a DC link adapter can be provided for linking the DC links of two drive line-ups. The DC link adapter is mounted sideways on the DC link busbars of the Motor Module. It can be mounted on the right or left side of the Motor Module; the identification of the poles (DCN and DCP) on the DC link adapter changes in accordance with the mounting position. The DC link cables are routed from behind. DC link adapters are supplied in sets of 2 units.

Technical specifications

		DC link rectifier adapter		DC link adapter
		6SL3162-2BD00-0AA0	6SL3162-2BM00-0AA0	6SL3162-2BM01-0AA0
Connection		Screw-type terminals	Screw-type terminals	Screw-type terminals
• Conductor cross-section	mm^2	0.5 … 10	35 … 95	35 … 95
Current currying capacity	A	43	240	240
Weight, approx.	kg (lb)	0.06 (0.13)	0.48 (1.06)	0.76 (1.68)
Approvals, according to		cURus	cURus	cURus
Suitable for Line Modules and Motor Modules	For-mats	booksize and booksize compact	booksize and booksize compact	booksize and booksize compact

Selection and ordering data

Description	Order No.
DC link rectifier adapter	
For direct infeed of DC link voltage	
For Line Modules and Motor Modules in booksize and booksize compact format	
• 50 mm (1.97 in), 75 mm (2.95 in) and 100 mm (3.94 in) wide	**6SL3162-2BD00-0AA0**
• 150 mm (5.91 in), 200 mm (7.87 in) and 300 mm (11.81 in) wide	**6SL3162-2BM00-0AA0**
DC link adapter set (2 units)	**6SL3162-2BM01-0AA0**
For multi-tier configuration	
For all Line Modules and Motor Modules in booksize and booksize compact format	

Voltage Clamping Module in booksize format

Overview

Oscillations to ground potential can occur in drive line-ups with total cable lengths (sum of all motor and DC link cables) of > 350 m (shielded) or 560 m (unshielded). The Voltage Clamping Module damps these oscillations, thereby allowing a total cable length of 630/850 m (shielded/unshielded) to be used in booksize format drive line-ups in combination with a Smart Line Module with application of derating, see derating characteristics for Smart Line Modules, or 1000/1500 m (shielded/unshielded) in combination with a Basic Line Module.

With total cable lengths of > 350 m, the limit values of Category C2 defined in EN 61800-3 can be exceeded.

VCM Voltage Clamping Modules may be operated only in networks with grounded neutral (TN system).

Where possible, the Voltage Clamping Module should be mounted next to the Line Module and connected to the voltage-source DC link via the integrated DC busbar.

Design

The Voltage Clamping Module features the following interfaces as standard:

- 2 DC link connections via integrated DC link busbars
- 1 connection for functional ground
- 2 PE (protective earth) connections

The scope of supply of the Voltage Clamping Modules includes:

- Jumper for connecting the 24 V DC busbar to the adjacent Motor Module
- 1 set of warning signs in 16 languages

Technical specifications

DC link voltage 510 … 720 V DC	**Voltage Clamping Module in booksize format** (Internal air cooling)
	6SL3100-1VE00-0AA0
Current carrying capacity	
• 24 V DC busbars	20 A
• DC link busbars	100 A
PE connection	M5 screw
Grounding	Screw-type terminal
• Conductor cross-section	4 … 16 mm^2
Power loss, approx.	50 W
Dimensions	
• Width	50 mm (1.97 in)
• Height	380 mm (14.96 in)
• Depth, with spacer (included in scope of supply)	270 mm (10.63 in)
Weight, approx.	3.1 kg (7 lb)
Approvals, according to	cULus

Selection and ordering data

Description	Order No.
Voltage Clamping Module in booksize format	**6SL3100-1VE00-0AA0**
Accessories for re-ordering	
Warning labels in 16 languages This set of foreign language warning signs can be placed on top of the standard English or German signs. A set of signs is supplied with the units. One sign in each of the following languages is provided in each set: Chinese Simplified, Czech, Danish, Dutch, Finnish, French, Greek, Italian, Japanese, Korean, Polish, Portuguese/Brazilian, Russian, Spanish, Swedish, Turkish.	**6SL3166-3AB00-0AA0**

Overview

Motor reactors for blocksize format

Motor reactors reduce the voltage loading on the motor windings. At the same time, the capacitive charge/discharge currents that place an additional load on the power unit when long motor cables are used are reduced. The maximum permissible output frequency when a motor reactor is used is 150 Hz.

The motor reactors are designed for a pulse frequency of 4 kHz. Higher pulse frequencies are not permissible.

The motor reactor must be installed as close as possible to the Power Module.

Technical specifications

DC link voltage 510 ... 720 V DC or line voltage 380 ... 480 V 3 AC		**Motor reactor (for a 4 kHz pulse frequency)**		
		6SE6400-3TC00-4AD2	6SL3202-0AE21-0CA0	6SL3202-0AJ23-2CA0
Rated current	A	4.5	10	32
Rated inductance	mH	2	1.24	0.33
Power loss	kW	0.005	0.02	0.06
Connection to the Power Module		Cable 4 × AWG16 (1.5 mm^2)	Cable 4 × AWG14 (1.5 mm^2)	Cable 4 × 6 mm^2
• Length, approx.	m (ft)	0.3 (0.98)	0.4 (1.31)	0.35 (1.15)
Motor connection		Screw-type terminals	Screw-type terminals	Screw-type terminals
• Conductor cross-section	mm^2	6	6	6
PE connection		M5 screw stud	M5 screw stud	M5 screw stud
Cable length between motor reactor and motor, max.				
• Shielded	m (ft)	100 (328)	100 (328)	100 (328)
• Unshielded	m (ft)	150 (492)	150 (492)	150 (492)
Degree of protection [1]		IP20	IP20	IP20
Dimensions				
• Width	mm (in)	75.5 (2.97)	153 (6.02)	189 (7.44)
• Height	mm (in)	201 (7.91)	285 (11.22)	351 (13.82)
• Depth	mm (in)	110 (4.33)	70 (2.76)	80 (3.15)
Weight, approx.	kg (lb)	2 (4.5)	4.5 (10)	9 (20)
Approvals, according to		cURus	cURus	cURus
Suitable for Power Module in blocksize format	Type (rated current)	6SL3210-1SE11-3UA0 (1.3 A) 6SL3210-1SE11-7UA0 (1.7 A) 6SL3210-1SE12-2UA0 (2.2 A) 6SL3210-1SE13-1UA0 (3.1 A) 6SL3210-1SE14-1UA0 (4.1 A)	6SL3210-1SE16-0 . A0 (5.9 A) 6SL3210-1SE17-7 . A0 (7.7 A) 6SL3210-1SE21-0 . A0 (10 A)	6SL3210-1SE21-8 . A0 (18 A) 6SL3210-1SE22-5 . A0 (25 A) 6SL3210-1SE23-2 . A0 (32 A)
• Frame size		FSA	FSB	FSC

[1] With correctly connected connection cable to the Power Module.

Technical specifications (continued)

DC link voltage 510 ... 720 V DC or line voltage 380 ... 480 V 3 AC		Motor reactor (for a 4 kHz pulse frequency)				
		6SE6400-3TC05-4DD0	6SE6400-3TC03-8DD0	6SE6400-3TC05-4DD0	6SE6400-3TC08-0ED0	6SE6400-3TC07-5ED0
Rated current	A	68	45	68	104	90
Rated inductance	mH	0.232	0.82	0.232	0.111	0.3
Power loss	kW	0.2	0.2	0.2	0.17	0.27
Connection to the Power Module		Flat connector for M6 screw	Flat connector for M6 screw	Flat connector for M6 screw	Flat connector for M6 screw	Flat connector for M6 screw
Motor connection		Flat connector for M6 screw	Flat connector for M6 screw	Flat connector for M6 screw	Flat connector for M6 screw	Flat connector for M6 screw
PE connection		M6 screw	M6 screw	M6 screw	M6 screw	M6 screw
Cable length between motor reactor and motor, max.						
• Shielded	m (ft)	200 (656)	200 (656)	200 (656)	200 (656)	200 (656)
• Unshielded	m (ft)	300 (984)	300 (984)	300 (984)	300 (984)	300 (984)
Degree of protection		IP00	IP00	IP00	IP00	IP00
Dimensions						
• Width	mm (in)	225 (8.86)	225 (8.86)	225 (8.86)	225 (8.86)	270 (10.63)
• Height	mm (in)	210 (8.27)	210 (8.27)	210 (8.27)	210 (8.27)	248 (9.76)
• Depth	mm (in)	140 (5.51)	140 (5.51)	140 (5.51)	140 (5.51)	189 (7.44)
Weight, approx.	kg (lb)	11.5 (25.4)	19 (42)	11.5 (25.4)	12 (26.5)	27 (59.5)
Approvals, according to		cURus	cURus	cURus	cURus	cURus
Suitable for Power Module in blocksize format	Type (rated current)	6SL3210-1SE23-8 . A0 (38 A)	6SL3210-1SE24-5 . A0 (45 A)	6SL3210-1SE26-0 . A0 (60 A)	6SL3210-1SE27-5 . A0 (75 A)	6SL3210-1SE31-0 . A0 (90 A)
• Frame size		FSD	FSD	FSD	FSE	FSE

DC link voltage 510 V ... 720 V DC or line voltage 380 ... 480 V 3 AC		Motor reactor (for a 4 kHz pulse frequency)		
		6SE6400-3TC14-5FD0	6SE6400-3TC15-4FD0	6SE6400-3TC14-5FD0
Rated current	A	178	178	178
Rated inductance	mH	0.2	0.033	0.2
Power loss	kW	0.47	0.25	0.47
Connection to the Power Module		Flat connector for M8 screw	Flat connector for M8 screw	Flat connector for M8 screw
Motor connection		Flat connector for M8 screw	Flat connector for M8 screw	Flat connector for M8 screw
PE connection		M8 screw	M8 screw	M8 screw
Cable length between motor reactor and motor, max.				
• Shielded	m (ft)	200 (656)	200 (656)	200 (656)
• Unshielded	m (ft)	300 (984)	300 (984)	300 (984)
Degree of protection		IP00	IP00	IP00
Dimensions				
• Width	mm (in)	357 (14.06)	270 (10.63)	357 (14.06)
• Height	mm (in)	321 (12.64)	248 (9.76)	321 (12.64)
• Depth	mm (in)	221 (8.70)	189 (7.44)	221 (8.70)
Weight, approx.	kg (lb)	57 (126)	24 (53)	57 (126)
Approvals, according to		cURus	cURus	cURus
Suitable for Power Module in blocksize format	Type (rated current)	6SL3210-1SE31-1 . A0 (110 A)	6SL3210-1SE31-5 . A0 (145 A)	6SL3210-1SE31-8 . A0 (178 A)
• Frame size		FSF	FSF	FSF

Selection and ordering data

Rated output current of the Power Module	Type rating of the Power Module	Suitable for Power Module in blocksize format		**Motor reactor**
A	kW (HP)	Type	Frame size	Order No.
Line voltage 380 ... 480 V 3 AC				
1.3	0.37 (0.50)	6SL3210-1SE11-3UA0	FSA	**6SE6400-3TC00-4AD2**
1.7	0.55 (0.75)	6SL3210-1SE11-7UA0		
2.2	0.75 (1)	6SL3210-1SE12-2UA0		
3.1	1.1 (1.5)	6SL3210-1SE13-1UA0		
4.1	1.5 (2)	6SL3210-1SE14-1UA0		
5.9	2.2 (3)	6SL3210-1SE16-0...	FSB	**6SL3202-0AE21-0CA0**
7.7	3 (5)	6SL3210-1SE17-7...		
10	4 (5)	6SL3210-1SE21-0...		
18	7.5 (10)	6SL3210-1SE21-8...	FSC	**6SL3202-0AJ23-2CA0**
25	11 (15)	6SL3210-1SE22-5...		
32	15 (20)	6SL3210-1SE23-2...		
38	18.5 (25)	6SL3210-1SE23-8...	FCD	**6SE6400-3TC05-4DD0**
45	22 (30)	6SL3210-1SE24-5...		**6SE6400-3TC03-8DD0**
60	30 (40)	6SL3210-1SE26-0...		**6SE6400-3TC05-4DD0**
75	37 (50)	6SL3210-1SE27-5...	FSE	**6SE6400-3TC08-0ED0**
90	45 (60)	6SL3210-1SE31-0...		**6SE6400-3TC07-5ED0**
110	55 (75)	6SL3210-1SE31-1...	FSF	**6SE6400-3TC14-5FD0**
145	75 (100)	6SL3210-1SE31-5...		**6SE6400-3TC15-4FD0**
178	90 (125)	6SL3210-1SE31-8...		**6SE6400-3TC14-5FD0**

Motor reactors for booksize format

Overview

Motor reactors reduce the voltage loading on the motor windings. At the same time, the capacitive charge/discharge currents that place an additional load on the power unit when long motor cables are used are reduced. The maximum permissible output frequency when a motor reactor is used is 120 Hz.

The motor reactors are designed for a pulse frequency of 4 kHz. Higher pulse frequencies are not permissible.

The motor reactor must be installed as close as possible to the Motor Module.

Selection and ordering data

Rated output current of Motor Module	Suitable for Motor Module in booksize format	**Motor reactor** Order No.
3 A and 2 × 3 A	6SL3120-1TE13-0AA3 6SL3121-1TE13-0AA3 6SL3120-2TE13-0AA3 6SL3121-2TE13-0AA3 6SL3126-2TE13-0AA3	**6SE7021-0ES87-1FE0**
5 A and 2 × 5 A	6SL3120-1TE15-0AA3 6SL3121-1TE15-0AA3 6SL3120-2TE15-0AA3 6SL3121-2TE15-0AA3 6SL3126-2TE15-0AA3	**6SE7021-0ES87-1FE0**
9 A and 2 × 9 A	6SL3120-1TE21-0AA3 6SL3121-1TE21-0AA3 6SL3120-2TE21-0AA3 6SL3121-2TE21-0AA3 6SL3126-2TE21-0AA3	**6SL3000-2BE21-0AA0**
18 A and 2 × 18 A	6SL3120-1TE21-8AA3 6SL3121-1TE21-8AA3 6SL3120-2TE21-8AA3 6SL3121-2TE21-8AA3 6SL3126-2TE21-8AA3	**6SE7022-6ES87-1FE0**
30 A	6SL3120-1TE23-0AA3 6SL3121-1TE23-0AA3 6SL3126-1TE23-0AA3	**6SE7024-7ES87-1FE0**
45 A	6SL3120-1TE24-5AA3 6SL3121-1TE24-5AA3 6SL3126-1TE24-5AA3	**6SE7027-2ES87-1FE0**
60 A	6SL3120-1TE26-0AA3 6SL3121-1TE26-0AA3 6SL3126-1TE26-0AA3	**6SL3000-2BE26-0AA0**
85 A	6SL3120-1TE28-5AA3 6SL3121-1TE28-5AA3 6SL3126-1TE28-5AA3	**6SE7031-5ES87-1FE0**
132 A	6SL3120-1TE31-3AA3 6SL3121-1TE31-3AA3 6SL3126-1TE31-3AA3	**6SE7031-8ES87-1FE0**
200 A	6SL3120-1TE32-0AA4 6SL3121-1TE32-0AA4 6SL3126-1TE32-0AA4	**6SE7032-6ES87-1FE0**

Technical specifications

DC link voltage 510 ... 720 V DC or line voltage 380 ... 480 V 3 AC		Motor reactor (for a 4 kHz pulse frequency)											
		6SE7021-0ES87-1FE0		6SL3000-2BE21-0AA0		6SE7022-6ES87-1FE0		6SE7024-7ES87-1FE0					
Rated current	A	9.2		9		23		42					
Rated inductance	µH	1243		1000		332		180					
Power loss	kW	0.08		0.07		0.11		0.19					
Connection Motor Module/Motor		Screw-type terminals 4 mm²		Screw-type terminals 4 mm²		Screw-type terminals 10 mm²		Flat connector for M8 screw					
PE connection		M6 screw stud		M6 screw stud		M6 screw stud		M6 screw					
Cable length between motor reactor and motor, max.													
(number of reactors in series)		(1)		(1)		(1)	(2)	(1)	(2)				
• Shielded	m (ft)	100 (328)		135 (443)		160 (525)	320 (1050)	190 (623)	375 (1230)				
• Unshielded	m (ft)	150 (492)		200 (656)		240 (787)	480 (1575)	280 (919)	560 (1837)				
Degree of protection		IP00		IP00		IP00		IP00					
Dimensions													
• Width	mm (in)	178 (7.01)		178 (7.01)		219 (8.62)		197 (7.76)					
• Height	mm (in)	97 (3.82)		159 (6.26)		180 (7.09)		220 (8.66)					
• Depth	mm (in)	88 (3.46)		111 (4.37)		132 (5.20)		121 (4.76)					
Weight, approx.	kg (lb)	6 (13.2)		5 (11.0)		9.5 (20.9)		20 (44.1)					
Approvals, according to		cURus		cURus		cURus		cURus					
Suitable for Motor Module in booksize format	Type	6SL3120-1TE13-0AA3	6SL3120-1TE15-0AA3	6SL3120-1TE21-0AA3		6SL3120-1TE21-8AA3		6SL3120-1TE23-0AA3					
		6SL3121-1TE13-0AA3	6SL3121-1TE15-0AA3	6SL3121-1TE21-0AA3		6SL3121-1TE21-8AA3		6SL3121-1TE23-0AA3					
		6SL3120-2TE13-0AA3	6SL3120-2TE15-0AA3	6SL3120-2TE21-0AA3		6SL3120-2TE21-8AA3							
		6SL3121-2TE13-0AA3	6SL3121-2TE15-0AA3	6SL3121-2TE21-0AA3		6SL3121-2TE21-8AA3							
• Rated current of the Motor Module	A	3	5	9		18		30					

DC link voltage 510 ... 720 V DC or line voltage 380 ... 480 V 3 AC		Motor reactor (for a 4 kHz pulse frequency)															
		6SE7027-2ES87-1FE0			6SL3000-2BE26-0AA0			6SE7031-5ES87-1FE0			6SE7031-8ES87-1FE0			6SE7032-6ES87-1FE0		
Rated current	A	65			60			131			167			234		
Rated inductance	µH	59			62			29			23			16		
Power loss	kW	0.2			0.1			0.22			0.29			0.29		
Connection Motor Module/Motor		Flat connector for M8 screw			Flat connector for M8 screw			Flat connector for M8 screw			Flat connector for M8 screw			Flat connector for M8 screw		
PE connection		M6 screw stud			M6 screw stud			M6 screw			M6 screw			M6 screw		
Cable length between motor reactor and motor, max.																	
(number of reactors in series)		(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)	
• Shielded	m (ft)	200 (656)	400 (1312)	600 (1969)	200 (656)	400 (1312)	600 (1969)	200 (656)	400 (1312)	600 (1969)	200 (656)	400 (1312)	600 (1969)	200 (656)	400 (1312)	600 (1969)	
• Unshielded	m (ft)	300 (984)	600 (1969)	900 (2953)	300 (984)	600 (1969)	900 (2953)	300 (984)	600 (1969)	900 (2953)	300 (984)	600 (1969)	900 (2953)	300 (984)	600 (1969)	900 (2953)	
Degree of protection		IP00			IP00			IP00			IP00			IP00			
Dimensions																	
• Width	mm (in)	267 (10.51)			267 (10.51)			219 (8.62)			281 (11.06)			281 (11.06)			
• Height	mm (in)	221 (8.70)			220 (8.66)			220 (8.66)			250 (9.84)			250 (9.84)			
• Depth	mm (in)	131 (5.16)			126 (4.96)			145 (5.71)			171 (6.73)			184 (7.24)			
Weight, approx.	kg (lb)	11 (24.3)			10.5 (23.2)			25 (55.1)			30 (66.2)			30 (66.2)			
Approvals, according to		cURus			cURus			cURus			cURus			cURus			
Suitable for Motor Module in booksize format	Type	6SL3120-1TE24-5AA3			6SL3120-1TE26-0AA3			6SL3120-1TE28-5AA3			6SL3120-1TE31-3AA3			6SL3120-1TE32-0AA4			
		6SL3121-1TE24-5AA3			6SL3121-1TE26-0AA3			6SL3121-1TE28-5AA3			6SL3121-1TE31-3AA3			6SL3121-1TE32-0AA4			
• Rated current of the Motor Module	A	45			60			85			132			200			

Motor reactors for chassis format

Overview

Motor reactors reduce the voltage loading on the motor windings. At the same time, the capacitive charge/discharge currents that place an additional load on the power unit when long motor cables are used are reduced. The maximum permissible output frequency when a motor reactor is used is 150 Hz.

The motor reactor must be installed as close as possible to the Motor Module or Power Module. Up to 2 motor reactors can be connected in series.

Technical specifications

DC link voltage 510 ... 720 V DC or line voltage 380 ... 480 V 3 AC		**Motor reactor (for pulse frequencies of 2 kHz to 4 kHz)**									
		6SL3000-2BE32-1AA0		6SL3000-2BE32-6AA0		6SL3000-2BE33-2AA0		6SL3000-2BE33-8AA0		6SL3000-2BE35-0AA0	
Rated current	A	210		260		310		380		490	
Rated inductance	µH	53		40		24		21		19	
Power loss	kW	0.486		0.5		0.47		0.5		0.5	
Line/load connection		Flat connector for M10 screw		Flat connector for M10 screw		Flat connector for M10 screw		Flat connector for M10 screw		Flat connector for M12 screw	
PE connection		M8 screw		M8 screw		M8 screw		M8 screw		M8 screw	
Cable length between motor reactor and motor, max. (number of reactors in series)		(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
• Shielded	m (ft)	300 (984)	525 (1723)	300 (984)	525 (1723)	300 (984)	525 (1723)	300 (984)	525 (1723)	300 (984)	525 (1723)
• Unshielded	m (ft)	450 (1476)	787 (2582)	450 (1476)	787 (2582)	450 (1476)	787 (2582)	450 (1476)	787 (2582)	450 (1476)	787 (2582)
Degree of protection		IP00		IP00		IP00		IP00		IP00	
Dimensions											
• Width	mm (in)	300 (11.81)		300 (11.81)		300 (11.81)		300 (11.81)		300 (11.81)	
• Height	mm (in)	285 (11.22)		315 (12.40)		285 (11.22)		285 (11.22)		365 (14.37)	
• Depth	mm (in)	257 (10.12)		277 (10.91)		257 (10.12)		277 (10.91)		277 (10.91)	
Weight, approx.	kg (lb)	66 (146)		66 (146)		66 (146)		73 (161)		100 (221)	
Approvals, according to		cURus		cURus		cURus		cURus		cURus	
Suitable for Single Motor Module in chassis format	Type	6SL3320-1TE32-1AA3		6SL3320-1TE32-6AA3		6SL3320-1TE33-1AA3		6SL3320-1TE33-8AA3		6SL3320-1TE35-0AA3	
Suitable for Power Module in chassis format	Type	6SL3310-1TE32-1AA3		6SL3310-1TE32-6AA3		6SL3310-1TE33-1AA3		6SL3310-1TE33-8AA3		6SL3310-1TE35-0AA3	
• Rated current of Motor Module or Power Module	A	210		260		310		380		490	
• Type rating of Motor Module or Power Module	kW (HP)	110 (150)		132 (200)		160 (250)		200 (300)		250 (400)	

Technical specifications (continued)

DC link voltage 510 ... 720 V DC or line voltage 380 ... 480 V 3 AC		Motor reactor (for pulse frequencies of 1.25 kHz to 2.5 kHz)											
		6SL3000-2AE36-1AA0		6SL3000-2AE38-4AA0		6SL3000-2AE41-0AA0		6SL3000-2AE41-4AA0					
Rated current	A	605		840		840		985		1405		1405	
Rated inductance	µH	18		13		13		10		5.1		5.1	
Power loss	kW	0.9		0.84		0.943		1.062		0.9		1.054	
Line/load connection		Flat connector for M12 screw		Flat connector for M12 screw		Flat connector for M12 screw		Flat connector for M12 screw		Flat connector for M12 screw (2×)		Flat connector for M12 screw (2×)	
PE connection		M10 screw		M10 screw		M10 screw		M10 screw		M10 screw		M10 screw	
Cable length between motor reactor and motor, max.													
(number of reactors in series)		(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
• Shielded	m (ft)	300 (984)	525 (1723)	300 (984)	525 (1723)	300 (984)	525 (1723)	300 (984)	525 (1723)	300 (984)	525 (1723)	300 (984)	525 (1723)
• Unshielded	m (ft)	450 (1476)	787 (2582)	450 (1476)	787 (2582)	450 (1476)	787 (2582)	450 (1476)	787 (2582)	450 (1476)	787 (2582)	450 (1476)	787 (2582)
Degree of protection		IP00		IP00		IP00		IP00		IP00		IP00	
Dimensions													
• Width	mm (in)	410 (16.14)		410 (16.14)		410 (16.14)		410 (16.14)		460 (18.11)		460 (18.11)	
• Height	mm (in)	392 (15.43)		392 (15.43)		392 (15.43)		392 (15.43)		392 (15.43)		392 (15.43)	
• Depth	mm (in)	292 (11.50)		292 (11.50)		292 (11.50)		302 (11.89)		326 (12.83)		326 (12.83)	
Weight, approx.	kg (lb)	130 (287)		140 (309)		140 (309)		146 (322)		179 (395)		179 (395)	
Approvals, according to		cURus		cURus		cURus		cURus		cURus		cURus	
Suitable for Single Motor Module in chassis format	Type	6SL3320-1TE36-1AA3		6SL3320-1TE37-5AA3		6SL3320-1TE38-4AA3		6SL3320-1TE41-0AA3		6SL3320-1TE41-2AA3		6SL3320-1TE41-4AA3	
• Rated current of the Motor Module	A	605		745		840		985		1260		1405	
• Type rating of the Motor Module	kW (HP)	315 (500)		400 (600)		450 (700)		560 (800)		710 (1000)		800 (1150)	

DC link voltage 675 ... 1035 V DC or line voltage 500 ... 690 V 3 AC		Motor reactor (for pulse frequencies of 1.25 kHz to 2.5 kHz)											
		6SL3000-2AH31-0AA0				6SL3000-2AH31-5AA0				6SL3000-2AH31-8AA0		6SL3000-2AH32-4AA0	
Rated current	A	100		100		150		150		175		215	
Rated inductance	µH	160		160		110		110		80		53	
Power loss	kW	0.257		0.3		0.318		0.335		0.4		0.425	
Line/load connection		Flat connector for M10 screw		Flat connector for M10 screw		Flat connector for M10 screw		Flat connector for M10 screw		Flat connector for M10 screw		Flat connector for M10 screw	
PE connection		M6 screw		M6 screw		M6 screw		M6 screw		M6 screw		M6 screw	
Cable length between motor reactor and motor, max.													
(number of reactors in series)		(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
• Shielded	m (ft)	300 (984)	525 (1723)	300 (984)	525 (1723)	300 (984)	525 (1723)	300 (984)	525 (1723)	300 (984)	525 (1723)	300 (984)	525 (1723)
• Unshielded	m (ft)	450 (1476)	787 (2582)	450 (1476)	787 (2582)	450 (1476)	787 (2582)	450 (1476)	787 (2582)	450 (1476)	787 (2582)	450 (1476)	787 (2582)
Degree of protection		IP00		IP00		IP00		IP00		IP00		IP00	
Dimensions													
• Width	mm (in)	270 (10.63)		270 (10.63)		270 (10.63)		270 (10.63)		300 (11.81)		300 (11.81)	
• Height	mm (in)	248 (9.76)		248 (9.76)		248 (9.76)		248 (9.76)		285 (11.22)		285 (11.22)	
• Depth	mm (in)	200 (7.87)		200 (7.87)		200 (7.87)		200 (7.87)		212 (8.35)		212 (8.35)	
Weight, approx.	kg (lb)	25 (55)		25 (55)		25.8 (57)		25.8 (57)		34 (75.0)		34 (75.0)	
Approvals, according to		–		–		–		–		–		–	
Suitable for Single Motor Module in chassis format	Type	6SL3320-1TG28-5AA3		6SL3320-1TG31-0AA3		6SL3320-1TG31-2AA3		6SL3320-1TG31-5AA3		6SL3320-1TG31-8AA3		6SL3320-1TG32-2AA3	
• Rated current of the Motor Module	A	85		100		120		150		175		215	
• Type rating of the Motor Module	kW	75		90		110		132		160		200	

Motor reactors for chassis format

Technical specifications (continued)

DC link voltage 675 … 1035 V DC or line voltage 500 … 690 V 3 AC		Motor reactor (for pulse frequencies of 1.25 kHz to 2.5 kHz)									
		6SL3000-2AH32-6AA0		6SL3000-2AH33-6AA0		6SL3000-2AH34-5AA0		6SL3000-2AH34-7AA0		6SL3000-2AH35-8AA0	
Rated current	A	260		330		410		465		575	
Rated inductance	µH	40		24		21		19		19	
Power loss	kW	0.44		0.45		0.545		0.72		0.8	
Line/load connection		Flat connector for M10 screw		Flat connector for M10 screw		Flat connector for M12 screw		Flat connector for M12 screw		Flat connector for M12 screw	
PE connection		M6 screw		M6 screw		M8 screw		M8 screw		M8 screw	
Cable length between motor reactor and motor, max.											
(number of reactors in series)		(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
• Shielded	m (ft)	300 (984)	525 (1723)	300 (984)	525 (1723)	300 (984)	525 (1723)	300 (984)	525 (1723)	300 (984)	525 (1723)
• Unshielded	m (ft)	450 (1476)	787 (2582)	450 (1476)	787 (2582)	450 (1476)	787 (2582)	450 (1476)	787 (2582)	450 (1476)	787 (2582)
Degree of protection		IP00		IP00		IP00		IP00		IP00	
Dimensions											
• Width	mm (in)	300 (11.81)		300 (11.81)		350 (13.78)		410 (16.14)		410 (16.14)	
• Height	mm (in)	285 (11.22)		285 (11.22)		330 (12.99)		392 (15.43)		392 (15.43)	
• Depth	mm (in)	212 (8.35)		212 (8.35)		215 (8.46)		292 (11.50)		292 (11.50)	
Weight, approx.	kg (lb)	40 (88)		46 (101)		68 (150)		80 (176)		80 (176)	
Approvals, according to		–		–		–		–		–	
Suitable for Single Motor Module in chassis format	Type	6SL3320-1TG32-6AA3		6SL3320-1TG33-3AA3		6SL3320-1TG34-1AA3		6SL3320-1TG34-7AA3		6SL3320-1TG35-8AA3	
• Rated current of the Motor Module	A	260		330		410		465		575	
• Type rating of the Motor Module	kW	250		315		400		450		560	

DC link voltage 675 … 1035 V DC or line voltage 500 … 690 V 3 AC		Motor reactor (for pulse frequencies of 1.25 kHz to 2.5 kHz)									
		6SL3000-2AH38-1AA0				6SL3000-2AH41-0AA0		6SL3000-2AH41-1AA0		6SL3000-2AH41-3AA0	
Rated current	A	810		810		910		1025		1270	
Rated inductance	µH	18		18		13		10		5,1	
Power loss	kW	0,96		1,0		0,97		1,05		0,95	
Line/load connection		Flat connector for M21 screw		Flat connector for M21 screw		Flat connector for M21 screw		Flat connector for M21 screw		Flat connector for M21 screw	
PE connection		M8 screw		M8 screw		M8 screw		M8 screw		M8 screw	
Cable length between motor reactor and motor, max.											
(number of reactors in series)		(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
• Shielded	m (ft)	300 (984)	525 (1723)	300 (984)	525 (1723)	300 (984)	525 (1723)	300 (984)	525 (1723)	300 (984)	525 (1723)
• Unshielded	m (ft)	450 (1476)	787 (2582)	450 (1476)	787 (2582)	450 (1476)	787 (2582)	450 (1476)	787 (2582)	450 (1476)	787 (2582)
Degree of protection		IP00		IP00		IP00		IP00		IP00	
Dimensions											
• Width	mm (in)	410 (16.14)		410 (16.14)		410 (16.14)		410 (16.14)		460 (18.11)	
• Height	mm (in)	392 (15.43)		392 (15.43)		392 (15.43)		392 (15.43)		392 (15.43)	
• Depth	mm (in)	279 (10.98)		279 (10.98)		279 (10.98)		317 (12.48)		296 (11.65)	
Weight, approx.	kg (lb)	146 (322)		146 (322)		150 (331)		163 (359)		153 (337)	
Approvals, according to		–		–		–		–		–	
Suitable for Single Motor Module in chassis format	Type	6SL3320-1TG37-4AA3		6SL3320-1TG38-1AA3		6SL3320-1TG38-8AA3		6SL3320-1TG41-0AA3		6SL3320-1TG41-3AA3	
• Rated current of the Motor Module	A	735		810		910		1025		1270	
• Type rating of the Motor Module	kW	710		800		900		1000		1200	

Selection and ordering data

Rated current of the Single Motor Module or Power Module	Type rating of the Single Motor Module or Power Module	Suitable for Single Motor Module or Power Module in chassis format	**Motor reactor**
A	kW (HP)	Type	Order No.
DC link voltage 510 ... 720 V DC (line voltage 380 ... 480 V 3 AC)			
210	110 (150)	6SL33 . 0-1TE32-1AA3	**6SL3000-2BE32-1AA0** *)
260	132 (200)	6SL33 . 0-1TE32-6AA3	**6SL3000-2BE32-6AA0** *)
310	160 (250)	6SL33 . 0-1TE33-1AA3	**6SL3000-2BE33-2AA0** *)
380	200 (300)	6SL33 . 0-1TE33-8AA3	**6SL3000-2BE33-8AA0** *)
490	250 (400)	6SL33 . 0-1TE35-0AA3	**6SL3000-2BE35-0AA0** *)
605	315 (500)	6SL3320-1TE36-1AA3	**6SL3000-2AE36-1AA0** *)
745	400 (600)	6SL3320-1TE37-5AA3	**6SL3000-2AE38-4AA0** *)
840	450 (700)	6SL3320-1TE38-4AA3	
985	560 (800)	6SL3320-1TE41-0AA3	**6SL3000-2AE41-0AA0**
1260	710 (1000)	6SL3320-1TE41-2AA3	**6SL3000-2AE41-4AA0**
1405	800 (1150)	6SL3320-1TE41-4AA3	
DC link voltage 675 ... 1035 V DC (line voltage 500 ... 690 V 3 AC)			
85	75	6SL3320-1TG28-5AA3	**6SL3000-2AH31-0AA0**
100	90	6SL3320-1TG31-0AA3	
120	110	6SL3320-1TG31-2AA3	**6SL3000-2AH31-5AA0**
150	132	6SL3320-1TG31-5AA3	
175	160	6SL3320-1TG31-8AA3	**6SL3000-2AH31-8AA0**
215	200	6SL3320-1TG32-2AA3	**6SL3000-2AH32-4AA0**
260	250	6SL3320-1TG32-6AA3	**6SL3000-2AH32-6AA0**
330	315	6SL3320-1TG33-3AA3	**6SL3000-2AH33-6AA0**
410	400	6SL3320-1TG34-1AA3	**6SL3000-2AH34-5AA0**
465	450	6SL3320-1TG34-7AA3	**6SL3000-2AH34-7AA0**
575	560	6SL3320-1TG35-8AA3	**6SL3000-2AH35-8AA0**
735	710	6SL3320-1TG37-4AA3	**6SL3000-2AH38-1AA0**
810	800	6SL3320-1TG38-1AA3	
910	900	6SL3320-1TG38-8AA3	**6SL3000-2AH41-0AA0**
1025	1000	6SL3320-1TG41-0AA3	**6SL3000-2AH41-1AA0**
1270	1200	6SL3320-1TG41-3AA3	**6SL3000-2AH41-3AA0**

*) Also for liquid-cooled Power Modules in chassis format.

Sine-wave filter for chassis format

Overview

If a sine-wave filter is connected at the Motor Module output, the voltage between the motor terminals is virtually sinusoidal. This reduces the voltage load on the motor windings and prevents motor noise induced by the pulse frequency.

The pulse frequency of the Motor Modules must be set to 4 kHz for the sine-wave filters. The max. output frequency with sine-wave filter is limited to 150 Hz.

With chassis format units, this reduces the maximum possible output current and the maximum achievable output voltage (see characteristic curves for Single Motor Modules in chassis format and chapter System description – Dimensioning).
The voltage drops across the sine-wave filter, a factor which must also be taken into account in the drive design (see chapter System description – Dimensioning).

The sine-wave filter must be installed as close as possible to the Motor Module.

The sine-wave filter may be operated only when the motor is connected (sine-wave filter is not no-load-proof). Operation in Servo control mode is not permissible.

Technical specifications

DC link voltage 510 ... 720 V DC		**Sine-wave filter**				
		6SL3000-2CE32-3AA0		6SL3000-2CE32-8AA0	6SL3000-2CE33-3AA0	6SL3000-2CE34-1AA0
Rated current	A	225	225	276	333	408
Power loss at 50/60 Hz	kW	0.35/0.6	0.35/0.6	0.4/0.69	0.245/0.53	0.38/0.7
Line connection		Flat connector for M10 screw	Flat connector for M10 screw	Flat connector for M10 screw	Flat connector for M10 screw	Flat connector for M10 screw
Load connection		Flat connector for M10 screw	Flat connector for M10 screw	Flat connector for M10 screw	Flat connector for M10 screw	Flat connector for M10 screw
Cable length between motor reactor and motor, max.						
• Shielded/Unshielded	m (ft)	300/450 (984/1476)	300/450 (984/1476)	300/450 (984/1476)	300/450 (984/1476)	300/450 (984/1476)
Degree of protection		IP00	IP00	IP00	IP00	IP00
Dimensions						
• Width	mm (in)	620 (24.41)	620 (24.41)	620 (24.41)	620 (24.41)	620 (24.41)
• Height	mm (in)	300 (11.81)	300 (11.81)	300 (11.81)	370 (14.57)	370 (14.57)
• Depth	mm (in)	320 (12.60)	320 (12.60)	320 (12.60)	360 (14.17)	360 (14.17)
Weight, approx.	kg (lb)	124 (273)	124 (273)	127 (280)	136 (300)	198 (437)
Approvals, according to		cURus	cURus	cURus	cURus	cURus
Suitable for Single Motor Module in chassis format	Type	6SL3320-1TE32-1AA3	6SL3320-1TE32-6AA3	6SL3320-1TE33-1AA3	6SL3320-1TE33-8AA3	6SL3320-1TE35-0AA3
Suitable for Power Module in chassis format [1]	Type	6SL3310-1TE32-1AA3	6SL3310-1TE32-6AA3	6SL3310-1TE33-1AA3	6SL3310-1TE33-8AA3	6SL3310-1TE35-0AA3
• Rated current of the Motor Module or Power Module at pulse frequency of 4 kHz	A	170	215	270	330	380
• Type rating of the Motor Module or Power Module at pulse frequency of 4 kHz	kW (HP)	90 (120)	110 (150)	132 (200)	160 (250)	200 (400)

[1] Also for liquid-cooled Power Modules in chassis format

Selection and ordering data

Rated output current of the Single Motor Module or Power Module	Type rating of the Single Motor Module or Power Module	Suitable for Single Motor Module or Power Module in chassis format	**Sine-wave filter**
A	kW (HP)	Type	Order No.
DC link voltage 510 ... 720 V DC (line voltage 380 ... 480 V 3 AC)			
210	110 (150)	6SL33 . 0-1TE32-1AA3	**6SL3000-2CE32-3AA0**
260	132 (200)	6SL33 . 0-1TE32-6AA3	
310	160 (250)	6SL33 . 0-1TE33-1AA3	**6SL3000-2CE32-8AA0**
380	200 (300)	6SL33 . 0-1TE33-8AA3	**6SL3000-2CE33-3AA0**
490	250 (400)	6SL33 . 0-1TE35-0AA3	**6SL3000-2CE34-1AA0**

BOP20 Basic Operator Panel

Overview

BOP20 Basic Operator Panel

The BOP20 Basic Operator Panel can be snapped onto any CU310 or CU320-2 Control Unit and may be used to acknowledge faults, set parameters and read diagnostic information (e.g. alarm and fault messages).

Design

The BOP20 Basic Operator Panel has a backlit two-line display area and 6 keys.

The integrated plug connector on the back of the BOP20 Basic Operator Panel provides the power to the BOP20 Basic Operator Panel and the communication with the CU310 or CU320-2 Control Unit.

Integration

CU310 DP Control Unit with attached BOP20 Basic Operator Panel

CU320-2 DP Control Unit with attached BOP20 Basic Operator Panel

Selection and ordering data

Description	Order No.
BOP20 Basic Operator Panel	**6SL3055-0AA00-4BA0**

Overview

The CBC10 Communication Board is used to interface the CU320-2 Control Unit to the CAN (Controller Area Network) protocol. The board's driver software fulfils the standards of the following CANopen specification of the CiA organization (CAN in Automation):

- Communication profiles in accordance with DS 301
- Drive profile in accordance with DSP 402 (in this case Profile Velocity Mode)
- EDS (Electronic Data Sheet) in accordance with DSP 306
- Operational status signaling in accordance with DSP 305

Design

The CBC10 Communication Board plugs into the option slot on the CU320-2 Control Unit. The CAN interface on the CBC10 has 2 SUB-D connections in each case of input and output.

Technical specifications

CBC10 Communication Board 6SL3055-0AA00-2CA0	
Power requirement, max. At 24 V DC via CU320-2 Control Unit	0.05 A
Power loss	< 10 W
Weight, approx.	0.1 kg (0.22 lb)
Approvals, according to	cULus

Selection and ordering data

Description	Order No.
CBC10 Communication Board	**6SL3055-0AA00-2CA0**
Accessories	
SUB-D connector, 9-pin, female (3 units)	**6FC9341-2AE**
SUB-D connector, 9-pin, male (3 units)	**6FC9341-2AF**

CBE20 Communication Board

Overview

The CBE20 Communication Board can be used to connect to a PROFINET IO network via a CU320-2 Control Unit.

The SINAMICS S120 then assumes the function of a PROFINET IO device and can perform the following functions:

- PROFINET IO device
- 100 Mbit/s full duplex
- Supports real-time classes of PROFINET IO:
  - RT (Real-Time)
  - IRT (Isochronous Real-Time), minimum send cycle 500 µs
- Connects to controls as PROFINET IO devices using PROFIdrive compliant with Specification V4
- Standard TCP/IP communication for engineering processes using the STARTER commissioning tool
- Integrated 4-port switch with four RJ45 sockets based on the PROFINET ASIC ERTEC400. The optimum topology (line, star, tree) can therefore be configured without additional external switches.

Integration

The CBE20 Communication Board plugs into the option slot on the CU320-2 Control Unit.

Technical specifications

CBE20 Communication Board 6SL3055-0AA00-2EB0	
Current requirement At 24 V DC	0.16 A
Ambient temperature, permissible	
• Storage and transport	-40 … +70 °C (-40 … +158 °F)
• Operation	0 … 55 °C (32 … 131 °F)
Dimensions	130 mm × 78 mm (5.12 in × 3.07 in)
Weight, approx.	76 g (2.68 oz)
Approvals, according to	cULus

Selection and ordering data

Description	Order No.
CBE20 Communication Board	**6SL3055-0AA00-2EB0**
Accessories	
Industrial Ethernet FC	
• RJ45 Plug 180 (1 unit)	**6GK1901-1BB30-0AA0**
• RJ45 Plug 180 (10 units)	**6GK1901-1BB30-0AHB0**
• Stripping tool	**6GK1901-1GA00**
• Standard cable GP 2x2	**6XV1840-2AH10**
• Flexible cable GP 2x2	**6XV1870-2B**
• Trailing cable GP 2x2	**6XV1870-2D**
• Trailing cable 2x2	**6XV1840-3AH10**
• Marine cable 2x2	**6XV1840-4AH10**

For further information on connectors and cables, please refer to Catalog IK PI or the Siemens Industry Mall:
www.siemens.com/industrymall

Overview

The CUA31 Control Unit Adapter converts the PM-IF interface to a DRIVE-CLiQ interface. The CUA31 Control Unit Adapter allows Power Modules in blocksize format to operate on a CU320-2 or SIMOTION D Control Unit, e.g. as a single axis next to a multi-axis drive. In this case, the CUA31 Control Unit Adapter must be the last device in the DRIVE-CLiQ link from the viewpoint of the CU320-2 or SIMOTION D Control Unit.

Design

The CUA31 Control Unit Adpater features the following connections and interfaces:

- 1 temperature sensor input (KTY84-130 or PTC)
- 3 DRIVE-CLiQ sockets
- 1 connection for the electronics power supply via the 24 V DC power supply connector
- 1 safe standstill input (enable pulses)

The status of the CUA31 Control Unit Adapter is indicated via multi-color LEDs.

Technical specifications

CUA31 Control Unit Adapter 6SL3040-0PA00-0AA1	
Power requirement, max. At 24 V DC without DRIVE-CLiQ supply	0.15 A for CUA31 + max. 0.5 A for PM340 Power Module
• Conductor cross-section, max.	2.5 mm^2
Power loss	< 4 W
PE connection	M5 screw
Dimensions	
• Width	73 mm (2.87 in)
• Height	165.8 mm (6.53 in)
• Depth	37.3 mm (1.47 in)
Weight, approx.	0.31 kg (0.68 lb)
Approvals, according to	cULus

Selection and ordering data

Description	Order No.
CUA31 Control Unit Adapter Without DRIVE-CLiQ cable	**6SL3040-0PA00-0AA1**

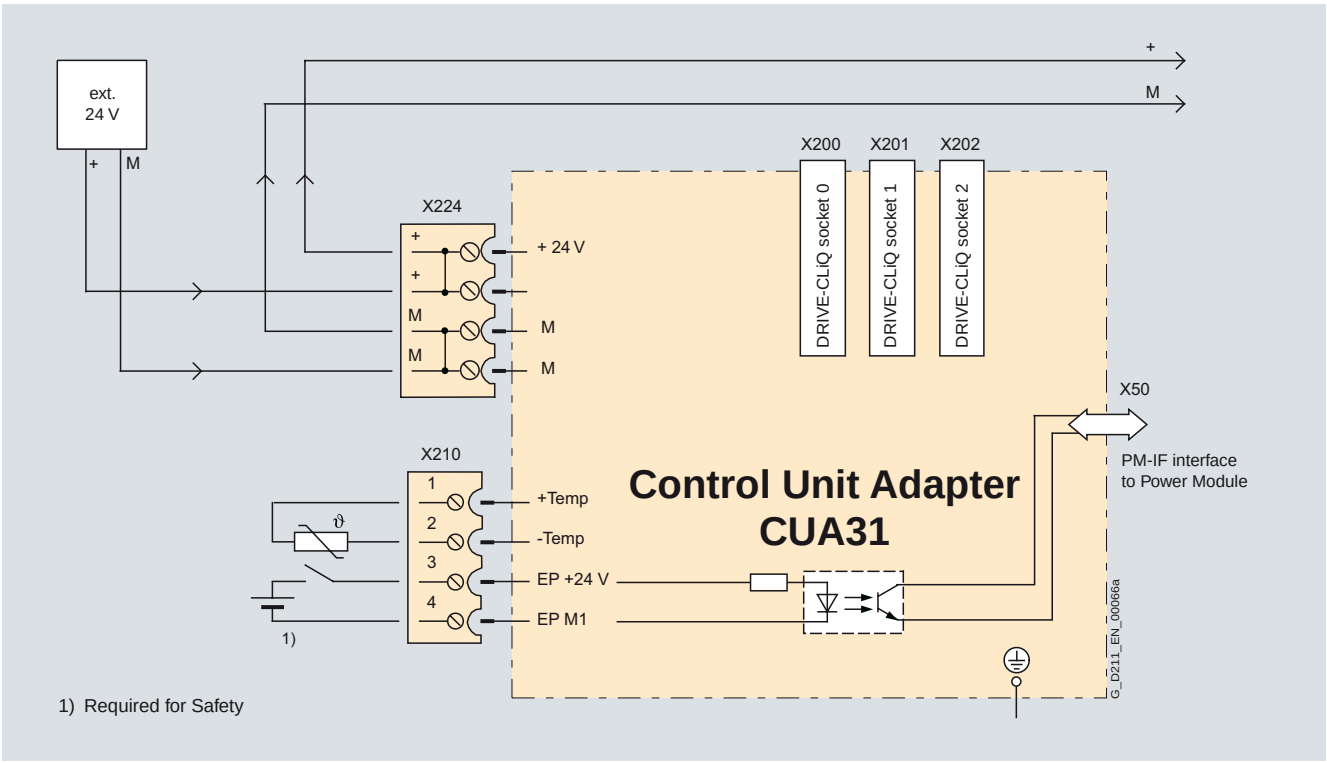
CUA31 Control Unit Adapter

Integration

The CUA31 Control Unit Adapter is snapped onto the Power Module in blocksize format and communicates with the CU320-2 or a SIMOTION D Control Unit by means of a DRIVE-CLiQ link.

The CUA31 Control Unit Adapter's power is supplied by the Power Module via the PM-IF interface. If the CUA31 Control Unit Adapter needs to communicate when the Power Module is switched off, it must be supplied with 24 V DC from an external source.

Other DRIVE-CLiQ devices such as Sensor Modules or Terminal Modules can be connected to the CUA31 Control Unit Adapter.



1) Required for Safety

CUA32 Control Unit Adapter

Overview

The CUA32 Control Unit Adapter converts the PM-IF interface to a DRIVE-CLiQ interface. The CUA32 Control Unit Adapter is also equipped with an integral encoder evaluation device which can be configured for an HTL/TTL or SSI encoder.

The CUA32 Control Unit Adapter allows Power Modules in block-size format to operate on a CU320-2 or SIMOTION D Control Unit, e.g. as a single axis next to a multi-axis drive. In this case, the CUA32 Control Unit Adapter must be the last device in the DRIVE-CLiQ link from the viewpoint of the CU320-2 or SIMOTION D Control Unit.

Design

The CUA32 Control Unit Adapter features the following interfaces:

- 1 temperature sensor input (KTY84-130 or PTC)
- 3 DRIVE-CLiQ sockets
- 1 connection for the electronics power supply via the 24 V DC power supply connector
- 1 safe standstill input (enable pulses)
- 1 encoder evaluation
  The following encoder signals can be evaluated:
  - Incremental encoder TTL/HTL
  - SSI encoder without incremental signals

The status of the CUA32 Control Unit Adapter is indicated via multi-color LEDs.

Technical specifications

CUA32 Control Unit Adapter 6SL3040-0PA01-0AA0	
Power requirement, max. At 24 V DC without DRIVE-CLiQ supply and encoder supply	0.15 A for CUA32 + max. 0.5 A for PM340 Power Module
• Conductor cross-section, max.	2.5 mm^2
Encoder evaluation	• Incremental encoder TTL/HTL • SSI encoder without incremental signals
• Input impedance	
- TTL	570 Ω
- HTL, max.	16 mA
• Encoder supply	24 V DC/0.35 A or 5 V DC/0.35 A
• Encoder frequency, max.	300 Hz
• SSI baud rate	100 ... 250 kbaud
• Resolution absolute position SSI	30 bit
• Cable length, max.	
- TTL encoder	100 m (328 ft) (only bipolar signals permitted)[1)]
- HTL encoder	100 m (328 ft) for unipolar signals 300 m (984 ft) for bipolar signals[1)]
- SSI encoder	100 m (328 ft)
Power loss	< 4 kW
PE connection	M5 screw
Dimensions	
• Width	73 mm (2.87 in)
• Height	165.8 mm (6.53 in)
• Depth	37.3 mm (1.47 in)
Weight, approx.	0.31 kg (0.68 lb)
Approvals, according to	cULus

Selection and ordering data

Description	Order No.
CUA32 Control Unit Adapter Without DRIVE-CLiQ cable	**6SL3040-0PA01-0AA0**
Accessories for re-ordering	
Dust-proof blanking plugs (50 units) For DRIVE-CLiQ port	**6SL3066-4CA00-0AA0**

1) Signal cables twisted in pairs and shielded.

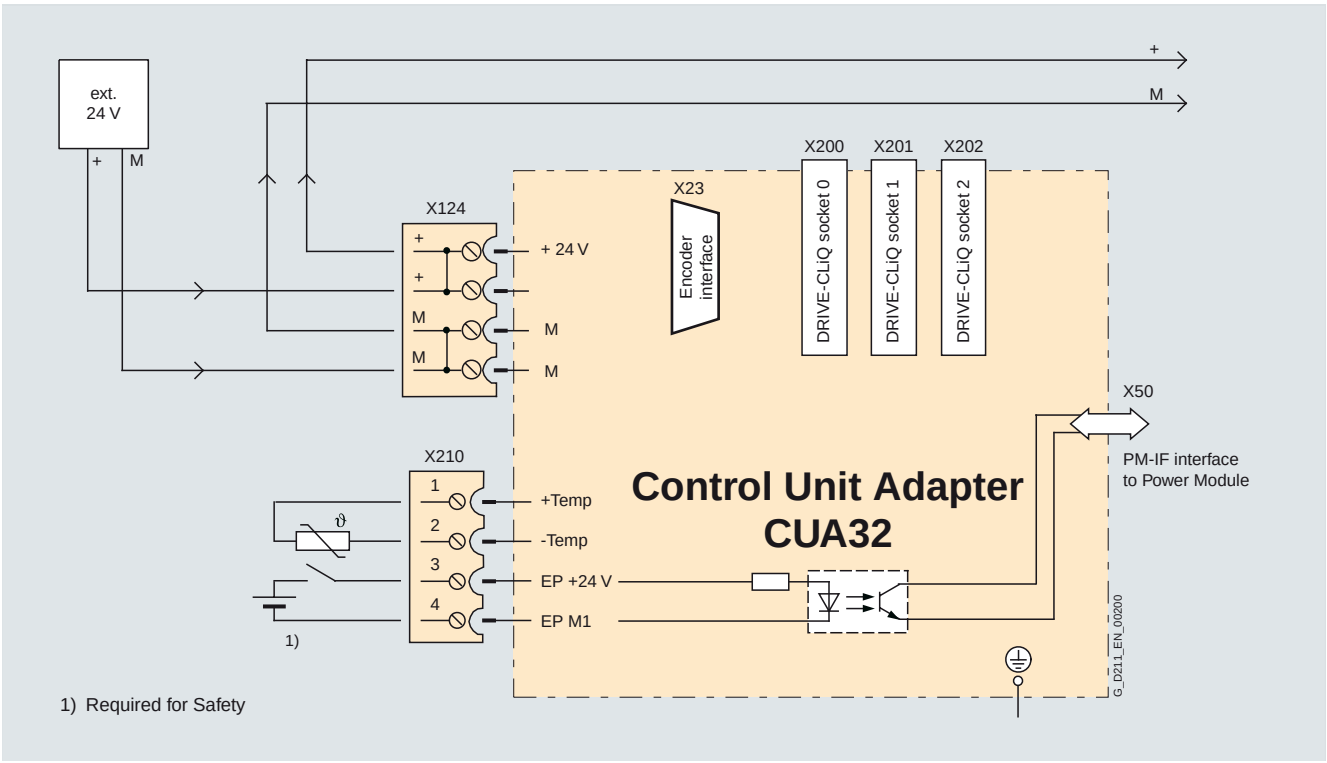
CUA32 Control Unit Adapter

Integration

The CUA32 Control Unit Adapter is snapped onto the Power Module in blocksize format and communicates with the CU320-2 or a SIMOTION D Control Unit by means of a DRIVE-CLiQ link.

The CUA32 Control Unit Adapter's power is supplied by the Power Module via the PM-IF interface. If the CUA32-2 Control Unit Adapter needs to communicate when the Power Module is switched off, it must be supplied with 24 V DC from an external source.

Other DRIVE-CLiQ devices such as Sensor Modules or Terminal Modules can be connected to the CUA32 Control Unit Adapter.



1) Required for Safety

Overview

DRIVE-CLiQ DMC20 Hub Module

The DRIVE-CLiQ DMC20 Hub Module is used to implement star-shaped distribution of a DRIVE-CLiQ line. Two DRIVE-CLiQ DMC20 Hub Modules can be connected in series (cascaded).

Design

The DMC20 DRIVE-CLiQ Hub Module in degree of protection IP20 is designed for mounting in control cabinets.

The following are located on the DMC20 DRIVE-CLiQ Hub Module:

- 6 DRIVE-CLiQ sockets for connecting 5 DRIVE-CLiQ devices
- 1 connection for the electronics power supply via the 24 V DC supply connector

The status of the DMC20 DRIVE-CLiQ Hub Module is indicated via a multi-color LED.

Technical specifications

DMC20 DRIVE-CLiQ Hub Module 6SL3055-0AA00-6AA0	
Power requirement, max. At 24 V DC without DRIVE-CLiQ supply	0.15 A
• Conductor cross-section, max.	2.5 mm^2
Degree of protection	IP20
Dimensions	
• Width	50 mm (1.97 in)
• Height	150 mm (5.91 in)
• Depth	111 mm (4.37 in)
Weight, approx.	0.8 kg (1.76 lb)
Approvals, according to	cULus

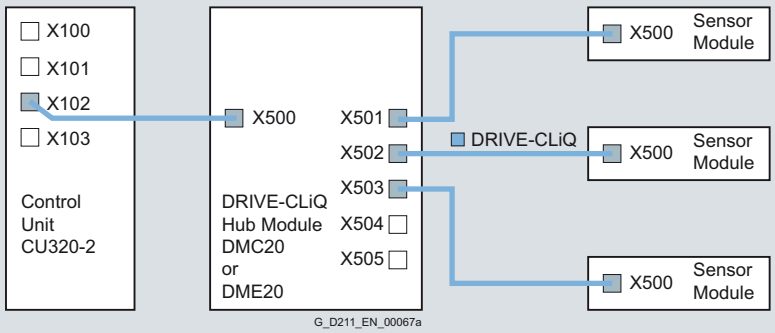
Selection and ordering data

Description	Order No.
DMC20 DRIVE-CLiQ Hub Module Without DRIVE-CLiQ cable	**6SL3055-0AA00-6AA0**
Accessories for re-ordering	
Dust-proof blanking plugs (50 units) For DRIVE-CLiQ port	**6SL3066-4CA00-0AA0**

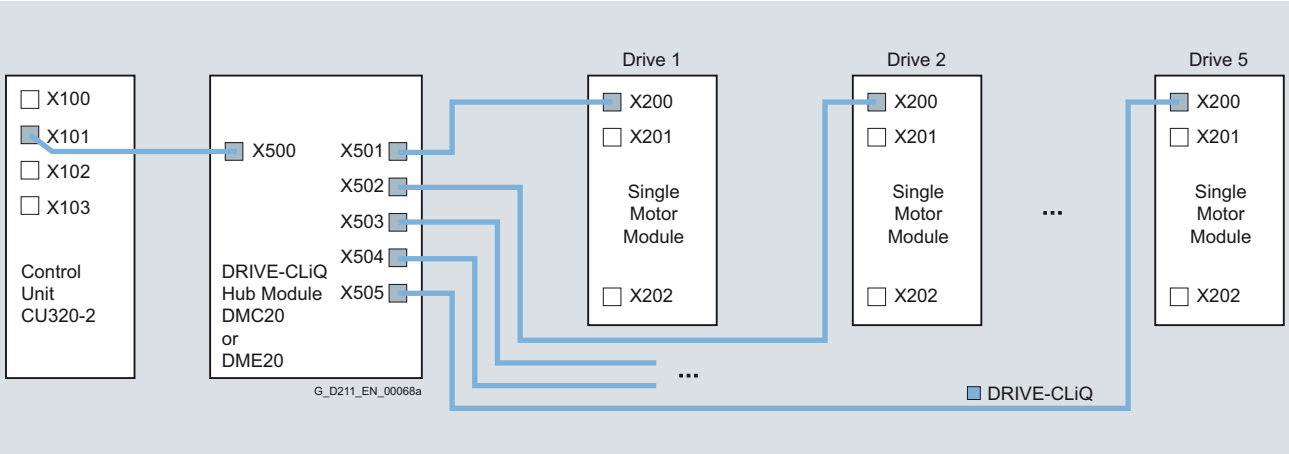
DMC20 DRIVE-CLiQ Hub Module

Integration

Signals from more than one encoder can be collected with one DRIVE-CLiQ Hub Module and forwarded to the Control Unit through a single DRIVE-CLiQ cable.



A DRIVE-CLiQ Hub Module allows individual DRIVE-CLiQ devices to be removed without interrupting the data exchange with the remaining devices in the DRIVE-CLiQ line.



Overview

DME20 DRIVE-CLiQ Hub Module

The DME20 DRIVE-CLiQ Hub Module is used to implement star-shaped distribution of a DRIVE-CLiQ line. Two DME20 DRIVE-CLiQ Hub Modules can be connected in series (cascaded).

Design

The DME20 DRIVE-CLiQ Hub Module in degree of protection IP67 is designed for mounting outside control cabinets.

The following are located on the DME20 DRIVE-CLiQ Hub Module:

- 6 DRIVE-CLiQ sockets for connecting 5 DRIVE-CLiQ devices
- 1 connection for the electronics power supply via the 24 V DC circular supply connector with conductor cross-section 4 × 0.75 mm^2 (pins 1+2 internally bridged; pins 3+4 internally bridged)

The following are included in the scope of supply of DRIVE-CLiQ Hub Modules:

- 6 blanking plugs for sealing unused DRIVE-CLiQ sockets

Technical specifications

DME20 DRIVE-CLiQ Hub Module 6SL3055-0AA00-6AB0	
Power requirement, max. At 24 V DC without DRIVE-CLiQ supply	0.15 A
• Conductor cross-section, max.	4 × 0.75 mm^2
Degree of protection	IP67
Dimensions	
• Width	99 mm (3.90 in)
• Height	149 mm (5.87 in)
• Depth	55.7 mm (2.19 in; without connector)
Weight, approx.	0.8 kg (1.76 lb)
Approvals, according to	cULus

Selection and ordering data

Description	Order No.
DME20 DRIVE-CLiQ Hub Module Without DRIVE-CLiQ cable; without electronics power supply cable and circular connector for 24 V DC	**6SL3055-0AA00-6AB0**
Accessories	
24 V DC power supply cable	Ordering and delivery Phoenix Contact www.phoenixcontact.com
• Shielded connector, 5-pole, user-assembled	Type No. 1508365
• 4-pole non-shielded connector, user-assembled, Speedcon quick-lock:	Type No. 1521601
Accessories for re-ordering	
Dust-proof blanking plugs IP67 (6 units) For DRIVE-CLiQ port	**6SL3066-4CA01-0AA0**

Integration

Refer to DMC20 DRIVE-CLiQ Hub Module.

TB30 Terminal Board

Overview

The TB30 Terminal Board supports the addition of digital inputs/digital outputs and analog inputs/analog outputs to the CU320-2 and SIMOTION D4x5 Control Units.

Design

The following are located on the TB30 Terminal Board:

- Power supply for digital inputs/digital outputs
- 4 digital inputs
- 4 digital outputs
- 2 analog inputs
- 2 analog outputs

The TB30 Terminal Board plugs into the option slot on a Control Unit.

A shield connection for the signal cable shield is located on the Control Unit.

Technical specifications

TB30 Terminal Board 6SL3055-0AA00-2TA0	
Power requirement, max.	0.05 A
At 24 V DC via CU320-2 Control Unit without taking account of digital outputs	
• Conductor cross-section, max.	2.5 mm^2
• Fuse protection, max.	20 A
Digital inputs In accordance with IEC 61131-2 Type 1	
• Voltage	-3 … +30 V
• Low level (an open digital input is interpreted as "low")	-3 … +5 V
• High level	15 … 30 V
• Current consumption at 24 V DC, typ.	10 mA
• Delay time of digital inputs [1], approx.	
- L → H	50 µs
- H → L	100 µs
• Conductor cross-section, max.	0.5 mm^2
Digital outputs Sustained short-circuit strength	
• Voltage	24 V DC
• Load current per digital output, max.	500 mA
• Delay time of digital outputs [1], approx.	150 µs
• Conductor cross-section, max.	0.5 mm^2
Analog inputs (Difference)	
• Voltage range (an open analog input is interpreted as 0 V)	-10 … +10 V
• Internal resistance R_i	65 kΩ
• Resolution [2]	13 bit + sign
• Conductor cross-section, max.	0.5 mm^2
Analog outputs Sustained short-circuit strength	
• Voltage range	-10 … +10 V
• Max. load current	-3 … +3 mA
• Resolution	11 bit + sign
• Settling time, approx.	200 µs
• Conductor cross-section, max.	0.5 mm^2
Power loss	< 3 W
Weight, approx.	0.1 kg (0.22 lb)
Approvals, according to	cULus

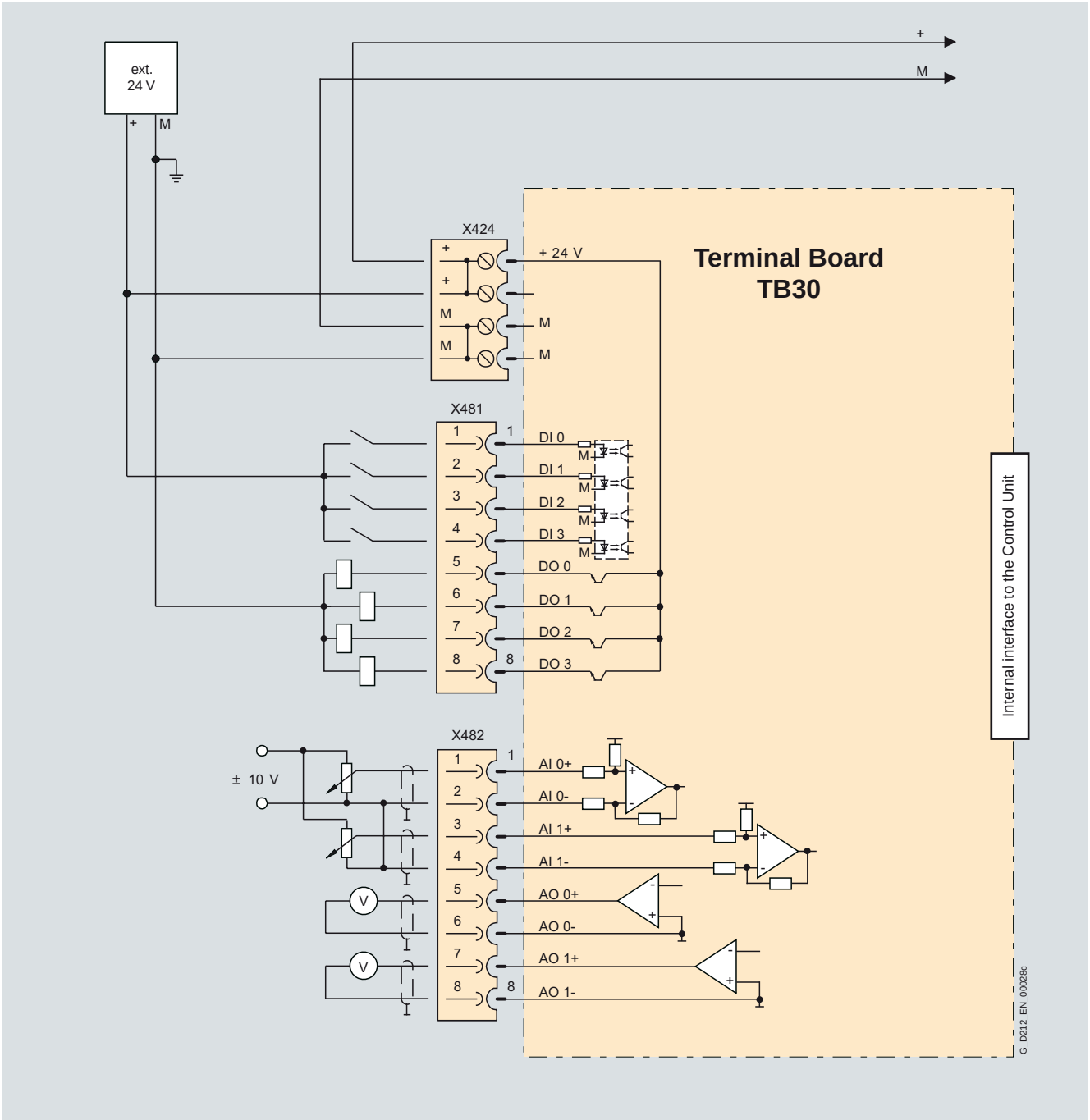
Selection and ordering data

Description	Order No.
TB30 Terminal Board	**6SL3055-0AA00-2TA0**

[1] The specified delay times refer to the hardware. The actual reaction time depends on the time slot in which the digital input is processed.

[2] If the analog input is to be operated in the signal processing sense with continuously variable input voltage, the sampling frequency $f_a = 1/t_{time\ slice}$ must be at least twice the value of the highest signal frequency f_{max}.

Integration



Connection example of TB30 Terminal Board

TM15 Terminal Module

Overview

The number of available digital inputs and outputs within a drive system can be expanded with the TM15 Terminal Module.

Design

The following are located on the TM15 Terminal Module:

- 24 bidirectional digital inputs/outputs (isolation in 3 groups with 8 channels each)
- 24 green status LEDs for indicating the logical signal status of the relevant terminal
- 2 × DRIVE-CLiQ sockets
- 1 connection for the electronics power supply via the 24 V DC power supply connector
- 1 PE (protective earth) connection

The TM15 Terminal Module can be snapped on a TH 35 top-hat rail in accordance with EN 60715 (IEC 60715).

The signal cable shield can be connected to the TM15 Terminal Module via a shield connection terminal, e.g. Phoenix Contact type SK8 or Weidmüller type KLBÜ CO 1. The shield connection terminal must not be used for strain relief.

The status of the TM15 Terminal Module is indicated via a multi-color LED.

Selection and ordering data

Description	Order No.
TM15 Terminal Module Without DRIVE-CLiQ cable	**6SL3055-0AA00-3FA0**
Accessories	
Dust-proof blanking plugs (50 units) For DRIVE-CLiQ ports	**6SL3066-4CA00-0AA0**

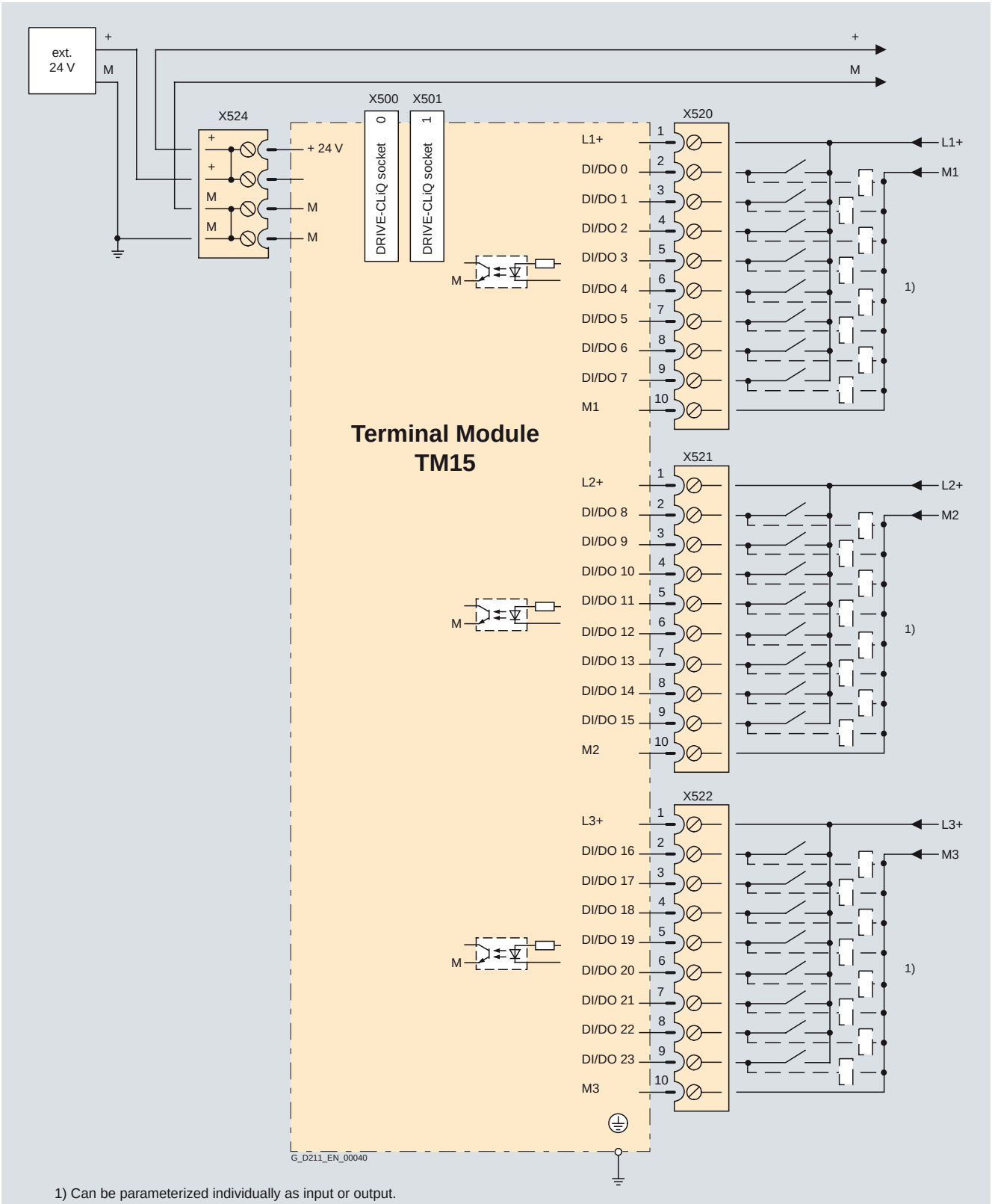
Technical specifications

TM15 Terminal Module 6SL3055-0AA00-3FA0	
Power requirement, max.	0.15 A
With 24 V DC without load	
• Conductor cross-section, max.	2.5 mm^2
• Fuse protection, max.	20 A
Number of DRIVE-CLiQ sockets	2
I/O	
• Digital inputs/outputs	Parameterizable channel-by-channel as DI or DO
• Number of digital inputs/outputs	24
• Isolation	Yes, in groups of 8
• Cables and connections	Plug-in screw-type terminals
• Conductor cross-section, max.	1.5 mm^2
Digital inputs	
• Voltage	-3 … +30 V
• Low level (an open digital input is interpreted as "low")	-3 … +5 V
• High level	15 … 30 V
• Current consumption at 24 V DC	5 … 11 mA
• Delay times of digital inputs, typ.[1)]	
- L → H	50 µs
- H → L	100 µs
Digital outputs	
Sustained short-circuit strength	
• Voltage	24 V DC
• Load current per digital output, max.	0.5 A
• Delay times (ohmic load) [1)]	
- L → H, typ. L → H, max.	50 µs 100 µs
- H → L, typ. H → L, max.	150 µs 225 µs
• Aggregate current of outputs (per group), max.	
- To 60 °C (140 °F)	2 A
- To 50 °C (122 °F)	3 A
- To 40 °C (104 °F)	4 A
Power loss	< 3 W
PE connection	M4 screw
Dimensions	
• Width	50 mm (1.97 in)
• Height	150 mm (5.91 in)
• Depth	111 mm (4.37 in)
Weight, approx.	0.86 kg (2 lb)
Approvals, according to	cULus

[1)] The specified delay times refer to the hardware.
The actual reaction time depends on the time slot in which the digital input/output is processed.

Integration

The TM15 Terminal Module communicates with a CU310, CU320-2 or SIMOTION D Control Unit via DRIVE-CLiQ.



1) Can be parameterized individually as input or output.

Connection example of TM15 Terminal Module

TM31 Terminal Module

Overview

With the TM31 Terminal Module, the number of available digital inputs and outputs and the number of analog input and outputs within a drive can be expanded.

The TM31 Terminal Module also features relay outputs with changeover contact and a temperature sensor input.

Design

The following are located on the TM31 Terminal Module:

- 8 digital inputs
- 4 bidirectional digital inputs/outputs
- 2 relay outputs with changeover contact
- 2 analog inputs
- 2 analog outputs
- 1 temperature sensor input (KTY84-130 or PTC)
- 2 DRIVE-CLiQ sockets
- 1 connection for the electronics power supply via the 24 V DC power supply connector
- 1 PE (protective earth) connection

The TM31 Terminal Module can be snapped on a TH 35 top-hat rail in accordance with EN 60715 (IEC 60715).

The signal cable shield can be connected to the TM31 Terminal Module via a shield connection terminal, e.g., Phoenix Contact type SK8 or Weidmüller type KLBÜ CO 1. The shield connection terminal must not be used for strain relief.

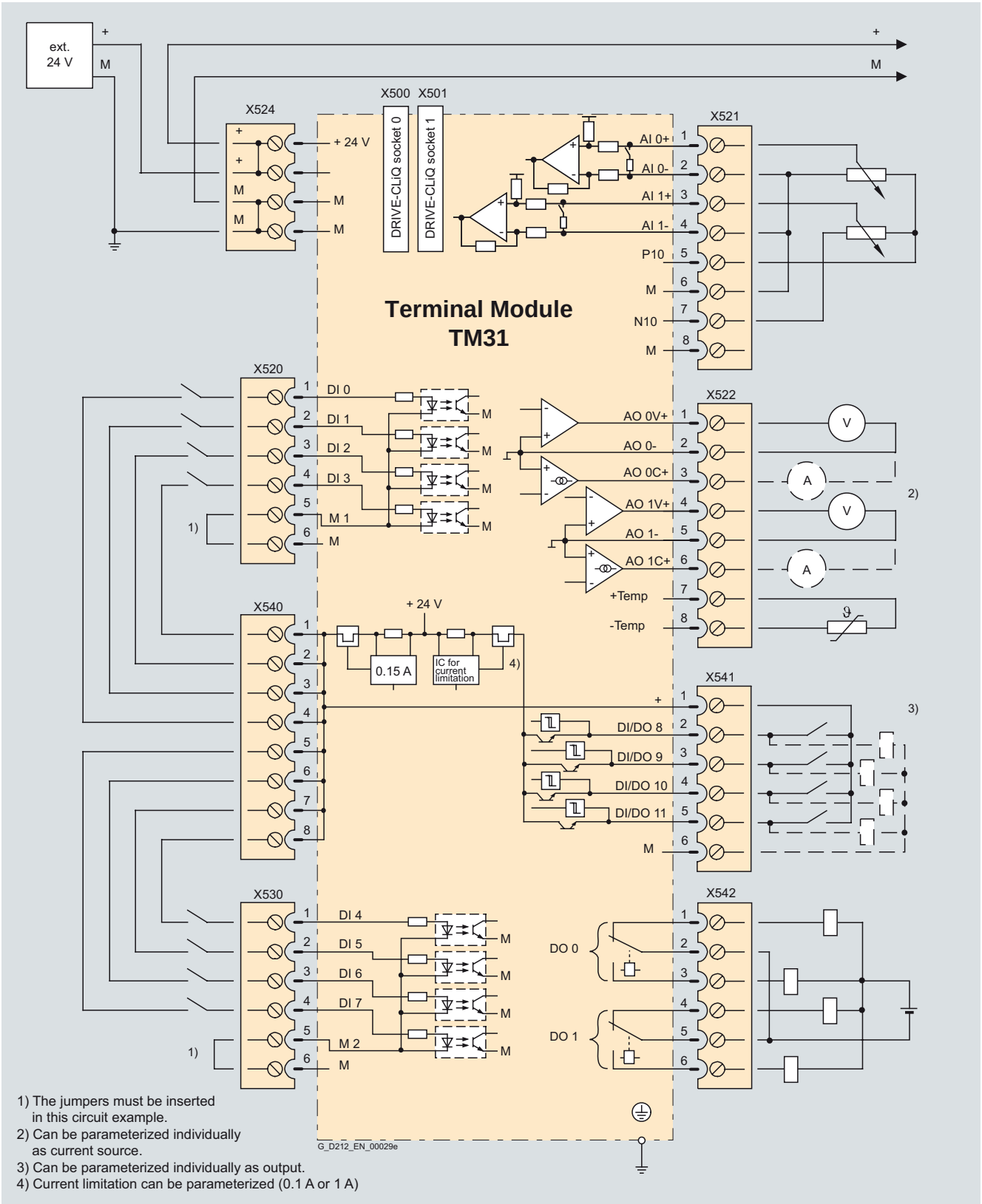
The status of the TM31 Terminal Module is indicated via a multi-color LED.

Selection and ordering data

Description	Order No.
TM31 Terminal Module Without DRIVE-CLiQ cable	**6SL3055-0AA00-3AA1**
Accessories	
Dust-proof blanking plugs (50 units) For DRIVE-CLiQ ports	**6SL3066-4CA00-0AA0**

Integration

The TM31 Terminal Module communicates with a CU310, CU320-2 or SIMOTION D Control Unit via DRIVE-CLiQ.



Connection example of TM31 Terminal Module

TM31 Terminal Module

Technical specifications

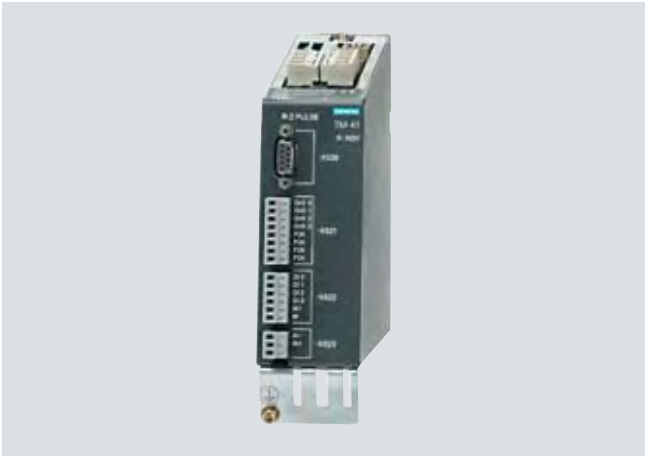
TM31 Terminal Module 6SL3055-0AA00-3AA1	
Power requirement, max. At 24 V DC without taking account of digital outputs and DRIVE-CLiQ supply	0.2 A
• Conductor cross-section, max.	2.5 mm^2
• Fuse protection, max.	20 A
Digital inputs In accordance with IEC 61131-2 Type 1	
• Voltage	-3 … +30 V
• Low level (an open digital input is interpreted as "low")	-3 … +5 V
• High level	15 … 30 V
• Current consumption at 24 V DC, typ.	10 mA
• Delay times of digital inputs [1], approx.	
- L → H	50 µs
- H → L	100 µs
• Conductor cross-section, max.	1.5 mm^2
Digital outputs (sustained short-circuit strength)	
• Voltage	24 V DC
• Load current per digital output, max.	100 mA
• Aggregate current of digital outputs, max.	400 mA
• Delay times of digital outputs [1]	
- Typ.	150 µs with 0.5 A resistive load
- Max.	500 µs
• Conductor cross-section, max.	1.5 mm^2
Analog inputs (a switch is used to toggle between voltage and current input)	
• As voltage input	
- Voltage range	-10 … +10 V
- Internal resistance R_i	100 kΩ
• As current input	
- Current ranges	4 … 20 mA, -20 … +20 mA, 0 … 20 mA
- Internal resistance R_i	250 Ω
- Resolution [2]	11 bit + sign
• Conductor cross-section, max.	1.5 mm^2

TM31 Terminal Module 6SL3055-0AA00-3AA1	
Analog outputs (sustained short-circuit strength)	
• Voltage range	-10 … +10 V
• Max. load current	-3 … +3 mA
• Current ranges	4 … 20 mA, -20 … +20 mA, 0 … 20 mA
• Load resistance, max.	500 Ω for outputs in the range -20 ... +20 mA
• Resolution	11 bit + sign
• Conductor cross-section, max.	1.5 mm^2
Relay outputs (changeover contacts)	
• Max. load current	8 A
• Operational voltage, max.	250 V AC, 30 V DC
• Switching capacity, max.	
- At 250 V AC	2000 VA (cos φ = 1) 750 VA (cos φ = 0.4)
- At 30 V DC	240 W (resistive load)
• Required minimum current	100 mA
• Conductor cross-section, max.	2.5 mm^2
Power loss	< 10 W
PE connection	M4 screw
Dimensions	
• Width	50 mm (1.97 in)
• Height	150 mm (5.91 in)
• Depth	111 mm (4.37 in)
Weight, approx.	0.87 kg (2 lb)
Approvals, according to	cULus

[1] The specified delay times refer to the hardware. The actual reaction time depends on the time slot in which the digital input is processed.

[2] If the analog input is to be operated in the signal processing sense with continuously variable input voltage, the sampling frequency $f_a = 1/t_{time\ slice}$ must be at least twice the value of the highest signal frequency f_{max}.

Overview



The TM41 Terminal Module supplies TTL signals which emulate an incremental encoder, e.g. to a higher-level control. The encoder interface (incremental encoder simulation) can be linked to an encoder signal from the Control Unit, e.g. incremental encoder sin/cos, by parameter assignment.

The TM41 Terminal Module increases the number of digital inputs/outputs and analog inputs that are available in the drive system.

Design

The following are located on the TM41 Terminal Module:

- 4 bidirectional digital inputs/outputs
- 4 digital inputs (with electrical isolation)
- 1 analog input
- 1 interface for simulation of TTL incremental encoder (RS422)
- 1 LED for signaling zero mark detection for encoder interface
- 2 DRIVE-CLiQ sockets
- 1 connection for the 24 V DC supply to digital outputs
- 1 connection for the electronics power supply via the 24 V DC power supply connector
- 1 PE (protective earth) connection

The TM41 Terminal Module can be snapped on a TH 35 top-hat rail in accordance with EN 60715 (IEC 60715).

The signal cable shield can be connected to the TM41 Terminal Module via a shield connection terminal, e.g., Phoenix Contact type SK8 or Weidmüller type KLBÜ CO 1. The shield connection terminal must not be used for strain relief.

The status of the TM41 Terminal Module is indicated via a multicolor LED.

A LED next to the interface for TTL pulse encoder emulation is illuminated as soon as a zero mark is detected.

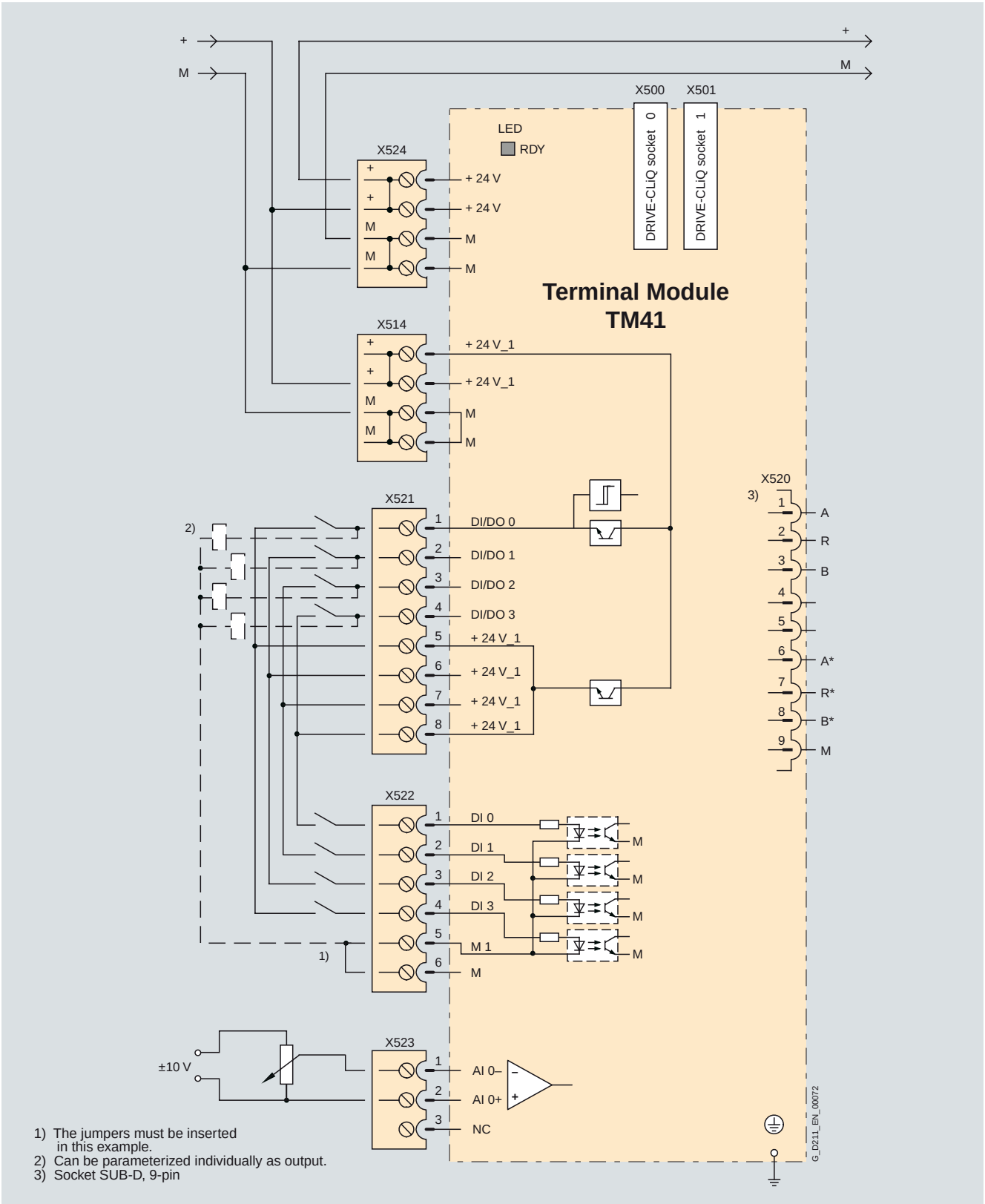
Selection and ordering data

Description	Order No.
TM41 Terminal Module Without DRIVE-CLiQ cable	**6SL3055-0AA00-3PA1**
Accessories	
Dust-proof blanking plugs (50 units) For DRIVE-CLiQ ports	**6SL3066-4CA00-0AA0**

TM41 Terminal Module

Integration

The TM41 Terminal Module communicates with a CU310, CU320-2 or SIMOTION D Control Unit via DRIVE-CLiQ.



1) The jumpers must be inserted in this example.
2) Can be parameterized individually as output.
3) Socket SUB-D, 9-pin

Connection example of TM41 Terminal Module

Technical specifications

TM41 Terminal Module 6SL3055-0AA00-3PA1	
Current requirement (X524 at 24 V DC) without DRIVE-CLiQ supply or digital outputs (X514)	0.2 A
• Conductor cross-section, max.	2.5 mm^2
• Fuse protection, max.	20 A
I/O	
• Digital inputs/outputs	Individually parameterizable as DI or DO
• Number of digital inputs/outputs	4
• Number of digital input/outputs (with isolation)	4
• Cables and connections	Plug-in screw-type terminals
• Conductor cross-section, max.	1.5 mm^2
Digital inputs	
• Voltage	
- Without isolation	-3 ... +30 V
- With isolation	-30 ... +30 V
• Low level (an open digital input is interpreted as "low")	
- Without isolation	-3 ... +5 V
- With isolation	-30 ... +5 V
• High level	15 … 30 V
• Current consumption at 24 V DC, typ.	< 9 mA
• Delay times of digital inputs, max. [1]	
- L → H	3 ms
- H → L	3 ms
Digital outputs (sustained-short-circuit-proof)	
• Voltage	24 V DC
• Load current per digital output, max.	0.5 A
• Delay times (ohmic load) [1]	
- L → H, typ. L → H, max.	50 µs 100 µs
- H → L, typ. H → L, max.	75 µs 150 µs
Analog input (difference)	
• Voltage range	-10 … +10 V
• Internal resistance	≥ 40 kΩ
• Resolution [2]	13 bit + sign

TM41 Terminal Module 6SL3055-0AA00-3PA1	
Pulse encoder emulation	
• Level	TTL (RS422), A+, A-, B+, B-, zero track N+, N-
• Limit frequency $f_{max.}$	512 kHz
• Ratio Encoder pulses : encoder emulation	1 : 1 with incremental encoder sin/cos and TTL/HTL (evaluation for resolver available soon)
PE connection	M4 screw
Dimensions	
• Width	50 mm (1.97 in)
• Height	150 mm (5.91 in)
• Depth	111 mm (4.37 in)
Weight, approx.	0.85 kg (2 lb)
Approvals, according to	cULus

[1] The specified delay times refer to the hardware. The actual reaction time depends on the time slot in which the digital input/output is processed.

[2] If the analog input is to be operated in the signal processing sense with continuously variable input voltage, the sampling frequency $f_a = 1/t_{time\ slice}$ must be at least twice the value of the highest signal frequency f_{max}.

TM54F Terminal Module

Overview

The TM54F Terminal Module is a dual-processor I/O interface with 4 fail-safe digital outputs and 10 fail-safe digital inputs for utilization of the Safety Integrated functions of the SINAMICS S120 drive system over external actuators and sensors.

Every available safety function integrated in the drive can be controlled via the fail-safe digital inputs on the TM54F Terminal Module. In cases where the parameterized safety functions of multiple drives operated on a CU320-2 or SIMOTION D4x5 must be executed on a group basis, the relevant drives can be combined into groups in the TM54F Terminal Module. The advantage of this approach is that only one fail-safe digital input needs to be connected for these drives.

The fail-safe digital inputs and outputs are redundantly configured with internal, cross-over data comparison using the two processors. A fail-safe digital output consists of one current sourcing and one current sinking output as well as a digital input for reading back the switching state. A fail-safe digital input consists of two digital inputs.

Safety sensors can be connected over two switchable 24 V sensor supplies and can be evaluated over the fail-safe digital inputs. The switchable 24 V sensor supply ensures that the fail-safe digital inputs can be dynamized for error discovery (dynamization allows switch-off signal paths to be checked). An unswitchable 24 V sensor supply is additionally provided by the TM54F Terminal Module for connecting undynamizable safety sensors.

The TM54F Terminal Module must be connected to a CU310, CU320-2 or SIMOTION D Control Unit via a DRIVE-CLiQ cable. Only one TM54F Terminal Module can be assigned to each Control Unit. It is not permissible to make the TM54F connection via another DRIVE-CLiQ device, e.g. a Motor Module or Line Module.

Design

The following are located on the TM54F Terminal Module:

- 4 fail-safe digital outputs
- 10 fail-safe digital inputs
- 4 LEDs, single color for indicating the status of the read back channel of the fail-safe digital outputs
- 4 LEDs, dual-color for indicating the status of the fail-safe digital outputs
- 20 LEDs, dual-color for indicating the status of the fail-safe digital inputs
- 3 LEDs, single color for indicating the status of the 24 V sensor supplies
- 2 DRIVE-CLiQ sockets
- 2 connections for 24 V sensor supply, switchable
- 1 connection for 24 V sensor supply, not switchable
- 1 connection for the electronics power supply via the 24 V DC power supply connector
- 1 connection for the 24 V power supply to digital outputs and sensors
- 1 PE/ground conductor connection

The TM54F Terminal Module can be snapped on a TH 35 top-hat rail in accordance with EN 60715 (IEC 60715).

The signal cable shield can be connected to the TM54F Terminal Module via a terminal element, e.g. Phoenix Contact type SK8 or Weidmüller type KLBÜ CO 1. The terminal element must not be used for strain relief.

The status of the TM54F Terminal Module is indicated via a multi-color LED.

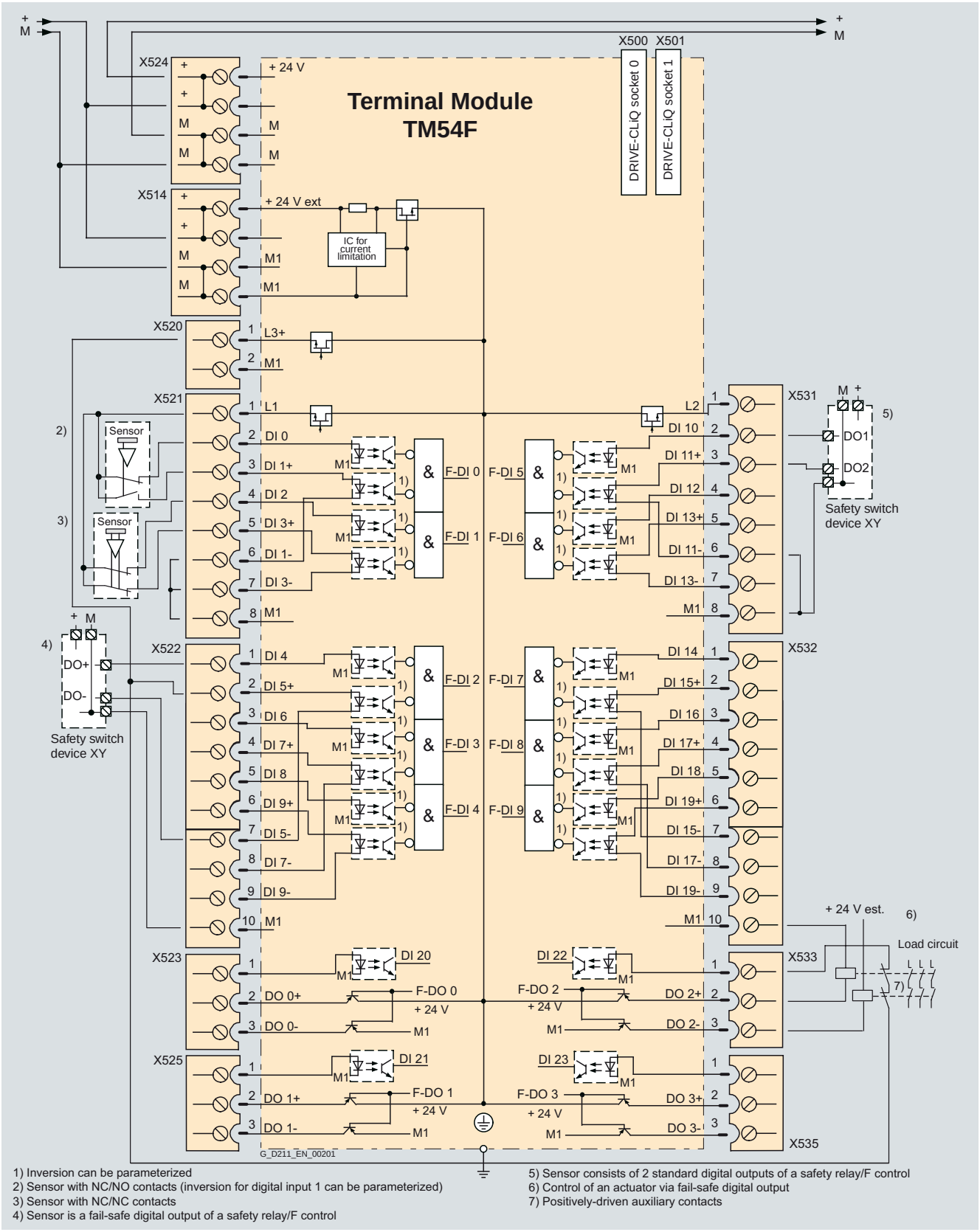
Pins for connector coding are supplied with the TM54F Terminal Module.

Selection and ordering data

Description	Order No.
TM54F Terminal Module Without DRIVE-CLiQ cable	**6SL3055-0AA00-3BA0**
Accessories	
Dust-proof blanking plugs (50 units) For DRIVE-CLiQ ports	**6SL3066-4CA00-0AA0**

Integration

The TM54F Terminal Module communicates with a CU310, CU320-2, SIMOTION D or SIMOTION CX32 Control Unit via DRIVE-CLiQ.



1) Inversion can be parameterized
2) Sensor with NC/NO contacts (inversion for digital input 1 can be parameterized)
3) Sensor with NC/NC contacts
4) Sensor is a fail-safe digital output of a safety relay/F control
5) Sensor consists of 2 standard digital outputs of a safety relay/F control
6) Control of an actuator via fail-safe digital output
7) Positively-driven auxiliary contacts

Connection example of TM54F Terminal Module

TM54F Terminal Module

Technical specifications

TM54F Terminal Module 6SL3055-0AA00-3BA0	
Current requirement (X524 at 24 V DC) without DRIVE-CLiQ supply	0.2 A
• Conductor cross-section, max.	2.5 mm^2
• Fuse protection, max.	20 A
Max. current requirement ext. 24 V For supplying the digital outputs and 24 V sensor supply (X514 at 24 V DC)	4 A
• Conductor cross-section, max.	2.5 mm^2
• Fuse protection, max.	20 A
I/O	
• Number of fail-safe digital inputs	10
• Number of fail-safe digital outputs	4
• 24 V sensor supply	3, of which 2 can be temporarily shut down using an internal test routine for dynamizing fail-safe digital inputs, current carrying capacity 0.5 A each
• Cables and connections	Plug-in screw-type terminals
• Conductor cross-section, max.	1.5 mm^2
Digital inputs According to IEC 61131-2 Type 1, with isolation	
• Voltage	-3 … +30 V
• Low level (an open digital input is interpreted as "low")	-3 … +5 V
• High level	15 … 30 V
• Current consumption at 24 V DC, typ.	> 2 mA
• Delay time of digital inputs, approx. [1]	
- L → H, typ.	30 µs
- H → L, typ.	60 µs
• Safe state	Low level (for inputs that can be inverted: without inversion)
Digital outputs (sustained short-circuit strength)	
• Voltage	24 V DC
• Load current per fail-safe digital output, max. [2]	0.5 A
• Delay times (ohmic load) [1]	
- L → H, typ.	300 µs
- H → L, typ.	350 µs
• Safe state	Output switched off
Scanning cycle t_{SI} For fail-safe digital inputs or fail-safe digital outputs	4 ... 25 ms (adjustable)

TM54F Terminal Module 6SL3055-0AA00-3BA0	
PE connection	M4 screw
Dimensions	
• Width	50 mm (1.97 in)
• Height	150 mm (5.91 in)
• Depth	111 mm (4.37 in)
Weight, approx.	0.9 kg (2 lb)
Approvals, according to	cULus
Safety Integrated	Safety Integrity Level 2 (SIL2) acc. to IEC 61508, Performance Level d (PLd) acc. to ISO 13849-1 and Control Category 3 acc. to ISO 13849-1 or EN 954-1

[1] The specified delay times refer to the hardware. The actual reaction time depends on the time slot in which the digital input/output is processed.

[2] The total current of all fail-safe digital outputs must not exceed 5.33 A.

Overview

The TM120 Terminal Module is capable of evaluating up to 4 temperature sensors (KTY84-130 or PTC). The temperature sensor inputs are safely electrically separated from the evaluation electronics in the TM120 Temperature Module and are suitable for evaluating the temperature of special motors, e.g. 1FN linear motors and 1FW6 built-in torque motors.

The TM120 Terminal Module can be operated on a CU320-2 Control Unit, firmware version 4.3 and higher.

Design

The following are located on the TM120 Terminal Module:

- 4 temperature sensor inputs (KTY84-130 or PTC)
- 2 DRIVE-CLiQ sockets

The status of the TM120 Terminal Module is indicated using a multi-color LED.

The TM120 Terminal Module is designed to be snapped onto a TH35 top-hat rail in accordance with EN 60715.

Technical specifications

TM120 Terminal Module 6SL3055-0AA00-3KA0	
Power requirement, max. at 24 V DC	0.5 A
• Conductor cross-section, max.	2.5 mm^2
• Fuse protection, max.	20 A
Temperature sensor inputs The inputs can be individually parameterized to evaluate sensors of type KTY84-130 or PTC, or temperature switches	
• Conductor cross-section	0.2 ... 6 mm^2
• Constant current per sensor, approx.	2 mA
• Safe electrical separation up to line voltage, max.	480 V AC
PE connection	M4 screw
Dimensions	
• Width	30 mm (1.18 in)
• Height	150 mm (5.91 in)
• Depth	111 mm (4.37 in)
Weight, approx.	0.41 kg (1 lb)

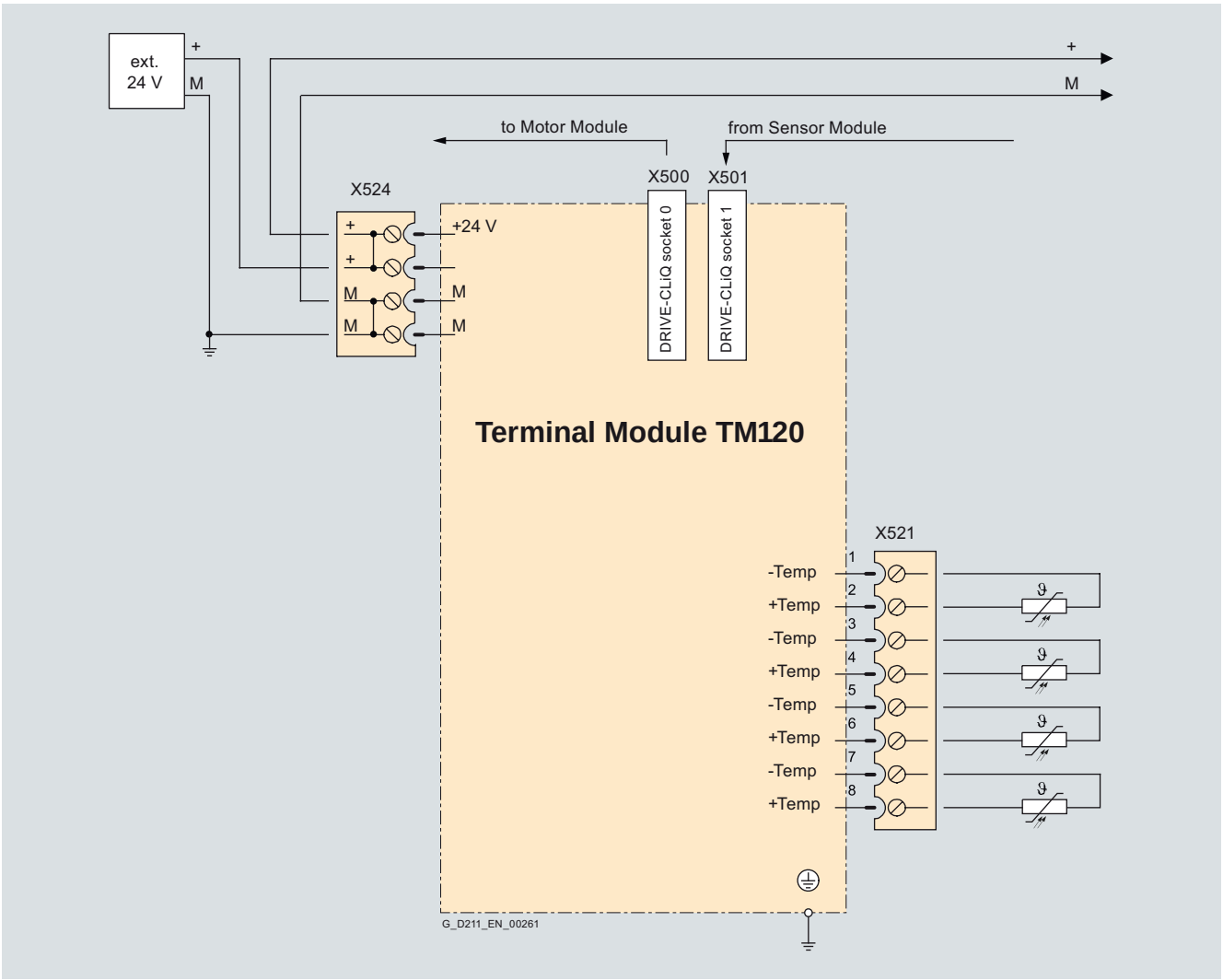
Selection and ordering data

Description	Order No.
TM120 Terminal Module Without DRIVE-CLiQ cable	**6SL3055-0AA00-3KA0**
Accessories	
Dust-proof blanking plugs (50 units) For DRIVE-CLiQ ports	**6SL3066-4CA00-0AA0**

TM120 Terminal Module

Integration

An automatic assignment is established between a TM120 Terminal Module and an SMCxx Sensor Module by connecting the Sensor Module via DRIVE-CLiQ over a TM120 Terminal Module on the Motor Module. The assignment can also be made manually.



Connection example of TM120 Terminal Module

Overview

The VSM10 Voltage Sensing Module can detect the exact line voltage characteristic and supports fault-free operation of Line Modules when power supply conditions are unfavorable, e.g. with severe voltage fluctuations or short-time interruptions.

The VSM10 Voltage Sensing Module is integrated in chassis format Active Interface Modules. It can be used optionally with all booksize format Active Line Modules and 16 kW or 36 kW Smart Line Modules.

Design

The VSM10 Voltage Sensing Module has the following interfaces:

- 1 connection for direct line voltage detection up to 690 V
- 1 connection for line voltage detection using voltage transformers, maximum voltage 100 V
- 2 analog inputs (reserved for resonance monitoring in Active Interface Modules in chassis format)
- 1 temperature sensor input (KTY84-130 or PTC)
- 1 DRIVE-CLiQ socket
- 1 connection for the electronics power supply via the 24 V DC power supply connector
- 1 PE (protective earth) connection

The VSM10 Voltage Sensing Module can be snapped on a TH 35 top-hat rail in accordance with EN 60715 (IEC 60715).

The status of the VSM10 Voltage Sensing Module is indicated by a two-color LED.

Technical specifications

VSM10 Voltage Sensing Module 6SL3053-0AA00-3AA0	
Power requirement, max. at 24 V DC	0.2 A
• Conductor cross-section, max.	2.5 mm^2
Power loss	< 10 W
Line voltage detection	
• Input resistance	
- Terminal X521	> 362 kΩ/phase
- Terminal X522	> 2.5 MΩ/phase
Analog inputs (reserved for monitoring an Active Interface Module in chassis format)	
• Internal resistance, approx. (between differential inputs)	100 kΩ
• Resolution	12 bit
PE connection	M4 screw
Dimensions	
• Width	50 mm (1.97 in)
• Height	150 mm (5.91 in)
• Depth	111 mm (4.37 in)
Weight, approx.	0.9 kg (2 lb)
Approvals, according to	cULus

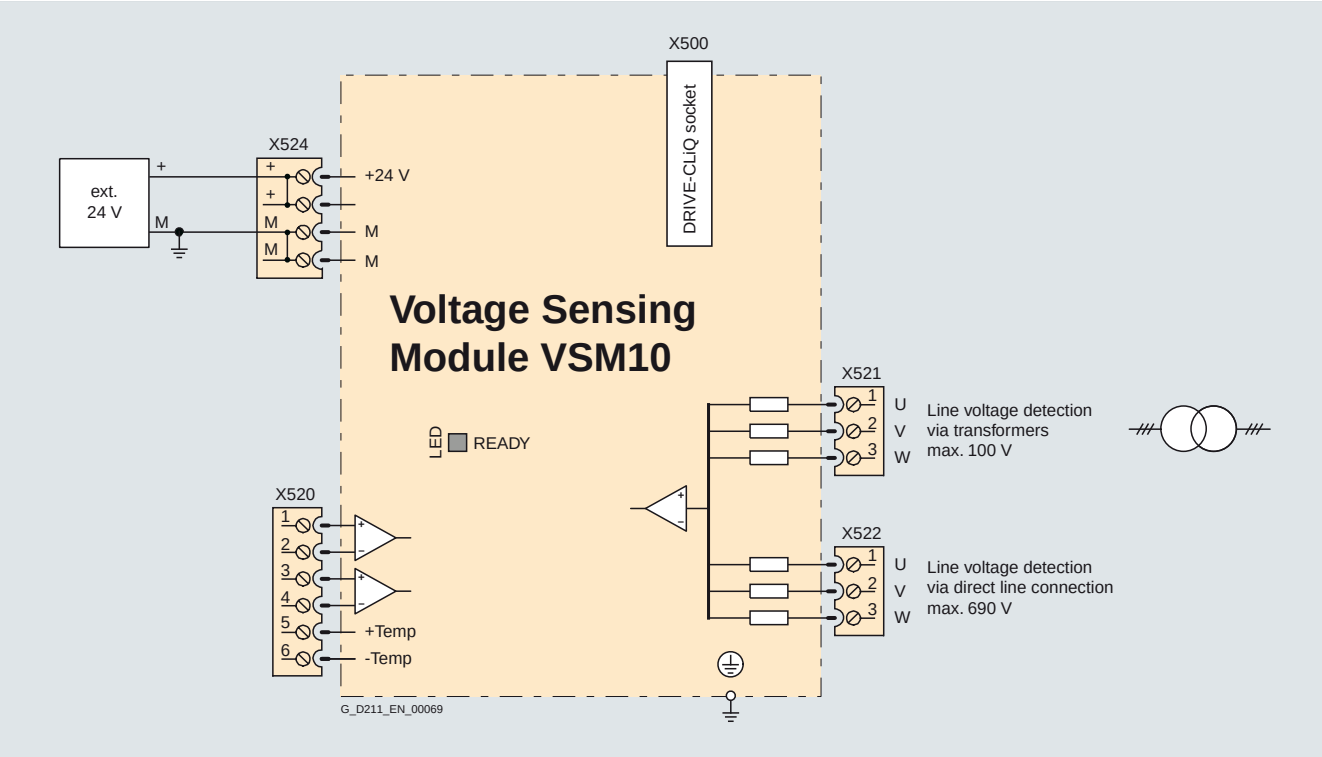
Selection and ordering data

Description	Order No.
VSM10 Voltage Sensing Module Without DRIVE-CLiQ cable	**6SL3053-0AA00-3AA0**

VSM10 Voltage Sensing Module

Integration

The VSM10 Voltage Sensing Module communicates with the CU320-2 or SIMOTION D4x5 Control Unit via DRIVE CLiQ.



Connection example of VSM10 Voltage Sensing Module

Overview

In the case of the Safe Brake Relay, the brake is controlled in accordance with EN 954-1 safety class 3 and IEC 61508 SIL2.

Design

The Safe Brake Relay can be installed below the Power Module on the shield connection plate.

The Safe Brake Relay has the following connections and interfaces:

- 1 two-channel transistor output stage to control the motor brake solenoid
- 1 connection for the cable harness (CTRL) to the Power Module in blocksize format
- 1 connection for the 24 V DC power supply

The connection between the 24 V DC supply and the Safe Brake Relay must be kept as short as possible.

The scope of supply of a Safe Brake Relay includes the following:

- 2 cable harnesses for connecting to the CTRL socket of the PM340 Power Module
  - 0.32 m (1.05 ft) length for frame sizes FSA and FSC
  - 0.55 m (1.8 ft) length for frame sizes FSD and FSF

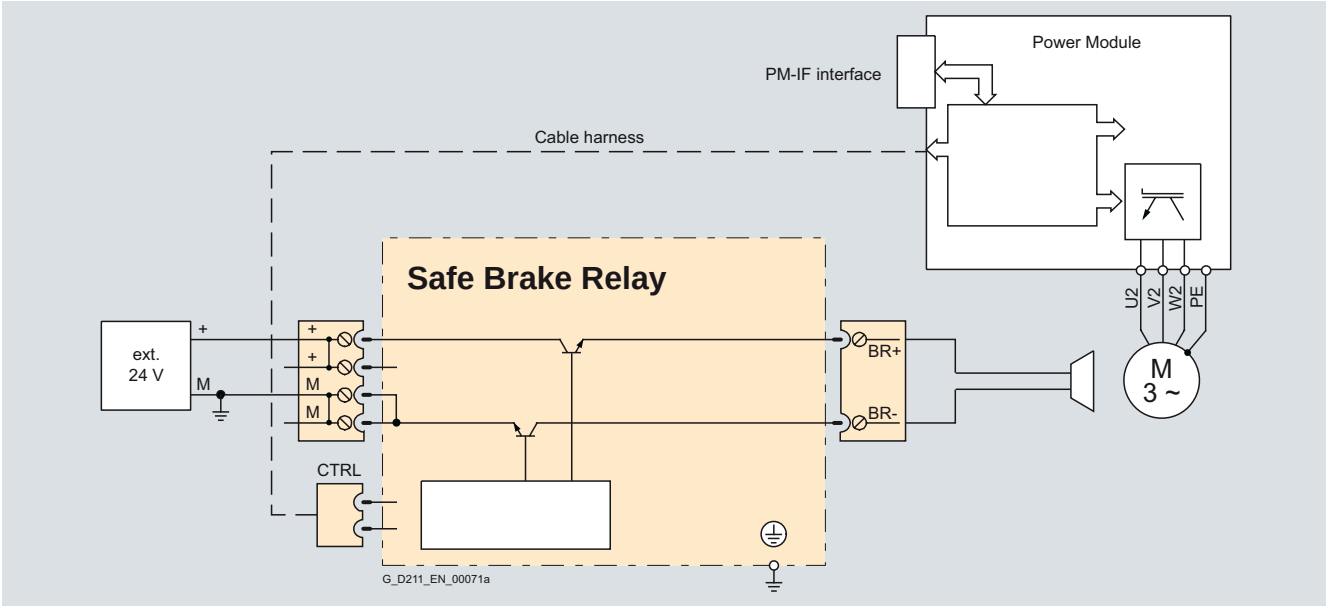
Technical specifications

Safe Brake Relay 6SL3252-0BB01-0AA0	
Switching capability of the NO contact	–
Power supply	20.4 … 28.8 V DC Recommended rated supply voltage 26 V DC (to compensate for voltage drop in feeder cable to 24 V DC motor brake solenoid)
Power requirement, max.	
• Motor brake	2 A
• 24 V DC	0.05 A + the current requirement of motor brake
• Conductor cross-section, max.	2.5 mm^2
Dimensions	
• Width	69 mm (2.72 in)
• Height	63 mm (2.48 in)
• Depth	33 mm (1.30 in)
Weight, approx.	0.17 kg (0.37 lb)

Selection and ordering data

Description	Order No.
Safe Brake Relay Including cable harness for connection to Power Module	**6SL3252-0BB01-0AA0**

Integration



Connection example of Safe Brake Relay

The 24 V DC solenoid of the motor brake is directly connected to the Safe Brake Relay. External overvoltage limiters are not required.

Encoder system connection

Overview

Motors with DRIVE-CLiQ interface

DRIVE-CLiQ is the preferred method for connecting the encoder systems to SINAMICS S120.

Motors with DRIVE-CLiQ interface are available for this purpose, e.g.

- 1PH8/1FT7/1FK7 synchronous motors
- 1PH8/1PH7/1PL6 asynchronous (induction) motors
- 1FW3 torque motors

Motors with a DRIVE-CLiQ interface can be directly connected to the associated Motor Module via the available MOTION-CONNECT DRIVE-CLiQ cables. The connection of the MOTION-CONNECT DRIVE-CLiQ cable at the motor has degree of protection IP67.

The DRIVE-CLiQ interface supplies the motor encoder via the integrated 24 V DC supply and transfers the motor encoder and temperature signals and the electronic rating plate data, e.g. a unique identification number and rated data (voltage, current, torque) to the Control Unit. This means that for the various encoder types – e.g. resolver or absolute encoder – different encoder cables with varying permissible lengths are now no longer required; just one cable type, MOTION-CONNECT DRIVE-CLiQ, can be used for all encoders.

Motors with DRIVE-CLiQ interface simplify commissioning and diagnostics, as the motor and encoder type are identified automatically.

Motors without DRIVE-CLiQ interface

The cables for encoder and temperature signals of motors without DRIVE-CLiQ interface, as well as those of external encoders, must be connected via Sensor Modules. Sensor Modules Cabinet-Mounted are available in degree of protection IP20 for control cabinet installation, as well as Sensor Modules External-Mounted (degree of protection IP67).

Only one encoder system can be connected to each Sensor Module.

More information

The cables for motor encoder and temperature signals must be connected when possible to the corresponding Motor Module or Power Module and external encoders to the Control Unit. However, the DRIVE-CLiQ connections can also be bundled via DRIVE-CLiQ Hub Modules.

The Safety Integrated Extended Functions of the SINAMICS S120 drive system require suitable encoders (see chapter Servomotors).

SMC10 Sensor Module Cabinet-Mounted

Overview

The SMC10 Sensor Module Cabinet-Mounted is required to evaluate the encoder signals of motors without a DRIVE-CLiQ interface. External encoders can also be connected via the SMC10.

The following encoder signals can be evaluated:

- 2-pole resolver
- Multi-pole resolver

Design

The SMC10 Sensor Module Cabinet-Mounted features the following interfaces as standard:

- 1 DRIVE-CLiQ interface
- 1 encoder connection, including motor temperature detection (KTY84-130 or PTC) via SUB-D connector
- 1 connection for the electronics power supply via the 24 V DC power supply connector
- 1 PE/ground conductor connection

The status of the SMC10 Sensor Module Cabinet-Mounted is indicated via a multi-color LED.

The SMC10 Sensor Module Cabinet-Mounted can be snapped on a TH 35 top-hat rail in accordance with EN 60715 (IEC 60715).

The signal cable shield is connected via the encoder system connector and can also be connected to the SMC10 Sensor Module Cabinet-Mounted via a shield connection terminal, e.g. Phoenix Contact type SK8 or Weidmüller type KLBÜ CO 1.

Integration

SMC10 Sensor Modules Cabinet-Mounted communicate with a Control Unit via DRIVE-CLiQ.

Technical specifications

SMC10 Sensor Module Cabinet-Mounted 6SL3055-0AA00-5AA3	
Power requirement, max. At 24 V DC, not taking encoder into account	0.2 A
• Conductor cross-section, max.	2.5 mm^2
• Fuse protection, max.	20 A
Power loss, max.	< 10 W
Encoders which can be evaluated	• 2-pole resolvers • Multi-pole resolver
• Excitation voltage, rms	4.1 V
• Excitation frequency	5 ... 10 kHz depending on the current controller clock cycle of the Motor Module or Power Module
• Transformation ratio	0.5
• Encoder frequency, max.	2 kHz (120000 rpm) depending on the number of resolver pole pairs and current controller clock cycle of the Motor Module or Power Module
• Signal subdivision (interpolation), max.	16384 times (14 bit)
• Cable length to encoder, max.	130 m (427 ft)
PE connection	M4 screw
Dimensions	
• Width	30 mm (1.18 in)
• Height	150 mm (5.91 in)
• Depth	111 mm (4.37 in)
Weight, approx.	0.4 kg (0.88 lb)
Approvals, according to	cULus

Selection and ordering data

Description	Order No.
SMC10 Sensor Module Cabinet-Mounted Without DRIVE-CLiQ cable	**6SL3055-0AA00-5AA3**

SMC20 Sensor Module Cabinet-Mounted

Overview

The SMC20 Sensor Module Cabinet-Mounted is required to evaluate the encoder signals of motors without a DRIVE-CLiQ interface. External encoders can also be connected via the SMC20.

The following encoder signals can be evaluated:

- Incremental encoder sin/cos 1 V_{pp}
- Absolute encoder EnDat
- SSI encoder with incremental signals sin/cos 1 V_{pp} (firmware version 2.4 and later)

The motor temperature can also be detected using KTY84-130 or PTC thermistors.

Design

The SMC20 Sensor Module Cabinet-Mounted features the following interfaces as standard:

- 1 DRIVE-CLiQ interface
- 1 encoder connection, including motor temperature detection (KTY84-130 or PTC) via SUB-D connector
- 1 connection for the electronics power supply via the 24 V DC power supply connector
- 1 PE/ground conductor connection

The status of the SMC20 Sensor Module Cabinet-Mounted is indicated via a multi-color LED.

The SMC20 Sensor Module Cabinet-Mounted can be snapped on a TH 35 top-hat rail in accordance with EN 60715 (IEC 60715).

The signal cable shield is connected via the encoder system connector and can also be connected to the SMC20 Sensor Module Cabinet-Mounted via a shield connection terminal, e.g. Phoenix Contact type SK8 or Weidmüller type KLBÜ CO 1.

Integration

SMC20 Sensor Modules Cabinet-Mounted communicate with a Control Unit via DRIVE-CLiQ.

Technical specifications

SMC20 Sensor Module Cabinet-Mounted 6SL3055-0AA00-5BA3	
Power requirement, max. At 24 V DC, not taking encoder into account	0.2 A
• Conductor cross-section, max.	2.5 mm^2
• Fuse protection, max.	20 A
Power loss	< 10 W
Encoders which can be evaluated	• Incremental encoder sin/cos 1 V_{pp} • Absolute encoder EnDat • SSI encoder with incremental signals sin/cos 1 V_{pp} (firmware version 2.4 and later)
• Encoder supply	5 V DC/0.35 A
• Encoder frequency incremental signals, max.	500 kHz
• Signal subdivision (interpolation), max.	16384 times (14 bit)
• SSI baud rate	100 kBaud
• Cable length to encoder, max.	100 m (328 ft)
PE connection	M4 screw
Dimensions	
• Width	30 mm (1.18 in)
• Height	150 mm (5.91 in)
• Depth	111 mm (4.37 in)
Weight, approx.	0.45 kg (1 lb)
Approvals, according to	cULus

Selection and ordering data

Description	Order No.
SMC20 Sensor Module Cabinet-Mounted Without DRIVE-CLiQ cable	**6SL3055-0AA00-5BA3**

Overview

The SMC30 Sensor Module Cabinet-Mounted is required to evaluate the encoder signals of motors without a DRIVE-CLiQ interface. External encoders can also be connected via the SMC30.

The following encoder signals can be evaluated:

- Incremental encoders TTL/HTL with/without open-circuit detection (open-circuit detection is only available with bipolar signals)
- SSI encoder with TTL/HTL incremental signals
- SSI encoder without incremental signals

The motor temperature can also be detected using KTY84-130 or PTC thermistors.

Design

The SMC30 Sensor Module Cabinet-Mounted features the following interfaces as standard:

- 1 DRIVE-CLiQ interface
- 1 encoder connection, including motor temperature detection (KTY84-130 or PTC) via SUB-D connector or
- 1 connection for the electronics power supply via the 24 V DC supply connector
- 1 PE (protective earth) connection

The status of the SMC30 Sensor Module Cabinet-Mounted is indicated using a multi-color LED.

The SMC30 Sensor Module Cabinet-Mounted can be snapped onto a TH 35 top-hat rail according to EN 60715 (IEC 60715).

The maximum encoder cable length between SMC30 modules and encoders is 100 m (328 ft). For HTL encoders, this length can be increased to 300 m (984 ft) if signals A+/A- and B+/B- are evaluated and the power supply cable has a minimum cross-section of 0.5 mm^2.

The signal cable shield can be connected to the SMC30 Sensor Module Cabinet-Mounted via a shield connection terminal, e.g., Phoenix Contact type SK8 or Weidmüller type KLBÜ CO 1.

Integration

SMC30 Sensor Modules Cabinet-Mounted communicate with a Control Unit via DRIVE-CLiQ.

Technical specifications

SMC30 Sensor Module Cabinet-Mounted 6SL3055-0AA00-5CA2	
Power requirement, max. At 24 V DC, not taking encoder into account	0.2 A
• Conductor cross-section, max.	2.5 mm^2
• Fuse protection, max.	20 A
Power loss, max.	10 W
Encoders which can be evaluated	• Incremental encoder TTL/HTL • SSI encoder with TTL/HTL incremental signals • SSI encoder without incremental signals
• Input impedance	
- TTL	570 Ω
- HTL, max.	16 mA
• Encoder supply	24 V DC/0.35 A or 5 V DC/0.35 A
• Encoder frequency, max.	300 kHz
• SSI baud rate	100 … 250 kBaud
• Limiting frequency	300 kHz
• Resolution absolute position SSI	30 bit
• Cable length, max.	
- TTL encoder	100 m (328 ft) (only bipolar signals permitted) [1]
- HTL encoder	100 m (328 ft) for unipolar signals 300 m (984 ft) for bipolar signals [1]
- SSI encoder	100 m (328 ft)
PE connection	M4 screw
Dimensions	
• Width	30 mm (1.18 in)
• Height	150 mm (5.91 in)
• Depth	111 mm (4.37 in)
Weight, approx.	0.45 kg (1 lb)
Approvals, according to	cULus

Selection and ordering data

Description	Order No.
SMC30 Sensor Module Cabinet-Mounted Without DRIVE-CLiQ cable	**6SL3055-0AA00-5CA2**

[1] Signal cables twisted in pairs and shielded.

SME20/SME25 Sensor Modules External

Overview

SME20/SME25 Sensor Modules External are encoder evaluation units for machine encoders (direct measuring systems). The devices are designed with IP67 degree of protection. This means that the units can be installed outside the control cabinet near the machine encoder.

The following encoder signals can be evaluated:

- Incremental encoder sin/cos 1 V_{pp} without rotor position track (C and D tracks)
- Absolute encoder EnDat 2.1
- SSI absolute encoder [1] with incremental signals sin/cos 1 V_{pp} (firmware version V2.4 and later)

It is possible to connect a motor with a 17-pole circular encoder connector to the 12-pole circular connector of the SME20 using adapter cable 6FX8002-2CA88-...

- KTY/PTC temperature sensors can be used for evaluation of the motor temperature.
- The Sensor Module is only suitable for motors without absolute track signals (C and D tracks, e.g.:
  - Synchronous motors with pole position identification (1FN, 1FW)
  - Asynchronous motors (1PH)

SME20/SME25 Sensor Modules External evaluate the encoder signals and convert the information obtained to DRIVE-CLiQ. Neither motor nor encoder data are saved in the SME20/SME25.

Design

SME20/SME25 Sensor Modules External feature the following interfaces as standard:

- 1 DRIVE-CLiQ interface with integrated DC 24 V electronic supply of the Control Unit and/or of the Motor Module
- 1 encoder connector (circular plug)
- 1 PE (protective earth) connection

Selection and ordering data

Description	Order No.
SME20 Sensor Module External For incremental measuring systems Without DRIVE-CLiQ cable	**6SL3055-0AA00-5EA3**
SME25 Sensor Module External For absolute measuring systems Without DRIVE-CLiQ cable	**6SL3055-0AA00-5HA3**
Accessories	
Adapter cable [2] For SME20, for connecting motors with 17-pole encoder connector, with encoders, without C and D tracks	**6FX8002-2CA88-....**

Integration

SME20/SME25 Sensor Modules External communicate with a Control Unit via DRIVE-CLiQ.

[1] For SME25, only encoders with 5 V supply voltage.

[2] For length code, see Connection system MOTION-CONNECT.

Technical specifications

		SME20 Sensor Module External 6SL3055-0AA00-5EA3	SME25 Sensor Module External 6SL3055-0AA00-5HA3
Encoder		• Incremental encoder sin/cos 1 V_{pp} with 5 V power supply 0.35 A	• Absolute encoder EnDat with 5 V power supply 0.35 A • Absolute encoder SSI with incremental signals sin/cos 1 V_{pp} with 5 V voltage supply 0.35 A
Signal subdivision (interpolation)		≤ 16384 times (14 bit)	≤ 16384 times (14 bit)
Max. encoder frequency that can be evaluated	kHz	≤ 500	≤ 500
SSI/EnDat 2.1 baud rate	kHz	–	100
Measuring system interface		12-pin M23 circular connector	17-pin M23 circular connector
Outlet		IP67 DRIVE-CLiQ connector	IP67 DRIVE-CLiQ connector
Power requirement, max. At 24 V DC, not taking encoder into account	A	0.11	0.11
• Conductor cross-section		Acc. to connector contacts	Acc. to connector contacts
• Protection		Via DRIVE-CLiQ power supply source	Via DRIVE-CLiQ power supply source
Power loss	W	≤ 4	≤ 4
PE connection		M4 screw/1.8 Nm	M4 screw/1.8 Nm
Cable length, max.			
• To measuring system [1]	m (ft)	3 (9.84)	3 (9.84)
• To automatic speed control	m (ft)	100 (328)	100 (328)
Degree of protection		IP67	IP67
Dimensions			
• Width	mm (in)	58 (2.28)	58 (2.28)
• Height	mm (in)	44 (1.73)	44 (1.73)
• Depth	mm (in)	112 (4.41)	112 (4.41)
Weight, approx.	kg (lb)	0.31 (0.68)	0.31 (0.68)
Approvals, according to		cULus	cULus

[1] The maximum cable length for the encoder system interface depends on the current consumption of the encoder system and the cross-section of the wires in the cable. However, the maximum length is 10 m (32.8 ft) (for further details, see the Equipment Manual SINAMICS S120 Control Units and supplementary system components).

SME120/SME125 Sensor Modules External

Overview

The SME120/SME125 Sensor Modules External are encoder evaluation units with degree of protection IP67, especially suitable for use in linear and torque motor applications. They can be installed close to the motor systems and encoders in the machine.

Sensor Modules External evaluate the encoder signals and motor temperature sensors specifically and convert the information obtained for DRIVE-CLiQ. The motor temperature signals are safely electrically separated.

A Hall-effect sensor box can be connected for the SME120 to determine the commutation position of a linear motor.

Neither motor nor encoder data are saved in the SME120/SME125.

The SME120 and SME125 can be operated on Control Units with firmware release V2.4 and later.

The following encoder signals can be evaluated depending on the type of Sensor Module:

- Incremental encoder sin/cos 1 V_{pp}
- Absolute encoder EnDat 2.1
- SSI absolute encoder [1] with sin/cos 1 V_{pp} incremental signals, but without reference signal

The motor temperature can also be detected using KTY84-130 and PTC thermistors.

Design

SME120/SME125 Sensor Modules External feature the following interfaces as standard:

- 1 DRIVE-CLiQ interface with integrated DC 24 V electronic supply of the Control Unit and/or of the Motor Module
- 1 encoder connection (circular connector)
- 1 temperature sensor connection (circular connector)
- 1 Hall-effect sensor connection (circular connector) (SME120 only)
- 1 PE/ground conductor connection

Selection and ordering data

Description	Order No.
SME120 Sensor Module External For incremental measuring systems Without DRIVE-CLiQ cable	**6SL3055-0AA00-5JA3**
SME125 Sensor Module External For absolute measuring systems Without DRIVE-CLiQ cable	**6SL3055-0AA00-5KA3**
Accessories	
Connector for temperature sensor input (connector kits, 6+1-pole)	**6FX2003-0SU07**
Connector for Hall sensor input (connector kits, 9-pole)	**6FX2003-0SU01**
Connector for SME120 encoder system interface (connector kits, 12-pole)	**6FX2003-0SA12**
Connector for SME125 encoder system interface (connector kits, 17-pole)	**6FX2003-0SA17**

[1] For SME125, only SSI encoders with 5 V supply voltage.

Technical specifications

		SME120 Sensor Module External 6SL3055-0AA00-5JA3	SME125 Sensor Module External 6SL3055-0AA00-5KA3
Encoder		• Incremental encoder sin/cos 1 V_{pp} with 5 V power supply	• Absolute encoder EnDat with 5 V power supply • SSI with incremental encoder sin/cos 1 V_{pp} with 5 V power supply
Signal subdivision (interpolation)		≤ 16384 times (14 bit)	≤ 16384 times (14 bit)
Max. encoder frequency that can be evaluated	kHz	≤ 500	≤ 500
SSI/EnDat 2.1 baud rate	kHz	–	100
Measuring system interface		12-pin M23 circular connector	17-pin M23 circular connector
Temperature sensor input		6-pin M17 circular connector	6-pin M17 circular connector
Hall-effect sensor input		9-pin M23 circular connector	–
Output		IP67 DRIVE-CLiQ connector	IP67 DRIVE-CLiQ connector
Power requirement, max. At 24 V DC, not taking encoder into account	A	0.16	0.16
• Current carrying capacity of the encoder supply, for measuring system (at 5 V DC) and, where applicable, including Hall-effect sensor box	A	0.35	0.35
• Conductor cross-section		Acc. to connector contacts	Acc. to connector contacts
• Protection		Via DRIVE-CLiQ power supply source	Via DRIVE-CLiQ power supply source
Power loss	W	≤ 4.5	≤ 4.5
PE connection		M4 screw/1.8 Nm	M4 screw/1.8 Nm
Cable length, max.			
• To measuring system [1]/ temperature sensor	m (ft)	3 (9.84)	3 (9.84)
• To automatic speed control	m (ft)	100 (328)	100 (328)
Degree of protection		IP67	IP67
Dimensions			
• Width	mm (in)	117.6 (4.63)	117.6 (4.63)
• Height	mm (in)	44 (1.73)	44 (1.73)
• Depth	mm (in)	127 (5.00)	127 (5.00)
Weight, approx.	kg (lb)	0.7 (1.54)	0.7 (1.54)
Approvals, according to		cULus	cULus

[1] The maximum cable length for the encoder system interface depends on the current consumption of the encoder system and the cross-section of the wires in the cable. However, the maximum length is 10 m (32.8 ft)
(For further details, see the Equipment Manual SINAMICS S120 Control Units and supplementary system components).

Notes

Servomotors

4

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1FT7 Compact motors
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1FK7 Compact motors
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Part 14 **CAD CREATOR**
Dimension drawing and 2D/3D CAD generator
www.siemens.com/cadcreator

Motor type	Features	Degree of protection	Cooling method
1FT7 servomotors 	1FT7 Compact servomotor Permanent-magnet synchronous servomotor	IP64 (optional IP65, IP67)	Natural cooling Forced ventilation Water cooling
	1FT7 High Dynamic servomotor Permanent-magnet synchronous servomotor Very low rotor moment of inertia	IP64 (optional IP65, IP67)	Forced ventilation Water cooling
1FK7 servomotors 	1FK7 Compact servomotor Permanent-magnet synchronous servomotor	IP64 (optional IP65)	Natural cooling
	1FK7 High Dynamic servomotor Permanent-magnet synchronous servomotor Very low rotor moment of inertia	IP64 (optional IP65)	Natural cooling
	1FK7 High Inertia servomotor Permanent-magnet synchronous servomotor Increased rotor moment of inertia	IP64 (optional IP65)	Natural cooling

Geared servomotors	Page
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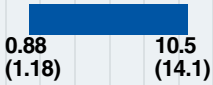
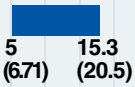
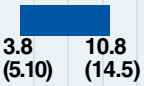
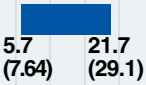
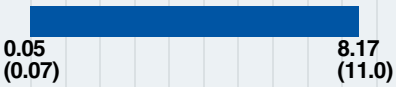
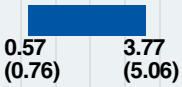
1FK7 servomotors with bevel gearbox	**4/76**
1FK7 servomotors with worm gearbox	**4/82**

The selection and ordering data for the SINAMICS S120 Motor Modules are based on the booksize format by way of example. Other formats are also possible. The SIZER configuration tool is available for detailed configuration.

Shaft height	Rated power P_{rated} for S1 duty kW (HP)	Rated torque M_{rated}	Page
SH 36/SH 48/SH 63/ SH 80/SH 100		1.4 ... 61 Nm (12.4 ... 540 lb_f-in)	**4/16**
SH 80/SH 100		21 ... 73 Nm (186 ... 646 lb_f-in)	**4/22**
SH 63/SH 80/SH 100		9.2 ... 125 Nm (81.4 ... 1106 lb_f-in)	**4/24**
SH 63/SH 80		11 ... 33 Nm (97.4 ... 292 lb_f-in)	**4/28**
SH 63/SH 80		16.5 ... 51 Nm (146 ... 451 lb_f-in)	**4/28**
SH 20/SH 28/SH 36/SH 48/ SH 63/SH 80/SH 100		0.08 ... 37 Nm (0.7 ... 327 lb_f-in)	**4/34**
SH 36/SH 48/SH 63/SH 80		0.9 ... 18 Nm (8 ... 159 lb_f-in)	**4/38**
SH 48/SH 63/SH 80		1.5 ... 15 Nm (13.3 ... 133 lb_f-in)	**4/42**

Overview

Regulations, standards and specifications

The motors comply with the appropriate standards and regulations, see table below.

As a result of the fact that in many countries the national regulations have been completely harmonized with the international IEC 60034-1 recommendation, there are no longer any differences with respect to coolant temperatures, temperature classes and temperature rise limits.

General specifications for rotating electrical machines	IEC 60034-1
Terminal designations and direction of rotation for electrical machines	IEC 60034-8
Types of construction of rotating electrical machines	IEC 60034-7
Cooling methods of rotating electrical machines	IEC 60034-6
Degrees of protection of rotating electrical machines	IEC 60034-5
Vibration severity of rotating electrical machines	IEC 60034-14
Noise limit values for rotating electrical machines	IEC 60034-9
Cylindrical shaft extensions for electrical machines	DIN 748-3/IEC 60072-1

The motors listed below are UL-approved by Underwriters Laboratories Inc. and also comply with Canadian cUR standards: 1FK7/1FT7/1FW3/1PH7 (without brake)/ 1PH8 (without brake)/1PL6.

Degrees of protection for AC motors

A suitable degree of protection must be selected to protect the machine against the following hazards depending on the relevant operating and environmental conditions:

- Ingress of water, dust and solid foreign objects;
- Contact with or approach to rotating parts inside a motor and
- Contact with or approach to live parts.

Degrees of protection of electric motors are specified by a code. This comprises 2 letters, 2 digits and, if required, an additional letter.

IP (International Protection)
Code letter designating the degree of protection against contact and the ingress of solid foreign objects and water

0 to **6**
1st digit designating the degree of touch protection and protection against ingress of solid foreign objects

0 to **8**
2nd digit designating the degree of protection against ingress of water (no oil protection)

W, S and **M**
Additional code letters for special degrees of protection

Most motors are supplied with the following degrees of protection:

Motor	Degree of protection	1st digit: Touch protection	Protection against foreign objects	2nd digit: Protection against water
Internally cooled	**IP23**	Protection against finger contact	Protection against medium-sized, solid foreign objects above 12 mm Ø	Protection against spray water up to 60° from the vertical
Surface-cooled	**IP54**	Complete protection against accidental contact	Protection against harmful dust deposits	Splash water from any direction
	IP55			Jet-water from any direction
	IP64	Complete protection against accidental contact	Protection against dust ingress	Splash water from any direction
	IP65[1)]			Jet-water from any direction
	IP67[1)]			Motor under specified pressure and time conditions under water

Recommended degrees of protection for AC motors

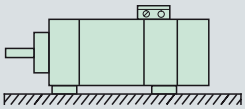
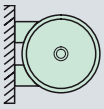
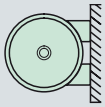
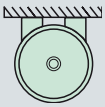
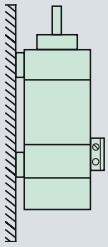
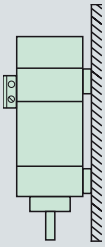
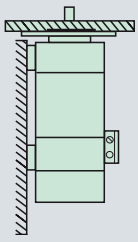
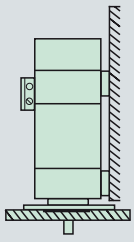
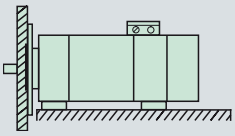
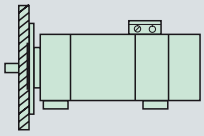
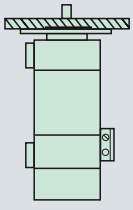
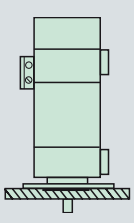
When cooling lubricants are used, protection against water alone is inadequate. The IP rating should only be considered here as a guideline. The motors may have to be protected by suitable covers. Attention must be paid to providing suitable sealing of the motor shaft for the selected degree of protection for the motor (for 1FT7: degree of protection IP67 and flange 0).

The table can serve as a decision aid for selecting the proper degree of protection for motors. A permanent covering of liquid on the flange must be avoided when the motor is mounted with the shaft extension facing upwards (IM V3, IM V19).

Effect \ Liquids	General workshop environment	Water; gen. cooling lubricant (95% water, 5% oil)
Dry	IP64	–
Water-enriched environment/ increased humidity	–	IP64
Mist	–	IP65
Spray	–	IP65
Jet	–	IP67
Splash/ brief immersion/ constant imundation	–	IP67

[1)] DIN VDE 0530 Part 5 or EN 60034 Part 5 specifies that there are only 5 degrees of protection for the first digit code and 8 degrees of protection for the second digit code in relation to rotating electrical machinery. However, IP6 is included in DIN 40050 which generally applies to electrical equipment.

Overview (continued)

Types of construction/mounting positions	Types of construction/mounting positions
IM B3	**IM B6**
	
IM B7	**IM B8**
	
IM V6	**IM V5**
	
IM V35[1]	**IM V15**[1]
	
IM B35[1]	**IM B5**
	
IM V3	**IM V1**
	

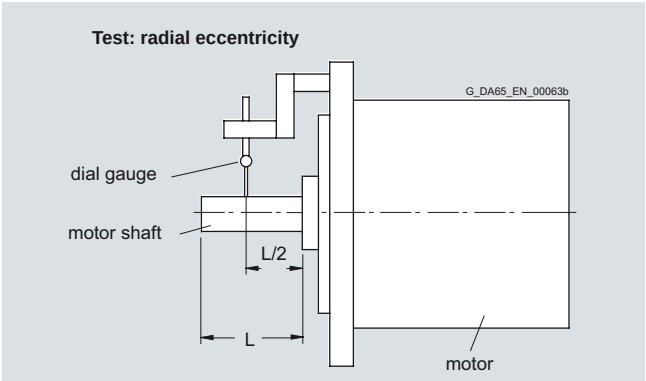
[1] Fixing on the flange and feet is necessary.

Overview (continued)

Radial eccentricity tolerance of shaft in relation to housing axis

refers to cylindrical shaft extensions

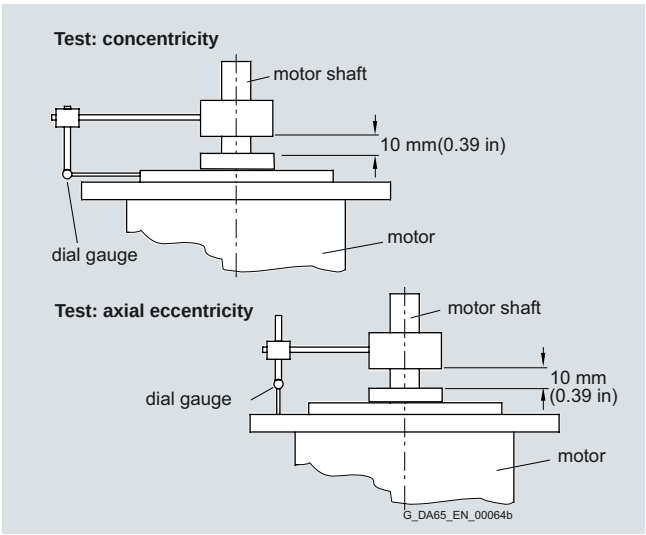
Shaft height SH	Tolerance N mm (in)	Tolerance R mm (in)
28/36	0.035 (0.0014)	0.018 (0.0007)
48/63	0.04 (0.0016)	0.021 (0.0008)
80/100/132	0.05 (0.0020)	0.025 (0.0010)
160/180/225	0.06 (0.0024)	0.03 (0.0012)
280	0.07 (0.0028)	0.035 (0.0014)
355	0.08 (0.0031)	0.04 (0.0016)



Concentricity and axial eccentricity tolerance of the flange surface to the shaft axis

referred to the centering diameter of the mounting flange

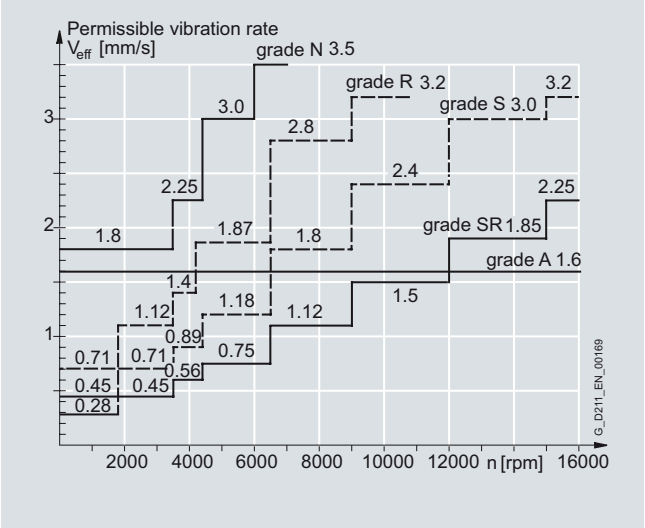
Shaft height SH	Tolerance N mm (in)	Tolerance R mm (in)
28/36/48	0.08 (0.0031)	0.04 (0.0016)
63/80/100	0.1 (0.0039)	0.05 (0.0020)
132/160/180/225	0.125 (0.0049)	0.063 (0.0025)
280/355	0.16 (0.0063)	0.08 (0.0031)



Vibration severity and vibration magnitude grade A according to IEC 60034-14

The vibration severity is the RMS value of the vibration velocity (frequency range from 10 to 1000 Hz). The vibration severity is measured using electrical measuring instruments in compliance with DIN 45666.

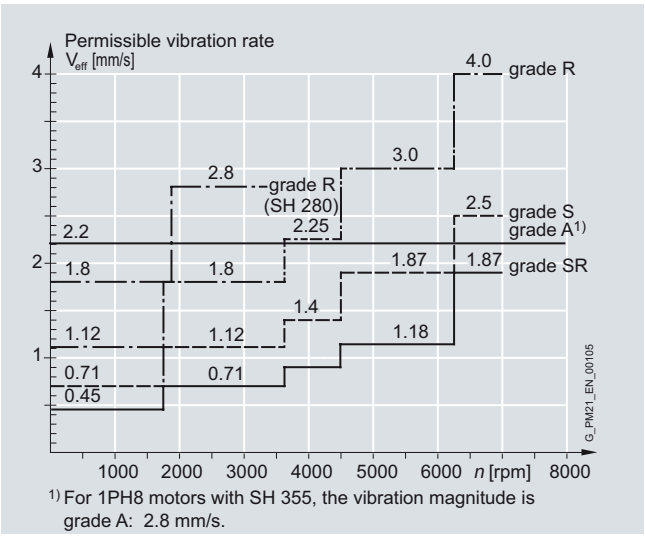
The values indicated refer only to the motor. These values can increase as a result of the overall system vibrational behavior due to installation.



Vibration severity limit values for shaft heights 20 to 132

The speeds of 1800 rpm and 3600 rpm and the associated limit values are defined in accordance with IEC 60034-14. Speeds of 4500 rpm and 6000 rpm and the specified values are defined by the motor manufacturer.

The motors maintain vibration magnitude Grade A up to rated speed.



1) For 1PH8 motors with SH 355, the vibration magnitude is grade A: 2.8 mm/s.

Vibration severity limit values for shaft heights 160 to 355

Overview (continued)

Balancing in accordance with DIN ISO 8821

In addition to the balance quality of the motor, the vibration quality of motors with mounted belt pulleys and coupling is essentially determined by the balance quality of the mounted component.

If the motor and mounted component are separately balanced before they are assembled, then the process used to balance the belt pulley or coupling must be adapted to the motor balancing type. The following different balancing methods are used on motors of types 1PH8/1PH7/1PL6:

- Half-key balancing
- Full-key balancing
- Plain shaft extension

The letter H (half key) or F (full key) is printed on the shaft extension face to identify a half-key balanced or a full-key balanced 1PH8/1PH7/1PL6 motor.

1FT7/1FK7 motors with fitted key are always half-key balanced.

In general, motors with a plain shaft are recommended for systems with the most stringent vibrational quality requirements. For full-key balanced motors, we recommend belt pulleys with two opposite keyways, but only one fitted key in the shaft extension.

Vibration stress, immitted vibration values

The following maximum permissible vibration stress limits at full functionality apply only to 1FT7/1FK7 permanent-magnet servomotors and 1FW3 torque motors.

Vibration stress in accordance with DIN ISO 10816:

- 1 *g* at 20 Hz to 2 kHz

The following limits are valid for (immitted) vibration values introduced externally to all 1PH8/1PH7/1PL6 main motors:

Vibration frequency	Vibration values for 1PH808/1PH810/1PH813/1PH816	
< 6.3 Hz	Vibration displacement *s*	≤ 0.16 mm (0.01 in)
6.3 ... 250 Hz	Vibration speed V_{rms}	≤ 4.5 mm/s (0.18 in/s)
> 250 Hz	Vibration acceleration *a*	≤ 10 m/s^2 (32.8 ft/s^2)

Vibration frequency	Vibration values for 1PH818/1PH822/1PH828/1PH835 1PH718/1PH722/1PH728 1PL618/1PL622/1PL628	
< 6.3 Hz	Vibration displacement *s*	≤ 0.25 mm (0.01 in)
6.3 ... 63 Hz	Vibration velocity V_{rms}	≤ 7.1 mm/s (0.28 in/s)
> 63 Hz	Vibration acceleration *a*	≤ 4.0 m/s^2 (13.1 ft/s^2)

The following limits are valid for (immitted) vibration values introduced externally to all complete torque motors of type 1FW3:

Vibration frequency	Vibration values for 1FW3	
< 6.3 Hz	Vibration displacement *s*	≤ 0.26 mm (0.01 in)
6.3 ... 63 Hz	Vibration speed V_{am}	≤ 7.1 mm/s (0.28 in/s)
> 63 Hz	Vibration acceleration *a*	≤ 4.0 m/s^2 (13.1 ft/s^2)

Coolant temperature (ambient temperature) and installation altitude

Operation (unrestricted): -15 °C to +40 °C (5 °F to 104 °F)

The rated power (rated torque) is applicable to continuous duty (S1) in accordance with EN 60034-1 at rated frequency, a coolant temperature of 40 °C (104 °F) and an installation altitude of 1000 m (3281 ft) above sea level.

Apart from the 1PH8 motors, all motors are in temperature class 155 (F) and utilized in accordance with temperature class 155 (F). The 1PH8 motors are designed for temperature class 180 (H). For all other conditions, the factors given in the table below must be applied to determine the permissible output (torque).

The coolant temperature and installation altitude are rounded to 5 °C and 500 m (1640 ft) respectively.

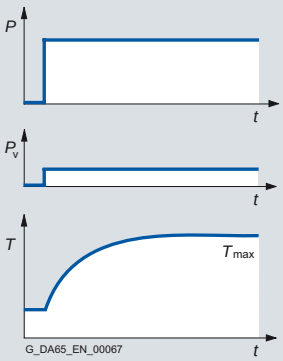
Installation altitude above sea level	Coolant temperature (ambient temperature)			
m (ft)	< 30 °C (86 °F)	30 ... 40 °C (86 ... 104 °F)	45 °C (113 °F)	50 °C (122 °F)
1000 (3281)	1.07	1.00	0.96	0.92
1500 (4922)	1.04	0.97	0.93	0.89
2000 (6562)	1.00	0.94	0.90	0.86
2500 (8203)	0.96	0.90	0.86	0.83
3000 (9843)	0.92	0.86	0.82	0.79
3500 (11484)	0.88	0.82	0.79	0.75
4000 (13124)	0.82	0.77	0.74	0.71

4

Overview (continued)

Duty types S1 and S6 in accordance with EN 0530

S1: Continuous duty

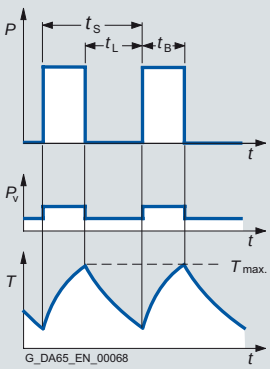


Duty cycle under constant load condition of sufficient duration to establish thermal equilibrium.

Designation: S1

Output specification (torque).

S6: Continuous duty with intermittent loading



Duty cycle comprising a sequence of identical duty cycles, each of which consists of a period of constant load followed by an interval at no load. There are no de-energized intervals.

Designation:

e.g.: S6 - 40 %, 85 kW. (114 HP).

$t_r = \frac{t_B}{t_B + t_L}$

t_s = 10 min

Rated torque

The torque supplied on the shaft is indicated in Nm (lb_f-ft) in the selection and ordering data.

$$M_{rated} = 9.55 \times P_{rated} \times \frac{1000}{n_{rated}}$$

P_{rated} Rated power in kW

n_{rated} Rated speed in rpm

M_{rated} Rated torque in Nm

$$M_{rated} = P_{rated} \times \frac{5250}{n_{rated}}$$

P_{rated} Rated power in HP

n_{rated} Rated speed in rpm

M_{rated} Rated torque in lb_f-ft

DURIGNIT IR 2000 insulation system

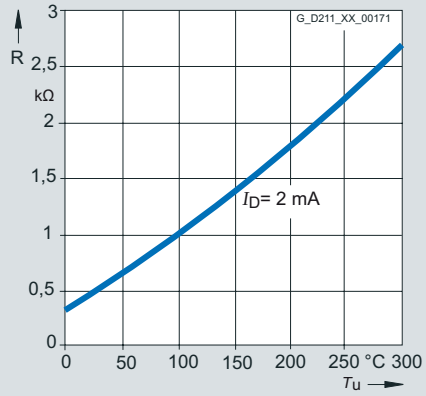
The DURIGNIT IR 2000 insulation system consists of high-quality enamel wires and insulating sheeting in conjunction with a solvent-free resin impregnation.

This ensures that these motors will have a high mechanical and electrical strength, high service value and a long service life.

The insulation system protects the winding to a large degree against aggressive gases, vapors, dust, oil and increased air humidity. It can withstand the usual vibration stressing.

Overview (continued)

Motor protection



The KTY84-130 temperature sensor is used to measure the motor temperature for converter-fed motor operation.

This sensor is a semi-conductor that changes its resistance depending on temperature in accordance with a defined curve.

Siemens converters determine the motor temperature using the resistance of the temperature sensor.

Their parameters can be set for specific alarm and shutdown temperatures.

The KTY84-130 temperature sensor is embedded in the winding overhang of the motor like a PTC thermistor.

The sensor is evaluated in the SINAMICS S120 drive system as a standard function.

If the motors are operated on converters that do not feature a KTY84 evaluation circuit, the temperature can be measured with the external 3RS1040 temperature monitoring relay. For a detailed description, please see Catalog IC 10 or Siemens Industry Mall:
www.siemens.com/industrymall

Paint finish

Motors without a paint finish have an impregnated resin coating. Motors with primer have corrosion protection.

All motors can be painted over with commercially available paints. Up to 2 additional paint coats are permissible.

Version	Suitability of paint finish for climate group in accordance with IEC 60721, Part 2 – 1	
Paint finish	**Moderate** (expanded) for indoor and outdoor installation with roof protection	
	Briefly	Up to 150 °C (302 °F)
	Continuously:	Up to 120 °C (248 °F)
Special paint finish	**Worldwide** (expanded) for outdoor installation	
	Briefly	Up to 150 °C (302 °F)
	Continuously	Up to 120 °C (248 °F)
	Also	For corrosive atmospheres up to 1 % acid and alkali concentration or permanent dampness in sheltered rooms

Overview (continued)

Built-in encoder systems without DRIVE-CLiQ interface

For motors without an integrated DRIVE-CLiQ interface, the analog encoder signal in the drive system is converted to a digital signal. For these motors as well as external encoders, the encoder signals must be connected to SINAMICS S120 via Sensor Modules.

Built-in encoder systems with DRIVE-CLiQ interface

For motors with an integrated DRIVE-CLiQ interface, the analog encoder signal is internally converted to a digital signal. There is no further conversion of the encoder signal in the drive system. The motor-internal encoders are the same encoders that are used for motors without a DRIVE-CLiQ interface. Motors with a DRIVE-CLiQ interface simplify the commissioning and diagnostics, for example, due to automatic identification of the encoder system.

The different encoder types, incremental, absolute or resolver, are uniformly connected with one type of MOTION-CONNECT DRIVE-CLiQ cable.

Short designations for the encoder systems

The first letters of the short designation define the encoder type. This is followed by the resolution in signals per revolution if S/R is specified (for encoders without DRIVE-CLiQ interface) or in bits if DQ is specified (for encoders with DRIVE-CLiQ interface).

Examples:

Type	Resolution/interface	
AM AS IC IN HTL	xxxxSR	Encoder without DRIVE-CLiQ interface Resolution = xxxx signals per revolution
AM AS IC IN R	xxDQ	Encoder with DRIVE-CLiQ interface Resolution = xx bit (2^{xx})
AM	Absolute encoder, multi-turn	
AS	Absolute encoder, single-turn	
IC	Incremental encoder sin/cos with commutation position C and D tracks	
IN	Incremental encoder sin/cos without commutation position	
HTL	Incremental encoder with HTL signal	
R	Resolver	

Overview of the motor encoder systems

Encoder without DRIVE-CLiQ interface	Encoder with DRIVE-CLiQ interface	Absolute position within a rotation (single-turn)	Absolute position over 4096 revolutions (multi-turn)	For use in safety applications[1]	Identification letter in the motor order number (without DRIVE-CLiQ interface)					Identification letter in the motor order number (with DRIVE-CLiQ interface)				
					1FT7	1FK7	1FW3	1PH8	1PH7	1FT7	1FK7	1FW3	1PH8	1PH7
AM2048S/R	AM22DQ	Yes	Yes	Yes	M	E	E	E	E	F	F	F	F	F
AM512S/R	AM20DQ	Yes	Yes	Yes	–	H	–	–	–	–	L	–	–	–
AM32S/R	AM16DQ	Yes	Yes	No	–	G	–	–	–	–	K	–	–	–
AM16S/R	AM15DQ	Yes	Yes	No	–	J	–	–	–	–	V	–	–	–
AS2048S/R	AS22DQ	Yes	No	No	–	–	N	–	–	–	–	P	–	–
IC2048S/R	IC22DQ	No	No	Yes	N	A	A	M	M	D	D	D	D	D
IN2048S/R	IN22DQ	No	No	Yes	–	–	–	–	N	–	–	–	–	Q
HTL1024S/R	–	No	No	No	–	–	–	H	H	–	–	–	–	–
HTL2048S/R	–	No	No	No	–	–	–	J	J	–	–	–	–	–
Resolver p=1	R14DQ	Yes	No	No	–	T	–	–	–	–	P	–	–	–
Resolver p=3	R15DQ	No	No	No	–	S	S	–	–	–	U	U	–	–
Resolver p=4	R15DQ	No	No	No	–	S	S	–	–	–	U	U	–	–

Not every encoder is available for every motor frame size.

– Not possible

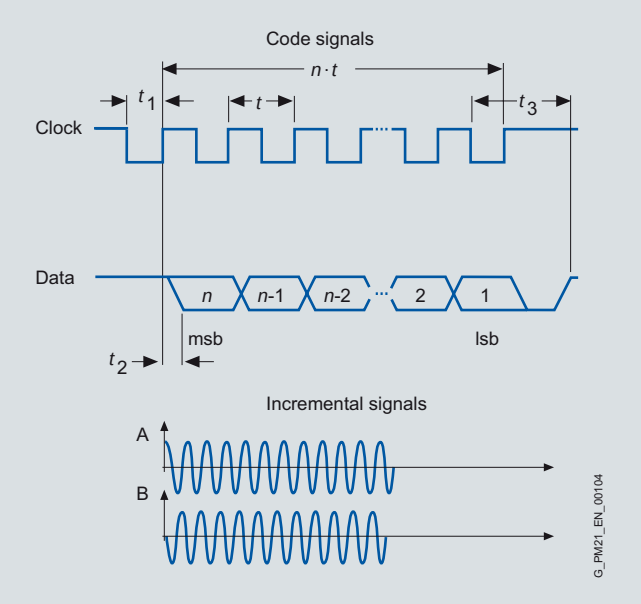
[1] Not for 1FW3 motors.

Overview (continued)

Multi-turn absolute encoder

This encoder outputs an absolute angular position between 0° and 360° in the specified resolution. An internal measuring gearbox enables it to differentiate 4096 rotations.

With a ball screw, for example, the absolute position of the slide can be determined over a long distance.



Multi-turn absolute encoder

Single-turn absolute encoder

This encoder outputs an absolute angular position between 0° and 360° in the specified resolution. In contrast to the multi-turn absolute encoder, it has no measuring gearbox and can therefore only supply the position value within one revolution.
It does not have a traversing range.

Absolute encoder without DRIVE-CLiQ interface	
AM2048S/R	Absolute encoder 2048 S/R, 4096 revolutions, multi-turn, with EnDat interface
AM512S/R	Absolute encoder 512 S/R, 4096 revolutions, multi-turn, with EnDat interface
AM32S/R	Absolute encoder 32 S/R, 4096 revolutions, multi-turn, with EnDat interface
AM16S/R	Absolute encoder 16 S/R, 4096 revolutions, multi-turn, with EnDat interface
AS2048S/R	Absolute encoder single-turn 2048 S/R
Absolute encoder with DRIVE-CLiQ interface	
AM22DQ	Absolute encoder, 22 bit + 12 bit multi-turn
AM20DQ	Absolute encoder, 20 bit + 12 bit multi-turn
AM16DQ	Absolute encoder, 16 bit + 12 bit multi-turn
AM15DQ	Absolute encoder, 15 bit + 12 bit multi-turn
AS22DQ	Absolute encoder, single-turn, 22 bit

Technical specifications	
Angular error	
• AM2048S/R and AM22DQ	± 40"
• AM512S/R and AM20DQ	± 120"
• AM32S/R and AM16DQ	± 280"
• AM16S/R and AM15DQ	± 480"
• AS2048S/R and AS22DQ	± 40"
Absolute encoder without DRIVE-CLiQ interface	
Supply voltage	5 V
Absolute position interface via EnDat	
• Traversing range (multi-turn)[1)]	4096 revolutions
Incremental signals (sinusoidal, 1 V_{pp})	
• Signals per revolution	2048/512/32/16
Absolute encoder with DRIVE-CLiQ interface	
Supply voltage	24 V
Absolute position via DRIVE-CLiQ	
• Resolution within one revolution	$2^{22}/2^{20}/2^{16}/2^{15}$ bit
• Traversing range (multi-turn)[1)]	4096 revolutions

[1)] Not for absolute encoder, single-turn AS.

Overview (continued)

Incremental encoder

This encoder senses relative movements and does not supply absolute position information. In combination with evaluation logic, a zero point can be determined via the integrated reference mark, which can be used in turn to calculate the absolute position.

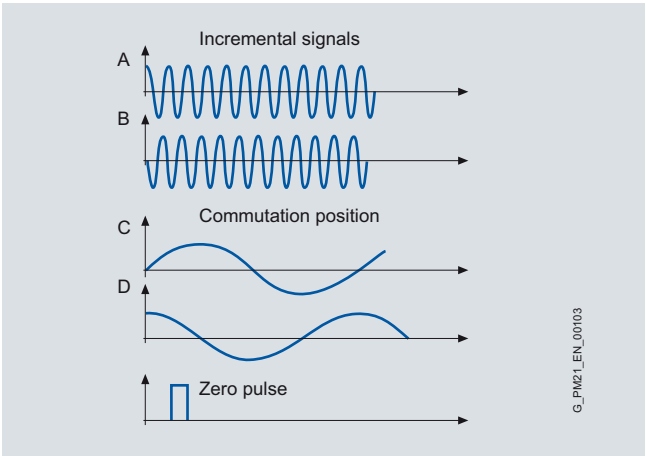
Incremental encoder IC/IN (sin/cos)

The encoder outputs sine and cosine signals. These can be interpolated using evaluation logic (usually 2048 points) and the direction of rotation can be determined.

In the version with DRIVE-CLiQ interface, this evaluation logic is already integrated in the encoder.

Commutation position

The position of the rotor is required for commutation of a synchronous motor. Encoders with commutation position (also termed C and D track) detect the angular position of the rotor.

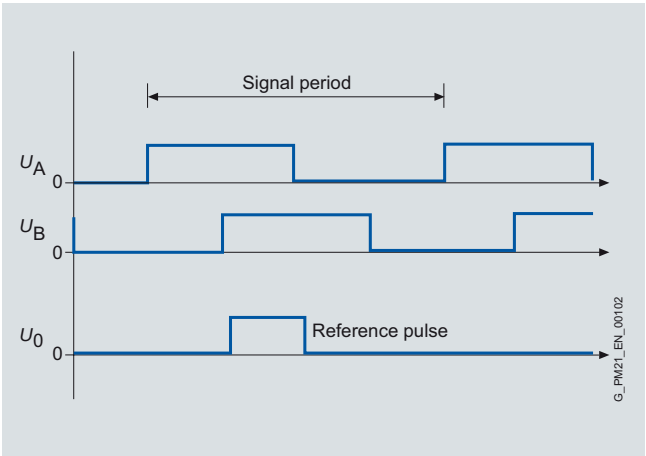


Incremental encoder IC/IN (sin/cos), commutation position for IC only

HTL incremental encoder

The encoder outputs square wave signals. The direction of rotation can be evaluated by means of edge evaluation.

The resolution is four times the number of encoder pulses. This encoder type is preferred for long signal cables.



HTL incremental encoder

Incremental encoder without DRIVE-CLiQ interface	
IC2048S/R	Incremental encoder sin/cos 1 V_{pp} 2048 S/R with C and D track
IN2048S/R	Incremental encoder sin/cos 1 V_{pp}, 2048 S/R without C or D tracks
HTL2048S/R	Incremental encoder HTL 2048S/R
HTL1024S/R	Incremental encoder HTL 1024S/R
Incremental encoder with DRIVE-CLiQ interface	
IC22DQ	Incremental encoder 22 bit (resolution 4194304, internal 2048 S/R) + commutation position 11 bit
IN22DQ	Incremental encoder 22 bit (resolution 4194304, internal 2048 S/R) without commutation position

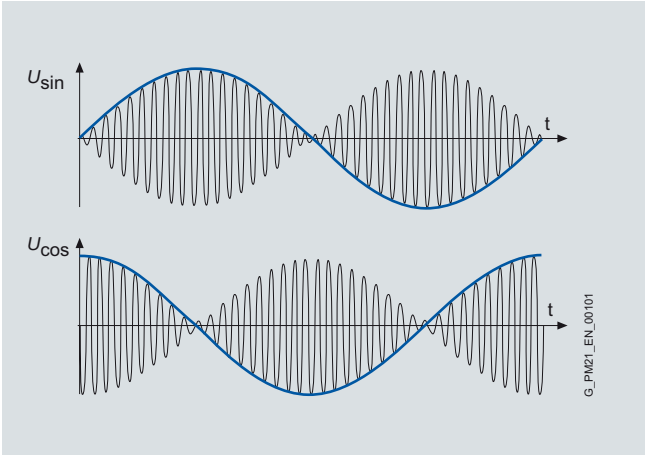
Technical specifications	
Angular error	
• IC2048S/R and IC22DQ	± 40"
• IN2048S/R and IN22DQ	± 120"
• HTL2048S/R	± 60"
• HTL1024S/R	± 60"
Incremental encoder IC/IN (sin/cos) without DRIVE-CLiQ interface	
Supply voltage	5 V
Incremental signals per revolution	
• Resolution (sin/cos)	2048
• Commutation position (for IC only)	1 sin/cos
• Reference signal	1
Incremental encoder IC/IN (sin/cos) with DRIVE-CLiQ interface	
Supply voltage	24 V
Incremental signals per revolution	
• Resolution	2^{22} bit
• Commutation position (for IC only)	11
• Reference signal	1
Incremental encoder HTL without DRIVE-CLiQ interface	
Supply voltage	10 ... 30 V
Incremental signals per revolution	
• Resolution (HTL)	2048/1024
• Reference signal	1

Overview (continued)

Resolver

The number of sine and cosine periods per revolution corresponds to the number of pole pairs of the resolver. In the case of a 2-pole resolver, the evaluation electronics may output an additional zero pulse per encoder revolution. This zero pulse ensures a unique assignment of the position information in relation to an encoder revolution. A 2-pole resolver can therefore be used as a single-turn encoder.

2-pole resolvers can be used for motors with any number of pairs of poles. In the case of multi-pole resolvers, the number of pairs of poles of the motor and resolver are always the same. The resolution is correspondingly higher than with 2-pole resolvers.



Resolver without DRIVE-CLiQ interface[1]	
Resolver p = 1	2-pole resolver
Resolver p = 3	6-pole resolver
Resolver p = 4	8-pole resolver
Resolver with DRIVE-CLiQ interface	
R15DQ	Resolver 15 bit (resolution 32768, internal, multi-pole)
R14DQ	Resolver 14 bit (resolution 16384, internal, 2-pole)

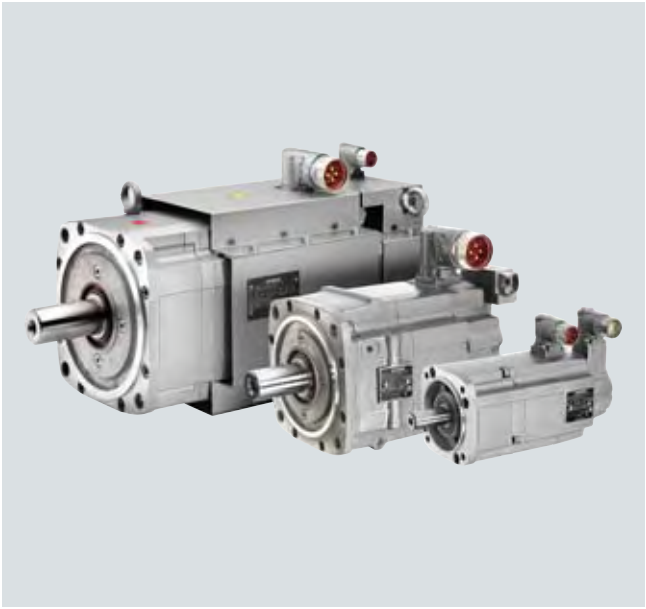
Technical specifications	
Angular error	
• Resolver p = 1 and R14DQ	± 840" [2]
• Resolver p = 3 and R15DQ	± 420"
• Resolver p = 4 and R15DQ	± 240"
Resolver without DRIVE-CLiQ interface	
Excitation voltage, rms	2 ... 8 V
Excitation frequency	5 ... 10 kHz
Output signals	$U_{\text{sine track}} = r \times U_{\text{excitation}} \times \sin \alpha$ $U_{\text{cosine track}} = r \times U_{\text{excitation}} \times \cos \alpha$ $\alpha = \arctan (U_{\text{sine track}}/U_{\text{cosine track}})$
Transmission ratio	$r = 0.5 \pm 5\%$
Resolver with DRIVE-CLiQ interface	
Supply voltage	24 V
• Resolution	$2^{15}/2^{14}$ bit

[1] Output signals:
2-pole resolver: 1 sin/cos signal per revolution
6-pole resolver: 3 sin/cos signals per revolution
8-pole resolver: 4 sin/cos signals per revolution

[2] For the 1FK701/1FK702 motors: 1200"

1FT7 motors

Overview



Motors 1FT7105 forced ventilation, 1FT7082 water cooling and 1FT7042 natural cooling

The 1FT7 motors are permanent-magnet synchronous motors with very compact dimensions and an optically attractive design. Due to the well proven cross-profile and the rotatable connectors with quick-release locks, quick and easy mounting of the motors is possible.

The 1FT7 motors fulfill the highest demands on dynamic performance, speed setting range, shaft and flange accuracy. They are equipped with state-of-the-art encoder technology and optimized for operation on our fully digital drive and control systems.

Natural cooling, forced ventilation or water cooling are available as cooling types. With the natural cooling method, heat is dissipated through the surface of the motor, whereas with the forced ventilation method, heat is forced out by means of built-on fans. Maximum cooling, and thus maximum power ratings can be achieved using water cooling.

Benefits

- Excellent dynamic performance in a wide speed range thanks to high overload capability ≥ 4 × M_0 with natural cooling
- High degree of protection – allows operation even with demanding ambient conditions
- High robustness against vibratory and shock loads thanks to vibration-isolated encoder mounting
- Quick and easy mounting due to cross-profile and rotatable connectors with quick-release locks
- Extremely high efficiency
- Due to their low torque ripple, 1FT7 Compact motors are especially suited for use in machine tools that require maximum surface quality and optimum machining quality. Their compact dimensions permit mounting in confined spaces
- 1FT7 High Dynamic motors have very low rotor moments of inertia to achieve extremely good dynamic performance and very short cycle times. As 1FT7 High Dynamic motors are available with forced ventilation and with water cooling, they possess high continuous performance capabilities.

Application

- High-performance machine tools
- Machines with stringent requirements in terms of dynamic performance and precision, e.g.:
  - Packaging machines
  - Foil extractor machines
  - Printing machines
  - Handling equipment

Technical specifications

1FT7 Compact/1FT7 High Dynamic motor	
Type of motor	Permanent-magnet synchronous motor
Magnet material	Rare-earth magnet material
Cooling	Natural cooling, forced ventilation, water cooling
Temperature monitoring	KTY84 temperature sensor in the stator winding
Insulation of the stator winding in accordance with EN 60034-1 (IEC 60034-1)	Temperature class 155 (F) for a winding temperature rise of ΔT = 100 K at an ambient temperature of 40 °C (104 °F). For water cooling, max. inlet temperature 30 °C (86 °F). Avoid condensation.
Type of construction in accordance with EN 60034-7 (IEC 60034-7)	IM B5 (IM V1, IM V3) with flange 0/flange 1 (compatible with 1FT6)
Degree of protection in accordance with EN 60034-5 (IEC 60034-5)	IP64/IP65/IP67
Shaft extension on the drive end (DE) in accordance with DIN 748-3 (IEC 60072-1)	Plain shaft/fitted key and keyway (half-key balancing)
Shaft and flange accuracy in accordance with DIN 42955 (IEC 60072-1)[1]	Tolerance N/Tolerance R
Vibration magnitude in accordance with EN 60034-14 (IEC 60034-14)	Grade A is maintained up to rated speed/ Grade R
Sound pressure level L_{pA} (1 m) in accordance with EN ISO 1680, max. Tolerance + 3 dB	
• 1FT703 • 1FT704 ... 1FT706 • 1FT708 ... 1FT710	60 dB 65 dB 70 dB
Connection	Connectors for signals and power rotatable
Paint finish	Pearl dark grey RAL 9023
2nd rating plate	Enclosed separately
Holding brake	Without/with
Approvals, according to	cURus

Built-in encoder systems without DRIVE-CLiQ interface

Incremental encoder	
IC2048S/R encoder	Incremental encoder sin/cos 1 V_{pp} 2048 S/R with C and D tracks
Absolute encoder	
AM2048S/R encoder	Absolute encoder 2048 S/R, 4096 revolutions, multi-turn

Built-in encoder systems with DRIVE-CLiQ interface

Incremental encoder	
IC22DQ encoder	Incremental encoder 22 bit (resolution 4194304, internal 2048 S/R) + commutation position 11 bit
Absolute encoder	
AM22DQ encoder	Absolute encoder 22 bit (resolution 4194304, internal 2048 S/R) + 12 bit multi-turn (traversing range 4096 revolutions)

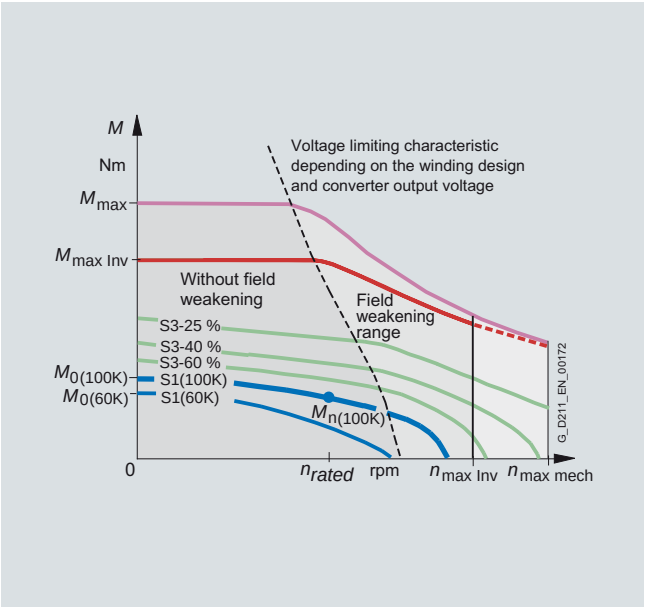
S/R=signals/revolution

Options

Order code	Description
X01	Paint finish: Jet black, matt RAL 9005
X02	Paint finish: Cream white RAL 9001
X03	Paint finish: Reseda green RAL 6011
X04	Paint finish: Pebble gray RAL 7032
X05	Paint finish: Sky blue RAL 5015
X06	Paint finish: Light ivory RAL 1015
X09	Paint finish: Anthracite RAL 7016
K23	Special paint finish for "worldwide" climate group: Primer and paint finish in anthracite RAL 7016
K23+X..	Special paint finish for "worldwide" climate group: Primer and paint finish selectable from X01 to X09
K24	Primed (unpainted)
Q12	Sealing air connection (Only in conjunction with IP67 degree of protection. Not in combination with terminal box.)
J..	Mounting of SP+ planetary gearbox (see geared servomotors)

When ordering a motor with options, **-Z** should be added to the order number.

Characteristic curve



Torque characteristic of a synchronous motor operating on a converter with field weakening (example)

[1] Shaft extension run-out, concentricity of centering ring and shaft, and perpendicularity of flange to shaft.

1FT7 Compact core type motors
Natural cooling

Selection and ordering data

Rated speed	Shaft height	Rated power	Static torque	Rated torque	Rated current	1FT7 Compact synchronous motors Core type	Number of pole pairs	Moment of inertia of rotor (without brake)	Weight (without brake)
n_{rated}	SH	P_{rated} at ΔT=100 K	M_0 at ΔT=100 K	M_{rated} at ΔT=100 K	I_{rated} at ΔT=100 K		p	J	m
rpm		kW (HP)	Nm (lb_f-ft)	Nm (lb_f-ft)	A	Order No.		10^{-4} kgm^2 (10^{-3} lb_f-in-s^2)	kg (lb)
Natural cooling									
2000	100	5.03 (6.75)	30 (22.1)	24 (17.7)	10	**1FT7102-1AC7■-1 ■ ■ 1**	5	91.4 (80.9)	26.1 (57.6)
		7.96 (10.7)	50 (36.9)	38 (28)	15	**1FT7105-1AC7■-1 ■ ■ 1**	5	178 (158)	44.2 (97.5)
3000	48	1.35 (1.81)	5 (3.7)	4.3 (3.2)	2.6	**1FT7044-1AF7■-1 ■ ■ 1**	3	5.43 (4.81)	7.2 (15.9)
	63	1.7 (2.28)	6 (4.4)	5.4 (4.0)	3.9	**1FT7062-1AF7■-1 ■ ■ 1**	5	7.36 (6.51)	7.1 (15.7)
		2.39 (3.20)	9 (6.6)	7.6 (5.6)	5.2	**1FT7064-1AF7■-1 ■ ■ 1**	5	11.9 (10.5)	9.7 (21.4)
	80	3.24 (4.34)	13 (9.6)	10.3 (7.6)	6.6	**1FT7082-1AF7■-1 ■ ■ 1**	5	26.5 (23.5)	14.0 (30.9)
		4.56 (6.11)	20 (14.8)	14.5 (10.7)	8.5	**1FT7084-1AF7■-1 ■ ■ 1**	5	45.1 (39.9)	20.8 (45.9)
		5.65 (7.58)	28 (20.7)	18 (13.3)	11	**1FT7086-1AF7■-1 ■ ■ 1**	5	63.6 (56.3)	27.5 (60.6)
4500	80	4.82 (6.46)[1]	20 (14.8)	11.5 (8.5)[1]	10.1[1]	**1FT7084-1AH7■-1 ■ ■ 1**	5	45.1 (39.9)	20.8 (45.9)
		4.71 (6.32)	28 (20.7)	10 (7.4)	10	**1FT7086-1AH7■-1 ■ ■ 1**	5	63.6 (56.3)	27.5 (60.6)
6000	36	0.88 (1.18)	2 (1.5)	1.4 (1.0)	2.1	**1FT7034-1AK7■-1 ■ ■ 1**	3	0.85 (0.75)	3.8 (8.38)
	63	2.13 (2.86)[2]	6 (4.4)	3.7 (2.7)[2]	5.9[2]	**1FT7062-1AK7■-1 ■ ■ 1**	5	7.36 (6.51)	7.1 (15.7)
		2.59 (3.47)[3]	9 (6.6)	5.5 (4.1)[3]	6.1[3]	**1FT7064-1AK7■-1 ■ ■ 1**	5	11.9 (10.5)	9.7 (21.4)

Type of construction:	IM B5	Flange 0	**0**		
		Flange 1 (compatible with 1FT6)	**1**		
Encoder systems for motors without DRIVE-CLiQ interface:	IC2048S/R encoder			**N**	
	AM2048S/R encoder			**M**	
Encoder systems for motors with DRIVE-CLiQ interface:	IC22DQ encoder			**D**	
	AM22DQ encoder			**F**	
Shaft extension:	**Shaft and flange accuracy:**	**Holding brake:**			
Plain shaft	Tolerance N	Without		**G**	
Plain shaft	Tolerance N	With		**H**	
Vibration magnitude:	**Degree of protection:**				
Grade A	IP65				**1**

To select the type of construction and degree of protection, see Technical definitions.

Some 1FT7 Compact motors are available as core types. These core types can be express delivered as replacement motors in the event of plant outages and offer the advantage of a quicker spare parts supply. For this reason, core types should be used for configuration wherever possible.

Motor type (repeated)	Efficiency[4]	Static current	Calculated power P_{calc}[7]	SINAMICS S120 Motor Module		Power cable with complete shield Motor connection (and brake connection) via power connector		
				Rated output current[5]	Booksize format For additional versions and components, see chapter SINAMICS S120 drive system	Power connector	Cable cross-section[6]	Pre-assembled cable
	η	I_0 at M_0 ΔT=100 K	P_{calc} for M_0 ΔT=100 K	I_{rated}				
	%	A	kW (HP)	A	Order No.	Size	mm^2	Order No.
1FT7102-1AC7...	93	12.5	6.28 (8.42)	18	6SL312■-■TE21-8AA3	1.5	4 × 1.5	6FX■002-5■N21-....
1FT7105-1AC7...	93	18	10.47 (14.0)	18	6SL312■-■TE21-8AA3	1.5	4 × 2.5	6FX■002-5■N31-....
1FT7044-1AF7...	92	2.8	1.57 (2.11)	3	6SL312■-■TE13-0AA3	1	4 × 1.5	6FX■002-5■N01-....
1FT7062-1AF7...	91	3.9	1.88 (2.52)	5	6SL312■-■TE15-0AA3	1	4 × 1.5	6FX■002-5■N01-....
1FT7064-1AF7...	93	5.7	2.83 (3.80)	9	6SL312■-■TE21-0AA3	1	4 × 1.5	6FX■002-5■N01-....
1FT7082-1AF7...	93	7.6	4.08 (5.47)	9	6SL312■-■TE21-0AA3	1	4 × 1.5	6FX■002-5■N01-....
1FT7084-1AF7...	93	11	6.28 (8.42)	18	6SL312■-■TE21-8AA3	1	4 × 1.5	6FX■002-5■N01-....
1FT7086-1AF7...	93	15.5	8.80 (11.8)	18	6SL312■-■TE21-8AA3	1.5	4 × 2.5	6FX■002-5■N31-....
1FT7084-1AH7...	93	15.6	9.42 (12.6)	18	6SL312■-■TE21-8AA3	1.5	4 × 2.5	6FX■002-5■N31-....
1FT7086-1AH7...	91	22.4	13.19 (17.7)	30	6SL312■-1 TE23-0AA3	1.5	4 × 4	6FX■002-5■N41-....
1FT7034-1AK7...	90	2.7	1.26 (1.69)	3	6SL312■-■TE13-0AA3	1	4 × 1.5	6FX■002-5■N01-....
1FT7062-1AK7...	90	8.4	3.77 (5.06)	9	6SL312■-■TE21-0AA3	1	4 × 1.5	6FX■002-5■N01-....
1FT7064-1AK7...	91	9	5.65 (7.58)	9	6SL312■-■TE21-0AA3	1	4 × 1.5	6FX■002-5■N01-....

Cooling:
Internal air cooling **0**
External air cooling **1**

Motor Module:
Single Motor Module **1**
Double Motor Module **2**

Power cable:
MOTION-CONNECT 800 **8**
MOTION-CONNECT 500 **5**

Without brake cores **C**
With brake cores **D**

Length code ....

Information about the cables can be found in chapter Connection system MOTION-CONNECT.

1) These values refer to n = 4000 rpm.
2) These values refer to n = 5500 rpm.
3) These values refer to n = 4500 rpm.
4) Optimum efficiency in continuous duty.
5) With default setting of the pulse frequency.
6) The current carrying capacity of the power cables complies with EN 60204-1 for installation type C, for continuous duty at an ambient air temperature of 40 °C (104 °F).
7) $P_{calc}\,[kW] = \frac{M_0\,[Nm] \times n_{rated}}{9550}$ $\quad P_{calc}\,[HP] = \frac{M_0\,[lb_f\text{-}ft] \times n_{rated}}{5250}$

Selection and ordering data

Rated speed	Shaft height	Rated power	Static torque	Rated torque	Rated current	1FT7 Compact synchronous motors	Number of pole pairs	Moment of inertia of rotor (without brake)	Weight (without brake)
n_{rated}	SH	P_{rated} at ΔT=100 K	M_0 at ΔT=100 K	M_{rated} at ΔT=100 K	I_{rated} at ΔT=100 K		p	J	m
rpm		kW (HP)	Nm (lb_f-ft)	Nm (lb_f-ft)	A	Order No.		10^{-4} kgm^2 (10^{-3} lb_f-in-s^2)	kg (lb)
Natural cooling									
1500	100	4.08 (5.47)	30 (22.1)	26 (19.2)	8	**1FT7102-5AB7■-1■ ■ ■**	5	91.4 (80.9)	26.1 (57.5)
		6.60 (8.85)	50 (36.9)	42 (31.0)	13	**1FT7105-5AB7■-1■ ■ ■**	5	178 (157)	44.2 (97.5)
		9.58 (12.8)	70 (51.6)	61 (45.0)	16	**1FT7108-5AB7■-1■ ■ ■**	5	248 (219)	59 (130)
2000	80	2.39 (3.20)	13 (9.6)	11.4 (8.4)	4.9	**1FT7082-5AC7■-1■ ■ ■**	5	26.5 (23.5)	14 (30.9)
		3.54 (4.75)	20 (14.8)	16.9 (12.5)	8.4	**1FT7084-5AC7■-1■ ■ ■**	5	45.1 (39.9)	20.8 (45.9)
		4.71 (6.32)	28 (20.7)	22.5 (16.6)	9.2	**1FT7086-5AC7■-1■ ■ ■**	5	63.6 (56.3)	27.5 (60.6)
	100	5.03 (6.75)	30 (22.1)	24 (17.7)	10	**1FT7102-5AC7■-1■ ■ ■**	5	91.4 (80.9)	26.1 (57.5)
		7.96 (10.7)	50 (36.9)	38 (28.0)	15	**1FT7105-5AC7■-1■ ■ ■**	5	178 (157)	44.2 (97.5)
		10.5 (14.1)	70 (51.6)	50 (36.9)	18	**1FT7108-5AC7■-1■ ■ ■**	5	248 (219)	59 (130)
3000	48	0.85 (1.14)	3 (2.2)	2.7 (2.0)	2.1	**1FT7042-5AF7■-1■ ■ ■**	3	2.81 (2.49)	4.6 (10.1)
		1.35 (1.81)	5 (3.7)	4.3 (3.2)	2.6	**1FT7044-5AF7■-1■ ■ ■**	3	5.43 (4.81)	7.2 (15.9)
		1.76 (2.36)	7 (5.2)	5.6 (4.1)	3.5	**1FT7046-5AF7■-1■ ■ ■**	3	7.52 (6.66)	9.3 (20.5)
	63	1.70 (2.28)	6 (4.4)	5.4 (4.0)	3.9	**1FT7062-5AF7■-1■ ■ ■**	5	7.36 (6.51)	7.1 (15.7)
		2.39 (3.20)	9 (6.6)	7.6 (5.6)	5.2	**1FT7064-5AF7■-1■ ■ ■**	5	11.9 (10.5)	9.7 (21.4)
		2.92 (3.92)	12 (8.9)	9.3 (6.9)	7.2	**1FT7066-5AF7■-1■ ■ ■**	5	16.4 (14.5)	12.3 (27.1)
		3.42 (4.59)	15 (11.1)	10.9 (8.0)	6.7	**1FT7068-5AF7■-1■ ■ ■**	5	23.2 (20.5)	16.3 (35.9)
	80	3.24 (4.34)	13 (9.6)	10.3 (7.6)	6.6	**1FT7082-5AF7■-1■ ■ ■**	5	26.5 (23.5)	14 (30.9)
		4.55 (6.10)	20 (14.8)	14.5 (10.7)	8.5	**1FT7084-5AF7■-1■ ■ ■**	5	45.1 (39.9)	20.8 (45.9)
		5.65 (7.58)	28 (20.7)	18 (13.3)	11	**1FT7086-5AF7■-1■ ■ ■**	5	63.6 (56.3)	27.5 (60.6)
	100	6.28 (8.42)	30 (22.1)	20 (14.8)	12	**1FT7102-5AF7■-1■ ■ ■**	5	91.4 (80.9)	26.1 (57.5)
		8.80 (11.8)	50 (36.9)	28 (20.7)	15	**1FT7105-5AF7■-1■ ■ ■**	5	178 (157)	44.2 (97.5)
		6.28 (8.42)	70 (51.6)	20 (14.8)	12	**1FT7108-5AF7■-1■ ■ ■**	5	248 (220)	59 (130)

Type of construction:	IM B5	Flange 0	**0**
		Flange 1 (compatible with 1FT6)	**1**
Encoder systems for motors without DRIVE-CLiQ interface:	IC2048S/R encoder		**N**
	AM2048S/R encoder		**M**
Encoder systems for motors with DRIVE-CLiQ interface:	IC22DQ encoder		**D**
	AM22DQ encoder		**F**

Shaft extension:	**Shaft and flange accuracy:**	**Holding brake:**	
Fitted key and keyway	Tolerance N	Without	**A**
Fitted key and keyway	Tolerance N	With	**B**
Fitted key and keyway	Tolerance R	Without	**D**
Fitted key and keyway	Tolerance R	With	**E**
Plain shaft	Tolerance N	Without	**G**
Plain shaft	Tolerance N	With	**H**
Plain shaft	Tolerance R	Without	**K**
Plain shaft	Tolerance R	With	**L**

Vibration magnitude:	**Degree of protection:**	
Grade A	IP64	**0**
Grade A	IP65	**1**
Grade A	IP67	**2**
Grade R	IP64	**3**
Grade R	IP65	**4**
Grade R	IP67	**5**

To select the type of construction and degree of protection, see Technical definitions.

Motor type (repeated)	Efficiency[1]	Static current	Calculated power P_{calc}[4]	SINAMICS S120 Motor Module		Power cable with complete shield Motor connection (and brake connection) via power connector		
				Rated output current[2]	Booksize format For additional versions and components, see chapter SINAMICS S120 drive system	Power connector	Cable cross-section[3]	Pre-assembled cable
	η	I_0 at M_0 ΔT=100 K	P_{calc} for M_0 ΔT=100 K	I_{rated}				
	%	A	kW (HP)	A	Order No.	Size	mm²	Order No.
1FT7102-5AB7...	93	9	4.71 (6.32)	9	6SL312■-■TE21-0AA3	1.5	4 × 1.5	6FX■002-5■N21-....
1FT7105-5AB7...	93	15	7.85 (10.5)	18	6SL312■-■TE21-8AA3	1.5	4 × 1.5	6FX■002-5■N21-....
1FT7108-5AB7...	93	18	10.99 (14.7)	18	6SL312■-■TE21-8AA3	1.5	4 × 2.5	6FX■002-5■N31-....
1FT7082-5AC7...	93	5	2.72 (3.65)	5	6SL312■-■TE15-0AA3	1	4 × 1.5	6FX■002-5■N01-....
1FT7084-5AC7...	93	9	4.19 (5.62)	9	6SL312■-■TE21-0AA3	1	4 × 1.5	6FX■002-5■N01-....
1FT7086-5AC7...	93	10.6	5.86 (7.86)	18	6SL312■-■TE21-8AA3	1	4 × 1.5	6FX■002-5■N01-....
1FT7102-5AC7...	93	12.5	6.28 (8.42)	18	6SL312■-■TE21-8AA3	1.5	4 × 1.5	6FX■002-5■N21-....
1FT7105-5AC7...	93	18	10.47 (14.0)	18	6SL312■-■TE21-8AA3	1.5	4 × 2.5	6FX■002-5■N31-....
1FT7108-5AC7...	93	25	14.66 (19.7)	30	6SL312■-1 TE23-0AA3	1.5	4 × 4	6FX■002-5■N41-....
1FT7042-5AF7...	92	2.1	0.94 (1.26)	3	6SL312■-■TE13-0AA3	1	4 × 1.5	6FX■002-5■N01-....
1FT7044-5AF7...	92	2.8	1.57 (2.11)	3	6SL312■-■TE13-0AA3	1	4 × 1.5	6FX■002-5■N01-....
1FT7046-5AF7...	92	4	2.20 (2.95)	5	6SL312■-■TE15-0AA3	1	4 × 1.5	6FX■002-5■N01-....
1FT7062-5AF7...	91	3.9	1.88 (2.52)	5	6SL312■-■TE15-0AA3	1	4 × 1.5	6FX■002-5■N01-....
1FT7064-5AF7...	93	5.7	2.83 (3.80)	9	6SL312■-■TE21-0AA3	1	4 × 1.5	6FX■002-5■N01-....
1FT7066-5AF7...	92	8.4	3.77 (5.06)	9	6SL312■-■TE21-0AA3	1	4 × 1.5	6FX■002-5■N01-....
1FT7068-5AF7...	92	8.3	4.71 (6.32)	9	6SL312■-■TE21-0AA3	1	4 × 1.5	6FX■002-5■N01-....
1FT7082-5AF7...	93	7.6	4.08 (5.47)	9	6SL312■-■TE21-0AA3	1	4 × 1.5	6FX■002-5■N01-....
1FT7084-5AF7...	93	11	6.28 (8.42)	18	6SL312■-■TE21-8AA3	1	4 × 1.5	6FX■002-5■N01-....
1FT7086-5AF7...	93	15.5	8.80 (11.8)	18	6SL312■-■TE21-8AA3	1.5	4 × 2.5	6FX■002-5■N31-....
1FT7102-5AF7...	93	18	9.42 (12.6)	18	6SL312■-■TE21-8AA3	1.5	4 × 2.5	6FX■002-5■N31-....
1FT7105-5AF7...	94	26	15.71 (21.1)	30	6SL312■-1 TE23-0AA3	1.5	4 × 4	6FX■002-5■N41-....
1FT7108-5AF7...	93	36	21.99 (29.5)	45	6SL312■-1 TE24-5AA3	1.5	4 × 6	6FX■002-5■N54-....

Cooling:
Internal air cooling **0**
External air cooling **1**

Motor Module:
Single Motor Module **1**
Double Motor Module **2**

Power cable:
MOTION-CONNECT 800 **8**
MOTION-CONNECT 500 **5**

Without brake cores **C**
With brake cores **D**

Length code **....**

Information about the cables can be found in chapter Connection system MOTION-CONNECT.

1) Optimum efficiency in continuous duty.

2) With default setting of the pulse frequency.

3) The current carrying capacity of the power cables complies with EN 60204-1 for installation type C, for continuous duty at an ambient air temperature of 40 °C (104 °F).

4) $P_{calc}\,[kW] = \frac{M_0\,[Nm] \times n_{rated}}{9550}$ $\quad P_{calc}\,[HP] = \frac{M_0\,[lb_f\text{-}ft] \times n_{rated}}{5250}$

1FT7 Compact motors
Natural cooling

Selection and ordering data

Rated speed	Shaft height	Rated power	Static torque	Rated torque	Rated current	1FT7 Compact synchronous motors	Number of pole pairs	Moment of inertia of rotor (without brake)	Weight (without brake)
n_{rated}	SH	P_{rated} at ΔT=100 K	M_0 at ΔT=100 K	M_{rated} at ΔT=100 K	I_{rated} at ΔT=100 K		p	J	m
rpm		kW (HP)	Nm (lb_f-ft)	Nm (lb_f-ft)	A	Order No.		10^{-4} kgm^2 (10^{-3} lb_f-in-s^2)	kg (lb)
Natural cooling									
4500	48	1.32 (1.77)[1]	7 (5.2)	3.6 (2.7)[1]	4.7[1]	**1FT7046-5AH7■-1■■■**	3	7.52 (6.66)	9.3 (20.5)
	63	2.55 (3.42)[2]	12 (8.9)	6.1 (4.5)[2]	7.5[2]	**1FT7066-5AH7■-1■■■**	5	16.4 (14.5)	12.3 (27.1)
	80	3.77 (5.06)	13 (9.6)	8 (5.9)	7.8	**1FT7082-5AH7■-1■■■**	5	26.5 (23.5)	14 (30.9)
		4.82 (6.46)[2]	20 (14.8)	11.5 (8.5)[2]	10.1[2]	**1FT7084-5AH7■-1■■■**	5	45.1 (39.9)	20.8 (45.9)
		4.71 (6.32)	28 (20.7)	10 (7.4)	10	**1FT7086-5AH7■-1■■■**	5	63.6 (56.3)	27.5 (60.6)
6000	36	0.88 (1.18)	2 (1.5)	1.4 (1.0)	2.1	**1FT7034-5AK7■-1■■■**	3	0.85 (0.75)	3.8 (8.38)
		1.07 (1.43)	3 (2.2)	1.7 (1.3)	2.4	**1FT7036-5AK7■-1■■■**	3	1.33 (1.18)	5.0 (11.0)
	48	1.26 (1.69)	3 (2.2)	2 (1.5)	3	**1FT7042-5AK7■-1■■■**	3	2.81 (2.49)	4.6 (10.1)
		1.41 (1.89)[3]	5 (3.7)	3 (2.2)[3]	3.6[3]	**1FT7044-5AK7■-1■■■**	3	5.43 (4.81)	7.2 (15.9)
	63	2.13 (2.86)[4]	6 (4.4)	3.7 (2.7)[4]	5.9[4]	**1FT7062-5AK7■-1■■■**	5	7.36 (6.51)	7.1 (15.7)
		2.59 (3.47)[3]	9 (6.6)	5.5 (4.1)[3]	6.1[3]	**1FT7064-5AK7■-1■■■**	5	11.9 (10.5)	9.7 (21.4)

Type of construction:	IM B5	Flange 0	**0**
		Flange 1 (compatible with 1FT6)	**1**
Encoder systems for motors without DRIVE-CLiQ interface:	IC2048S/R encoder		**N**
	AM2048S/R encoder		**M**
Encoder systems for motors with DRIVE-CLiQ interface:	IC22DQ encoder		**D**
	AM22DQ encoder		**F**

Shaft extension:	**Shaft and flange accuracy:**	**Holding brake:**	
Fitted key and keyway	Tolerance N	Without	**A**
Fitted key and keyway	Tolerance N	With	**B**
Fitted key and keyway	Tolerance R	Without	**D**
Fitted key and keyway	Tolerance R	With	**E**
Plain shaft	Tolerance N	Without	**G**
Plain shaft	Tolerance N	With	**H**
Plain shaft	Tolerance R	Without	**K**
Plain shaft	Tolerance R	With	**L**

Vibration magnitude:	**Degree of protection:**	
Grade A	IP64	**0**
Grade A	IP65	**1**
Grade A	IP67	**2**
Grade R	IP64	**3**
Grade R	IP65	**4**
Grade R	IP67	**5**

To select the type of construction and degree of protection, see Technical definitions.

Motor type (repeated)	Efficiency[5]	Static current	Calculated power	SINAMICS S120 Motor Module		Power cable with complete shield Motor connection (and brake connection) via power connector		
				Rated output current[6]	Booksize format For additional versions and components, see chapter SINAMICS S120 drive system	Power connector	Cable cross-section[7]	Pre-assembled cable
	η	I_0 at M_0 ΔT=100 K	P_{calc} for M_0 ΔT=100 K	I_{rated}				
	%	A	kW (HP)	A	Order No.	Size	mm^2	Order No.
1FT7046-5AH7...	90	8.1	3.3 (4.43)	9	**6SL312■-■TE21-0AA3**	1	4 × 1.5	**6FX■002-5■N01-....**
1FT7066-5AH7...	90	13.6	5.65 (7.58)	18	**6SL312■-■TE21-8AA3**	1	4 × 1.5	**6FX■002-5■N01-....**
1FT7082-5AH7...	93	12.3	6.13 (8.22)	18	**6SL312■-■TE21-8AA3**	1	4 × 1.5	**6FX■002-5■N01-....**
1FT7084-5AH7...	93	15.6	9.42 (12.6)	18	**6SL312■-■TE21-8AA3**	1.5	4 × 2.5	**6FX■002-5■N31-....**
1FT7086-5AH7...	91	22.4	13.19 (17.7)	30	**6SL312■-1TE23-0AA3**	1.5	4 × 4	**6FX■002-5■N41-....**
1FT7034-5AK7...	90	2.7	1.26 (1.69)	3	**6SL312■-■TE13-0AA3**	1	4 × 1.5	**6FX■002-5■N01-....**
1FT7036-5AK7...	90	4.0	1.88 (2.52)	5	**6SL312■-■TE15-0AA3**	1	4 × 1.5	**6FX■002-5■N01-....**
1FT7042-5AK7...	91	3.9	1.88 (2.52)	5	**6SL312■-■TE15-0AA3**	1	4 × 1.5	**6FX■002-5■N01-....**
1FT7044-5AK7...	91	5.7	3.14 (4.21)	9	**6SL312■-■TE21-0AA3**	1	4 × 1.5	**6FX■002-5■N01-....**
1FT7062-5AK7...	90	8.4	3.77 (5.06)	9	**6SL312■-■TE21-0AA3**	1	4 × 1.5	**6FX■002-5■N01-....**
1FT7064-5AK7...	91	9	5.65 (7.58)	9	**6SL312■-■TE21-0AA3**	1	4 × 1.5	**6FX■002-5■N01-....**

Cooling:
Internal air cooling **0**
External air cooling **1**

Motor Module:
Single Motor Module **1**
Double Motor Module **2**

Power cable:
MOTION-CONNECT 800 **8**
MOTION-CONNECT 500 **5**

Without brake cores **C**
With brake cores **D**

Length code **....**

Information about the cables can be found in chapter Connection system MOTION-CONNECT.

1) These values refer to n = 3500 rpm.
2) These values refer to n = 4000 rpm.
3) These values refer to n = 4500 rpm.
4) These values refer to n = 5500 rpm.
5) Optimum efficiency in continuous duty.
6) With default setting of the pulse frequency.
7) The current carrying capacity of the power cables complies with EN 60204-1 for installation type C, for continuous duty at an ambient air temperature of 40 °C (104 °F).
8) $P_{calc}\,[kW] = \frac{M_0\,[Nm] \times n_{rated}}{9550}$ $\quad P_{calc}\,[HP] = \frac{M_0\,[lb_f\text{-}ft] \times n_{rated}}{5250}$

Selection and ordering data

Rated speed	Shaft height	Rated power	Static torque	Rated torque	Rated current	1FT7 Compact synchronous motors	Number of pole pairs	Moment of inertia of rotor (without brake)	Weight (without brake)
n_{rated}	SH	P_{rated} at ΔT=100 K	M_0 at ΔT=100 K	M_{rated} at ΔT=100 K	I_{rated} at ΔT=100 K		p	J	m
rpm		kW (HP)	Nm (lb_f-ft)	Nm (lb_f-ft)	A	Order No.		10^{-4} kgm^2 (10^{-3} lb_f-in-s^2	kg (lb)
Forced ventilation									
2000	80	5.0 (6.7)	27 (19.9)	24 (17.7)	13.5	**1FT7084-5SC7■-1 ■ ■ ■**	5	45 (39.8)	25 (55.1)
		6.7 (8.98)	36 (26.5)	32 (23.6)	17	**1FT7086-5SC7■-1 ■ ■ ■**	5	64 (56.7)	36 (79.4)
	100	11.7 (15.7)	65 (47.9)	56 (41.3)	29	**1FT7105-5SC7■-1 ■ ■ ■**	5	178 (157.6)	50 (110.3)
		15.3 (20.5)	91 (67.1)	73 (53.8)	33	**1FT7108-5SC7■-1 ■ ■ ■**	5	248 (219.5)	64 (141.1)
3000	80	7.2 (9.66)	27 (19.9)	23 (17)	18.5	**1FT7084-5SF7■-1 ■ ■ ■**	5	45 (39.8)	25 (55.1)
		9.1 (12.2)	36 (26.5)	29 (21.4)	24	**1FT7086-5SF7■-1 ■ ■ ■**	5	64 (56.7)	36 (79.4)
	100	15.1 (20.3)	65 (47.9)	48 (35.4)	35	**1FT7105-5SF7■-■ ■ ■ ■**	5	178 (157.6)	50 (110.3)
		18.8 (25.1)	91 (67.1)	60 (44.3)	38	**1FT7108-5SF7■-■ ■ ■ ■**	5	248 (219.5)	64 (141.1)
4500	80	9.9 (13.3)	27 (19.9)	21 (15.5)	24.5	**1FT7084-5SH7■-1 ■ ■ ■**	5	45 (39.8)	25 (55.1)
		11.8 (15.8)	36 (26.5)	25 (18.4)	25	**1FT7086-5SH7■-1 ■ ■ ■**	5	64 (56.7)	36 (79.4)

Type of construction:	IM B5	Flange 0	**0**
		Flange 1 (compatible with 1FT6)	**1**
Connector outlet direction:	Connector size 1 and 1.5	Rotatable connector	**1**
	Connector size 3[1)]	Transverse right	**1**
		Transverse left	**2**
		Axial NDE	**3**
		Axial DE	**4**
Terminal box/ cable entry:[1)]	Top/transverse from right		**5**
	Top/transverse from left		**6**
	Top/axial from NDE		**7**
	Top/axial from DE		**8**
Encoder systems for motors without DRIVE-CLiQ interface:	IC2048S/R encoder		**N**
	AM2048S/R encoder		**M**

Shaft extension:	**Shaft and flange accuracy:**	**Holding brake:**	
Fitted key	Tolerance N	Without	**A**
Fitted key	Tolerance N	With	**B**
Fitted key	Tolerance R	Without	**D**
Fitted key	Tolerance R	With	**E**
Plain shaft	Tolerance N	Without	**G**
Plain shaft	Tolerance N	With	**H**
Plain shaft	Tolerance R	Without	**K**
Plain shaft	Tolerance R	With	**L**

Vibration magnitude:	**Degree of protection:**[2)]	
Grade A	IP64	**0**
Grade A	IP65	**1**
Grade R	IP64	**3**
Grade R	IP65	**4**

To select the type of construction and degree of protection, see Technical definitions.

Motor type (repeated)	Efficiency[3]	Static current	Calculated power P_{calc}[6]	SINAMICS S120 Motor Module		Power cable with complete shield Motor connection (and brake connection) via power connector		
				Rated output current[4]	Booksize format For additional versions and components, see chapter SINAMICS S120 drive system	Power connector	Cable cross-section[5]	Pre-assembled cable
	η	I_0 at M_0 ΔT=100 K	P_{calc} for M_0 ΔT=100 K	I_{rated}				
	%	A	kW (HP)	A	Order No.	Size	mm^2	Order No.
1FT7084-5SC7...	93	15	5.7 (7.64)	18	**6SL312■-■TE21-8AA3**	1.5	4 × 1.5	**6FX■002-5■N21-....**
1FT7086-5SC7...	93	19.5	7.5 (10.1)	30	**6SL312■-1TE23-0AA3**	1.5	4 × 2.5	**6FX■002-5■N31-....**
1FT7105-5SC7...	93	31	13.6 (18.2)	45	**6SL312■-1TE24-5AA3**	1.5	4 × 6	**6FX■002-5■N54-....**
1FT7108-5SC7...	93	39	19.1 (25.6)	45	**6SL312■-1TE24-5AA3**	1.5	4 × 10	**6FX■002-5■N64-....**
1FT7084-5SF7...	94	21	8.5 (11.4)	30	**6SL312■-1TE23-0AA3**	1.5	4 × 2.5	**6FX■002-5■N31-....**
1FT7086-5SF7...	93	29	11.3 (15.2)	30	**6SL312■-1TE23-0AA3**	1.5	4 × 6	**6FX■002-5■N51-....**
1FT7105-5SF7...	94	45	20.4 (27.4)	45	**6SL312■-1TE24-5AA3**	3	4 × 10	**6FX■002-5■S14-....**
1FT7108-5SF7...	94	57	28.6 (38.4)	60	**6SL312■-1TE26-0AA3**	3	4 × 16	**6FX■002-5■S23-....**
1FT7084-5SH7...	94	30.5	12.7 (17.0)	30	**6SL312■-1TE23-0AA3**	1.5	4 × 6	**6FX■002-5■N51-....**
1FT7086-5SH7...	93	34	17.0 (22.8)	45	**6SL312■-1TE24-5AA3**	1.5	4 × 6	**6FX■002-5■N54-....**

Cooling:
Internal air cooling **0**
External air cooling **1**

Motor Module:
Single Motor Module **1**
Double Motor Module **2**

Power cable:
MOTION-CONNECT 800 **8**
MOTION-CONNECT 500 **5**

Without brake cores **C**
With brake cores **D**

Length code **....**

Information about the cables can be found in chapter Connection system MOTION-CONNECT.

1) Connector size 3 not rotatable. An alternative terminal box can be selected with connector size 3 only.

2) The degree of protection refers to the motor. The built-in fan meets the requirements of degree of protection IP54.

3) Optimum efficiency in continuous duty.

4) With default setting of the pulse frequency.

5) The current carrying capacity of the power cable complies with EN 60204-1 for installation type C, for continuous duty at an ambient air temperature of 40 °C (104 °F).

6) $P_{calc}\,[kW] = \frac{M_0\,[Nm] \times n_{rated}}{9550}$ $\quad P_{calc}\,[HP] = \frac{M_0\,[lb_f\text{-}ft] \times n_{rated}}{5250}$

Selection and ordering data

Rated speed	Shaft height	Rated power	Static torque	Rated torque	Rated current	1FT7 Compact synchronous motors	Number of pole pairs	Moment of inertia of rotor (without brake)	Weight (without brake)
n_{rated}	SH	P_{rated} at ΔT=100 K	M_0 at ΔT=100 K	M_{rated} at ΔT=100 K	I_{rated} at ΔT=100 K		p	J	m
rpm		kW (HP)	Nm (lb_f-ft)	Nm (lb_f-ft)	A	Order No.		10^{-4} kgm^2 (10^{-3} lb_f-in-s^2)	kg (lb)
Water cooling									
1500	100	7.9 (10.6)	50 (36.9)	50 (36.9)	20.3	**1FT7102-5WB7■-1 ■ ■ ■**	5	98.9 (87.5)	36.6 (80.7)
		14.1 (18.9)	90 (66.3)	90 (66.3)	29.5	**1FT7105-5WB7■-1 ■ ■ ■**	5	191 (169)	54.8 (121)
		19.6 (26.3)	125 (92.1)	125 (92.1)	40.3	**1FT7108-5WB7■-1 ■ ■ ■**	5	265 (235)	68.6 (151)
2000	80	4.4 (5.90)	21 (15.5)	21 (15.5)	11	**1FT7082-5WC7■-1 ■ ■ ■**	5	28.9 (25.6)	20.7 (45.6)
		7.33 (9.83)	35 (25.8)	35 (25.8)	17	**1FT7084-5WC7■-1 ■ ■ ■**	5	48.3 (42.8)	27.5 (60.6)
		10.5 (14.1)	50 (36.9)	50 (36.9)	24	**1FT7086-5WC7■-1 ■ ■ ■**	5	67.8 (60.0)	34.1 (75.2)
	100	10.4 (14.0)	50 (36.9)	49.5 (36.5)	29.3	**1FT7102-5WC7■-1 ■ ■ ■**	5	98.9 (87.5)	36.6 (80.7)
		18.8 (25.2)	90 (66.3)	90 (66.3)	40.8	**1FT7105-5WC7■-1 ■ ■ ■**	5	191 (169)	54.8 (121)
		26.2 (35.1)	125 (92.1)	125 (92.1)	47.5	**1FT7108-5WC7■-■ ■ ■ ■**	5	265 (235)	69.6 (153)

Type of construction:	IM B5	Flange 0	**0**
		Flange 1 (compatible with 1FT6)	**1**
Connector outlet direction:	Connector size 1 and 1.5	Rotatable connector	**1**
	Connector size 3[1]	Transverse right	**1**
		Transverse left	**2**
		Axial NDE	**3**
		Axial DE	**4**
Terminal box/ cable entry:[1]	Top/transverse from right		**5**
	Top/transverse from left		**6**
	Top/axial from NDE		**7**
	Top/axial from DE		**8**
Encoder systems for motors without DRIVE-CLiQ interface:	IC2048S/R encoder		**N**
	AM2048S/R encoder		**M**
Encoder systems for motors with DRIVE-CLiQ interface:	IC22DQ encoder		**D**
	AM22DQ encoder		**F**

Shaft extension:	Shaft and flange accuracy:	Holding brake:	
Fitted key and keyway	Tolerance N	Without	**A**
Fitted key and keyway	Tolerance N	With	**B**
Fitted key and keyway	Tolerance R	Without	**D**
Fitted key and keyway	Tolerance R	With	**E**
Plain shaft	Tolerance N	Without	**G**
Plain shaft	Tolerance N	With	**H**
Plain shaft	Tolerance R	Without	**K**
Plain shaft	Tolerance R	With	**L**

Vibration magnitude:	Degree of protection:	
Grade A	IP64	**0**
Grade A	IP65	**1**
Grade A	IP67	**2**
Grade R	IP64	**3**
Grade R	IP65	**4**
Grade R	IP67	**5**

To select the type of construction and degree of protection, see Technical definitions.

Motor type (repeated)	Efficiency[2]	Static current	Calculated power P_{calc}[5]	SINAMICS S120 Motor Module		Power cable with complete shield Motor connection (and brake connection) via power connector		
				Rated output current[3]	Booksize format For additional versions and components, see chapter SINAMICS S120 drive system	Power connector	Cable cross-section[4]	Pre-assembled cable
	η	I_0 at M_0 ΔT=100 K	P_{calc} for M_0 ΔT=100 K	I_{rated}				
	%	A	kW (HP)	A	Order No.	Size	mm^2	Order No.
1FT7102-5WB7...	93	17.8	7.9 (10.6)	18	**6SL312■-■TE21-8AA3**	1.5	4 × 2.5	**6FX■002-5■N31-....**
1FT7105-5WB7...	94	28	14.1 (18.9)	30	**6SL312■-1TE23-0AA3**	1.5	4 × 4	**6FX■002-5■N41-....**
1FT7108-5WB7...	94	39	19.6 (26.3)	45	**6SL312■-1TE24-5AA3**	1.5	4 × 10	**6FX■002-5■N64-....**
1FT7082-5WC7...	93	10.7	4.4 (5.90)	18	**6SL312■-■TE21-8AA3**	1.5	4 × 1.5	**6FX■002-5■N21-....**
1FT7084-5WC7...	94	16.5	7.3 (9.79)	18	**6SL312■-■TE21-8AA3**	1.5	4 × 2.5	**6FX■002-5■N31-....**
1FT7086-5WC7...	94	23	10.5 (14.1)	30	**6SL312■-1TE23-0AA3**	1.5	4 × 4	**6FX■002-5■N41-....**
1FT7102-5WC7...	94	25.5	10.5 (14.1)	30	**6SL312■-1TE23-0AA3**	1.5	4 × 4	**6FX■002-5■N41-....**
1FT7105-5WC7...	94	39	18.8 (25.2)	45	**6SL312■-1TE24-5AA3**	1.5	4 × 10	**6FX■002-5■N64-....**
1FT7108-5WC7...	95	45.3	26.2 (35.1)	45	**6SL312■-1TE24-5AA3**	3	4 × 10	**6FX■002-5■S14-....**

Cooling:
Internal air cooling **0**
External air cooling **1**

Motor Module:
Single Motor Module **1**
Double Motor Module **2**

Power cable:
MOTION-CONNECT 800 **8**
MOTION-CONNECT 500 **5**

Without brake cores **C**
With brake cores **D**

Length code **....**

Information about the cables can be found in chapter Connection system MOTION-CONNECT.

[1] Connector size 3 not rotatable. An alternative terminal box can be selected with connector size 3 only.

[2] Optimum efficiency in continuous duty.

[3] With default setting of the pulse frequency.

[4] The current carrying capacity of the power cables complies with EN 60204-1 for installation type C, for continuous duty at an ambient air temperature of 40 °C (104 °F).

[5] $P_{calc}\,[kW] = \frac{M_0\,[Nm] \times n_{rated}}{9550}$ $\quad P_{calc}\,[HP] = \frac{M_0\,[lb_f\text{-}ft] \times n_{rated}}{5250}$

Selection and ordering data

Rated speed	Shaft height	Rated power	Static torque	Rated torque	Rated current	1FT7 Compact synchronous motors	Number of pole pairs	Moment of inertia of rotor (without brake)	Weight (without brake)
n_{rated}	SH	P_{rated} at ΔT=100 K	M_0 at ΔT=100 K	M_{rated} at ΔT=100 K	I_{rated} at ΔT=100 K		p	J	m
rpm		kW (HP)	Nm (lb_f-ft)	Nm (lb_f-ft)	A	Order No.		10^{-4} kgm² (10^{-3} lb_f-in-s²)	kg (lb)
Water cooling									
3000	63	3.1 (4.2)	10 (7.4)	10 (7.4)	7.8	**1FT7062-5WF7■-1■■■**	5	8.1 (7.17)	11 (24.3)
		5 (6.7)	16 (11.8)	16 (11.8)	12.5	**1FT7064-5WF7■-1■■■**	5	12.9 (11.4)	13.7 (30.2)
		6.2 (8.3)	20 (14.8)	19.6 (14.5)	14.4	**1FT7066-5WF7■-1■■■**	5	17.7 (15.7)	16.3 (35.9)
		9.3 (12.5)	30 (22.1)	29.5 (21.8)	19.6	**1FT7068-5WF7■-1■■■**	5	24.8 (22.0)	20.1 (44.3)
	80	6.28 (8.42)	21 (15.5)	20.5 (15.1)	16	**1FT7082-5WF7■-1■■■**	5	28.9 (25.6)	20.7 (45.6)
		11 (14.8)	35 (25.8)	35 (25.8)	24.2	**1FT7084-5WF7■-1■■■**	5	48.3 (42.8)	27.5 (60.6)
		15.4 (20.7)	50 (36.9)	49 (36.1)	36	**1FT7086-5WF7■-1■■■**	5	67.8 (60.0)	34.1 (75.2)
	100	14.3 (19.2)	50 (36.9)	45.5 (33.6)	38.8	**1FT7102-5WF7■-1■■■**	5	98.9 (87.5)	36.6 (80.7)
		24.8 (33.3)	90 (66.4)	79 (58.3)	49.5	**1FT7105-5WF7■-■■■■**	5	164 (145.1)	55.9 (123.3)
		34.2 (45.9)	125 (92.2)	109 (80.4)	60	**1FT7108-5WF7■-■■■■**	5	265 (235)	69.6 (153.5)
4500	63	9.1 (12.2)	20 (14.8)	19.4 (14.3)	20.8	**1FT7066-5WH7■-1■■■**	5	17.7 (15.7)	16.3 (35.9)
	80	8.95 (12.0)	21 (15.5)	19 (14.0)	23.9	**1FT7082-5WH7■-1■■■**	5	28.9 (25.6)	20.7 (45.6)
		14.6 (20.0)	35 (25.8)	32 (23.6)	34.5	**1FT7084-5WH7■-1■■■**	5	48.3 (42.8)	27.5 (60.6)
		20.3 (406)	50 (36.9)	43 (31.7)	38	**1FT7086-5WH7■-1■■■**	5	67.8 (60.0)	34.1 (75.2)
6000	63	5.8 (7.78)	10 (7.4)	9.2 (6.80)	12.7	**1FT7062-5WK7■-1■■■**	5	8.1 (7.17)	11 (24.3)
		8.9 (11.9)	16 (11.8)	14.2 (10.5)	20	**1FT7064-5WK7■-1■■■**	5	12.9 (11.4)	13.7 (30.2)

Type of construction:	IM B5	Flange 0	**0**
		Flange 1 (compatible with 1FT6)	**1**
Connector outlet direction:	Connector size 1 and 1.5	Rotatable connector	**1**
	Connector size 3[1]	Transverse right	**1**
		Transverse left	**2**
		Axial NDE	**3**
		Axial DE	**4**
Terminal box/ cable entry:[1]	Top/transverse from right		**5**
	Top/transverse from left		**6**
	Top/axial from NDE		**7**
	Top/axial from DE		**8**
Encoder systems for motors without DRIVE-CLiQ interface:	IC2048S/R encoder		**N**
	AM2048S/R encoder		**M**
Encoder systems for motors with DRIVE-CLiQ interface:	IC22DQ encoder		**D**
	AM22DQ encoder		**F**

Shaft extension:	**Shaft and flange accuracy:**	**Holding brake:**	
Fitted key and keyway	Tolerance N	Without	**A**
Fitted key and keyway	Tolerance N	With	**B**
Fitted key and keyway	Tolerance R	Without	**D**
Fitted key and keyway	Tolerance R	With	**E**
Plain shaft	Tolerance N	Without	**G**
Plain shaft	Tolerance N	With	**H**
Plain shaft	Tolerance R	Without	**K**
Plain shaft	Tolerance R	With	**L**

Vibration magnitude:	**Degree of protection:**	
Grade A	IP64	**0**
Grade A	IP65	**1**
Grade A	IP67	**2**
Grade R	IP64	**3**
Grade R	IP65	**4**
Grade R	IP67	**5**

To select the type of construction and degree of protection, see Technical definitions.

Motor type (repeated)	Efficiency[2]	Static current	Calculated power P_{calc}[6]	SINAMICS S120 Motor Module		Power cable with complete shield Motor connection (and brake connection) via power connector		
				Rated output current[3]	Booksize format For additional versions and components, see chapter SINAMICS S120 drive system	Power connector	Cable cross-section[4]	Pre-assembled cable
	η	I_0 at M_0 ΔT=100 K	P_{calc} for M_0 ΔT=100 K	I_{rated}				
	%	A	kW (HP)	A	Order No.	Size	mm²	Order No.
1FT7062-5WF7...	91	7.4	3.1 (4.16)	9	6SL312■-■TE21-0AA3	1	4 × 1.5	6FX■002-5■N01-....
1FT7064-5WF7...	91	11.9	5.0 (6.7)	18	6SL312■-■TE21-8AA3	1	4 × 1.5	6FX■002-5■N01-....
1FT7066-5WF7...	91	14	6.3 (8.5)	18	6SL312■-■TE21-8AA3	1	4 × 1.5	6FX■002-5■N01-....
1FT7068-5WF7...	93	19	9.4 (12.6)	18[5]	6SL312■-■TE21-8AA3	1	4 × 2.5	6FX■002-5■N11-....
1FT7082-5WF7...	94	16	6.6 (8.85)	18	6SL312■-■TE21-8AA3	1.5	4 × 2.5	6FX■002-5■N31-....
1FT7084-5WF7...	94	23	11.0 (14.8)	30	6SL312■-1TE23-0AA3	1.5	4 × 4	6FX■002-5■N41-....
1FT7086-5WF7...	94	34	15.7 (21.1)	45	6SL312■-1TE24-5AA3	1.5	4 × 6	6FX■002-5■N54-....
1FT7102-5WF7...	95	40	15.7 (21.1)	45	6SL312■-1TE24-5AA3	1.5	4 × 10	6FX■002-5■N64-....
1FT7105-5WF7...	94	53.2	28.3 (38.0)	60	6SL312■-1TE26-0AA3	3	4 × 16	6FX■002-5■S23-....
1FT7108-5WF7...	95	65	39.3 (52.7)	85	6SL312■-1TE28-5AA3	3	4 × 16	6FX■002-5■G23-....
1FT7066-5WH7...	91	19.7	9.4 (12.6)	30	6SL312■-1TE23-0AA3	1	4 × 2.5	6FX■002-5■N11-....
1FT7082-5WH7...	94	24	9.9 (13.3)	30	6SL312■-1TE23-0AA3	1.5	4 × 4	6FX■002-5■N41-....
1FT7084-5WH7...	94	34.3	16.5 (22.1)	45	6SL312■-1TE24-5AA3	1.5	4 × 6	6FX■002-5■N54-....
1FT7086-5WH7...	94	40.5	23.6 (31.7)	45	6SL312■-1TE24-5AA3	1.5	4 × 10	6FX■002-5■N64-....
1FT7062-5WK7...	92	12.5	6.3 (8.45)	18	6SL312■-■TE21-8AA3	1	4 × 1.5	6FX■002-5■N01-....
1FT7064-5WK7...	92	20.2	10.1 (13.5)	30	6SL312■-1TE23-0AA3	1	4 × 2.5	6FX■002-5■N11-....

Cooling:
Internal air cooling **0**
External air cooling **1**

Motor Module:
Single Motor Module **1**
Double Motor Module **2**

Power cable:
MOTION-CONNECT 800 **8**
MOTION-CONNECT 500 **5**

Without brake cores **C**
With brake cores **D**

Length code ....

Information about the cables can be found in chapter Connection system MOTION-CONNECT.

1) Connector size 3 is not rotatable. An alternative terminal box can be selected with connector size 3 only.

2) Optimum efficiency in continuous duty.

3) With default setting of the pulse frequency.

4) The current carrying capacity of the power cables complies with EN 60204-1 for installation type C, for continuous duty at an ambient air temperature of 40 °C (104 °F).

5) With the specified Motor Module, the motor cannot be fully utilized with M_0 at ΔT = 100 K winding temperature rise. If a Motor Module with a higher rating is used, you must check whether the specified power cable can be connected to it.

6) $P_{calc}\,[kW] = \frac{M_0\,[Nm] \times n_{rated}}{9550}$ $\quad P_{calc}\,[HP] = \frac{M_0\,[lb_f\text{-}ft] \times n_{rated}}{5250}$

1FT7 High Dynamic motors
Forced ventilation/Water cooling

Selection and ordering data

Rated speed	Shaft height	Rated power	Static torque	Rated torque	Rated current	1FT7 High Dynamic synchronous motors	Number of pole pairs	Moment of inertia of rotor (without brake)	Weight (without brake)
n_{rated}	SH	P_{rated} at ΔT=100 K	M_0 at ΔT=100 K	M_{rated} at ΔT=100 K	I_{rated} at ΔT=100 K		p	J	m
rpm		kW (HP)	Nm (lb_f-ft)	Nm (lb_f-ft)	A	Order No.		10^{-4} kgm^2 (10^{-3} lb_f-in-s^2)	kg (lb)
Forced ventilation									
3000	63	3.8 (5.10)	14 (10.3)	12 (8.90)	10.5	**1FT7065-7S F7■-1 ■ ■ ■**	5	6.4 (5.66)	19 (41.9)
		4.4 (5.90)	17 (12.5)	14 (10.3)	13	**1FT7067-7S F7■-1 ■ ■ ■**	5	8.3 (7.35)	23 (50.7)
	80	7.2 (9.66)	34 (25.1)	23 (17.0)	20	**1FT7085-7S F7■-1 ■ ■ ■**	5	20.7 (18.3)	34 (75.0)
		10.4 (14.0)	48 (35.4)	33 (24.3)	29	**1FT7087-7S F7■-1 ■ ■ ■**	5	27.4 (24.3)	42 (92.6)
4500	63	5.2 (6.97)	14 (10.3)	11 (8.10)	13.5	**1FT7065-7S H7■-1 ■ ■ ■**	5	6.4 (5.66)	19 (41.9)
		6.1 (8.18)	17 (12.5)	13 (9.60)	15	**1FT7067-7S H7■-1 ■ ■ ■**	5	8.3 (7.35)	23 (50.7)
	80	8.2 (11.0)	34 (25.1)	17.5 (12.9)	22.5	**1FT7085-7S H7■-1 ■ ■ ■**	5	20.7 (18.3)	34 (75.0)
		10.8 (14.5)	48 (35.4)	23 (17.0)	24	**1FT7087-7S H7■-■ ■ ■ ■**	5	27.4 (24.3)	43 (94.8)
Water cooling									
3000	63	5.7 (7.64)	19 (14.0)	18 (13.3)	15	**1FT7065-7W F7■-1 ■ ■ ■**	5	6.4 (5.66)	16 (35.3)
		7.4 (9.92)	25 (18.4)	23.5 (17.3)	21	**1FT7067-7W F7■-1 ■ ■ ■**	5	8.3 (7.35)	22 (48.5)
	80	11.9 (16.0)	43 (31.7)	38 (28.0)	32	**1FT7085-7W F7■-1 ■ ■ ■**	5	20.7 (18.3)	32 (70.6)
		16.0 (21.5)	61 (45.0)	51 (37.6)	43	**1FT7087-7W F7■-■ ■ ■ ■**	5	27.4 (24.3)	41 (90.4)
4500	63	7.8 (10.5)	19 (14.0)	16.5 (12.2)	20	**1FT7065-7WH7■-1 ■ ■ ■**	5	6.4 (5.66)	16 (35.3)
		10.4 (14.0)	25 (18.4)	22 (16.2)	25	**1FT7067-7WH7■-1 ■ ■ ■**	5	8.3 (7.35)	22 (48.5)
	80	15.6 (20.9)	43 (31.7)	33 (24.3)	48	**1FT7085-7WH7■-■ ■ ■ ■**	5	20.7 (18.3)	32 (70.6)
		21.7 (29.1)	61 (45.0)	46 (33.9)	53	**1FT7087-7WH7■-■ ■ ■ ■**	5	27.4 (24.3)	41 (90.4)

Type of construction:	IM B5	Flange 0	**0**
		Flange 1 (compatible with 1FT6)	**1**
Connector outlet direction:	Connector size 1 and 1.5	Rotatable connector	**1**
	Connector size 3[1)]	Transverse right	**1**
		Transverse left	**2**
		Axial NDE	**3**
		Axial DE	**4**
Terminal box/ cable entry:[1)]	Top/transverse from right		**5**
	Top/transverse from left		**6**
	Top/axial from NDE		**7**
	Top/axial from DE		**8**
Encoder systems for motors without DRIVE-CLiQ interface:	IC2048S/R encoder		**N**
	AM2048S/R encoder		**M**
Encoder systems for motors with DRIVE-CLiQ interface: (Only for water cooling)	IC22DQ encoder		**D**
	AM22DQ encoder		**F**

Shaft extension:	Shaft and flange accuracy:	Holding brake:	
Fitted key and keyway	Tolerance N	Without	**A**
Fitted key and keyway	Tolerance N	With	**B**
Fitted key and keyway	Tolerance R	Without	**D**
Fitted key and keyway	Tolerance R	With	**E**
Plain shaft	Tolerance N	Without	**G**
Plain shaft	Tolerance N	With	**H**
Plain shaft	Tolerance R	Without	**K**
Plain shaft	Tolerance R	With	**L**

Vibration magnitude:	Degree of protection:	
Grade A	IP64	**0**
Grade A	IP65	**1**
Grade A	IP67 (only for water cooling)	**2**
Grade R	IP64	**3**
Grade R	IP65	**4**
Grade R	IP67 (only for water cooling)	**5**

To select the type of construction and degree of protection, see Technical definitions.

Motor type (repeated)	Efficiency[2]	Static current	Calculated power P_{calc}[5]	SINAMICS S120 Motor Module		Power cable with complete shield Motor connection (and brake connection) via power connector		
				Rated output current[3]	Booksize format For additional versions and components, see chapter SINAMICS S120 drive system	Power connector	Conductor cross-section[4]	Pre-assembled cable
	η	I_0 at M_0 ΔT=100 K	P_{calc} for M_0 ΔT=100 K	I_{rated}				
	%	A	kW (HP)	A	Order No.	Size	mm²	Order No.
1FT7065-7SF7...	92	12	4.4 (5.90)	18	6SL312■-■TE21-8AA3	1.5	4 × 1.5	6FX■002-5■ N21-....
1FT7067-7SF7...	94	15	5.3 (7.11)	18	6SL312■-■TE21-8AA3	1.5	4 × 1.5	6FX■002-5■ N21-....
1FT7085-7SF7...	92	28	10.7 (14.4)	30	6SL312■-1 TE23-0AA3	1.5	4 × 4	6FX■002-5■ N41-....
1FT7087-7SF7...	93	40	15.1 (20.3)	45	6SL312■-1 TE24-5AA3	1.5	4 × 10	6FX■002-5■ N64-....
1FT7065-7SH7...	92	16	6.6 (8.85)	18	6SL312■-■TE21-8AA3	1.5	4 × 2.5	6FX■002-5■ N31-....
1FT7067-7SH7...	94	19	8.0 (10.7)	30	6SL312■-1 TE23-0AA3	1.5	4 × 2.5	6FX■002-5■ N31-....
1FT7085-7SH7...	92	40	16.0 (21.5)	45	6SL312■-1 TE24-5AA3	1.5	4 × 10	6FX■002-5■ N64-....
1FT7087-7SH7...	93	45	22.6 (30.3)	45	6SL312■-1 TE24-5AA3	3	4 × 10	6FX■002-5■ S14-....
1FT7065-7WF7...	92	16	6.0 (8.05)	18	6SL312■-■TE21-8AA3	1.5	4 × 2.5	6FX■002-5■ N31-....
1FT7067-7WF7...	94	22	7.9 (10.6)	30	6SL312■-1 TE23-0AA3	1.5	4 × 4	6FX■002-5■ N41-....
1FT7085-7WF7...	93	36	13.5 (18.1)	45	6SL312■-1 TE24-5AA3	1.5	4 × 6	6FX■002-5■ N54-....
1FT7087-7WF7...	94	51	19.2 (25.8)	60	6SL312■-1 TE26-0AA3	3	4 × 16	6FX■002-5■ S23-....
1FT7065-7WH7...	92	22	9.0 (12.1)	30	6SL312■-1 TE23-0AA3	1.5	4 × 4	6FX■002-5■ N41-....
1FT7067-7WH7...	94	28	11.8 (15.8)	30	6SL312■-1 TE23-0AA3	1.5	4 × 4	6FX■002-5■ N41-....
1FT7085-7WH7...	94	58	20.3 (27.2)	60	6SL312■-1 TE26-0AA3	3	4 × 16	6FX■002-5■ S23-....
1FT7087-7WH7...	94	67	28.7 (38.5)	85	6SL312■-1 TE28-5AA3	3	4 × 25	6FX■002-5DG33-....

Cooling:
Internal air cooling **0**
External air cooling **1**

Motor Module:
Single Motor Module **1**
Double Motor Module **2**

Power cable:
MOTION-CONNECT 800 **8**
MOTION-CONNECT 500 **5**

Without brake cores **C**
With brake cores **D**

Length code **....**

Information about the cables can be found in chapter Connection system MOTION-CONNECT.

1) Connector size 3 is not rotatable. An alternative terminal box can be selected with connector size 3 only.

2) Optimum efficiency in continuous duty.

3) With default setting of the pulse frequency.

4) The current carrying capacity of the power cable complies with EN 60204-1 for installation type C, for continuous duty at an ambient air temperature of 40 °C (104 °F).

5) $P_{calc}\,[kW] = \frac{M_0\,[Nm] \times n_{rated}}{9550}$ $\quad P_{calc}\,[HP] = \frac{M_0\,[lb_f\text{-}ft] \times n_{rated}}{5250}$

1FK7 motors

Overview

1FK708/1FK706 High Inertia and 1FK704/1FK703 Compact motors

1FK7 motors are compact, permanent-magnet synchronous motors. The available options, gearboxes and encoders, together with the expanded product range, mean that 1FK7 motors can be optimally adapted to any application. They therefore also satisfy the permanently increasing demands of state-of-the-art machine generations.

1FK7 motors can be combined with the SINAMICS S120 drive system to create a powerful system with high functionality. The integrated encoder systems for speed and position control can be selected depending on the application.

The motors are designed for operation without external cooling and the heat is dissipated through the motor surface. 1FK7 motors have a high overload capability.

Benefits

1FK7 Compact motors offer:

- Space-saving installation due to extremely high power density
- Can be used for universal applications
- Wide range of motors

1FK7 High Dynamic motors offer:

- Extremely high dynamic response due to low rotor moment of inertia

1FK7 High Inertia motors offer:

- Robust closed-loop control properties for high or variable load moment of inertia
- Minimal optimization and commissioning overhead for the compensation of disturbances

Application

- Machine tools
- Robots and handling systems
- Wood, glass, ceramics and stone working
- Packaging, plastics and textile machines
- Auxiliary axes

Technical specifications

1FK7 Compact/1FK7 High Dynamic/1FK7 High Inertia motor	
Type of motor	Permanent-magnet synchronous motor
Magnet material	Rare-earth magnet material
Cooling	Natural cooling
Temperature monitoring	KTY84 temperature sensor in the stator winding
Insulation of the stator winding in accordance with EN 60034-1 (IEC 60034-1)	Temperature class 155 (F) for a winding temperature rise of ΔT = 100 K at an ambient temperature of 40 °C (104 °F)
Type of construction in accordance with EN 60034-7 (IEC 60034-7)	IM B5 (IM V1, IM V3)
Degree of protection in accordance with EN 60034-5 (IEC 60034-5)	IP64/IP65
Shaft extension on the drive end (DE) in accordance with DIN 748-3 (IEC 60072-1)	Plain shaft/fitted key and keyway (half-key balancing)
Shaft and flange accuracy in accordance with DIN 42955 (IEC 60072-1)[1]	Tolerance N
Vibration magnitude in accordance with EN 60034-14 (IEC 60034-14)	Grade A is maintained up to rated speed
Sound pressure level L_{pA} (1 m) in accordance with EN ISO 1680, max. Tolerance + 3 dB	
• 1FK701 ... 1FK704	55 dB
• 1FK706	65 dB
• 1FK708/1FK710	70 dB
Connection	Connectors for signals and power, can be rotated
Paint finish[2]	Unpainted
2nd rating plate[2]	Attached in the NDE cover
3rd rating plate	Enclosed separately
Holding brake	Without/with
Approvals, according to	cURus

Built-in encoder systems without DRIVE-CLiQ interface

Incremental encoder	
IC2048S/R encoder	Incremental encoder sin/cos 1 V_{pp} 2048 S/R with C and D tracks
Absolute encoder	
AM2048S/R encoder	Absolute encoder 2048 S/R, 4096 revolutions, multi-turn
AM512S/R encoder	Absolute encoder 512 S/R, 4096 revolutions, multi-turn
AM32S/R encoder	Absolute encoder 32 S/R, 4096 revolutions, multi-turn
AM16S/R encoder	Absolute encoder 16 S/R, 4096 revolutions, multi-turn
Resolver	
Multi-pole resolver	Multi-pole resolver (number of pole pairs corresponds to number of pole pairs of the motor)
2-pole resolver	2-pole resolver

Built-in encoder systems with DRIVE-CLiQ interface

Incremental encoder	
IC22DQ encoder	Incremental encoder 22 bit (resolution 4194304, internal 2048 S/R) + commutation position 11 bit
Absolute encoder	
AM22DQ encoder	Absolute encoder 22 bit (resolution 4194304, internal 2048 S/R) + 12 bit multi-turn (traversing range 4096 revolutions)
AM20DQ encoder	Absolute encoder 20 bit (resolution 1048576, internal 512 S/R) + 12 bit multi-turn (traversing range 4096 revolutions)
AM16DQ encoder	Absolute encoder 16 bit (resolution 65536, internal 32 S/R) + 12 bit multi-turn (traversing range 4096 revolutions)
AM15DQ encoder	Absolute encoder 15 bit (resolution 32768, internal 16 S/R) + 12 bit multi-turn (traversing range 4096 revolutions)
Resolver	
R15DQ resolver	Resolver 15 bit (resolution 32768, internal, multi-pole)
R14DQ resolver	Resolver 14 bit (resolution 16384, internal, 2-pole)

S/R=signals/revolution

[1] Shaft extension run-out, concentricity of centering ring and shaft, and perpendicularity of flange to shaft.

[2] 1FK701 only available in degree of protection IP54 with paint finish, without rating plate in NDE cover, planetary gearbox not available. 1FK7 High Inertia only available with paint finish and without rating plate in NDE cover.

4

Options

Order code	Description
M03	Version for Zone 2 hazardous areas according to EN 50021/IEC 60079-15 (only for 1FK7 Compact/1FK7 High Dynamic)
M39	Version for Zone 22 hazardous areas according to EN 50281/IEC 61241-1 (only for 1FK7 Compact/1FK7 High Dynamic)
N05	Non-standard shaft extension (dimensions as for 1FT5 motors)
N16	Nickel-plated connector and paint finish for increased chemical resistance (only for 1FK7 Compact/1FK7 High Dynamic without DRIVE-CLiQ interface.)
N25	Permanent-magnet brake instead of spring-loaded brake (only for 1FK7 High Dynamic)
Q31	Metal rating plate on motor
X01	Paint finish: Jet black, matt RAL 9005[1)]
X02	Paint finish: Cream white RAL 9001[1)]
X03	Paint finish: Reseda green RAL 6011[1)]
X04	Paint finish: Pebble gray RAL 7032[1)]
X05	Paint finish: Sky blue RAL 5015[1)]
X06	Paint finish: Pale ivory RAL 1015[1)]
X08	Paint finish: Suitable for food grade applications White aluminum RAL 9006[1)]
X27	Paint finish: Dark pearl gray RAL 9023[1)]
K23	Special paint finish for "worldwide" climate group: Primer and paint finish in anthracite RAL 7016[1)]
K23+X..	Special paint finish for "worldwide" climate group: Primer and paint finish selectable from X01 to X27[2)]
K24	Primed (unpainted)
J..	Mounting of SP+ planetary gearbox (see geared servomotors)
V..	Mounting of LP+ planetary gearbox (see geared servomotors)

When ordering a motor with options, **-Z** should be added to the order number.

M03
Version for Zone 2 hazardous areas according to IEC EN 60079-15

Combustible or explosive gases or vapors occur only rarely or briefly in Zone 2 areas. The type of protection designation is EEx nA II (non sparking).

The special conditions for operating 1FK7 motors in Zone 2 areas, in particular the reduction in permissible operating speeds, are described in detail in Appendix 610.40063.01 to the EC Declaration of Conformity 664.20025.21.

M39
Version for Zone 22 hazardous areas according to IEC 61241-1

Combustible or potentially explosive dust (non-conductive dust) occurs only rarely or briefly in Zone 22 areas. The type of protection designation is Ex 3D T 150 °C.

The special conditions for operating 1FK7 motors in Zone 22 areas are described in detail in Appendix 610.40071.01 to the EC Declaration of Conformity 664.20031.21.

Note regarding M03 and M39 options:
When used in Zone 2 or Zone 22, 1FK7 motors are only designed for encoder connection through connectors. A version with a DRIVE-CLiQ interface on the motor is not possible. Connection to SINAMICS S120 is only possible via SMC (Sensor Module Cabinet-Mounted).

N05
Non-standard shaft extension (dimensions as for 1FT5 motors)

1FK7 motors are shipped with the following shaft dimensions that are compatible with 1FT5 motors:

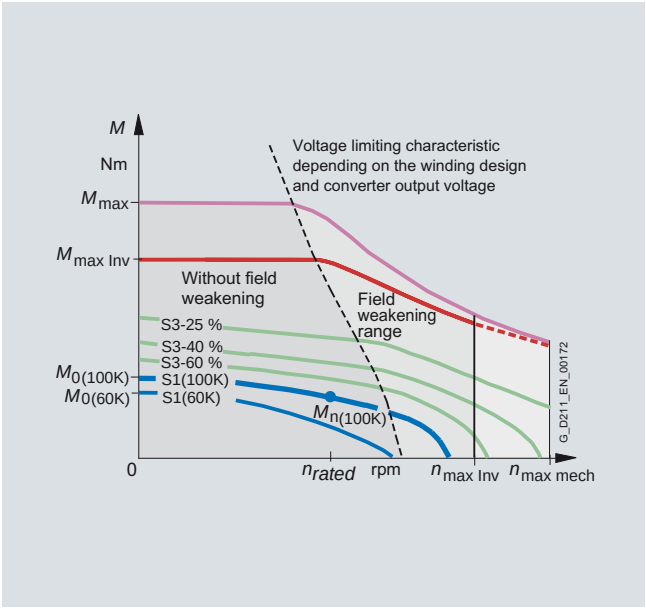
- SH 36: 11 × 23 mm (0.43 × 0.91 in)
- SH 48: 14 × 30 mm (0.55 × 1.18 in)
- SH 63: 19 × 40 mm (0.75 × 1.57 in)
- SH 80: 24 × 50 mm (0.94 × 1.97 in)
- SH 100: 32 × 58 mm (1.26 × 2.28 in)

Note:
1FK706 motors with Option N05 do not have a compatible flange with 1FT506 motors.

[1)] For the paint finish, 1FK7 Compact/1FK7 High Dynamic motors must be ordered with 3 or 5 in the 16th data position.

[2)] For primer, 1FK7 Compact/1FK7 High Dynamic motors must be ordered with 0 or 2 in the 16th data position.

Characteristic curves



Torque characteristic of a synchronous motor operating on a converter with field weakening (example)

1FK7 Compact motors
Natural cooling

Selection and ordering data

Rated speed	Shaft height	Rated power	Static torque	Rated torque[1]	Rated current	1FK7 Compact synchronous motor	Number of pole pairs	Moment of inertia of rotor (without brake)	Weight (without brake)
n_{rated}	SH	P_{rated} at ΔT=100 K	M_0 at ΔT=100 K	M_{rated} at ΔT=100 K	I_{rated} at ΔT=100 K		p	J	m
rpm		kW (HP)	Nm (lb_f-ft)	Nm (lb_f-ft)	A	Order No.		10^{-4} kgm^2 (10^{-3} lb_f-in-s^2)	kg (lb)
Natural cooling									
2000	100	4.29 (5.75)	27 (19.9)	20.5 (15.1)	9.6	**1FK7101-5AC71-1■ ■ ■**	4	79.9 (70.7)	21 (46.3)
		5.23 (7.01)	36 (26.6)	25 (18.4)	11.5	**1FK7103-5AC71-1■ ■ ■**	4	105 (92.9)	29 (63.9)
		7.75 (10.4)	48 (35.4)	37 (27.3)	16	**1FK7105-5AC71-1■ ■ ■**	4	156 (138)	39 (86.2)
3000	48	0.82 (1.10)	3.0 (2.2)	2.6 (1.9)	1.95	**1FK7042-5AF71-1■ ■ ■**	4	3.01 (2.66)	4.9 (10.8)
	63	1.48 (1.98)	6.0 (4.4)	4.7 (3.5)	3.7	**1FK7060-5AF71-1■ ■ ■**	4	7.95 (7.04)	7.0 (15.4)
		2.29 (3.07)	11 (8.2)	7.3 (5.4)	5.6	**1FK7063-5AF71-1■ ■ ■**	4	15.1 (13.3)	11.5 (25.4)
	80	2.14 (2.87)	8.0 (5.9)	6.8 (5.0)	4.4	**1FK7080-5AF71-1■ ■ ■**	4	15.0 (13.2)	10 (22.1)
		3.3 (4.43)	16 (11.8)	10.5 (7.7)	7.4	**1FK7083-5AF71-1■ ■ ■**	4	27.3 (24.1)	14 (30.9)
	100	3.77 (5.06)	18 (13.3)	12.0 (8.8)	8	**1FK7100-5AF71-1■ ■ ■**	4	55.3 (48.9)	19 (41.9)
		4.87 (6.53)	27 (19.9)	15.5 (11.4)	11.8	**1FK7101-5AF71-1■ ■ ■**	4	79.9 (70.7)	21 (46.3)
		5.37 (7.20)[2]	36 (26.6)	20.5 (15.1)[2]	16.5[2]	**1FK7103-5AF71-1■ ■ ■**	4	105 (92.9)	29 (63.9)
		8.17 (11.0)	48 (35.4)	26.0 (19.2)	18	**1FK7105-5AF71-1■ ■ ■**	4	156 (138)	39 (86.2)

Encoder systems for motors without DRIVE-CLiQ interface:	IC2048S/R encoder	**A**
	AM2048S/R encoder[1] AM32S/R encoder[1]	**E** **G**
	Multi-pole resolver	**S**
	2-pole resolver	**T**
Encoder systems for motors with DRIVE-CLiQ interface:	IC22DQ encoder	**D**
	AM22DQ encoder[1] AM16DQ encoder[1]	**F** **K**
	R15DQ resolver	**U**
	R14DQ resolver	**P**

Shaft extension:	Shaft and flange accuracy:	Holding brake:	
Fitted key and keyway	Tolerance N	Without	**A**
Fitted key and keyway	Tolerance N	With	**B**
Plain shaft	Tolerance N	Without	**G**
Plain shaft	Tolerance N	With	**H**

Degree of protection:	IP64	**0**
	IP65 and DE flange IP67	**2**
	IP64 (IP54 for 1FK701) and anthracite paint finish	**3**
	IP65, DE flange IP67 and anthracite paint finish	**5**

To select the type of construction and degree of protection, see Technical definitions.

Motor type (repeated)	Efficiency[3]	Static current	Calculated power P_{calc}[7]	SINAMICS S120 Motor Module		Power cable with complete shield Motor connection (and brake connection) via power connector		
				Rated output current[4]	Booksize format For additional versions and components, see chapter SINAMICS S120 drive system	Power connector	Cable cross-section[5]	Pre-assembled cable
	η	I_0 at M_0 ΔT=100 K	P_{calc} for M_0 ΔT=100 K	I_{rated}				
	%	A	kW (HP)	A	Order No.	Size	mm²	Order No.
1FK7101-5AC71...	93	12.3	5.7 (7.64)	18	**6SL312■-■TE21-8AA3**	1.5	4 × 1.5	**6FX■002-5■S21-....**
1FK7103-5AC71...	93	14.7	7.5 (10.0)	18	**6SL312■-■TE21-8AA3**	1.5	4 × 1.5	**6FX■002-5■S21-....**
1FK7105-5AC71...	93	20	10 (13.4)	30	**6SL312■-1 TE23-0AA3**	1.5	4 × 2.5	**6FX■002-5■S31-....**
1FK7042-5AF71...	89	2.2	0.9 (1.21)	3	**6SL312■-■TE13-0AA3**	1	4 × 1.5	**6FX■002-5■S01-....**
1FK7060-5AF71...	90	4.5	1.9 (2.55)	5	**6SL312■-■TE15-0AA3**	1	4 × 1.5	**6FX■002-5■S01-....**
1FK7063-5AF71...	91	8	3.5 (4.69)	9	**6SL312■-■TE21-0AA3**	1	4 × 1.5	**6FX■002-5■S01-....**
1FK7080-5AF71...	92	4.8	2.5 (3.35)	5	**6SL312■-■TE15-0AA3**	1	4 × 1.5	**6FX■002-5■S01-....**
1FK7083-5AF71...	93	10.4	5.0 (6.71)	9[6]	**6SL312■-1 TE21-0AA3**	1	4 × 1.5	**6FX■002-5■S01-....**
1FK7100-5AF71...	92	11.2	5.7 (7.64)	18	**6SL312■-■TE21-8AA3**	1	4 × 1.5	**6FX■002-5■S01-....**
1FK7101-5AF71...	93	19	8.5 (11.4)	18[6]	**6SL312■-■TE21-8AA3**	1.5	4 × 2.5	**6FX■002-5■S31-....**
1FK7103-5AF71...	93	27.5	11.3 (15.2)	30	**6SL312■-1 TE23-0AA3**	1.5	4 × 4	**6FX■002-5■S41-....**
1FK7105-5AF71...	94	31	15 (20.1)	30[6]	**6SL312■-1 TE23-0AA3**	1.5	4 × 6	**6FX■002-5■S51-....**

Cooling:
Internal air cooling **0**
External air cooling **1**

Motor Module:
Single Motor Module **1**
Double Motor Module **2**

Power cable:
MOTION-CONNECT 800 **8**
MOTION-CONNECT 500 **5**

Without brake cores **C**
With brake cores **D**

Length code **....**

Information about the cables can be found in chapter Connection system MOTION-CONNECT.

1) If the absolute encoder is used, M_{rated} is reduced by 10 %.

2) These values refer to n = 2500 rpm.

3) Optimum efficiency in continuous duty.

4) With default setting of the pulse frequency.

5) The current carrying capacity of the power cables complies with EN 60204-1 for installation type C, for continuous duty at an ambient air temperature of 40 °C (104 °F).

6) With the specified Motor Module, the motor cannot be fully utilized with M_0 at ΔT = 100 K winding temperature rise. If a Motor Module with a higher rating is used, you must check whether the specified power cable can be connected to it.

7) $P_{calc}\,[kW] = \frac{M_0\,[Nm] \times n_{rated}}{9550}$ $\quad P_{calc}\,[HP] = \frac{M_0\,[lb_f\text{-}ft] \times n_{rated}}{5250}$

Selection and ordering data

Rated speed	Shaft height	Rated power	Static torque	Rated torque[1]	Rated current	1FK7 Compact synchronous motor	Number of pole pairs	Moment of inertia of rotor (without brake)	Weight (without brake)
n_{rated}	SH	P_{rated} at ΔT=100 K	M_0 at ΔT=100 K	M_{rated} at ΔT=100 K	I_{rated} at ΔT=100 K		p	J	m
rpm		kW (HP)	Nm (lb_f-ft)	Nm (lb_f-ft)	A	Order No.		10^{-4} kgm^2 (10^{-3} lb_f-in-s^2)	kg (lb)
Natural cooling									
4500	63	1.74 (2.33)	6 (4.43)	3.7 (2.73)	4.1	**1FK7060-5AH71-1■ ■ ■**	4	7.95 (7.04)	7.0 (15.4)
		2.09 (2.81)[2]	11 (8.11)	5 (3.69)[2]	6.1[2]	**1FK7063-5AH71-1■ ■ ■**	4	15.1 (13.3)	11.5 (25.4)
	80	2.39 (3.21)[2]	8 (5.90)	5.7 (4.20)[2]	5.6[2]	**1FK7080-5AH71-1■ ■ ■**	4	15 (13.2)	10 (22.1)
		3.04 (4.08)[3]	16 (11.8)	8.3 (6.12)[3]	9[3]	**1FK7083-5AH71-1■ ■ ■**	4	27.3 (24.1)	14 (30.9)
6000	20	0.05 (0.07)	0.18 (0.13)	0.08 (0.06)	0.85	**1FK7011-5AK71-1■ ■ 3**	4	0.064 (0.06)	0.9 (2.0)
		0.10 (0.13)	0.35 (0.26)	0.16 (0.12)	0.85	**1FK7015-5AK71-1■ ■ 3**	4	0.083 (0.08)	1.1 (2.4)
	28	0.38 (0.51)	0.85 (0.63)	0.6 (0.44)	1.4	**1FK7022-5AK71-1■ ■ ■**	3	0.28 (0.25)	1.8 (4.0)
	36	0.50 (0.67)	1.1 (0.81)	0.8 (0.59)	1.3	**1FK7032-5AK71-1■ ■ ■**	3	0.61 (0.54)	2.7 (6.0)
		0.63 (0.84)	1.6 (1.18)	1 (0.74)	1.3	**1FK7034-5AK71-1■ ■ ■**	3	0.9 (0.80)	3.7 (8.2)
	48	0.69 (0.93)	1.6 (1.18)	1.1 (0.81)	1.7	**1FK7040-5AK71-1■ ■ ■**	4	1.69 (1.50)	3.5 (7.7)
		1.02 (1.37)[4]	3 (2.21)	1.95 (1.44)[4]	3.1[4]	**1FK7042-5AK71-1■ ■ ■**	4	3.01 (2.66)	4.9 (10.8)

Encoder systems for motors without DRIVE-CLiQ interface:	IC2048S/R encoder	**A**
	AM2048S/R encoder (not for 1FK701 ... 1FK703)[1]	**E**
	AM512S/R encoder (only for 1FK702/1FK703)[1]	**H**
	AM32S/R encoder (not for 1FK701 ... 1FK703)[1]	**G**
	AM16S/R encoder (only for 1FK701 ... 1FK703)[1]	**J**
	Multi-pole resolver	**S**
	2-pole resolver	**T**
Encoder systems for motors with DRIVE-CLiQ interface:[5]	IC22DQ encoder (not for 1FK701)	**D**
	AM22DQ encoder (not for 1FK701 ... 1FK703)[1]	**F**
	AM20DQ encoder (only for 1FK702/1FK703)[1]	**L**
	AM16DQ encoder (not for 1FK701 ... 1FK703)[1]	**K**
	AM15DQ encoder (only for 1FK702/1FK703)[1]	**V**
	R15DQ resolver (not for 1FK701)	**U**
	R14DQ resolver (not for 1FK701)	**P**

Shaft extension:	Shaft and flange accuracy:	Holding brake:	
Fitted key and keyway	Tolerance N	Without	**A**
Fitted key and keyway	Tolerance N	With	**B**
Plain shaft	Tolerance N	Without	**G**
Plain shaft	Tolerance N	With	**H**

Degree of protection:	IP64 (not for 1FK701)	**0**
	IP65 and DE flange IP67 (not for 1FK701)	**2**
	IP64 (IP54 for 1FK701) and anthracite paint finish	**3**
	IP65, DE flange IP67 and anthracite paint finish (not for 1FK701)	**5**

To select the type of construction and degree of protection, see Technical definitions.

Motor type (repeated)	Efficiency[6]	Static current	Calculated power P_{calc}[9]	SINAMICS S120 Motor Module		Power cable with complete shield Motor connection (and brake connection) via power connector		
				Rated output current[7]	Booksize format For additional versions and components, see chapter SINAMICS S120 drive system	Power connector	Cable cross-section[8]	Pre-assembled cable
	η	I_0 at M_0 ΔT=100 K	P_{calc} for M_0 ΔT=100 K	I_{rated}				
	%	A	kW (HP)	A	Order No.	Size	mm²	Order No.
1FK7060-5AH71...	90	6.2	2.8 (3.75)	9	6SL312■-■TE21-0AA3	1	4 × 1.5	6FX■002-5■S01-....
1FK7063-5AH71...	90	12	5.2 (6.97)	18	6SL312■-■TE21-8AA3	1	4 × 1.5	6FX■002-5■S01-....
1FK7080-5AH71...	92	7.4	3.8 (5.10)	9	6SL312■-■TE21-0AA3	1	4 × 1.5	6FX■002-5■S01-....
1FK7083-5AH71...	93	15	7.5 (10.1)	18	6SL312■-■TE21-8AA3	1	4 × 1.5	6FX■002-5■S01-....
1FK7011-5AK71...	62	1.5	0.11 (0.15)	3	6SL312■-■TE13-0AA3	0.5	4 × 1.5	6FX5 002-5DA20-....
1FK7015-5AK71...	68	1.5	0.22 (0.30)	3	6SL312■-■TE13-0AA3	0.5	4 × 1.5	6FX5 002-5DA20-....
1FK7022-5AK71...	86	1.8	0.5 (0.67)	3	6SL312■-■TE13-0AA3	1	4 × 1.5	6FX■002-5■S01-....
1FK7032-5AK71...	88	1.7	0.7 (0.94)	3	6SL312■-■TE13-0AA3	1	4 × 1.5	6FX■002-5■S01-....
1FK7034-5AK71...	88	1.9	1 (1.34)	3	6SL312■-■TE13-0AA3	1	4 × 1.5	6FX■002-5■S01-....
1FK7040-5AK71...	88	2.25	1 (1.34)	3	6SL312■-■TE13-0AA3	1	4 × 1.5	6FX■002-5■S01-....
1FK7042-5AK71...	89	4.4	1.9 (2.55)	5	6SL312■-■TE15-0AA3	1	4 × 1.5	6FX■002-5■S01-....

Cooling:
Internal air cooling **0**
External air cooling **1**

Motor Module:
Single Motor Module **1**
Double Motor Module **2**

Power cable:
MOTION-CONNECT 800 **8**
MOTION-CONNECT 500 **5**

Without brake cores **C**
With brake cores **D**

Length code **....**

Information about the cables can be found in chapter Connection system MOTION-CONNECT.

1) If the absolute encoder is used, M_{rated} is reduced by 10 %.
2) These values refer to n = 4000 rpm.
3) These values refer to n = 3500 rpm.
4) These values refer to n = 5000 rpm.
5) 1FK701 motors are not available with a DRIVE-CLiQ interface. The encoder systems are connected via the SMC (Sensor Module Cabinet-Mounted).
6) Optimum efficiency in continuous duty.
7) With default setting of the pulse frequency.
8) The current carrying capacity of the power cables complies with EN 60204-1 for installation type C, for continuous duty at an ambient air temperature of 40 °C (104 °F).
9) $P_{calc}\,[kW] = \frac{M_0\,[Nm] \times n_{rated}}{9550}$ $\quad P_{calc}\,[HP] = \frac{M_0\,[lb_f\text{-}ft] \times n_{rated}}{5250}$

1FK7 High Dynamic motors
Natural cooling

Selection and ordering data

Rated speed	Shaft height	Rated power	Static torque	Rated torque[1]	Rated current	1FK7 High Dynamic synchronous motors	Number of pole pairs	Moment of inertia of rotor (without brake)	Weight (without brake)
n_{rated}	SH	P_{rated} at ΔT=100 K	M_0 at ΔT=100 K	M_{rated} at ΔT=100 K	I_{rated} at ΔT=100 K		p	J	m
rpm		kW (HP)	Nm (lb_f-ft)	Nm (lb_f-ft)	A	Order No.		10^{-4} kgm^2 (10^{-3} lb_f-in-s^2)	kg (lb)
Natural cooling									
3000	48	1.1 (1.48)	4 (2.9)	3.5 (2.6)	4	**1FK7044-7AF71-1■■■**	3	1.28 (1.13)	7.7 (17)
	63	1.7 (2.28)	6.4 (4.7)	5.4 (4.0)	5.3	**1FK7061-7AF71-1■■■**	3	3.4 (3.01)	10 (22.1)
		2.51 (3.37)	12 (8.8)	8 (5.9)	7.5	**1FK7064-7AF71-1■■■**	3	6.5 (5.75)	15.5 (34.2)
	80	3.14 (4.21)[2]	22 (16.2)	12 (8.8)[2]	12.5[2]	**1FK7085-7AF71-1■■■**	4	23 (20.3)	23.5 (51.8)
		3.77 (5.06)[3]	28 (20.6)	18 (13.3)[3]	14.5[3]	**1FK7086-7AF71-1■■■**	4	23 (20.3)	23.5 (51.8)
4500	48	1.23 (1.65)	3.1 (2.3)	2.6 (1.9)	4	**1FK7043-7AH71-1■■■**	3	1 (0.89)	6.3 (13.9)
		1.41 (1.89)	4 (2.9)	3 (2.2)	4.9	**1FK7044-7AH71-1■■■**	3	1.28 (1.13)	7.7 (17)
	63	2.03 (2.72)	6.4 (4.7)	4.3 (3.2)	5.9	**1FK7061-7AH71-1■■■**	3	3.4 (3.01)	10 (22.1)
		2.36 (3.16)	12 (8.8)	5 (3.7)	7	**1FK7064-7AH71-1■■■**	3	6.5 (5.75)	15.5 (34.2)
6000	36	0.57 (0.76)	1.3 (1.0)	0.9 (0.7)	1.5	**1FK7033-7AK71-1■■■**	3	0.27 (0.24)	3.1 (6.8)
	48	1.26 (1.69)	3.1 (2.3)	2 (1.5)	4.4	**1FK7043-7AK71-1■■■**	3	1 (0.89)	6.3 (13.9)

Encoder systems for motors without DRIVE-CLiQ interface:	IC2048S/R encoder	**A**
	AM2048S/R encoder (not for 1FK703)[1]	**E**
	AM512/R encoder (only for 1FK703)[1]	**H**
	AM32S/R encoder (not for 1FK703)[1]	**G**
	AM16S/R encoder (only for 1FK703)[1]	**J**
	Multi-pole resolver	**S**
	2-pole resolver	**T**
Encoder systems for motors with DRIVE-CLiQ interface:	IC22DQ encoder	**D**
	AM22DQ encoder (not for 1FK703)[1]	**F**
	AM20DQ encoder (only for 1FK703)[1]	**L**
	AM16DQ encoder (not for 1FK703)[1]	**K**
	AM15DQ encoder (only for 1FK703)[1]	**V**
	R15DQ resolver	**U**
	R14DQ resolver	**P**

Shaft extension:	Shaft and flange accuracy:	Holding brake:	
Fitted key and keyway	Tolerance N	Without	**A**
Fitted key and keyway	Tolerance N	With	**B**
Plain shaft	Tolerance N	Without	**G**
Plain shaft	Tolerance N	With	**H**

Degree of protection:	IP64	**0**
	IP65 and DE flange IP67	**2**
	IP64 and anthracite paint finish	**3**
	IP65, DE flange IP67 and anthracite paint finish	**5**

To select the type of construction and degree of protection, see Technical definitions.

Motor type (repeated)	Efficiency[4]	Static current	Calculated power P_{calc}[7]	SINAMICS S120 Motor Module		Power cable with complete shield Motor connection (and brake connection) via power connector		
				Rated output current[5]	Booksize format For additional versions and components, see chapter SINAMICS S120 drive system	Power connector	Cable cross section[6]	Pre-assembled cable
	η	I_0 at M_0 ΔT=100 K	P_{calc} for M_0 ΔT=100 K	I_{rated}				
	%	A	kW (HP)	A	Order No.	Size	mm^2	Order No.
1FK7044-7AF71...	91	4.5	1.3 (1.74)	5	**6SL312■-■TE15-0AA3**	1	4 × 1.5	**6FX■002-5■S01-....**
1FK7061-7AF71...	93	6.1	2.0 (2.68)	9	**6SL312■-■TE21-0AA3**	1	4 × 1.5	**6FX■002-5■S01-....**
1FK7064-7AF71...	93	11	3.8 (5.10)	18	**6SL312■-■TE21-8AA3**	1	4 × 1.5	**6FX■002-5■S01-....**
1FK7085-7AF71...	92	22.5	6.9 (9.25)	30	**6SL312■- 1TE23-0AA3**	1.5	4 × 4	**6FX■002-5■S41-....**
1FK7086-7AF71...	93	21	8.8 (11.8)	30	**6SL312■- 1TE23-0AA3**	1.5	4 × 4	**6FX■002-5■S41-....**
1FK7043-7AH71...	90	4.5	1.5 (2.01)	5	**6SL312■-■TE15-0AA3**	1	4 × 1.5	**6FX■002-5■S01-....**
1FK7044-7AH71...	91	6.3	1.9 (2.55)	9	**6SL312■-■TE21-0AA3**	1	4 × 1.5	**6FX■002-5■S01-....**
1FK7061-7AH71...	93	8	3.0 (4.02)	9	**6SL312■-■TE21-0AA3**	1	4 × 1.5	**6FX■002-5■S01-....**
1FK7064-7AH71...	93	15	5.7 (7.64)	18	**6SL312■-■TE21-8AA3**	1	4 × 1.5	**6FX■002-5■S01-....**
1FK7033-7AK71...	88	2.2	0.8 (1.07)	3	**6SL312■-■TE13-0AA3**	1	4 × 1.5	**6FX■002-5■S01-....**
1FK7043-7AK71...	90	6.4	1.9 (2.55)	9	**6SL312■-■TE21-0AA3**	1	4 × 1.5	**6FX■002-5■S01-....**

Cooling:
Internal air cooling **0**
External air cooling **1**

Motor Module:
Single Motor Module **1**
Double Motor Module **2**

Power cable:
MOTION-CONNECT 800 **8**
MOTION-CONNECT 500 **5**

Without brake cores **C**
With brake cores **D**

Length code **....**

Information about the cables can be found in chapter Connection system MOTION-CONNECT.

1) If the absolute encoder is used, M_{rated} is reduced by 10 %.

2) These values refer to n = 2500 rpm.

3) These values refer to n = 2000 rpm.

4) Optimum efficiency in continuous duty.

5) With default setting of the pulse frequency.

6) The current carrying capacity of the power cables complies with EN 60204-1 for installation type C, for continuous duty at an ambient air temperature of 40 °C (104 °F).

7) $P_{calc}\,[kW] = \frac{M_0\,[Nm] \times n_{rated}}{9550}$ $\quad P_{calc}\,[HP] = \frac{M_0\,[lb_f\text{-}ft] \times n_{rated}}{5250}$

1FK7 Compact/1FK7 High Dynamic motors for 230 V 1 AC Power Modules – natural cooling

Selection and ordering data

Rated speed	Shaft height	Rated power	Static torque	Rated torque[1]	Rated current	**1FK7 Compact/High Dynamic synchronous motors Connection to SINAMICS S120 230 V 1 AC Power Modules**	Number of pole pairs	Moment of inertia of rotor (without brake)	Weight (without brake)
n_{rated}	SH	P_{rated} at ΔT=100 K	M_0 at ΔT=100 K	M_{rated} at ΔT=100 K	I_{rated} at ΔT=100 K		p	J	m
rpm		kW (HP)	Nm (lb_f-ft)	Nm (lb_f-ft)	A	Order No.		10^{-4} kgm^2 (10^{-3} lb_f-in-s^2)	kg (lb)
Natural cooling									
3000	36	0.31 (0.42)	1.15 (0.85)	1.0 (0.74)	1.6	**1FK7032-5AF21-1■ ■ ■**	3	0.61 (0.54)	2.7 (5.9)
		0.38 (0.51)	1.3 (0.96)	1.2 (0.89)	2	**1FK7033-7AF21-1■ ■ ■**	3	0.27 (0.24)	3.1 (6.8)
		0.46 (0.62)	1.6 (1.18)	1.45 (1.07)	1.8	**1FK7034-5AF21-1■ ■ ■**	3	0.9 (0.8)	3.7 (8.2)
	48	0.82 (1.10)	3 (2.21)	2.6 (1.92)	3.5	**1FK7042-5AF21-1■ ■ ■**	4	3.01 (2.66)	4.9 (10.8)
		0.79 (1.06)	2.7 (1.99)	2.5 (1.84)	3.8	**1FK7043-7AF21-1■ ■ ■**	3	1 (0.89)	6.3 (13.9)
6000	20	0.05 (0.07)	0.18 (0.13)	0.08 (0.06)	0.5	**1FK7011-5AK21-1■ ■ 3**	4	0.064 (0.06)	0.9 (2.0)
		0.10 (0.13)	0.35 (0.26)	0.16 (0.12)	0.5	**1FK7015-5AK21-1■ ■ 3**	4	0.083 (0.08)	1.1 (2.4)
	28	0.38 (0.51)	0.85 (0.63)	0.6 (0.44)	1.4	**1FK7022-5AK21-1■ ■ ■**	3	0.28 (0.25)	1.8 (4.0)

Synchronous motor:	1FK7 Compact	**5**
	1FK7 High Dynamic	**7**
Encoder systems for motors without DRIVE-CLiQ interface:	IC2048S/R encoder	**A**
	AM2048S/R encoder (only for 1FK704)[1]	**E**
	AM512/R encoder (only for 1FK702/1FK703)[1]	**H**
	AM32S/R encoder (only for 1FK704)[1]	**G**
	AM16S/R encoder) (not for 1FK704)[1]	**J**
	Multi-pole resolver	**S**
	2-pole resolver	**T**
Encoder systems for motors with DRIVE-CLiQ interface:[2]	IC22DQ encoder (not for 1FK701)	**D**
	AM22DQ encoder (only for 1FK704)[1]	**F**
	AM20DQ encoder (only for 1FK702/1FK703)[1]	**L**
	AM16DQ encoder (only for 1FK704)[1]	**K**
	AM15DQ encoder (only for 1FK702/1FK703)[1]	**V**
	R15DQ resolver (not for 1FK701)	**U**
	R14DQ resolver (not for 1FK701)	**P**

Shaft extension:	**Shaft and flange accuracy:**	**Holding brake:**	
Fitted key and keyway	Tolerance N	Without	**A**
Fitted key and keyway	Tolerance N	With	**B**
Plain shaft	Tolerance N	Without	**G**
Plain shaft	Tolerance N	With	**H**

Degree of protection:	IP64 (not for 1FK701)	**0**
	IP65 and DE flange IP67 (not for 1FK701)	**2**
	IP64 (IP54 for 1FK701) and anthracite paint finish	**3**
	IP65, DE flange IP67 and anthracite paint finish (not for 1FK701)	**5**

To select the type of construction and degree of protection, see Technical definitions.

Motor type (repeated)	Efficiency[3]	Static current	Calculated power P_{calc}[7]	SINAMICS S120 Power Module		Power cable with complete shield Motor connection (and brake connection) via power connector		
				Rated output current[4]	Blocksize format without line filter For additional versions and components, see chapter SINAMICS S120 drive system	Power connector	Cable cross-section[5]	Pre-assembled cable
	η	I_0 at M_0 ΔT=100 K	P_{calc} for M_0 ΔT=100 K	I_{rated}		Size		
	%	A	kW (HP)	A	Order No.		mm^2	Order No.
1FK7032-5AF21...	85	1.7	0.36 (0.48)	2.3	**6SL3210-1SB12-3UA0**	1	4 × 1.5	**6FX■002-5■G01-....**
1FK7033-7AF21...	86	2.2	0.41 (0.5)	2.3	**6SL3210-1SB12-3UA0**	1	4 × 1.5	**6FX■002-5■G01-....**
1FK7034-5AF21...	85	1.9	0.5 (0.67)	2.3	**6SL3210-1SB12-3UA0**	1	4 × 1.5	**6FX■002-5■G01-....**
1FK7042-5AF21...	89	3.9	0.94 (1.26)	3.9	**6SL3210-1SB14-0UA0**	1	4 × 1.5	**6FX■002-5■G01-....**
1FK7043-7AF21...	88	3.9	0.85 (1.14)	3.9	**6SL3210-1SB14-0UA0**	1	4 × 1.5	**6FX■002-5■G01-....**
1FK7011-5AK21...	62	0.85	0.11 (0.15)	0.9	**6SL3210-1SB11-0UA0**	0.5[6]	4 × 1.5	**6FX5002-5DA30-....**
1FK7015-5AK21...	68	0.85	0.22 (0.30)	0.9	**6SL3210-1SB11-0UA0**	0.5[6]	4 × 1.5	**6FX5002-5DA30-....**
1FK7022-5AK21...	85	1.8	0.53 (0.71)	2.3	**6SL3210-1SB12-3UA0**	1	4 × 1.5	**6FX■002-5■G01-....**

Cooling:
Internal air cooling **0**

Motor Module:
Single Motor Module **1**

Power cable:
MOTION-CONNECT 800 **8**
MOTION-CONNECT 500 **5**

Without brake cores **C**
With brake cores **D**

Length code **....**

Information about the cables can be found in chapter Connection system MOTION-CONNECT.

1) If the absolute encoder is used, M_{rated} is reduced by 10 %.

2) 1FK701 motors are not available with a DRIVE-CLiQ interface. The encoder systems are connected via the SMC (Sensor Module Cabinet-Mounted).

3) Optimum efficiency in continuous duty.

4) With default setting of the pulse frequency.

5) The current carrying capacity of the power cables complies with EN 60204-1 for installation type C, for continuous duty at an ambient air temperature of 40 °C (104 °F).

6) This power cable is fitted with a connector with M17 thread at the motor end and brake cores as standard (4 × 1.5 mm^2 + 2 × 1.5 mm^2).

7) $P_{calc}\,[kW] = \frac{M_0\,[Nm] \times n_{rated}}{9550}$ $\quad P_{calc}\,[HP] = \frac{M_0\,[lb_f\text{-}ft] \times n_{rated}}{5250}$

Selection and ordering data

Rated speed	Shaft height	Rated power	Static torque	Rated torque	Rated current	1FK7 High Inertia synchronous motors	Number of pole pairs	Moment of inertia of rotor (without brake)	Weight (without brake)
n_{rated}	SH	P_{rated} at ΔT=100 K	M_0 at ΔT=100 K	M_{rated} at ΔT=100 K	I_{rated} at ΔT=100 K		p	J	m
rpm		kW (HP)	Nm (lb_f-ft)	Nm (lb_f-ft)	A	Order No.		10^{-4} kgm^2 (10^{-3} lb_f-in-s^2)	kg (lb)
Natural cooling									
2000	80	3.1 (4.16)	20 (14.7)	15 (11.1)	7.1	**1FK7084-3BC71-1■■■**	4	99 (87.6)	22.7 (50.1)
3000	63	1.5 (2.01)	6 (4.4)	4.7 (3.5)	3.7	**1FK7060-3BF71-1■■■**	4	12.5 (11.1)	7.8 (17.2)
		1.6 (2.15)	8 (5.9)	5.1 (3.8)	3.5	**1FK7062-3BF71-1■■■**	4	23.6 (20.9)	10.6 (23.4)
	80	2.7 (3.62)	12 (8.9)	8.7 (6.4)	7	**1FK7081-3BF71-1■■■**	4	49 (43.4)	15.2 (33.5)
		3.1 (4.16)	20 (14.8)	10 (7.4)	6.8	**1FK7084-3BF71-1■■■**	4	99 (87.6)	22.7 (50.1)
6000	48	0.9 (1.21)	3 (2.2)	1.5 (1.1)	2.45	**1FK7042-3BK71-1■■■**	4	5.05 (4.47)	5.1 (11.3)

Encoder systems for motors without DRIVE-CLiQ interface:	IC2048S/R encoder	**A**
	AM2048S/R encoder	**E**
Encoder systems for motors with DRIVE-CLiQ interface:	IC22DQ encoder	**D**
	AM22DQ encoder	**F**

Shaft extension:	**Shaft and flange accuracy:**	**Holding brake:**	
Fitted key	Tolerance N	Without	**A**
Fitted key	Tolerance N	With	**B**
Plain shaft	Tolerance N	Without	**G**
Plain shaft	Tolerance N	With	**H**

Degree of protection:	IP64 and anthracite paint finish	**0**
	IP65 and anthracite paint finish	**1**
	IP65, DE flange IP67 and anthracite paint finish	**2**

To select the degree of protection and type of construction, see Technical definitions.

Motor type (repeated)	Efficiency[1]	Static current	Calculated power P_{calc}[4]	SINAMICS S120 Motor Module		Power cable with complete shield Motor connection (and brake connection) via power connector		
				Rated output current[2]	Booksize format For additional versions and components, see chapter SINAMICS S120 drive system	Power connector	Cable cross-section[3]	Pre-assembled cable
	η	I_0 at M_0 ΔT=100 K	P_{calc} for M_0 ΔT=100 K	I_{rated}				
	%	A	kW (HP)	A	Order No.	Size	mm^2	Order No.
1FK7084-3BC71...	93	8.8	4.2 (5.63)	9	**6SL312■-■TE21-0AA3**	1	4 × 1.5	**6FX■002-5■N01-....**
1FK7060-3BF71...	90	4.5	1.9 (2.55)	5	**6SL312■-■TE15-0AA3**	1	4 × 1.5	**6FX■002-5■N01-....**
1FK7062-3BF71...	91	5	2.5 (3.35)	5	**6SL312■-■TE15-0AA3**	1	4 × 1.5	**6FX■002-5■N01-....**
1FK7081-3BF71...	93	9	3.8 (5.10)	9	**6SL312■-■TE21-0AA3**	1	4 × 1.5	**6FX■002-5■N01-....**
1FK7084-3BF71...	93	12.5	6.3 (8.45)	18	**6SL312■-■TE21-8AA3**	1	4 × 1.5	**6FX■002-5■N01-....**
1FK7042-3BK71...	89	4.4	1.9 (2.55)	5	**6SL312■-■TE15-0AA3**	1	4 × 1.5	**6FX■002-5■N01-....**

Cooling:	
Internal air cooling	**0**
External air cooling	**1**
Motor Module:	
Single Motor Module	**1**
Double Motor Module	**2**

Power cable:	
MOTION-CONNECT 800	**8**
MOTION-CONNECT 500	**5**
Without brake cores	**C**
With brake cores	**D**
Length code	**....**

Information about the cables can be found in chapter Connection system MOTION-CONNECT.

1) Optimum efficiency in continuous duty.

2) With default setting of the pulse frequency.

3) The current carrying capacity of the power cables complies with EN 60204-1 for installation type C, for continuous duty at an ambient air temperature of 40 °C (104 °F).

4) $P_{calc}\,[kW] = \frac{M_0\,[Nm] \times n_{rated}}{9550}$ $\quad P_{calc}\,[HP] = \frac{M_0\,[lb_f\text{-}ft] \times n_{rated}}{5250}$

Built-in holding brakes for 1FT7/1FK7 motors

Overview

Many drives need a holding brake with an emergency stop function for safety reasons or to meet process requirements.

The permanent-magnet or spring-loaded, single-face brakes used for the 1FT7/1FK7 motors function according to the closed-circuit current principle. The magnetic field of the permanent magnet exerts a tension on the brake anchor plate, i.e. in a condition of zero current, the brake is closed and the motor shaft thereby stopped. When the rated voltage of 24 V DC ± 10 % is applied to the brake, current flows through the coil and produces a counter-field that cancels the pull of the permanent magnet, causing the brake to release.

The spring-loaded, single-face brake operates by the force of pressure exerted by the spring instead of a permanent magnet.

In the event of an emergency stop or power outage, approximately 2000 braking operations can be performed with the maximum switched energy without causing excessive wear on the holding brake (condition: maximum external moment of inertia = moment of inertia of motor and n_{max} type-specific).

The holding brake is not an operational brake.

In order to avoid switching overvoltages and any related effects on the plant environment, the brake cables must be connected externally with a varistor. The connection is made via the power connector or the terminal box.

When connected to the SINAMICS S120 drive system, this overvoltage protection is already included.

Technical specifications

Motor		Built-in holding brake					
Shaft height SH	Type	Holding torque[1]	Direct current	Opening time with varistor	Closing time with varistor	Moment of inertia J	Maximum switched energy per brake operation from n = 3000 rpm
		Nm (lb_f-ft)	A	ms	ms	10^{-4}kgm^2 (10^{-3} lb_f-in-s^2)	J
1FT7 motors with permanent-magnet brake, without play							
36	1FT703	3 (2.2)	0.3	60	25	0.12 (0.11)	30
48	1FT704	8 (5.9)	0.6	90	30	0.87 (0.77)	270
63	1FT706	18 (13.3)	0.8	150	50	2.84 (2.51)	880
80	1FT708	48 (35.4)	1.0	220	65	15.4 (13.6)	1900
100	1FT710	85 (62.7)	1.6	250	70	27.6 (24.4)	5300
1FK7 Compact motors with permanent-magnet brake, without play							
20	1FK701	0.4 (0.3)	0.3	30	20	0.019 (0.02)	2
28	1FK7022	1.1 (0.8)	0.3	30	20	0.07 (0.06)	8
36	1FK7032	1.3 (1.0)	0.4	50	30	0.08 (0.07)	17
48	1FK704	3.2 (2.4)	0.6	70	30	0.72 (0.64)	74
63	1FK706	13 (9.6)	0.8	100	50	2.25 (1.99)	400
80	1FK7080	10 (7.4)	0.7	100	50	3.1 (2.74)	400
80	1FK7083	22 (16.2)	0.9	200	60	8.6 (7.61)	1400
100	1FK7100	22 (16.2)	0.9	200	60	8.6 (7.61)	1400
100	1FK7101 1FK7103 1FK7105	41 (30.2)	1.0	300	70	13.5 (11.9)	3000
1FK7 High Dynamic motors with spring-loaded, single-face brake[2]							
36	1FK703	1.3 (1.0)	0.45	100	40	0.12 (0.11)	14
48	1FK704	4 (3.0)	0.6	150	50	0.13 (0.12)	96
63	1FK706	12 (8.9)	0.8	150	50	0.34 (0.30)	230
80	1FK708	22 (16.2)	1.2	200	60	2.0 (1.77)	700
1FK7 High Inertia motors with permanent-magnet brake, without play							
48	1FK704	4 (3.0)	0.5	90	15	0.32 (0.28)	150
63	1FK706	13 (9.6)	0.8	130	20	0.99 (0.88)	400
80	1FK708	22 (16.2)	0.9	150	30	3.28 (2.90)	1400

[1] The holding torque is the highest permissible torque with which the closed brake can be loaded in steady-state operation without slip (holding function when motor is stationary).

[2] Permanent-magnet brake without play is available as an option.

Overview

1FT7 motor with mounted series SP+ planetary gearbox

1FT7 motors can be combined with planetary gearboxes to form compact coaxial drive units. The gearboxes are flanged directly to the drive end of the motors.

When selecting the gearbox, ensure that its maximum permissible input speed is not exceeded by the maximum speed of the motor. In the case of high operating frequencies, allowance must be made for the factor f_2 (see Configuration Manual for 1FT7 synchronous motors). The frictional losses of the gearbox must always be taken into account.

The gearboxes are only available in non-balanced design.

Benefits

- High efficiency
  Single-stage: > 97 %
  Two-stage: > 94 %
- Minimum torsional backlash
  Single-stage: ≤ 4 arcmin
  Two-stage: ≤ 6 arcmin
- Power transmission from the central sun wheel via planet wheels
- No shaft deflections in the planet wheel set due to symmetrical force distribution
- Very low moment of inertia and thus short acceleration times of the motors
- Output shaft bearings dimensioned for high cantilever and axial loads with preloaded tapered-roller bearings
- The gearboxes are connected to the motor shaft via an integrated clamping hub. A plain motor shaft extension is necessary for this purpose. Shaft and flange accuracy tolerance N in accordance with DIN 42955 and vibration magnitude grade A in accordance with EN 60034-14 are sufficient. The motor flange is adapted by means of adapter plates.
- Output shaft of gearbox exactly coaxial with the motor
- The gearboxes are enclosed (seal between gearbox and motor) and filled with oil at the factory. They are lubricated and sealed for their service life.
  The gearboxes are suitable for all mounting positions.
- Degree of protection of gearbox: IP65
- Small dimensions
- Low weight

Integration

1FT703 to 1FT710 motors can be supplied ex factory (Siemens AG) complete with flange-mounted planetary gearbox.

The gearboxes assigned to the individual motors and gear ratios *i* available for these motor/gearbox combinations are listed in the subsequent selection table. When making a selection, note the maximum permissible input speed of the gearbox (this is the same as the maximum motor speed).

The motor/gearbox combinations listed in the selection tables are mainly intended for cycle operation S3-60 % (ON time ≤ 60 % and ≤ 20 min). Reduced maximum motor speeds and output torques apply for use in S1 continuous duty (ON time > 60 % or > 20 min). The gearbox temperature may not exceed 90 °C (194 °F).

Follow the instructions contained in the Configuration Manual for 1FT7 synchronous motors when assigning gearboxes to the motor.

1FT7 motors with SP+ planetary gearbox

Selection and ordering data

Motor	Planetary gearbox single-stage			Available gear ratio i =				Motor speed, max. S3-60 %	Output torque, max. S3-60 %	Radial output shaft loading, max.[1]	Axial output shaft loading, max.[1]
Type	Type	Torsional backlash	Gearbox weight, approx.	4	5	7	10	n_{G1} (n_1)	M_{G2} (T_{2B})	F_r (F_{2Rmax})	F_a (F_{2Amax})
		arcmin	kg (lb)					rpm	Nm (lb$_f$-ft)	N (lb$_f$)	N (lb$_f$)
1FT7034	SP 060S-MF1	≤ 4	1.9 (4.2)	✔	✔	✔	–	6000	40 (29.5)	2700 (607)	2400 (540)
1FT7034	SP 075S-MF1	≤ 4	3.9 (8.6)	–	–	–	✔	6000	110 (81.1)	4000 (899)	3350 (753)
1FT7036				✔	✔	✔	✔		(90 for i = 10)		
1FT7042				✔	✔	✔	✔				
1FT7044				✔	✔	✔	✔				
1FT7046				✔	✔	✔	–				
1FT7046	SP 100S-MF1	≤ 3	7.7 (17.0)	–	–	–	✔	4500	300 (221)	6300 (1416)	5650 (1270)
1FT7062				✔	✔	✔	✔		(225 for i = 10)		
1FT7064				✔	✔	✔	✔				
1FT7065				✔	✔	✔	✔				
1FT7066				✔	✔	✔	✔				
1FT7067				✔	✔	✔	–				
1FT7068				✔	✔	✔	–				
1FT7067	SP 140S-MF1	≤ 3	17.2 (37.9)	–	–	–	✔	4000	600 (443)	9450 (2124)	9870 (2219)
1FT7068				–	–	–	✔		(480 for i = 10)		
1FT7082				✔	✔	✔	✔				
1FT7084				✔	✔	✔	✔				
1FT7085				✔	✔	✔	–				
1FT7086				✔	✔	✔	–				
1FT7087				✔	✔	–	–				
1FT7085	SP 180S-MF1	≤ 3	34 (75)	–	–	–	✔	3500	1100 (811)	14700 (3305)	14150 (3181)
1FT7086				–	–	–	✔		(880 for i = 10)		
1FT7087				–	–	✔	✔				
1FT7102				✔	✔	✔	✔				
1FT7105				✔	✔	✔	–				
1FT7108				✔	✔	✔	–				
1FT7105	SP 210S-MF1	≤ 3	56 (123)	–	–	–	✔	2500	2500 (1844) (2400 for i = 7 1900 for i = 10)	21000 (4721)	30000 (6744)
1FT7108				–	–	–	✔				
	Gear shaft			**Order code**							
	With fitted key			**J02**	**J03**	**J05**	**J09**				
	Without fitted key			**J22**	**J23**	**J25**	**J29**				

Preconditions:

With the following motor versions, SP+ planetary gearboxes can be mounted:

- Flange 1
- Plain motor shaft extension, shaft and flange accuracy tolerance N, without/with holding brake
- Vibration magnitude grade A/IP65 degree of protection

SP+ planetary gearbox can therefore only be ordered with these 1FT7 motors:
1FT7...-5..71-..G1
1FT7...-5..71-..H1
1FT7...-7..71-..G1
1FT7...-7..71-..H1

When ordering a motor with gearbox, **-Z** should be added to the order number.

Example:

1FT7042 motor without holding brake
with single-stage SP+ planetary gearbox
with i = 5 and gear shaft without fitted key.
1FT7042-5AF71-1NG1**-Z**
J23

✔ Possible
– Not possible
[1] In reference to the output shaft center.

Technical specifications

1FT7 motor with SP+ planetary gearbox

Single-stage Type	Gear ratio	Motor speed	Output torque	Moments of inertia of gearbox (referred to the drive)				
		Continuous duty S1[1]		1FT703.	1FT704.	1FT706.	1FT708.	1FT710.
	i	n_{N1}	M_{N2} (T_{2N})	J_1	J_1	J_1	J_1	J_1
		rpm	Nm (lb_f-ft)	kgcm^2 (lb_f-in^2)	kgcm^2 (lb_f-in^2)	kgcm^2 (lb_f-in^2)	kgcm^2 (lb_f-in^2)	kgcm^2 (lb_f-in^2)
SP 060S-MF1	4	3300	26 (19.2)	0.22 (0.08)	–	–	–	
	5	3300	26 (19.2)	0.20 (0.07)	–	–	–	
	7	4000	26 (19.2)	0.18 (0.06)	–	–	–	
SP 075S-MF1	4	2900	75 (55.3)	0.61 (0.21)	0.78 (0.27)	–	–	
	5	2900	75 (55.3)	0.51 (0.17)	0.68 (0.23)	–	–	
	7	3100	75 (55.3)	0.42 (0.14)	0.59 (0.20)	–	–	
	10	3100	52 (38.4)	0.38 (0.13)	0.54 (0.19)	–	–	
SP 100S-MF1	4	2500	180 (133)	–	–	3.04 (1.04)	–	
	5	2500	175 (129)	–	–	2.61 (0.89)	–	
	7	2800	170 (125)	–	–	2.29 (0.78)	–	
	10	2800	120 (88.5)	–	1.38 (0.47)	2.07 (0.71)	–	
SP 140S-MF1	4	2100	360 (266)	–	–	–	11.0 (3.76)	
	5	2100	360 (266)	–	–	–	9.95 (3.40)	
	7	2600	360 (266)	–	–	–	9.01 (3.08)	
	10	2600	220 (162)	–	–	5.28 (1.80)	8.44 (2.88)	
SP 180S-MF1	4	1500	750 (553)	–	–	–	–	33.9 (11.6)
	5	1500	750 (553)	–	–	–	–	27.9 (9.53)
	7	2300	750 (553)	–	–	–	22.2 (7.59)	22.2 (7.59)
	10	2300	750 (553)	–	–	–	19.2 (6.56)	19.2 (6.56)
SP 210S-MF1	10	2000	1000 (738)	–	–	–	–	53.1 (18.1)

[1] The limit values in the table apply for S1 continuous duty (ON time > 60 % or > 20 min) for a maximum gearbox temperature of 90 °C (194 °F).

1FT7 motors with SP+ planetary gearbox

Selection and ordering data

Motor	Planetary gearbox two-stage			Available gear ratio i =					Motor speed, max. S3-60 %	Output torque, max. S3-60 %	Radial output shaft loading, max.[1]	Axial output shaft loading, max.[1]
Type	Type	Torsional backlash	Gearbox weight, approx.	16	20	28	40	50	n_{G1} (n_1)	M_{G2} (T_{2B})	F_r (F_{2Rmax})	F_a (F_{2Amax})
		arcmin	kg (lb)						rpm	Nm (lb$_f$-ft)	N (lb$_f$)	N (lb$_f$)
1FT7034	SP 075S-MF2	≤ 6	3.6 (7.9)	✔	✔	✔	–	–	6000	110 (81.1)	4000 (899)	3350 (753)
1FT7036				✔	–	–	–	–				
1FT7042				✔	–	–	–	–				
1FT7034	SP 100S-MF2	≤ 5	7.9 (17.4)	–	–	–	✔	✔	4500	300 (221)	6300 (1416)	5650 (1270)
1FT7036				–	✔	✔	✔	✔				
1FT7042				–	✔	✔	✔	✔				
1FT7044				✔	✔	✔	–	–				
1FT7046				✔	✔	–	–	–				
1FT7062				✔	✔	–	–	–				
1FT7064				✔	–	–	–	–				
1FT7044	SP 140S-MF2	≤ 5	17 (37.5)	–	–	–	✔	✔	4000	600 (443)	9450 (2124)	9870 (2219)
1FT7046				–	–	✔	✔	✔				
1FT7062				–	–	✔	✔	✔				
1FT7064				–	✔	✔	–	–				
1FT7065				✔	✔	–	–	–				
1FT7066				✔	✔	–	–	–				
1FT7067				✔	–	–	–	–				
1FT7068				✔	✔	–	–	–				
1FT7082				✔	✔	–	–	–				
1FT7084				✔	–	–	–	–				
1FT7064	SP 180S-MF2	≤ 5	36.4 (80.3)	–	–	–	✔	✔	4000	1100 (811)	14700 (3305)	14150 (3181)
1FT7065				–	–	✔	✔	–				
1FT7066				–	–	✔	✔	✔				
1FT7067				–	✔	✔	–	–				
1FT7068				–	–	✔	✔	✔				
1FT7082				–	–	✔	✔	✔				
1FT7084				–	✔	✔	–	–				
1FT7085				✔	–	–	–	–				
1FT7086				✔	✔	–	–	–				
1FT7102				✔	✔	–	–	–				
1FT7084	SP 210S-MF2	≤ 5	55 (121)	–	–	–	✔	✔	3500	2400 (1770) (2500 for i = 20)	21000 (4721)	30000 (6744)
1FT7085				–	✔	✔	–	–				
1FT7086				–	–	✔	✔	–				
1FT7087				✔	✔	✔	–	–				
1FT7102				–	–	✔	–	–				
1FT7105				✔	✔	–	–	–				
1FT7108				✔	–	–	–	–				
1FT7085	SP 240S-MF2	≤ 5	80.6 (178)	–	–	–	✔	✔	3500	4500 (3319) (4000 for i = 40 4300 for i = 50)	30000 (6744)	33000 (7419)
1FT7086				–	–	–	–	✔				
1FT7102				–	–	–	✔	✔				
1FT7105				–	–	✔	✔	–				
1FT7108				–	✔	✔	–	–				
	Gear shaft			**Order code**								
	With fitted key			**J12**	**J13**	**J15**	**J16**	**J17**				
	Without fitted key			**J32**	**J33**	**J35**	**J36**	**J37**				

Preconditions, see page 4/46.

✔ Possible
– Not possible
[1] In reference to the output shaft center.

Technical specifications

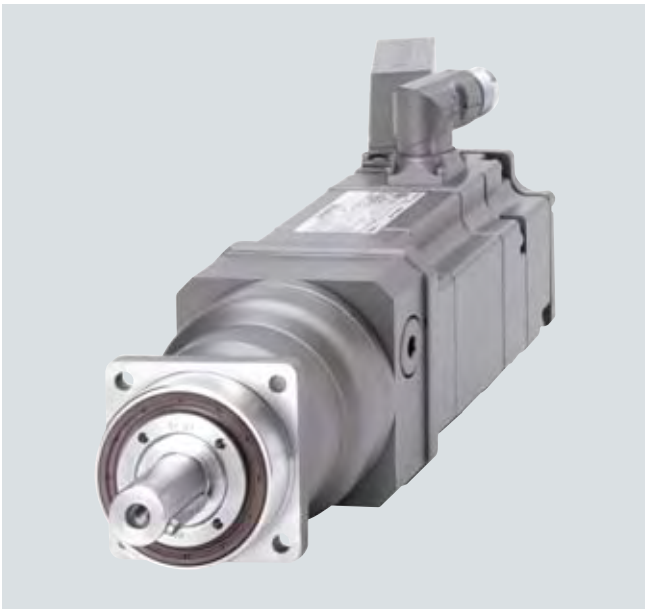
1FT7 motor with SP+ planetary gearbox

Two-stage Type	Gear ratio	Motor speed	Output torque	Moments of inertia of gearbox (referred to the drive)				
		Continuous duty S1[1]		1FT703.	1FT704.	1FT706.	1FT708.	1FT710.
	i	n_{N1}	M_{N2} (T_{2N})	J_1	J_1	J_1	J_1	J_1
		rpm	Nm (lb_f-ft)	kgcm^2 (lb_f-in^2)	kgcm^2 (lb_f-in^2)	kgcm^2 (lb_f-in^2)	kgcm^2 (lb_f-in^2)	kgcm^2 (lb_f-in^2)
SP 075S-MF2	16	3500	75 (55.3)	0.23 (0.08)	0.55 (0.19)	–	–	–
	20	3500	75 (55.3)	0.20 (0.07)	–	–	–	–
	28	3500	75 (55.3)	0.18 (0.06)	–	–	–	–
SP 100S-MF2	16	3100	180 (133)	–	0.81 (0.28)	2.18 (0.75)	–	–
	20	3100	180 (133)	0.54 (0.19)	0.70 (0.24)	2.07 (0.71)	–	–
	28	3100	180 (133)	0.43 (0.15)	0.60 (0.21)	–	–	–
	40	3100	180 (133)	0.38 (0.13)	0.55 (0.19)	–	–	–
	50	3500	175 (129)	0.38 (0.13)	0.54 (0.19)	–	–	–
SP 140S-MF2	16	2900	360 (265)	–	–	3.19 (1.09)	10.3 (3.52)	–
	20	2900	360 (265)	–	–	2.71 (0.93)	9.77 (3.34)	–
	28	2900	360 (265)	–	1.65 (0.56)	2.34 (0.80)	–	–
	40	2900	360 (265)	–	1.40 (0.48)	2.10 (0.72)	–	–
	50	3200	360 (265)	–	1.39 (0.48)	2.08 (0.71)	–	–
SP 180S-MF2	16	2700	750 (553)	–	–	–	12.4 (4.24)	13.5 (4.61)
	20	2700	750 (553)	–	–	7.27 (2.48)	10.9 (3.73)	12.0 (4.10)
	28	2700	750 (553)	–	–	6.32 (2.16)	9.48 (3.24)	–
	40	2700	750 (553)	–	–	5.51 (1.88)	8.67 (2.96)	–
	50	2900	750 (553)	–	–	5.45 (1.86)	8.61 (2.94)	–
SP 210S-MF2	16	2500	1500 (1106)	–	–	–	34.5 (11.8)	34.5 (11.8)
	20	2500	1500 (1106)	–	–	–	31.5 (10.8)	31.5 (10.8)
	28	2500	1500 (1106)	–	–	–	30.0 (10.3)	30.0 (10.3)
	40	2500	1500 (1106)	–	–	–	28.5 (9.74)	–
	50	2500	1500 (1106)	–	–	–	28.3 (9.67)	–
SP 240S-MF2	20	2500	2500 (1844)	–	–	–	–	34.6 (11.8)
	28	2500	2500 (1844)	–	–	–	–	30.5 (10.4)
	40	2500	2500 (1844)	–	–	–	28.2 (9.64)	28.2 (9.64)
	50	2500	2500 (1844)	–	–	–	27.9 (9.53)	27.9 (9.53)

[1] The limit values in the table apply for S1 continuous duty (ON time > 60 % or > 20 min) for a maximum gearbox temperature of 90 °C (194 °F).

1FK7 motors with SP+ planetary gearbox

Overview



1FK7 motor with mounted series SP+ planetary gearbox

1FK7 motors can easily be combined with planetary gearboxes to form compact coaxial drive units. The gearboxes are flanged directly to the drive end of the motors.

When selecting the gearbox, ensure that its maximum permissible input speed is not exceeded by the maximum speed of the motor. In the case of high operating frequencies, allowance must be made for the factor f_2 (see Configuration Manual for 1FK7 synchronous motors). The frictional losses of the gearbox must always be taken into account.

The gearboxes are only available in non-balanced design.

Benefits

- High efficiency
  Single-stage: > 97 %
  Two-stage: > 94 %
- Minimum torsional backlash
  Single-stage: ≤ 4 arcmin
  2-stage: ≤ 6 arcmin
- Power transmission from the central sun wheel via planet wheels
- No shaft deflections in the planet wheel set due to symmetrical force distribution
- Very low moment of inertia and thus short acceleration times of the motors
- Output shaft bearings dimensioned for high cantilever and axial loads with preloaded tapered-roller bearings
- The gearboxes are connected to the motor shaft via an integrated clamping hub. A plain motor shaft extension is necessary for this purpose. Shaft and flange accuracy tolerance N in accordance with DIN 42955 and vibration magnitude grade A in accordance with EN 60034-14 are sufficient. The motor flange is adapted by means of adapter plates.
- Output shaft of gearbox exactly coaxial with the motor
- The gearboxes are enclosed (seal between gearbox and motor) and filled with oil at the factory. They are lubricated and sealed for their service life.
  The gearboxes are suitable for all mounting positions.
- Degree of protection of gearbox: IP65
- Small dimensions
- Low weight

Integration

1FK702 to 1FK710 motors can be supplied ex works (Siemens AG) complete with flange-mounted planetary gearbox.

The gearboxes assigned to the individual motors and gear ratios *i* available for these motor/gearbox combinations are listed in the subsequent selection table. When making a selection, note the maximum permissible input speed of the gearbox (this is the same as the maximum motor speed).

The motor/gearbox combinations listed in the selection table are mainly intended for cycle operation S3-60 % (ON time ≤ 60 % and ≤ 20 min). Reduced maximum motor speeds and output torques apply for use in S1 continuous duty (ON time > 60 % or > 20 min). The gearbox temperature may not exceed 90 °C (194 °F).

Follow the instructions contained in the Configuration Manual for 1FK7 synchronous motors when assigning gearboxes to the motor.

Selection and ordering data

Motor	Planetary gearbox single-stage			Available gear ratio i =				Motor speed, max. S3-60 %	Output torque, max. S3-60 %	Radial output shaft loading, max.[1]	Axial output shaft loading, max.[1]
Type	Type	Torsional backlash	Gearbox weight, approx.	4	5	7	10	n_{G1} (n_1)	M_{G2} (T_{2B})	F_r (F_{2Rmax})	F_a (F_{2Amax})
		arcmin	kg (lb)					rpm	Nm (lb$_f$-ft)	N (lb$_f$)	N (lb$_f$)
1FK7022	SP 060S-MF1	≤ 4	1.9 (4.2)	✔	✔	✔	✔	6000	40 (295)	2700 (607)	2400 (540)
1FK7032				✔	✔	✔	✔		(32 for i = 10)		
1FK7033				✔	✔	✔	✔				
1FK7034				✔	✔	✔	✔				
1FK7040	SP 075S-MF1	≤ 4	3.9 (8.6)	✔	✔	✔	✔	6000	110 (81.1)	4000 (899)	3350 (753)
1FK7042				✔	✔	✔	✔		(90 for i = 10)		
1FK7043				✔	✔	✔	✔				
1FK7044				✔	✔	✔	✔				
1FK7060	SP 100S-MF1	≤ 3	7.7 (17.0)	✔	✔	✔	✔	4500	300 (221)	6300 (1416)	5650 (1270)
1FK7061				✔	✔	✔	✔		(225 for i = 10)		
1FK7062				✔	✔	✔	✔				
1FK7063				✔	✔	✔	✔				
1FK7064				✔	✔	✔	✔				
1FK7080	SP 140S-MF1	≤ 3	17.2 (37.9)	✔	✔	✔	✔	4000	600 (442)	9450 (2124)	9870 (2219)
1FK7081				✔	✔	✔	✔		(480 for i = 10)		
1FK7083				✔	✔	✔	✔				
1FK7084				✔	✔	✔	✔				
1FK7085				✔	✔	✔	✔				
1FK7086				✔	✔	✔	✔				
1FK7100	SP 180S-MF1	≤ 3	34 (75.0)	✔	✔	✔	✔	3500	1100 (810)	14700 (3305)	14150 (3181)
1FK7101				✔	✔	✔	✔		(880 for i = 10)		
1FK7103				✔	✔	✔	✔				
1FK7105				✔	✔	✔	–				
1FK7105	SP 210S-MF1	≤ 3	56 (123)	–	–	–	✔	2500	2500 (1844) (2400 for i = 7 1900 for i = 10)	21000 (4721)	30000 (6744)
	Gear shaft			**Order code**							
	With fitted key			**J02**	**J03**	**J05**	**J09**				
	Without fitted key			**J22**	**J23**	**J25**	**J29**				

Preconditions:

With the following motor versions, SP+ planetary gearboxes can be mounted:

- Plain motor shaft extension, shaft and flange accuracy tolerance N, without/with holding brake
- IP65 degree of protection and anthracite paint finish

SP+ planetary gearboxes can therefore only be ordered with these 1FK7 motors:
1FK7...-3B.71-1.G1
1FK7...-3B.71-1.H1
1FK7...-.A..1-1.G5
1FK7...-.A..1-1.H5

When ordering a motor with gearbox, **-Z** should be added to the order number.

Example:

1FK7042 motor without holding brake
with single-stage SP+ planetary gearbox
with i = 7 and gear shaft without fitted key.
1FK7042-5AF71-1AG5-**Z**
J25

✔ Possible
– Not possible
[1] In reference to the output shaft center.

1FK7 motors with SP+ planetary gearbox

Technical specifications

1FK7 motor with SP+ planetary gearbox

Single-stage Type	Gear ratio	Motor speed	Output torque	Moments of inertia of gearbox (referred to the drive)					
		Continuous duty S1[1]		1FK702.	1FK703.	1FK704.	1FK706.	1FK708.	1FK710.
	i	n_{N1}	M_{N2} (T_{2N})	J_1	J_1	J_1	J_1	J_1	J_1
		rpm	Nm (lb$_f$-ft)	kgcm^2 (lb$_f$-in^2)	kgcm^2 (lb$_f$-in^2)	kgcm^2 (lb$_f$-in^2)	kgcm^2 (lb$_f$-in^2)	kgcm^2 (lb$_f$-in^2)	kgcm^2 (lb$_f$-in^2)
SP 060S-MF1	4	3300	26 (19.2)	0.15 (0.05)	0.22 (0.08)	–	–	–	–
	5	3300	26 (19.2)	0.12 (0.04)	0.20 (0.07)	–	–	–	–
	7	4000	26 (19.2)	0.10 (0.034)	0.18 (0.062)	–	–	–	–
	10	4000	17 (12.5)	0.09 (0.031)	0.17 (0.058)	–	–	–	–
SP 075S-MF1	4	2900	75 (55.3)	–	–	0.78 (0.27)	–	–	–
	5	2900	75 (55.3)	–	–	0.68 (0.23)	–	–	–
	7	3100	75 (55.3)	–	–	0.59 (0.20)	–	–	–
	10	3100	52 (38.4)	–	–	0.54 (0.19)	–	–	–
SP 100S-MF1	4	2500	180 (133)	–	–	–	3.04 (1.04)	–	–
	5	2500	175 (129)	–	–	–	2.61 (0.89)	–	–
	7	2800	170 (125)	–	–	–	2.29 (0.78)	–	–
	10	2800	120 (88.5)	–	–	–	2.07 (0.71)	–	–
SP 140S-MF1	4	2100	360 (266)	–	–	–	–	11.0 (3.76)	–
	5	2100	360 (266)	–	–	–	–	9.95 (3.40)	–
	7	2600	360 (266)	–	–	–	–	9.01 (3.08)	–
	10	2600	220 (162)	–	–	–	–	8.44 (2.88)	–
SP 180S-MF1	4	1500	750 (553)	–	–	–	–	–	33.9 (11.6)
	5	1500	750 (553)	–	–	–	–	–	27.9 (9.53)
	7	2300	750 (553)	–	–	–	–	–	22.2 (7.59)
	10	2300	750 (553)	–	–	–	–	–	19.2 (6.56)
SP 210S-MF1	10	2000	1000 (738)	–	–	–	–	–	53.1 (18.1)

[1] The limit values in the table apply for S1 continuous duty (ON time > 60 % or > 20 min) for a maximum gearbox temperature of 90 °C (194 °F).

Selection and ordering data

Motor	Planetary gearbox two-stage			Available gear ratio i =					Motor speed, max. S3-60 %	Output torque, max. S3-60 %	Radial output shaft loading, max.[1]	Axial output shaft loading, max.[1]
Type	Type	Torsional backlash	Gearbox weight, approx.	16	20	28	40	50	n_{G1} (n_1)	M_{G2} (T_{2B})	F_r (F_{2Rmax})	F_a (F_{2Amax})
		arcmin	kg (lb)						rpm	Nm (lb$_f$-ft)	N (lb$_f$)	N (lb$_f$)
1FK7022	SP 060S-MF2	≤ 6	2 (4.41)	✔	✔	✔	–	–	6000	40 (29.5)	2700 (607)	2400 (540)
1FK7032				✔	✔	–	–	–				
1FK7033				✔	✔	–	–	–				
1FK7022	SP 075S-MF2	≤ 6	3.6 (7.9)	–	–	–	✔	✔	6000	110 (81.1)	4000 (899)	3350 (753)
1FK7032				–	–	✔	✔	✔				
1FK7033				–	–	✔	✔	✔				
1FK7034				✔	✔	✔	–	–				
1FK7040				✔	✔	✔	–	–				
1FK7042				✔	✔	–	–	–				
1FK7043				✔	–	–	–	–				
1FK7034	SP 100S-MF2	≤ 5	7.9 (17.4)	–	–	–	✔	✔	4500	300 (221)	6300 (1416)	2400 (540)
1FK7040				–	–	–	✔	✔				
1FK7042				–	–	✔	✔	✔				
1FK7043				–	✔	✔	✔	✔				
1FK7044				✔	✔	✔	✔	–				
1FK7060				✔	✔	✔	–	–				
1FK7061				✔	✔	–	–	–				
1FK7062				✔	✔	–	–	–				
1FK7044	SP 140S-MF2	≤ 5	17 (37.5)	–	–	–	–	✔	4000	600 (442)	9450 (2124)	9870 (2219)
1FK7060				–	–	–	✔	✔				
1FK7061				–	–	✔	✔	✔				
1FK7062				–	–	✔	✔	–				
1FK7063				✔	✔	✔	–	–				
1FK7064				✔	✔	✔	–	–				
1FK7080				✔	✔	✔	✔	–				
1FK7081				✔	✔	✔	–	–				
1FK7083				✔	✔	–	–	–				
1FK7084				✔	–	–	–	–				
	Gear shaft			**Order code**								
	With fitted key			**J12**	**J13**	**J15**	**J16**	**J17**				
	Without fitted key			**J32**	**J33**	**J35**	**J36**	**J37**				

Preconditions:

With the following motor versions, SP+ planetary gearboxes can be mounted:

- Plain motor shaft extension, shaft and flange accuracy tolerance N, without/with holding brake
- IP65 degree of protection and anthracite paint finish

SP+ planetary gearboxes can therefore only be ordered with these 1FK7 motors:
1FK7...-3B.71-1.G1
1FK7...-3B.71-1.H1
1FK7...-.A..1-1.G5
1FK7...-.A..1-1.H5

When ordering a motor with gearbox, **-Z** should be added to the order number.

Example:

1FK7042 motor without holding brake
with single-stage SP+ planetary gearbox
with i = 7 and gear shaft without fitted key.
1FK7042-5AF71-1AG5-**Z**
J25

✔ Possible
– Not possible
[1] Referred to the center of the output shaft at 100 rpm.

1FK7 motors with SP+ planetary gearbox

Selection and ordering data

Motor	Planetary gearbox two-stage			Available gear ratio i =					Motor speed, max. S3-60 %	Output torque, max. S3-60 %	Radial output shaft loading, max.[1]	Axial output shaft loading, max.[1]
Type	Type	Torsional backlash	Gearbox weight, approx.	16	20	28	40	50	n_{G1} (n_1)	M_{G2} (T_{2B})	F_r (F_{2Rmax})	F_a (F_{2Amax})
		arcmin	kg (lb)						rpm	Nm (lb$_f$-ft)	N (lb$_f$)	N (lb$_f$)
1FK7062	SP 180S-MF2	≤ 5	36.4 (80.3)	–	–	–	–	✔	4000	1100 (811)	14700 (3305)	14150 (3181)
1FK7063				–	–	–	✔	✔				
1FK7064				–	–	–	✔	✔				
1FK7080				–	–	–	–	✔				
1FK7081				–	–	–	✔	✔				
1FK7083				–	–	✔	–	–				
1FK7084				–	✔	✔	–	–				
1FK7085				✔	✔	–	–	–				
1FK7086				✔	✔	–	–	–				
1FK7100				✔	✔	✔	–	–				
1FK7101				✔	✔	–	–	–				
1FK7103				✔	–	–	–	–				
1FK7083	SP 210S-MF2	≤ 6	55 (121)	–	–	–	✔	✔	3500	2400 (1770) (2500 for i = 20)	21000 (4721)	30000 (6744)
1FK7084				–	–	–	✔	✔				
1FK7085				–	–	✔	✔	–				
1FK7086				–	–	✔	–	–				
1FK7100				–	–	–	✔	✔				
1FK7101				–	–	✔	–	–				
1FK7103				–	✔	–	–	–				
1FK7105				✔	✔	–	–	–				
1FK7101	SP 240S-MF2	≤ 6	80.6 (178)	–	–	–	✔	✔	3500	4500 (3319) (4000 for i = 40 4300 for i = 50)	30000 (6744)	33000 (7419)
1FK7103				–	–	✔	✔	–				
1FK7105				–	–	✔	–	–				
	Gear shaft			**Order code**								
	With fitted key			**J12**	**J13**	**J15**	**J16**	**J17**				
	Without fitted key			**J32**	**J33**	**J35**	**J36**	**J37**				

Preconditions:

With the following motor versions, SP+ planetary gearboxes can be mounted:

- Plain motor shaft extension, shaft and flange accuracy tolerance N, without/with holding brake
- IP65 degree of protection and anthracite paint finish

SP+ planetary gearboxes can therefore only be ordered with these 1FK7 motors:
1FK7...-3B.71-1.G1
1FK7...-3B.71-1.H1
1FK7...-.A..1-1.G5
1FK7...-.A..1-1.H5

When ordering a motor with gearbox, **-Z** should be added to the order number.

Example:

1FK7042 motor without holding brake
with single-stage SP+ planetary gearbox
with i = 7 and gear shaft without fitted key.
1FK7042-5AF71-1AG5-**Z**
J25

✔ Possible
– Not possible
[1] In reference to the output shaft center.

Technical specifications

1FK7 motor with SP+ planetary gearbox

Two-stage Type	Gear ratio	Motor speed	Output torque	Moments of inertia of gearbox (referred to the drive)					
		Continuous duty S1[1]		1FK702.	1FK703.	1FK704.	1FK706.	1FK708.	1FK710.
	i	n_{N1}	M_{N2} (T_{2N})	J_1	J_1	J_1	J_1	J_1	J_1
		rpm	Nm (lb_f-ft)	kgcm^2 (lb_f-in^2)	kgcm^2 (lb_f-in^2)	kgcm^2 (lb_f-in^2)	kgcm^2 (lb_f-in^2)	kgcm^2 (lb_f-in^2)	kgcm^2 (lb_f-in^2)
SP 060S-MF2	16	4400	26 (19.2)	0.08 (0.03)	0.17 (0.06)	–	–	–	–
	20	4400	26 (19.2)	0.07 (0.024)	0.16 (0.05)	–	–	–	–
	28	4400	26 (19.2)	0.06 (0.021)	–	–	–	–	–
SP 075S-MF2	16	3500	75 (55.3)	–	0.23 (0.08)	0.55 (0.19)	–	–	–
	20	3500	75 (55.3)	–	0.20 (0.07)	0.53 (0.18)	–	–	–
	28	3500	75 (55.3)	–	0.18 (0.062)	0.50 (0.17)	–	–	–
	40	3500	75 (55.3)	0.10 (0.03)	0.17 (0.058)	–	–	–	–
	50	3800	75 (55.3)	0.10 (0.03)	0.16 (0.055)	–	–	–	–
SP 100S-MF2	16	3100	180 (133)	–	–	0.81 (0.28)	2.18 (0.75)	–	–
	20	3100	180 (133)	–	–	0.70 (0.24)	2.07 (0.71)	–	–
	28	3100	180 (133)	–	–	0.60 (0.21)	1.97 (0.67)	–	–
	40	3100	180 (133)	–	0.38 (0.13)	0.55 (0.188)	–	–	–
	50	3500	175 (129)	–	0.38 (0.13)	0.54 (0.185)	–	–	–
SP 140S-MF2	16	2900	360 (265)	–	–	–	3.19 (1.09)	10.3 (3.52)	–
	20	2900	360 (265)	–	–	–	2.71 (0.93)	9.77 (3.34)	–
	28	2900	360 (265)	–	–	–	2.34 (0.80)	9.41 (3.21)	–
	40	2900	360 (265)	–	–	–	2.10 (0.72)	9.16 (3.13)	–
	50	3200	360 (265)	–	–	1.39 (0.48)	2.08 (0.71)	–	–
SP 180S-MF2	16	2700	750 (553)	–	–	–	–	12.4 (4.24)	13.5 (4.61)
	20	2700	750 (553)	–	–	–	–	10.9 (3.73)	12.0 (4.10)
	28	2700	750 (553)	–	–	–	–	9.48 (3.24)	10.6 (3.62)
	40	2700	750 (553)	–	–	–	5.51 (1.88)	8.67 (2.96)	–
	50	2900	750 (553)	–	–	–	5.45 (1.86)	8.61 (2.94)	–
SP 210S-MF2	16	2500	1500 (1106)	–	–	–	–	–	34.5 (11.8)
	20	2500	1500 (1106)	–	–	–	–	–	31.5 (10.8)
	28	2500	1500 (1106)	–	–	–	–	30.0 (10.3)	30.0 (10.3)
	40	2500	1500 (1106)	–	–	–	–	28.5 (9.74)	28.5 (9.74)
	50	2500	1500 (1106)	–	–	–	–	28.3 (9.67)	28.3 (9.67)
SP 240S-MF2	28	2500	2500 (1844)	–	–	–	–	–	30.5 (10.4)
	40	2500	2500 (1844)	–	–	–	–	–	28.2 (9.64)
	50	2500	2500 (1844)	–	–	–	–	–	27.9 (9.53)

[1] The limit values in the table apply for S1 continuous duty (ON time > 60 % or > 20 min) for a maximum gearbox temperature of 90 °C (194 °F).

1FK7 motors with LP+ planetary gearbox

Overview

1FK7 motor with mounted series LP+ planetary gearbox

1FK7 motors can easily be combined with planetary gearboxes to form compact coaxial drive units. The gearboxes are flanged directly to the drive end of the motors.

When selecting the gearbox, ensure that its maximum permissible input speed is not exceeded by the maximum speed of the motor. In the case of high operating frequencies, allowance must be made for the factor f_2 (see Configuration Manual for 1FK7 synchronous motors). The frictional losses of the gearbox must always be taken into account.

The gearboxes are only available in non-balanced design and with fitted key.

Benefits

- High efficiency, single-stage: > 97 %
- Minimum torsional backlash, single-stage: ≤ 12 arcmin
- Power transmission from the central sun wheel via planet wheels
- No shaft deflections in the planet wheel set due to symmetrical force distribution
- The gearboxes are connected to the motor shaft via an integrated clamping hub. A plain motor shaft extension is necessary for this purpose. Shaft and flange accuracy tolerance N in accordance with DIN 42955 and vibration magnitude grade A in accordance with EN 60034-14 are sufficient. The motor flange is adapted by means of adapter plates.
- Output shaft of gearbox exactly coaxial with the motor
- The gearboxes are enclosed (seal between gearbox and motor) and filled with grease in the factory.
  They are lubricated and sealed for their service life.
  The gearboxes are suitable for all mounting positions.
- Degree of protection of gearbox: IP64
- Small dimensions
- Low weight

Integration

1FK702 to 1FK710 motors can be supplied ex works (Siemens AG) complete with flange-mounted planetary gearbox.

The gearboxes assigned to the individual motors and gear ratios i available for these motor/gearbox combinations are listed in the subsequent selection table. When making a selection, note the maximum permissible input speed of the gearbox (this is the same as the maximum motor speed).

The motor/gearbox combinations listed in the selection table are mainly intended for cycle operation S3-60 % (ON time ≤ 60 % and ≤ 20 min). Reduced maximum motor speeds and output torques apply for use in S1 continuous duty (ON time > 60 % or > 20 min). The gearbox temperature may not exceed 90 °C (194 °F).

Follow the instructions contained in the Configuration Manual for 1FK7 synchronous motors when assigning gearboxes to the motor.

Selection and ordering data

Motor	Planetary gearbox LP+ single-stage Torsional backlash ≤ 12 arcmin		Available gear ratio i =		Input speed, max. S3-60 %	Output torque, max. S3-60 %		Output shaft radial force, max.[1]	Gearbox moment of inertia
Type	Type	Gearbox weight, approx. kg (lb)	5	10	n_{G1} rpm	M_{G2} at i = 5 Nm (lb_f-ft)	M_{G2} at i = 10 Nm (lb_f-ft)	F_r N (lb_f)	J_G at i = 5/10 10^{-4} kgm^2 (10^{-3} lb_f-in-s^2)
1FK7022	LP 050-MO1	0.75 (1.65)	✔	–	8000	12 (8.9)	11 (8.1)	650 (146)	0.055 (0.05
1FK7022	LP 070-MO1	2 (4.41)	–	✔	6000	35 (25.8)	32 (23.6)	1450 (326)	0.28 (0.25)
1FK7032			✔	✔					
1FK7033			✔	✔					
1FK7034			✔	✔					
1FK7040	LP 090-MO1	4 (8.82)	✔	✔	6000	90 (66.4)	80 (59.0)	1900 (427)	1.77 (1.57)
1FK7042			✔	✔					
1FK7043			✔	✔					
1FK7044			✔	✔					
1FK7060	LP 120-MO1	8.6 (19.0)	✔	✔	4800	220 (162)	200 (148)	4000 (899)	5.42 (4.80)
1FK7061			✔	✔					
1FK7062			✔	✔					
1FK7063			✔	✔					
1FK7064			✔	–					
1FK7080	LP 155-MO1	17 (37.5)	✔	✔	3600	450 (332)	350 (258)	6000 (1349)	25.7 (22.8)
1FK7081			✔	✔					
1FK7083			✔	✔					
1FK7084			✔	✔					
1FK7085			✔	✔					
1FK7086			✔	✔					
1FK7100			✔	✔					
1FK7101			✔	–					
1FK7103			✔	–					
1FK7105			✔	–					
	Gear shaft With fitted key		**Order code** **V40**	**V42**					

Preconditions:

With the following motor versions, LP+ planetary gearboxes can be mounted:

- Plain motor shaft extension, shaft and flange accuracy tolerance N, without/with holding brake
- IP64 degree of protection and anthracite paint finish

LP+ planetary gearbox can therefore only be ordered with these 1FK7 motors:
1FK7...-3B.71-1.G0
1FK7...-3B.71-1.H0
1FK7...-.A..1-1.G3
1FK7...-.A..1-1.H3

When ordering a motor with gearbox, **-Z** should be added to the order number.

Example:

1FK7042 motor with holding brake with single-stage LP+ planetary gearbox with i = 5 and gear shaft with fitted key.
1FK7042-3BK71-1AH0-**Z**
V40

Continuous duty

Continuous duty is permissible at the rated speed and rated torque. The gearbox temperature may not exceed 90 °C (194 °F).

Planetary gearbox LP+ single-stage Torsional backlash ≤ 12 arcmin	Rated input speed	Rated output torque	
Type	n_{G1} rpm	M_{G2} at i = 5 Nm (lb_f-ft)	M_{G2} at i = 10 Nm (lb_f-ft)
LP 050-MO1	4000	5.7 (4.2)	–
LP 070-MO1	3700	18 (13.3)	16.5 (12.2)
LP 090-MO1	3400	45 (33.2)	40 (29.5)
LP 120-MO1	2600	110 (81.1)	100 (73.8)
LP 155-MO1	2000	320 (236)	190 (140)

✔ Possible
– Not possible
[1] Referred to the center of the output shaft at 100 rpm.

1FK7-DYA compact geared motors

Overview

1FK7-DYA compact geared motor

The 1FK7-DYA compact geared motor combines electrical and mechanical components in the smallest space possible. This mechatronic unit consists of a permanent-magnet 1FK7 synchronous motor and a directly mounted single-stage planetary gearbox.

The 1FK7-DYA compact geared motors with IP64 degree of protection are designed for operation without external cooling and the heat is dissipated over the motor surface. The integrated planetary gearboxes have high maximum torques and permit high radial and axial forces at the shaft extension.

Benefits

- Space-saving installation due to the high power density of the motor and integration of the planetary gearbox directly into the motor end shield. Mounting to the machine is greatly simplified by this and the logistics are reduced to a minimum.
- Mounting in construction types IM B5 and IMB14 is possible
- Highly dynamic due to lower motor moment of inertia; this means shorter cycle times.
- Maintenance-free
- Suitable for S1 continuous duty
- High positioning accuracy thanks to low mechanical torsional backlash of < 8 arcmin
- Mechanical compatibility with regard to IM B14 flange and shaft extension for the LP+ planetary gearbox
- Power and signals are connected via a connector

Application

In general mechanical engineering, any place where coaxial drive units are used, e.g. in

- Packaging machines
- Wood, glass and ceramic processing machines
- Plastic, injection molding and foil stretching machines
- Handling systems
- Machine tools
- All kinds of auxiliary axes

Integration

1FK7-DYA compact geared motors can be combined with the SINAMICS S120 drive system to create a powerful system with high functionality. The integrated encoder system for speed and position control can be selected depending on the application.

Technical specifications

1FK7-DYA compact geared motor	
Type of motor	Permanent-magnet synchronous motor
Magnet material	Rare-earth magnet material
Cooling	Natural cooling
Temperature monitoring	KTY84 temperature sensor in stator winding
Insulation of the stator winding in accordance with EN 60034-1 (IEC 60034-1)	Temperature class155 (F) for a winding temperature rise of ΔT = 100 K at an ambient temperature of 40 °C (104 °F)
Type of construction in accordance with EN 60034-7 (IEC 60034-7)	IM B5 (IM V1, IM V3) IM B14
Degree of protection in accordance with EN 60034-5 (IEC 60034-5)	IP64
Shaft extension on the drive end (DE) in accordance with DIN 748-3 (IEC 60072-1)	With fitted key
Shaft and flange accuracy in accordance with DIN 42955 (IEC 60072-1)[1]	Tolerance N
Vibration magnitude in accordance with EN 60034-14 (IEC 60034-14)	Grade A is maintained up to rated speed
Max. sound pressure level L_{pA} (1 m) in accordance with EN ISO 1680	
• 1FK703	72 dB
• 1FK704	75 dB
• 1FK706	80 dB
• 1FK708	82 dB
Connection	Connectors for signals and power can be rotated 270°
Paint finish	Anthracite RAL 7016
2nd rating plate **3rd rating plate**	Attached in the NDE cover Enclosed separately
Holding brake	Without/with
Approvals, according to	cURus

Built-in encoder systems without DRIVE-CLiQ interface

Incremental encoder	
IC2048S/R encoder	Incremental encoder sin/cos 1 V_{pp} 2048 S/R with C and D tracks
Absolute encoder	
AM2048S/R encoder	Absolute encoder 2048 S/R, 4096 revolutions, multi-turn
AM512S/R encoder	Absolute encoder 512 S/R, 4096 revolutions, multi-turn
AM32S/R encoder	Absolute encoder 32 S/R, 4096 revolutions, multi-turn
AM16S/R encoder	Absolute encoder 16 S/R, 4096 revolutions, multi-turn
Resolver	
Multi-pole resolver	Multi-pole resolver (number of pole pairs corresponds to number of pole pairs of the motor)
2-pole resolver	2-pole resolver

Built-in encoder systems with DRIVE-CLiQ interface

Incremental encoder	
IC22DQ encoder	Incremental encoder 22 bit (resolution 4194304, internal 2048 S/R) + commutation position 11 bit
Absolute encoder	
AM22DQ encoder	Absolute encoder 22 bit (resolution 4194304, internal 2048 S/R) + 12 bit multi-turn (traversing range 4096 revolutions)
AM20DQ encoder	Absolute encoder 20 bit (resolution 1048576, internal 512 S/R) + 12 bit multi-turn (traversing range 4096 revolutions)
AM16DQ encoder	Absolute encoder 16 bit (resolution 65536, internal 32 S/R) + 12 bit multi-turn (traversing range 4096 revolutions)
AM15DQ encoder	Absolute encoder 15 bit (resolution 32768, internal 16 S/R) + 12 bit multi-turn (traversing range 4096 revolutions)
Resolver	
R15DQ resolver	Resolver 15 bit (resolution 32768, internal, multi-pole)
R14DQ resolver	Resolver 14 bit (resolution 16384, internal, 2-pole)

S/R=signals/revolution

[1] Shaft extension run-out, concentricity of centering ring and shaft, and perpendicularity of flange to shaft.

1FK7-DYA compact geared motors
Natural cooling

Selection and ordering data

Rated speed	Rated power	Speed, max.	Torque, max.	Static torque	Rated torque[1]	Available gear ratio	1FK7-DYA compact geared motors		Number of pole pairs	Moment of inertia of rotor[2] without brake	with brake
$n_{2\ rated}$	P_2	n_{2max}	M_{2max}	M_{20}	$M_{2\ rated}$	i			p	J	J
rpm	kW (HP)	rpm	Nm (lb_f-ft)	Nm (lb_f-ft)	Nm (lb_f-ft)		Order No.	Order code		10^{-4} kgm^2 (10^{-3} lb_f-in-s^2)	10^{-4} kgm^2 (10^{-3} lb_f-in-s^2)
Natural cooling											
370	0.37 (0.50)	600	32 (23.6)	11 (8.1)	9.5 (7.0)	10	**1FK7032-5AK71-1 ■ ■ 3-Z**	**A03**	3	0.75 (0.66)	0.83 (0.73)
740	0.5 (0.67)	1200	32 (23.6)	7.5 (5.5)	6.5 (4.8)	5	**1FK7034-5AK71-1 ■ ■ 3-Z**	**A00**	3	1.04 (0.92)	1.12 (0.99)
340	0.45 (0.60)	600	49 (36.1)	15 (11.1)	12.5 (9.2)	10	**1FK7040-5AK71-1 ■ ■ 3-Z**	**A13**	4	2.3 (2.04)	3 (2.66)
680	0.71 (0.95)	1200	51 (37.6)	13 (9.6)	10 (7.4)	5	**1FK7042-5AK71-1 ■ ■ 3-Z**	**A10**	4	3.6 (3.19)	4.3 (3.81)
260	1.25 (1.68)	480	175 (129)	57 (42)	46 (33.9)	10	**1FK7060-5AH71-1 ■ ■ 3-Z**	**A73**	4	10.3 (9.12)	12.5 (11.1)
520	1.74 (2.33)	960	170 (125)	51 (37.6)	32 (23.6)	5	**1FK7063-5AH71-1 ■ ■ 3-Z**	**A70**	4	17.4 (15.4)	19.6 (17.4)
200	1.47 (1.97)	360	242 (179)	76 (56.1)	70 (51.6)	10	**1FK7080-5AH71-1 ■ ■ 3-Z**	**A83**	4	28.7 (25.4)	31.8 (28.2)
400	1.88 (2.52)	720	233 (172)	68 (50.2)	45 (33.2)	5	**1FK7083-5AH71-1 ■ ■ 3-Z**	**A80**	4	41 (36.3)	49.6 (43.9)

Encoder systems for motors without DRIVE-CLiQ interface:	IC2048S/R encoder	**A**
	AM2048S/R encoder (not for 1FK703)	**E**
	AM512S/R encoder (only for 1FK703)	**H**
	AM32S/R encoder (not for 1FK703)	**G**
	AM16S/R encoder (only for 1FK703)	**J**
	Multi-pole resolver	**S**
	2-pole resolver	**T**
Encoder systems for motors with DRIVE-CLiQ interface:	IC22DQ encoder	**D**
	AM22DQ encoder	**F**
	AM20DQ encoder	**L**
	AM16DQ encoder	**K**
	AM15DQ encoder	**V**
	R15DQ resolver	**U**
	R14DQ resolver	**P**

Shaft extension:	**Shaft and flange accuracy:**	**Holding brake:**	
Fitted key and keyway	Tolerance N	Without	**U**
Fitted key and keyway	Tolerance N	With	**V**
Degree of protection:	IP64, anthracite paint finish		**3**

Motor type (repeated)	Weight without brake	with brake	Static current	Maximum current	SINAMICS S120 Motor Module		Power cable with complete shield Motor connection (and brake connection) via power connector		
					Rated output current[3]	Booksize format For additional versions and components, see chapter SINAMICS S120 drive system	Power connector	Cable cross-section[4]	Pre-assembled cable
	m	m	I_0 at M_0 ΔT=100 K	I_{max}	I_{rated}				
	kg (lb)	kg (lb)	A	A	A	Order No.	Size	mm²	Order No.
1FK7032-5AK71-...	4.11 (9.06)	4.47 (9.86)	1.7	5	3	**6SL312■-■TE13-0AA3**	1	4 × 1.5	**6FX■ 002-5■S01-....**
1FK7034-5AK71-...	5.01 (11.1)	5.37 (11.8)	1.9	7.9	3	**6SL312■-■TE13-0AA3**	1	4 × 1.5	**6FX■ 002-5■S01-....**
1FK7040-5AK71-...	6.60 (14.6)	7.61 (16.8)	2.3	7.4	3	**6SL312■-■TE13-0AA3**	1	4 × 1.5	**6FX■ 002-5■S01-....**
1FK7042-5AK71-...	7.91 (17.4)	8.62 (19.0)	4.4	14.9	5	**6SL312■-■TE15-0AA3**	1	4 × 1.5	**6FX■ 002-5■S01-....**
1FK7060-5AH71-...	13.9 (30.7)	15 (33.1)	6.2	19	9	**6SL312■-■TE21-0AA3**	1	4 × 1.5	**6FX■ 002-5■S01-....**
1FK7063-5AH71-...	17.6 (38.8)	19 (41.9)	12	41	18	**6SL312■-■TE21-8AA3**	1	4 × 1.5	**6FX■ 002-5■S01-....**
1FK7080-5AH71-...	23.4 (51.6)	24.6 (54.2)	7.4	24	9	**6SL312■-■TE21-0AA3**	1	4 × 1.5	**6FX■ 002-5■S01-....**
1FK7083-5AH71-...	28.6 (63.1)	31.2 (68.8)	15	48	18	**6SL312■-■TE21-8AA3**	1	4 × 1.5	**6FX■ 002-5■S01-....**

Cooling:	
Internal air cooling	**0**
External air cooling	**1**
Motor Module:	
Single Motor Module	**1**
Double Motor Module	

Power cable:	
MOTION-CONNECT 800	**8**
MOTION-CONNECT 500	**5**
Without brake cores	**C**
With brake cores	**D**
Length code	**....**

Information about the cables can be found in chapter Connection system MOTION-CONNECT.

[1] If the absolute encoder is used, $M_{2\,rated}$ is reduced by 10 %.

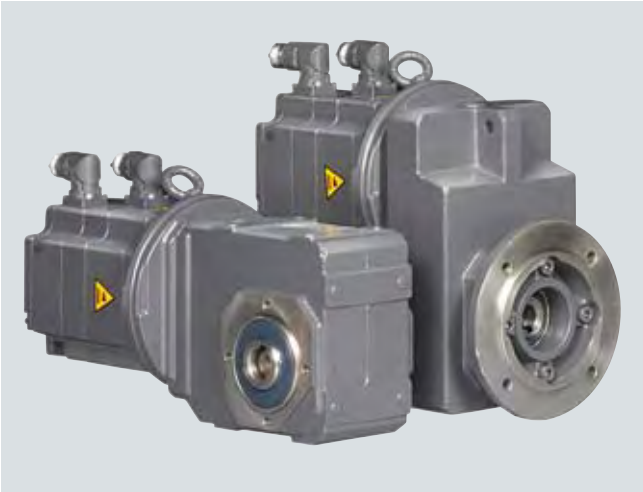
[2] In reference to the internal motor shaft.

[3] With default setting of the pulse frequency.

[4] The current carrying capacity of the power cables complies with EN 60204-1 for installation type C, for continuous duty at an ambient air temperature of 40 °C (104 °F).

1FK7 geared servomotors

Overview



1FK7 bevel geared motor/1FK7 offset-shaft geared motors

1FK7 worm geared motors/1FK7 helical geared motors

The 1FK7 geared servomotors comprise the 1FK7 synchronous motors described above and the directly mounted helical and bevel gears.

The 1FK7 geared servomotors are pre-assembled as a complete unit and supplied with a gearbox filled with oil.
The type range comprises helical geared motors with 9 gearbox sizes, offset-shaft geared motors with 5 gearbox sizes, bevel geared motors with 8 gearbox sizes and worm geared motors with 5 gearbox sizes. A wide range of mechanical mounting methods can be implemented with the numerous options.

1FK7 geared servomotors are designed for operation without external cooling and the heat is dissipated through the motor surface and the gearbox mounting surface.

1FK7 geared servomotors can be combined with the SINAMICS S120 drive system to create a powerful system with high functionality. Integrated encoder systems for speed and position control can be selected depending on the application just as for 1FK7 synchronous motors.

Benefits

- Extremely compact design as a result of the direct mounting (because there is no coupling cage between the motor and gearbox)
- Maintenance-free and lubricated for life (exception, worm gearing)
- High efficiency
- Low torsional backlash
- Low running noise due to the helical gearing
- Service-life maintenance-free gearing (exception: worm gearing)
- Suitable for cyclic operation with alternating load and continuous duty
- Low-cost solution when compared to planetary geared motors

Application

1FK7 geared servomotors are ideally suited for applications in general machine construction for basic positioning tasks and auxiliary drives with servo quality that continually operate, for example in:

- Packaging machines
- High-bay racking units
- Wood, glass and ceramic processing machines
- Beverage filling plants
- Conveyor belts

Other Siemens geared motors can be found at
www.siemens.com/sgmdesigner

Technical specifications

1FK7 helical geared motor	
Nominal ratio i_{nom}	3.8 ... 70
Rated output torque M_2	3.6 ... 1737 Nm (2.7 ... 1281 lb_f-ft)
Acceleration torque M_{2max}	19 ... 4140 Nm (14 ... 3054 lb_f-ft)
Torsional backlash	10 ... 20 arcmin
Efficiency	94 ... 96 %
Mechanical options	Solid shaft with fitted key, flange, mounting feet, tapped hole group

1FK7 offset-shaft geared motor	
Nominal ratio i_{nom}	4.3 ... 35
Rated output torque M_2	4 ... 587 Nm (3 ... 433 lb_f-ft)
Acceleration torque M_{2max}	24 ... 1100 Nm (2.7 ... 811 lb_f-ft)
Torsional backlash	10 ... 11 arcmin
Efficiency	94 ... 96 %
Mechanical options	Solid shaft, hollow shaft with fitted key, hollow shaft with clamping element/shrink disk, flange, mounting feet, tapped hole group

1FK7 bevel geared motor	
Nominal ratio i_{nom}	4 ... 76
Rated output torque M_2	3.8 ... 1626 Nm (2.8 ... 1199 lb_f-ft)
Acceleration torque M_{2max}	22 ... 4650 Nm (16 ... 3430 lb_f-ft)
Torsional backlash	10 ... 12 arcmin
Efficiency	94 ... 96 %
Mechanical options	Solid shaft, hollow shaft with fitted key, hollow shaft with clamping element/shrink disk, flange, mounting feet, tapped hole group, torque bracket

1FK7 worm geared motor	
Nominal ratio i_{nom}	9.2 ... 70
Rated output torque M_2	8.5 ... 399 Nm (6.3 ... 294 lb_f-ft)
Acceleration torque M_{2max}	43 ... 791 Nm (32 ... 583 lb_f-ft)
Torsional backlash	Depending on the gearbox size and gear ratio
Mechanical options	Solid shaft, hollow shaft with fitted key, hollow shaft with clamping element/shrink disk, flange, mounting feet, tapped hole group, torque bracket

Explanation of the designations in the selection tables

n_2	Gearbox output speed referred to the input speed of the motor of n_1 = 3000 rpm for a horizontal gear shaft output
i_{nom}	Nominal gear ratio (approximate value as decimal number)
i_{exact}	Exact gear ratio (specified as a fraction for parameter entry in the drive converter)
f_B	Gearbox overload factor (quotient between the max. permissible acceleration torque and static torque of the motor and ratio)

Built-in encoder systems without DRIVE-CLiQ interface

Incremental encoder	
IC2048S/R encoder	Incremental encoder sin/cos 1 V_{pp} 2048 S/R with C and D tracks
Absolute encoder	
AM2048S/R encoder	Absolute encoder 2048 S/R, 4096 revolutions, multi-turn
AM512S/R encoder	Absolute encoder 512 S/R, 4096 revolutions, multi-turn
AM32S/R encoder	Absolute encoder 32 S/R, 4096 revolutions, multi-turn
AM16S/R encoder	Absolute encoder 16 S/R, 4096 revolutions, multi-turn
Resolver	
Multi-pole resolver	Multi-pole resolver (number of pole pairs corresponds to number of pole pairs of the motor)
2-pole resolver	2-pole resolver

Built-in encoder systems with DRIVE-CLiQ interface

Incremental encoder	
IC22DQ encoder	Incremental encoder 22 bit (resolution 4194304, internal 2048 S/R) + commutation position 11 bit
Absolute encoder	
AM22DQ encoder	Absolute encoder 22 bit (resolution 4194304, internal 2048 S/R) + 12 bit multi-turn (traversing range 4096 revolutions)
AM20DQ encoder	Absolute encoder 20 bit (resolution 1048576, internal 512 S/R) + 12 bit multi-turn (traversing range 4096 revolutions)
AM16DQ encoder	Absolute encoder 16 bit (resolution 65536, internal 32 S/R) + 12 bit multi-turn (traversing range 4096 revolutions)
AM15DQ encoder	Absolute encoder 15 bit (resolution 32768, internal 16 S/R) + 12 bit multi-turn (traversing range 4096 revolutions)
Resolver	
R15DQ resolver	Resolver 15 bit (resolution 32768, internal, multi-pole)
R14DQ resolver	Resolver 14 bit (resolution 16384, internal, 2-pole)

S/R=signals/revolution

4

1FK7 helical geared motors

Selection and ordering data

Power at duty type S3-60 %	Output speed at the gear shaft	Rated output torque gearbox at duty type S3-60 %	Acceleration torque, max. gearbox	Nominal ratio	Exact ratio	Cantilever force, perm., gear shaft extension	Overload factor
P_2	n_2	M_2	M_{2max}	i_{nom}	i_{exact}	$F_{rpermiss}$	f_B
kW (HP)	rpm	Nm (lb_f-ft)	Nm (lb_f-ft)			N (lb_f)	
Natural cooling – SH 36/SH 48/SH 63							
0.30 (0.40)	782	3.63 (2.68)	19 (14.0)	3.8	441/115	560 (126)	4.2
	476	5.96 (4.40)	29 (21.4)	6.3	2035/323	660 (148)	3.9
	291	9.74 (7.18)	51 (37.6)	10.5	1421/138	778 (175)	4.2
	192	14.8 (10.9)	72 (53.1)	15.5	1595/102	894 (201)	3.9
	129	22 (16.2)	65 (47.9)	23	325/14	1020 (229)	2.4
	86	33.1 (24.4)	65 (47.9)	35	1261/36	1170 (263)	1.6
	64	44.3 (32.7)	65 (47.9)	47	7865/168	1289 (290)	1.2
	43	66.6 (49.1)	138 (102)	70	775/11	2099 (472)	1.7
0.41 (0.55)	782	5.02 (3.70)	36 (26.6)	3.8	441/115	560 (126)	6.0
	476	8.25 (6.10)	55 (40.6)	6.3	2035/323	660 (148)	5.6
	291	13.5 (10.0)	72 (53.1)	10.5	1421/138	778 (175)	4.5
	192	20.5 (15.1)	72 (53.1)	15.5	1595/102	894 (201)	3.0
	128	30.8 (22.7)	138 (102)	24	1035/44	1456 (327)	3.8
	129	30.4 (22.4)	65 (47.9)	23	325/14	1020 (229)	1.8
	86	45.9 (33.9)	138 (102)	35	2700/77	1663 (374)	2.5
	86	45.9 (33.9)	65 (47.9)	35	1261/36	1170 (263)	1.2
	64	61.4 (45.3)	138 (102)	47	516/11	1833 (412)	1.9
0.79 (1.06)	782	9.67 (7.10)	36 (26.6)	3.8	441/115	560 (126)	3.2
	476	15.9 (11.7)	55 (40.6)	6.3	2035/323	660 (148)	3.0
	291	26 (19.2)	72 (53.1)	10.5	1421/138	778 (175)	2.4
	191	39.6 (29.2)	138 (102	15.5	377/24	1273 (286)	3.0
	192	39.4 (29.1)	72 (53.1)	15.5	1595/102	894 (201)	1.6
	128	59.3 (43.7)	138 (102	24	1035/44	1456 (327)	2.0
	86	88.4 (65.2)	138 (102)	35	2700/77	1663 (374)	1.4
	64	118 (87.0	138 (102)	47	516/11	1833 (412)	1.0
1.43 (1.92)	782	17.5 (12.9)	50 (36.9)	3.8	441/115	560 (126)	2.2
	476	28.7 (21.2)	59 (43.5)	6.3	2035/323	660 (148)	1.6
	511	26.8 (19.8)	102 (75.2)	5.9	47/8	917 (206)	3.0
	291	46.9 (34.6)	72 (53.1)	10.5	1421/138	778 (175)	1.2
	289	47.3 (34.9)	138 (102)	10.5	841/81	1109 (249)	2.3
	191	71.6 (52.8)	138 (102)	15.5	377/24	1273 (286)	1.5
	196	69.7 (51.4)	230 (170)	15.5	703/46	1775 (399)	2.6
	128	107 (78.9)	138 (102)	25	1035/44	1456 (327)	1.0
	128	107 (78.9)	350 (258)	24	845/36	3045 (685)	2.6

Gearbox size	Motor shaft height	1FK7 helical geared motors	Gearbox type	Type/gear shaft extension	Type of construction/ mounting position/ connector mounting position	Gearbox weight, approx.
	SH	Order No.	Order codes			kg (lb)
C002	36	1FK7032-5AK71-1 ■■ 5 - Z	D01	G . .	H . .	8.6 (19.0)
C002	36	1FK7032-5AK71-1 ■■ 5 - Z	D02	G . .	H . .	8.6 (19.0)
C002	36	1FK7032-5AK71-1 ■■ 5 - Z	D03	G . .	H . .	8.6 (19.0)
C002	36	1FK7032-5AK71-1 ■■ 5 - Z	D04	G . .	H . .	8.6 (19.0)
C002	36	1FK7032-5AK71-1 ■■ 5 - Z	D05	G . .	H . .	8.6 (19.0)
C002	36	1FK7032-5AK71-1 ■■ 5 - Z	D06	G . .	H . .	8.6 (19.0)
C002	36	1FK7032-5AK71-1 ■■ 5 - Z	D07	G . .	H . .	8.6 (19.0)
C102	36	1FK7032-5AK71-1 ■■ 5 - Z	D18	G . .	H . .	13.5 (29.8)
C002	48	1FK7040-5AK71-1 ■■ 5 - Z	D01	G . .	H . .	9.4 (20.7)
C002	48	1FK7040-5AK71-1 ■■ 5 - Z	D02	G . .	H . .	9.4 (20.7)
C002	48	1FK7040-5AK71-1 ■■ 5 - Z	D03	G . .	H . .	9.4 (20.7)
C002	48	1FK7040-5AK71-1 ■■ 5 - Z	D04	G . .	H . .	9.4 (20.7)
C102	48	1FK7040-5AK71-1 ■■ 5 - Z	D15	G . .	H . .	14.3 (31.5)
C002	48	1FK7040-5AK71-1 ■■ 5 - Z	D05	G . .	H . .	9.4 (20.7)
C102	48	1FK7040-5AK71-1 ■■ 5 - Z	D16	G . .	H . .	14.3 (31.5)
C002	48	1FK7040-5AK71-1 ■■ 5 - Z	D06	G . .	H . .	9.4 (20.7)
C102	48	1FK7040-5AK71-1 ■■ 5 - Z	D17	G . .	H . .	14.3 (31.5)
C002	48	1FK7042-5AF71-1 ■■ 5 - Z	D01	G . .	H . .	10.7 (23.6)
C002	48	1FK7042-5AF71-1 ■■ 5 - Z	D02	G . .	H . .	10.7 (23.6)
C002	48	1FK7042-5AF71-1 ■■ 5 - Z	D03	G . .	H . .	10.7 (23.6)
C102	48	1FK7042-5AF71-1 ■■ 5 - Z	D14	G . .	H . .	15.6 (34.4)
C002	48	1FK7042-5AF71-1 ■■ 5 - Z	D04	G . .	H . .	10.7 (23.6)
C102	48	1FK7042-5AF71-1 ■■ 5 - Z	D15	G . .	H . .	15.6 (34.4)
C102	48	1FK7042-5AF71-1 ■■ 5 - Z	D16	G . .	H . .	15.6 (34.4)
C102	48	1FK7042-5AF71-1 ■■ 5 - Z	D17	G . .	H . .	15.6 (34.4)
C002	63	1FK7060-5AF71-1 ■■ 5 - Z	D01	G . .	H . .	13.4 (29.6)
C002	63	1FK7060-5AF71-1 ■■ 5 - Z	D02	G . .	H . .	13.4 (29.6)
C102	63	1FK7060-5AF71-1 ■■ 5 - Z	D12	G . .	H . .	18.3 (40.4)
C002	63	1FK7060-5AF71-1 ■■ 5 - Z	D03	G . .	H . .	13.4 (29.6)
C102	63	1FK7060-5AF71-1 ■■ 5 - Z	D13	G . .	H . .	18.3 (40.4)
C102	63	1FK7060-5AF71-1 ■■ 5 - Z	D14	G . .	H . .	18.3 (40.4)
C202	63	1FK7060-5AF71-1 ■■ 5 - Z	D24	G . .	H . .	22.3 (49.2)
C102	63	1FK7060-5AF71-1 ■■ 5 - Z	D15	G . .	H . .	18.3 (40.4)
C302	63	1FK7060-5AF71-1 ■■ 5 - Z	D35	G . .	H . .	27.4 (60.4)

Encoder systems for motors without DRIVE-CLiQ interface:	IC2048S/R encoder	A
	AM2048S/R encoder (from shaft height 48)	E
	AM512S/R encoder (shaft height 36 only)	H
	AM32S/R encoder (from shaft height 48)	G
	AM16S/R encoder (shaft height 36 only)	J
	Multi-pole resolver	S
	2-pole resolver	T
Encoder systems for motors with DRIVE-CLiQ interface:	IC22DQ encoder	D
	AM22DQ encoder (from shaft height 48)	F
	AM20DQ encoder (shaft height 36 only)	L
	AM16DQ encoder (from shaft height 48)	K
	AM15DQ encoder (shaft height 36 only)	V
	R15DQ resolver	U
	R14DQ resolver	P
Holding brake:	Motor without holding brake	U
	Motor with holding brake	V

. . . .

Order codes for type/ gear shaft extension and type of construction/mounting position/ connector mounting position, see page 4/86.

1FK7 helical geared motors

Selection and ordering data

Power at duty type S3-60 %	Output speed at the gear shaft	Rated output torque gearbox at duty type S3-60 %	Acceleration torque, max. gearbox	Nominal ratio	Exact ratio	Cantilever force, perm., gear shaft extension	Overload factor
P_2	n_2	M_2	M_{2max}	i_{nom}	i_{exact}	$F_{rpermiss}$	f_B
kW (HP)	rpm	Nm (lb_f-ft)	Nm (lb_f-ft)			N (lb_f)	
Natural cooling – SH 63/SH 80							
1.42 (1.90)	85	160 (118)	230 (170)	35	1372/39	2343 (527)	1.1
1.43 (1.92)	86 60	159 (117) 227 (167)	550 (406) 400 (295)	35 50	975/28 2736/55	5961 (1340) 3911 (879)	2.7 1.4
1.44 (1.93)	60 43	229 (169) 319 (235)	600 (443) 550 (406)	50 70	1305/26 559/8	6734 (1514) 7519 (1690)	2.1 1.4
	43	319 (235)	850 (627)	70	10075/144	9229 (2075)	2.1
2.23 (2.99)	782 511	27.2 (20.1) 41.6 (30.7)	50 (36.9) 102 (75.2)	3.8 5.9	441/115 47/8	560 (126) 917 (206)	1.2 1.6
2.22 (2.98)	289 196	73.5 (54.2) 108 (79.7)	138 (102) 230 (170)	10.5 15.5	841/81 703/46	1109 (249) 1775 (399)	1.2 1.4
	128 86	166 (122) 247 (182)	350 (258) 550 (406)	23 35	845/36 975/28	3045 (685) 5961 (1340)	1.4 1.5
2.23 (2.99)	60 43	355 (262) 495 (365)	600 (443) 850 (627)	50 70	1305/26 10075/144	6734 (1514) 9229 (2075)	1.1 1.1
2.07 (2.78)	773	25.6 (18.9)	101 (74.5)	3.9	1363/351	799 (180)	3.3
2.08 (2.79)	511	38.8 (28.6)	115 (84.8)	5.9	47/8	917 (206)	2.5
2.07 (2.78)	289 196	68.5 (50.5) 101 (74.5)	138 (102) 230 (170)	10.5 15.5	847/81 703/46	1109 (249) 1775 (399)	1.7 1.9
2.08 (2.79)	191 128	104 (76.7) 155 (114)	138 (102) 350 (258)	15.5 23	377/24 845/36	1273 (286) 3045 (685)	1.1 1.9
2.07 (2.78)	127 86	156 (115) 230 (170)	230 (170) 550 (406)	24 35	637/27 975/28	2051 (461) 5961 (1340)	1.3 2.0
2.08 (2.79)	86	231 (170)	350 (258)	35	1261/36	3479 (782)	1.3
2.07 (2.78)	60	329 (243)	920 (679)	50	1943/39	8241 (1853)	2.4
2.09 (2.80)	44	454 (335)	1380 (1018)	69	620/9	12344 (2775)	2.6
3.20 (4.29)	773 772	39.5 (29.1) 39.6 (29.2)	101 (74.5) 154 (114)	3.9 3.9	1363/351 486/125	799 (180) 1125 (253)	1.7 2.5
	511 518	59.8 (44.1) 59.0 (43.5)	115 (84.8) 176 (130)	5.9 5.8	47/8 666/115	917 (206) 1284 (289)	1.3 2.0
	320 322	95.6 (70.5) 94.8 (69.9)	230 (170) 350 (258)	9.4 9.3	2450/261 3575/384	1509 (339) 2237 (503)	1.6 2.4
3.19 (4.28)	193	158 (117)	400 (295)	15.5	544/35	2654 (597)	1.7
3.18 (4.26)	190	160 (118)	600 (443)	16	63/4	4576 (1029)	2.5
3.19 (4.28)	128 128	238 (176) 238 (176)	550 (406) 850 (627)	23 23	1495/64 1495/64	5219 (1173) 6402 (1439)	1.5 2.3
3.20 (4.29)	86 86	355 (262) 355 (262)	550 (406) 1380 (1018)	35 35	975/28 1360/39	5961 (1340) 9838 (2212)	1.0 2.6
3.19 (4.28)	60	507 (374)	920 (679)	50	1943/39	2265 (509)	1.2
3.20 (4.29)	64	477 (352)	1971 (1454)	47	515/11	14923 (3355)	2.7
3.23 (4.33)	44	702 (518)	1380 (1018)	69	620/9	12344 (2775)	1.3
3.19 (4.28)	43	708 (522)	2300 (1697)	70	765/11	17027 (3828)	2.1

Gearbox size	Motor shaft height	1FK7 helical geared motors	Gearbox type	Type/gear shaft extension	Type of construction/ mounting position/ connector mounting position	Gearbox weight, approx.
	SH	Order No.	Order codes			kg (lb)
C202	63	1FK7060-5AF71-1 ■■ 5 - Z	D26	G . .	H . .	22.3 (49.2)
C402 C302	63 63	1FK7060-5AF71-1 ■■ 5 - Z 1FK7060-5AF71-1 ■■ 5 - Z	D46 D37	G . . G . .	H . . H . .	37.6 (82.9) 27.4 (60.4)
C402 C402	63 63	1FK7060-5AF71-1 ■■ 5 - Z 1FK7060-5AF71-1 ■■ 5 - Z	D47 D48	G . . G . .	H . . H . .	37.6 (82.9) 37.6 (82.9)
C502	63	1FK7060-5AF71-1 ■■ 5 - Z	D58	G . .	H . .	49.2 (108)
C002 C102	63 63	1FK7063-5AF71-1 ■■ 5 - Z 1FK7063-5AF71-1 ■■ 5 - Z	D01 D12	G . . G . .	H . . H . .	17.1 (37.7) 22.0 (48.5)
C102 C202	63 63	1FK7063-5AF71-1 ■■ 5 - Z 1FK7063-5AF71-1 ■■ 5 - Z	D13 D24	G . . G . .	H . . H . .	22.0 (48.5) 26.0 (57.3)
C302 C402	63 63	1FK7063-5AF71-1 ■■ 5 - Z 1FK7063-5AF71-1 ■■ 5 - Z	D35 D46	G . . G . .	H . . H . .	31.1 (68.6) 41.3 (91.1)
C402 C502	63 63	1FK7063-5AF71-1 ■■ 5 - Z 1FK7063-5AF71-1 ■■ 5 - Z	D47 D58	G . . G . .	H . . H . .	41.3 (91.1) 52.9 (117)
C102	80	1FK7080-5AF71-1 ■■ 5 - Z	D11	G . .	H . .	21.7 (47.9)
C102	80	1FK7080-5AF71-1 ■■ 5 - Z	D12	G . .	H . .	21.7 (47.9)
C102 C202	80 80	1FK7080-5AF71-1 ■■ 5 - Z 1FK7080-5AF71-1 ■■ 5 - Z	D13 D24	G . . G . .	H . . H . .	21.7 (47.9) 25.7 (56.7)
C102 C302	80 80	1FK7080-5AF71-1 ■■ 5 - Z 1FK7080-5AF71-1 ■■ 5 - Z	D14 D35	G . . G . .	H . . H . .	21.7 (47.9) 30.8 (67.9)
C202 C402	80 80	1FK7080-5AF71-1 ■■ 5 - Z 1FK7080-5AF71-1 ■■ 5 - Z	D25 D46	G . . G . .	H . . H . .	25.7 (56.7) 41.0 (90.4)
C302	80	1FK7080-5AF71-1 ■■ 5 - Z	D36	G . .	H . .	30.8 (67.9)
C502	80	1FK7080-5AF71-1 ■■ 5 - Z	D57	G . .	H . .	52.6 (116)
C612	80	1FK7080-5AF71-1 ■■ 5 - Z	D68	G . .	H . .	67.9 (150)
C102 C202	80 80	1FK7083-5AF71-1 ■■ 5 - Z 1FK7083-5AF71-1 ■■ 5 - Z	D11 D21	G . . G . .	H . . H . .	26.9 (59.3) 30.9 (68.1)
C102 C202	80 80	1FK7083-5AF71-1 ■■ 5 - Z 1FK7083-5AF71-1 ■■ 5 - Z	D12 D22	G . . G . .	H . . H . .	26.9 (59.3) 30.9 (68.1)
C202 C302	80 80	1FK7083-5AF71-1 ■■ 5 - Z 1FK7083-5AF71-1 ■■ 5 - Z	D23 D33	G . . G . .	H . . H . .	30.9 (68.1) 36.0 (79.4)
C302	80	1FK7083-5AF71-1 ■■ 5 - Z	D34	G . .	H . .	36.0 (79.4)
C402	80	1FK7083-5AF71-1 ■■ 5 - Z	D44	G . .	H . .	46.2 (102)
C402 C502	80 80	1FK7083-5AF71-1 ■■ 5 - Z 1FK7083-5AF71-1 ■■ 5 - Z	D45 D55	G . . G . .	H . . H . .	46.2 (102) 57.8 (127)
C402 C612	80 80	1FK7083-5AF71-1 ■■ 5 - Z 1FK7083-5AF71-1 ■■ 5 - Z	D46 D66	G . . G . .	H . . H . .	46.2 (102) 73.1 (161)
C502	80	1FK7083-5AF71-1 ■■ 5 - Z	D57	G . .	H . .	57.8 (127)
C712	80	1FK7083-5AF71-1 ■■ 5 - Z	D77	G . .	H . .	108.4 (239)
C612	80	1FK7083-5AF71-1 ■■ 5 - Z	D68	G . .	H . .	73.1 (161)
C712	80	1FK7083-5AF71-1 ■■ 5 - Z	D78	G . .	H . .	108.4 (239)

Encoder systems for motors without DRIVE-CLiQ interface:	IC2048S/R encoder	A
	AM2048S/R encoder	E
	AM32S/R encoder	G
	Multi-pole resolver	S
	2-pole resolver	T
Encoder systems for motors with DRIVE-CLiQ interface:	IC22DQ encoder	D
	AM22DQ encoder	F
	AM16DQ encoder	K
	R15DQ resolver	U
	R14DQ resolver	P
Holding brake:	Motor without holding brake	U
	Motor with holding brake	V

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Order codes for type/ gear shaft extension and type of construction/mounting position/ connector mounting position, see page 4/86.

1FK7 helical geared motors

Selection and ordering data

Power at duty type S3-60 %	Output speed at the gear shaft	Rated output torque gearbox at duty type S3-60 %	Acceleration torque, max. gearbox	Nominal ratio	Exact ratio	Cantilever force, perm., gear shaft extension	Overload factor
P_2	n_2	M_2	M_{2max}	i_{nom}	i_{exact}	$F_{rpermiss}$	f_B
kW (HP)	rpm	Nm (lb_f-ft)	Nm (lb_f-ft)			N (lb_f)	
Natural cooling – SH 100							
3.66 (4.91)	774 512	45.1 (33.3) 68.2 (50.3)	251 (185) 288 (212)	3.9 5.9	190/49 2584/441	1671 (376) 1917 (431)	3.7 2.8
3.64 (4.88)	322	108 (79.7)	350 (258)	9.3	3575/384	2237 (503)	2.2
3.66 (4.91)	193	181 (134)	400 (295)	15.5	544/35	2654 (597)	1.5
3.64 (4.88)	190	183 (135)	600 (443)	16	63/4	4576 (1029)	2.2
3.65 (4.89)	128 128	272 (201) 272 (201)	850 (627) 550 (406)	23 23	1495/64 1495/64	6402 (1439) 5219 (1173)	2.1 1.3
3.66 (4.91)	86	406 (300)	1380 (1018)	35	1360/39	9838 (2212)	2.3
3.65 (4.89)	66 64	528 (390) 545 (402)	1380 (1018) 2300 (1697)	45 47	136/3 515/11	1852 (416) 14923 (3355)	1.7 2.8
3.70 (4.96)	44	802 (592)	4140 (3054)	69	620/9	23146 (5203)	3.4
4.73 (6.34)	774	58.3 (43.0)	251 (185)	3.9	190/49	1671 (376)	2.5
4.72 (6.33)	512 324	88.1 (65.1) 139 (103)	288 (212) 550 (406)	5.9 9.3	2584/441 3445/372	1917 (431) 3834 (862)	1.9 2.3
	322 191	140 (103) 236 (174)	350 (258) 920 (679)	9.3 15.5	3575/384 377/24	2237 (503) 5609 (1261)	1.4 2.2
	190	237 (175)	600 (443)	16	63/4	4576 (1029)	1.5
4.70 (6.30)	128	351 (259)	850 (627)	23	1495/64	6402 (1439)	1.4
4.71 (6.32)	120	375 (277)	1650 (1217)	25	5185/208	8797 (1978)	2.5
4.75 (6.37)	86	527 (389)	2300 (1697)	35	2700/77	13552 (3047)	2.5
4.71 (6.32)	66	682 (503)	1380 (1018)	45	136/3	10737 (2414)	1.2
4.72 (6.33)	64	704 (519)	2300 (1697)	47	515/11	14923 (3355)	1.9
4.77 (6.40)	44	1036 (764)	4140 (3054)	69	620/9	23146 (5203)	2.3

Gearbox size	Motor shaft height	1FK7 helical geared motors	Gearbox type	Type/gear shaft extension	Type of construction/ mounting position/ connector mounting position	Gearbox weight, approx.
	SH	Order No.	Order codes			kg (lb)
C302	100	1FK7100-5AF71-1 ■■ 5 - Z	D31	G . .	H . .	38.2 (84.2)
C302	100	1FK7100-5AF71-1 ■■ 5 - Z	D32	G . .	H . .	38.2 (84.2)
C302	100	1FK7100-5AF71-1 ■■ 5 - Z	D33	G . .	H . .	38.2 (84.2)
C302	100	1FK7100-5AF71-1 ■■ 5 - Z	D34	G . .	H . .	38.2 (84.2)
C402	100	1FK7100-5AF71-1 ■■ 5 - Z	D44	G . .	H . .	48.4 (107)
C502	100	1FK7100-5AF71-1 ■■ 5 - Z	D55	G . .	H . .	60.0 (132)
C402	100	1FK7100-5AF71-1 ■■ 5 - Z	D45	G . .	H . .	48.4 (107)
C612	100	1FK7100-5AF71-1 ■■ 5 - Z	D66	G . .	H . .	75.3 (166)
C612	100	1FK7100-5AF71-1 ■■ 5 - Z	D67	G . .	H . .	75.3 (166)
C712	100	1FK7100-5AF71-1 ■■ 5 - Z	D77	G . .	H . .	110.6 (244)
C812	100	1FK7100-5AF71-1 ■■ 5 - Z	D88	G . .	H . .	170.2 (375)
C302	100	1FK7101-5AF71-1 ■■ 5 - Z	D31	G . .	H . .	43.8 (96.6)
C302	100	1FK7101-5AF71-1 ■■ 5 - Z	D32	G . .	H . .	43.8 (96.6)
C402	100	1FK7101-5AF71-1 ■■ 5 - Z	D43	G . .	H . .	43.8 (96.6)
C302	100	1FK7101-5AF71-1 ■■ 5 - Z	D33	G . .	H . .	54.0 (119)
C502	100	1FK7101-5AF71-1 ■■ 5 - Z	D54	G . .	H . .	65.6 (145)
C402	100	1FK7101-5AF71-1 ■■ 5 - Z	D44	G . .	H . .	54.0 (119)
C502	100	1FK7101-5AF71-1 ■■ 5 - Z	D55	G . .	H . .	65.6 (145)
C612	100	1FK7101-5AF71-1 ■■ 5 - Z	D65	G . .	H . .	80.9 (178)
C712	100	1FK7101-5AF71-1 ■■ 5 - Z	D76	G . .	H . .	116.2 (256)
C612	100	1FK7101-5AF71-1 ■■ 5 - Z	D67	G . .	H . .	80.9 (178)
C712	100	1FK7101-5AF71-1 ■■ 5 - Z	D77	G . .	H . .	116.2 (256)
C812	100	1FK7101-5AF71-1 ■■ 5 - Z	D88	G . .	H . .	175.8 (388)

Encoder systems for motors without DRIVE-CLiQ interface:	IC2048S/R encoder	A
	AM2048S/R encoder	E
	AM32S/R encoder	G
	Multi-pole resolver	S
	2-pole resolver	T
Encoder systems for motors with DRIVE-CLiQ interface:	IC22DQ encoder	D
	AM22DQ encoder	F
	AM16DQ encoder	K
	R15DQ resolver	U
	R14DQ resolver	P
Holding brake:	Motor without holding brake	U
	Motor with holding brake	V

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Order codes for type/ gear shaft extension and type of construction/mounting position/ connector mounting position, see page 4/86.

1FK7 helical geared motors

Selection and ordering data

Power at duty type S3-60 %	Output speed at the gear shaft	Rated output torque gearbox at duty type S3-60 %	Acceleration torque, max. gearbox	Nominal ratio	Exact ratio	Cantilever force, perm., gear shaft extension	Overload factor
P_2	n_2	M_2	M_{2max}	i_{nom}	i_{exact}	$F_{rpermiss}$	f_B
kW (HP)	rpm	Nm (lb_f-ft)	Nm (lb_f-ft)			N (lb_f)	
Natural cooling – SH 100							
5.19 (6.96)	644	77 (56.8)	251 (185)	3.9	190/49	1671 (376)	1.9
5.18 (6.95)	423	117 (86.3)	288 (212)	5.9	2584/441	1917 (431)	2.0
5.19 (6.96)	424	117 (86.3)	420 (310)	5.9	377/64	3297 (741)	1.4
5.18 (6.95)	269	184 (136)	350 (258)	9.3	3575/384	2237 (503)	2.5
5.20 (6.97)	241	206 (152)	850 (627)	9.3	3445/372	4886 (1098)	1.1
5.21 (6.99)	159	313 (231)	600 (443)	16	63/4	4576 (1029)	1.1
5.19 (6.96)	154	322 (238)	1650 (1217)	16	1037/64	7620 (1713)	2.9
5.20 (6.97)	107	464 (342)	850 (627)	23	1495/64	6402 (1439)	1.9
5.19 (6.96)	100	496 (366)	1650 (1217)	25	5185/208	8797 (1978)	1.1
5.23 (7.01)	72 71	694 (512) 703 (519)	1380 (1018) 4140 (3054)	35 35	1360/39 106/3	9838 (2212) 18528 (4165)	3.4 1.1
5.17 (6.93)	53	931 (687)	2300 (1697)	47	515/11	14923 (3355)	2.2
5.18 (6.95)	46	1076 (794)	4140 (3054)	54	704/13	21362 (4802)	1.2
5.16 (6.92)	36	1370 (1011)	4140 (3054)	69	620/9	23146 (5203)	1.1
7.92 (10.6)	770	98.2 (72.4)	366 (270)	3.9	841/216	2872 (646)	2.0
7.93 (10.6)	774	97.8 (72.1)	251 (185)	3.9	190/49	1671 (377)	1.4
7.95 (10.7)	513	148 (109)	650 (479)	5.9	117/20	4036 (907)	2.4
7.93 (10.6)	512	148 (109)	288 (212)	5.9	2584/441	1917 (431)	1.1
7.94 (10.7)	324 324	234 (173) 234 (173)	850 (627) 550 (406)	9.3 9.3	3445/372 3445/372	4703 (1057) 3834 (862)	2.0 1.3
7.92 (10.6)	191 185	396 (292) 409 (302)	920 (679) 1650 (1217)	16 16	377/24 1037/64	5609 (1261) 7620 (1713)	1.3 2.2
7.90 (10.6)	129 120	585 (432) 629 (464)	2300 (1697) 1650 (1217)	23 25	255/11 5185/208	11806 (2654) 8797 (1978)	2.1 1.4
7.93 (10.6)	85	891 (657)	4140 (3054)	36	106/3	18528 (4165)	2.5
7.96 (10.7)	86	884 (652)	2300 (1697)	35	2700/77	13552 (3047)	1.4
7.93 (10.6)	66	1148 (847)	4140 (3054)	46	592/13	20163 (4533)	2.0
7.91 (10.6)	64	1181 (871)	2300 (1697)	47	515/11	14923 (3355)	1.1
8.00 (10.7)	44	1737 (1281)	4140 (3054)	69	620/9	23146 (5203)	1.3

Gearbox size	Motor shaft height	1FK7 helical geared motors	Gearbox type	Type/gear shaft extension	Type of construction/ mounting position/ connector mounting position	Gearbox weight, approx.
	SH	Order No.	Order codes			kg (lb)
C302	100	**1FK7103-5AF71-1 ■■ 5 - Z**	**D31**	**G . .**	**H . .**	50.4 (111)
C302	100	**1FK7103-5AF71-1 ■■ 5 - Z**	**D32**	**G . .**	**H . .**	50.4 (111)
C402	100	**1FK7103-5AF71-1 ■■ 5 - Z**	**D42**	**G . .**	**H . .**	60.6 (134)
C302	100	**1FK7103-5AF71-1 ■■ 5 - Z**	**D33**	**G . .**	**H . .**	50.4 (111)
C502	100	**1FK7103-5AF71-1 ■■ 5 - Z**	**D53**	**G . .**	**H . .**	72.2 (159)
C402	100	**1FK7103-5AF71-1 ■■ 5 - Z**	**D44**	**G . .**	**H . .**	60.6 (134)
C612	100	**1FK7103-5AF71-1 ■■ 5 - Z**	**D64**	**G . .**	**H . .**	87.5 (193)
C502	100	**1FK7103-5AF71-1 ■■ 5 - Z**	**D55**	**G . .**	**H . .**	72.2 (159)
C612	100	**1FK7103-5AF71-1 ■■ 5 - Z**	**D65**	**G . .**	**H . .**	87.5 (193)
C612	100	**1FK7103-5AF71-1 ■■ 5 - Z**	**D66**	**G . .**	**H . .**	87.5 (193)
C812	100	**1FK7103-5AF71-1 ■■ 5 - Z**	**D86**	**G . .**	**H . .**	182.4 (402)
C712	100	**1FK7103-5AF71-1 ■■ 5 - Z**	**D77**	**G . .**	**H . .**	122.8 (271)
C812	100	**1FK7103-5AF71-1 ■■ 5 - Z**	**D87**	**G . .**	**H . .**	182.4 (402)
C812	100	**1FK7103-5AF71-1 ■■ 5 - Z**	**D88**	**G . .**	**H . .**	182.4 (402)
C402	100	**1FK7105-5AF71-1 ■■ 5 - Z**	**D41**	**G . .**	**H . .**	70.6 (156)
C302	100	**1FK7105-5AF71-1 ■■ 5 - Z**	**D31**	**G . .**	**H . .**	60.4 (133)
C502	100	**1FK7105-5AF71-1 ■■ 5 - Z**	**D52**	**G . .**	**H . .**	82.2 (181)
C302	100	**1FK7105-5AF71-1 ■■ 5 - Z**	**D32**	**G . .**	**H . .**	60.4 (133)
C502	100	**1FK7105-5AF71-1 ■■ 5 - Z**	**D53**	**G . .**	**H . .**	82.2 (181)
C402	100	**1FK7105-5AF71-1 ■■ 5 - Z**	**D43**	**G . .**	**H . .**	70.6 (156)
C502	100	**1FK7105-5AF71-1 ■■ 5 - Z**	**D54**	**G . .**	**H . .**	82.2 (181)
C612	100	**1FK7105-5AF71-1 ■■ 5 - Z**	**D64**	**G . .**	**H . .**	97.5 (215)
C712	100	**1FK7105-5AF71-1 ■■ 5 - Z**	**D75**	**G . .**	**H . .**	132.8 (293)
C612	100	**1FK7105-5AF71-1 ■■ 5 - Z**	**D65**	**G . .**	**H . .**	97.5 (215)
C812	100	**1FK7105-5AF71-1 ■■ 5 - Z**	**D86**	**G . .**	**H . .**	192.4 (424)
C712	100	**1FK7105-5AF71-1 ■■ 5 - Z**	**D76**	**G . .**	**H . .**	132.8 (293)
C812	100	**1FK7105-5AF71-1 ■■ 5 - Z**	**D87**	**G . .**	**H . .**	192.4 (424)
C712	100	**1FK7105-5AF71-1 ■■ 5 - Z**	**D77**	**G . .**	**H . .**	132.8 (293)
C812	100	**1FK7105-5AF71-1 ■■ 5 - Z**	**D88**	**G . .**	**H . .**	192.4 (424)

Encoder systems for motors without DRIVE-CLiQ interface:	IC2048S/R encoder	**A**
	AM2048S/R encoder	**E**
	AM32S/R encoder	**G**
	Multi-pole resolver	**S**
	2-pole resolver	**T**
Encoder systems for motors with DRIVE-CLiQ interface:	IC22DQ encoder	**D**
	AM22DQ encoder	**F**
	AM16DQ encoder	**K**
	R15DQ resolver	**U**
	R14DQ resolver	**P**
Holding brake:	Motor without holding brake	**U**
	Motor with holding brake	**V**

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Order codes for type/ gear shaft extension and type of construction/mounting position/ connector mounting position, see page 4/86.

1FK7 offset-shaft geared motors

Selection and ordering data

Power at duty type S3-60 %	Output speed at the gear shaft	Rated output torque gearbox at duty type S3-60 %	Acceleration torque, max. gearbox	Nominal ratio	Exact ratio	Cantilever force, perm., gear shaft extension	Overload factor
P_2	n_2	M_2	M_{2max}	i_{nom}	i_{exact}	$F_{rpermiss}$	f_B
kW (HP)	rpm	Nm (lb_f-ft)	Nm (lb_f-ft)			N (lb_f)	
Natural cooling – SH 36/SH 48/SH 63							
0.30 (0.40)	696	4.07 (3.00)	24 (17.7)	4.3	56/13	1021 (230)	4.7
	464	6.11 (4.51)	33 (24.3)	6.5	84/13	1169 (263)	4.5
	275	10.3 (7.60)	52 (38.4)	11	273/25	1392 (313)	4.1
	221	12.9 (9.52)	62 (45.7)	13.5	231/17	1497 (337)	3.9
	130	21.8 (16.1)	114 (84.1)	23	3185/138	1786 (402)	4.2
	86	33.1 (24.4)	120 (88.5)	35	3575/102	2053 (462)	2.9
0.41 (0.55)	696	5.64 (4.16)	45 (33.2)	4.3	56/13	1021 (230)	6.7
	464	8.46 (6.24)	64 (47.2)	6.5	84/13	1169 (263)	6.3
	275	14.3 (10.5)	99 (73.0)	11	273/25	1392 (313)	5.8
	221	17.8 (13.1)	105 (77.4)	13.5	231/17	1497 (337)	5.0
	130	30.2 (22.3)	120 (88.5)	23	3185/138	1786 (402)	3.4
	86	45.9 (33.9)	120 (88.5)	35	3575/102	2053 (462)	2.2
0.79 (1.06)	696	10.9 (8.00)	45 (33.2)	4.3	56/13	1021 (230)	3.6
	464	16.3 (12.0)	64 (47.2)	6.5	84/13	1169 (263)	3.4
	275	27.5 (20.3)	99 (73.0)	11	273/25	1392 (313)	3.1
	221	34.3 (25.3)	105 (77.4)	13.5	231/17	1497 (337)	2.7
	130	58.2 (42.9)	120 (88.5)	23	3185/138	1786 (402)	1.8
	128	59.1 (43.6)	233 (172)	23	2320/99	2308 (519)	3.4
	86	88.4 (65.2)	120 (88.5)	35	3575/102	2053 (462)	1.2
	85	89.4 (65.9)	270 (199)	35	390/11	2650 (596)	2.6
1.43 (1.92)	696	19.6 (14.5)	80 (59.0)	4.3	56/13	1021 (230)	3.2
	464	29.5 (21.8)	91 (67.1)	6.5	84/13	1169 (263)	2.4
	275	49.8 (36.7)	105 (77.4)	11	273/25	1392 (313)	1.7
	278	49.3 (36.4)	196 (145)	11	7303/676	1783 (402)	3.1
	221	61.9 (45.7)	105 (77.4)	13.5	231/17	1497 (337)	1.3
	220	62.1 (45.8)	210 (155)	13.5	109/8	1927 (433)	2.6
	128	107 (78.9)	270 (199)	23	2320/99	2308 (519)	2.0
	85	162 (120)	270 (199)	35	390/11	2650 (596)	1.3
	86	160 (118)	450 (332)	35	7252/207	3666 (824)	2.2
2.22 (2.98)	696	30.5 (22.5)	80 (59.0)	4.3	56/13	1021 (230)	1.7
	464	45.8 (33.8)	91 (67.1)	6.5	84/13	1169 (263)	1.3
	540	39.3 (29.0)	112 (82.6)	5.6	5341/962	1428 (321)	1.9
	278	76.5 (56.4)	196 (145)	11	7303/676	1783 (401)	1.7
	220	96.5 (71.2)	210 (155)	13.5	109/8	1927 (433)	1.4
	128	166 (122)	270 (199)	23	2320/99	2308 (519)	1.1
	86	248 (183)	450 (332)	35	7252/207	3666 (824)	1.2

4

Gearbox size	Motor shaft height	1FK7 offset-shaft geared motors	Gearbox type	Type/gear shaft extension	Type of construction/ mounting position/ connector mounting position	Gearbox weight, approx.
	SH	Order No.	Order codes			kg (lb)
F102	36	1FK7032-5AK71-1 ■■ 5 - Z	C11	G . .	H . .	13.8 (30.4)
F102	36	1FK7032-5AK71-1 ■■ 5 - Z	C12	G . .	H . .	13.8 (30.4)
F102	36	1FK7032-5AK71-1 ■■ 5 - Z	C13	G . .	H . .	13.8 (30.4)
F102	36	1FK7032-5AK71-1 ■■ 5 - Z	C14	G . .	H . .	13.8 (30.4)
F102	36	1FK7032-5AK71-1 ■■ 5 - Z	C15	G . .	H . .	13.8 (30.4)
F102	36	1FK7032-5AK71-1 ■■ 5 - Z	C16	G . .	H . .	13.8 (30.4)
F102	48	1FK7040-5AK71-1 ■■ 5 - Z	C11	G . .	H . .	14.6 (32.2)
F102	48	1FK7040-5AK71-1 ■■ 5 - Z	C12	G . .	H . .	14.6 (32.2)
F102	48	1FK7040-5AK71-1 ■■ 5 - Z	C13	G . .	H . .	14.6 (32.2)
F102	48	1FK7040-5AK71-1 ■■ 5 - Z	C14	G . .	H . .	14.6 (32.2)
F102	48	1FK7040-5AK71-1 ■■ 5 - Z	C15	G . .	H . .	14.6 (32.2)
F102	48	1FK7040-5AK71-1 ■■ 5 - Z	C16	G . .	H . .	14.6 (32.2)
F102	48	1FK7042-5AF71-1 ■■ 5 - Z	C11	G . .	H . .	15.9 (35.1)
F102	48	1FK7042-5AF71-1 ■■ 5 - Z	C12	G . .	H . .	15.9 (35.1)
F102	48	1FK7042-5AF71-1 ■■ 5 - Z	C13	G . .	H . .	15.9 (35.1)
F102	48	1FK7042-5AF71-1 ■■ 5 - Z	C14	G . .	H . .	15.9 (35.1)
F102	48	1FK7042-5AF71-1 ■■ 5 - Z	C15	G . .	H . .	15.9 (35.1)
F202	48	1FK7042-5AF71-1 ■■ 5 - Z	C25	G . .	H . .	24.1 (53.1)
F102	48	1FK7042-5AF71-1 ■■ 5 - Z	C16	G . .	H . .	15.9 (35.1)
F202	48	1FK7042-5AF71-1 ■■ 5 - Z	C26	G . .	H . .	24.1 (53.1)
F102	63	1FK7060-5AF71-1 ■■ 5 - Z	C11	G . .	H . .	18.6 (41.0)
F102	63	1FK7060-5AF71-1 ■■ 5 - Z	C12	G . .	H . .	18.6 (41.0)
F102	63	1FK7060-5AF71-1 ■■ 5 - Z	C13	G . .	H . .	18.6 (41.0)
F202	63	1FK7060-5AF71-1 ■■ 5 - Z	C23	G . .	H . .	26.8 (59.1)
F102	63	1FK7060-5AF71-1 ■■ 5 - Z	C14	G . .	H . .	18.6 (41.0)
F202	63	1FK7060-5AF71-1 ■■ 5 - Z	C24	G . .	H . .	26.8 (59.1)
F202	63	1FK7060-5AF71-1 ■■ 5 - Z	C25	G . .	H . .	26.8 (59.1)
F202	63	1FK7060-5AF71-1 ■■ 5 - Z	C26	G . .	H . .	26.8 (59.1)
F302	63	1FK7060-5AF71-1 ■■ 5 - Z	C36	G . .	H . .	34.4 (75.9)
F102	63	1FK7063-5AF71-1 ■■ 5 - Z	C11	G . .	H . .	22.3 (49.2)
F102	63	1FK7063-5AF71-1 ■■ 5 - Z	C12	G . .	H . .	22.3 (49.2)
F202	63	1FK7063-5AF71-1 ■■ 5 - Z	C22	G . .	H . .	30.5 (67.3)
F202	63	1FK7063-5AF71-1 ■■ 5 - Z	C23	G . .	H . .	30.5 (67.3)
F202	63	1FK7063-5AF71-1 ■■ 5 - Z	C24	G . .	H . .	30.5 (67.3)
F202	63	1FK7063-5AF71-1 ■■ 5 - Z	C25	G . .	H . .	30.5 (67.3)
F302	63	1FK7063-5AF71-1 ■■ 5 - Z	C36	G . .	H . .	38.1 (84.0)

Encoder systems for motors without DRIVE-CLiQ interface:	IC2048S/R encoder	A
	AM2048S/R encoder (from shaft height 48)	E
	AM512S/R encoder (shaft height 36 only)	H
	AM32S/R encoder (from shaft height 48)	G
	AM16S/R encoder (shaft height 36 only)	J
	Multi-pole resolver	S
	2-pole resolver	T
Encoder systems for motors with DRIVE-CLiQ interface:	IC22DQ encoder	D
	AM22DQ encoder (from shaft height 48)	F
	AM20DQ encoder (shaft height 36 only)	L
	AM16DQ encoder (from shaft height 48)	K
	AM15DQ encoder (shaft height 36 only)	V
	R15DQ resolver	U
	R14DQ resolver	P
Holding brake:	Motor without holding brake	U
	Motor with holding brake	V

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Order codes for type/ gear shaft extension and type of construction/mounting position/ connector mounting position, see page 4/86.

1FK7 offset-shaft geared motors

Selection and ordering data

Power at duty type S3-60 %	Output speed at the gear shaft	Rated output torque gearbox at duty type S3-60 %	Acceleration torque, max. gearbox	Nominal ratio	Exact ratio	Cantilever force, perm., gear shaft extension	Overload factor
P_2	n_2	M_2	M_{2max}	i_{nom}	i_{exact}	$F_{rpermiss}$	f_B
kW (HP)	rpm	Nm (lb_f-ft)	Nm (lb_f-ft)			N (lb_f)	
Natural cooling – SH 80/SH 100							
2.08 (2.79)	540	36.6 (27.0)	173 (128)	5.6	5341/962	1428 (321)	4.0
	278	71.3 (52.6)	210 (155)	11	7303/676	1783 (401)	2.5
	220	89.9 (66.3)	210 (155)	13.5	109/8	1927 (433)	2.0
	128	155 (114)	270 (199)	23	2320/99	2308 (519)	1.5
	128	155 (114)	450 (332)	24	588/25	3210 (722)	2.5
	86	231 (170)	450 (332)	35	7252/207	3666 (824)	1.7
	86	231 (170)	700 (516)	35	2210/63	4523 (1017	2.6
3.20 (4.29)	540	56.5 (41.7)	173 (128)	5.6	5341/962	1428 (321)	2.0
	278	110 (81.1)	210 (155)	11	7303/676	1783 (401)	1.3
	278	110 (81.1)	350 (258)	11	1456/135	2475 (556)	2.1
	224	136 (100)	350 (258)	13.5	7696/575	2660 (598)	1.7
	221	138 (102)	550 (406)	13.5	5984/441	3296 (741)	2.6
	128	240 (177)	450 (332)	24	588/25	3210 (722)	1.2
	129	236 (174)	700 (516)	23	325/14	3942 (886)	1.9
	86	357 (263)	700 (516)	35	2210/63	4523 (1017)	1.3
	85	359 (265)	1100 (811)	35	845/24	6120 (1376)	2.0
3.66 (4.91)	516	67.7 (49.9)	482 (356)	5.8	3784/651	2484 (558)	4.8
	277	126 (92.9)	550 (406)	11	682/63	3057 (687)	2.9
	221	158 (117)	550 (406)	13.5	5984/441	3296 (741)	2.3
	129	270 (199)	700 (516)	23	325/14	3942 (886)	1.7
	129	271 (200)	1100 (811)	23	1885/81	5331 (1198)	2.7
	86	408 (301)	700 (516)	35	2210/63	4523 (1017)	1.1
4.72 (6.33)	516	87.4 (64.5)	482 (356)	5.8	3784/651	2484 (558)	3.2
	277	163 (120)	550 (406)	11	682/63	3057 (687)	1.9
	221	204 (151)	550 (406)	13.5	5984/441	3296 (741)	1.5
	220	205 (151	1000 (738)	13.5	871/64	4458 (1002)	2.8
	129	349 (257)	700 (516)	23	325/14	3942 (886)	1.2
	85	529 (390)	1100 (811)	35	845/24	6120 (1376)	1.2
5.20 (6.97)	430	115 (84.8)	482 (356)	5.8	3784/651	2484 (558)	2.4
	231	215 (159)	550 (406)	11	682/63	3057 (687)	1.5
	231	215 (159)	991 (731)	11	2077/192	4130 (928)	2.6
	184	269 (198)	550 (406)	13.5	5984/441	3296 (741)	1.2
	183	270 (199)	1000 (738)	13.5	871/64	4458 (1002)	2.1
	108	460 (339)	1100 (811)	23	1885/81	5331 (1198)	1.4
7.93 (10.6)	529	143 (106)	766 (565)	5.7	1407/248	3330 (749)	2.9
	516	147 (108)	482 (356)	6	3784/651	2484 (558)	1.8
	277	273 (201)	991 (731)	11	2077/192	4130 (928)	2.0
	277	273 (201)	550 (406)	11	682/63	3057 (687)	1.1
	220	343 (253)	1000 (738)	13.6	871/64	4458 (1002)	1.6
	129	587 (433)	1100 (811)	24	1885/81	5331 (1198)	1.0

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Gearbox size	Motor shaft height	1FK7 offset-shaft geared motors	Gearbox type	Type/gear shaft extension	Type of construction/ mounting position/ connector mounting position	Gearbox weight, approx.
	SH	Order No.	Order codes			kg (lb)
F202	80	1FK7080-5AF71-1 ■■ 5 - Z	C22	G . .	H . .	30.2 (66.6)
F202	80	1FK7080-5AF71-1 ■■ 5 - Z	C23	G . .	H . .	30.2 (66.6)
F202	80	1FK7080-5AF71-1 ■■ 5 - Z	C24	G . .	H . .	30.2 (66.6)
F202	80	1FK7080-5AF71-1 ■■ 5 - Z	C25	G . .	H . .	30.2 (66.6)
F302	80	1FK7080-5AF71-1 ■■ 5 - Z	C35	G . .	H . .	37.8 (83.4)
F302	80	1FK7080-5AF71-1 ■■ 5 - Z	C36	G . .	H . .	37.8 (83.4)
F402	80	1FK7080-5AF71-1 ■■ 5 - Z	C46	G . .	H . .	46.1 (102)
F202	80	1FK7083-5AF71-1 ■■ 5 - Z	C22	G . .	H . .	35.4 (78.1)
F202	80	1FK7083-5AF71-1 ■■ 5 - Z	C23	G . .	H . .	35.4 (78.1)
F302	80	1FK7083-5AF71-1 ■■ 5 - Z	C33	G . .	H . .	43.0 (94.8)
F302	80	1FK7083-5AF71-1 ■■ 5 - Z	C34	G . .	H . .	43.0 (94.8)
F402	80	1FK7083-5AF71-1 ■■ 5 - Z	C44	G . .	H . .	51.3 (113)
F302	80	1FK7083-5AF71-1 ■■ 5 - Z	C35	G . .	H . .	43.0 (94.8)
F402	80	1FK7083-5AF71-1 ■■ 5 - Z	C45	G . .	H . .	51.3 (113)
F402	80	1FK7083-5AF71-1 ■■ 5 - Z	C46	G . .	H . .	51.3 (113)
F602	80	1FK7083-5AF71-1 ■■ 5 - Z	C66	G . .	H . .	78.3 (173)
F402	100	1FK7100-5AF71-1 ■■ 5 - Z	C42	G . .	H . .	53.5 (118)
F402	100	1FK7100-5AF71-1 ■■ 5 - Z	C43	G . .	H . .	53.3 (118)
F402	100	1FK7100-5AF71-1 ■■ 5 - Z	C44	G . .	H . .	53.5 (118)
F402	100	1FK7100-5AF71-1 ■■ 5 - Z	C45	G . .	H . .	53.3 (118)
F602	100	1FK7100-5AF71-1 ■■ 5 - Z	C65	G . .	H . .	80.5 (178)
F402	100	1FK7100-5AF71-1 ■■ 5 - Z	C46	G . .	H . .	53.3 (118)
F402	100	1FK7101-5AF71-1 ■■ 5 - Z	C42	G . .	H . .	59.1 (130)
F402	100	1FK7101-5AF71-1 ■■ 5 - Z	C43	G . .	H . .	59.1 (130)
F402	100	1FK7101-5AF71-1 ■■ 5 - Z	C44	G . .	H . .	59.1 (130)
F602	100	1FK7101-5AF71-1 ■■ 5 - Z	C64	G . .	H . .	86.1 (190)
F402	100	1FK7101-5AF71-1 ■■ 5 - Z	C45	G . .	H . .	59.1 (130)
F602	100	1FK7101-5AF71-1 ■■ 5 - Z	C66	G . .	H . .	86.1 (190)
F402	100	1FK7103-5AF71-1 ■■ 5 - Z	C42	G . .	H . .	65.7 (145)
F402	100	1FK7103-5AF71-1 ■■ 5 - Z	C43	G . .	H . .	65.7 (145)
F602	100	1FK7103-5AF71-1 ■■ 5 - Z	C63	G . .	H . .	92.7 (204)
F402	100	1FK7103-5AF71-1 ■■ 5 - Z	C44	G . .	H . .	65.7 (145)
F602	100	1FK7103-5AF71-1 ■■ 5 - Z	C64	G . .	H . .	92.7 (145)
F602	100	1FK7103-5AF71-1 ■■ 5 - Z	C65	G . .	H . .	92.7 (145)
F602	100	1FK7105-5AF71-1 ■■ 5 - Z	C62	G . .	H . .	103 (227)
F402	100	1FK7105-5AF71-1 ■■ 5 - Z	C42	G . .	H . .	75.7 (167)
F602	100	1FK7105-5AF71-1 ■■ 5 - Z	C63	G . .	H . .	103 (227)
F402	100	1FK7105-5AF71-1 ■■ 5 - Z	C43	G . .	H . .	75.7 (167)
F602	100	1FK7105-5AF71-1 ■■ 5 - Z	C64	G . .	H . .	103 (227)
F602	100	1FK7105-5AF71-1 ■■ 5 - Z	C65	G . .	H . .	103 (227)

Encoder systems for motors without DRIVE-CLiQ interface:	IC2048S/R encoder	A
	AM2048S/R encoder	E
	AM32S/R encoder	G
	Multi-pole resolver	S
	2-pole resolver	T
Encoder systems for motors with DRIVE-CLiQ interface:	IC22DQ encoder	D
	AM22DQ encoder	F
	AM16DQ encoder	K
	R15DQ resolver	U
	R14DQ resolver	P
Holding brake:	Motor without holding brake	U
	Motor with holding brake	V

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Order codes for type/ gear shaft extension and type of construction/mounting position/ connector mounting position, see page 4/86.

1FK7 bevel geared motors

Selection and ordering data

Power at duty type S3-60 %	Output speed at the gear shaft	Rated output torque gearbox at duty type S3-60 %	Acceleration torque, max. gearbox	Nominal ratio	Exact ratio	Cantilever force, perm., gear shaft extension	Overload factor
P_2	n_2	M_2	M_{2max}	i_{nom}	i_{exact}	$F_{rpermiss}$	f_B
kW (HP)	rpm	Nm (lb_f-ft)	Nm (lb_f-ft)			N (lb_f)	
Natural cooling – SH 36/SH 48/SH 63							
0.30 (0.40)	750	3.78 (2.79)	22 (16.2)	4	4/1	1494 (336)	4.7
	500	5.68 (4.19)	31 (22.9)	6	6/1	1710 (384)	4.5
	296	9.59 (7.07)	48 (35.4)	10	507/50	2037 (458)	4.1
	179	15.8 (11.7)	73 (53.8)	16.5	117/7	2406 (541)	3.8
	129	22.0 (16.2)	102 (75.2)	23	1140/49	2686 (604)	3.8
	85	33.2 (24.5)	135 (99.6)	35	3686/105	3081 (693)	3.3
	65	43.7 (32.2)	185 (137)	46	1849/40	4053 (911)	3.4
	43	65.7 (48.5)	159 (117)	69	6665/96	4641 (1043)	2.0
0.41 (0.55)	750	5.24 (3.87)	42 (31.0)	4	4/1	1494 (336)	6.7
	500	7.86 (5.80)	59 (43.5)	6	6/1	1710 (384)	6.3
	296	13.3 (9.81)	92 (67.9)	10	507/50	2037 (458)	5.8
	179	21.9 (16.2)	122 (90.0)	16.5	117/7	2406 (541)	4.7
	129	30.5 (22.5)	135 (99.6)	23	1140/49	2686 (604)	3.7
	85	46.0 (33.9)	135 (99.6)	35	3686/105	3081 (693)	2.5
	65	60.5 (44.6)	220 (162)	46	1849/40	4053 (911)	3.1
0.79 (1.06)	750	10.1 (7.45)	42 (31.0)	4	4/1	1494 (336)	3.6
	500	15.1 (11.1)	59 (43.5)	6	6/1	1710 (384)	3.4
	296	25.6 (18.9)	92 (67.9)	10	507/50	2037 (458)	3.1
	179	42.2 (31.1)	122 (90.0)	16.5	117/7	2406 (541)	2.5
	129	58.7 (43.3)	135 (99.6)	23	1140/49	2686 (604)	2.0
	85	88.5 (65.3)	135 (99.6)	35	3686/105	3081 (693)	1.3
	87	87.1 (64.2)	220 (162)	35	1935/56	3678 (1043)	2.2
1.43 (1.92)	750	18.2 (13.4)	76 (56.1)	4	4/1	1494 (336)	3.3
	500	27.4 (20.2)	87 (64.2)	6	6/1	1710 (384)	2.5
	296	46.2 (34.1)	103 (76.0)	10	507/50	2037 (458)	1.8
	178	76.9 (56.7)	219 (162)	17	2967/176	2895 (651)	2.2
	129	106 (78.2)	220 (162)	23	2967/128	3220 (724)	1.6
	129	106 (78.2)	385 (284)	23	559/24	3762 (846)	2.8
	87	158 (117)	220 (162)	35	1935/56	3678 (1043)	1.1
	86	158 (117)	385 (284)	35	903/26	4298 (966)	1.9
	65	211 (156)	385 (284)	46	1849/40	4728 (1063)	1.4
	65	211 (156)	600 (443)	46	602/13	7570 (1702)	2.2
	46	290 (214)	1000 (738)	65	12586/195	10154 (2283)	2.7

Gearbox size	Motor shaft height	1FK7 bevel geared motors	Gearbox type	Type/gear shaft extension	Type of construction/ mounting position/ connector mounting position	Gearbox weight, approx.
	SH	Order No.	Order codes			kg (lb)
K102	36	1FK7032-5AK71-1 ■■ 5 - Z	B11	G . .	H . .	12.3 (27.1)
K102	36	1FK7032-5AK71-1 ■■ 5 - Z	B12	G . .	H . .	12.3 (27.1)
K102	36	1FK7032-5AK71-1 ■■ 5 - Z	B13	G . .	H . .	12.3 (27.1)
K102	36	1FK7032-5AK71-1 ■■ 5 - Z	B14	G . .	H . .	12.3 (27.1)
K102	36	1FK7032-5AK71-1 ■■ 5 - Z	B15	G . .	H . .	12.3 (27.1)
K102	36	1FK7032-5AK71-1 ■■ 5 - Z	B16	G . .	H . .	12.3 (27.1)
K202	36	1FK7032-5AK71-1 ■■ 5 - Z	B27	G . .	H . .	19.8 (43.7)
K202	36	1FK7032-5AK71-1 ■■ 5 - Z	B28	G . .	H . .	19.8 (43.7)
K102	48	1FK7040-5AK71-1 ■■ 5 - Z	B11	G . .	H . .	13.1 (28.9)
K102	48	1FK7040-5AK71-1 ■■ 5 - Z	B12	G . .	H . .	13.1 (28.9)
K102	48	1FK7040-5AK71-1 ■■ 5 - Z	B13	G . .	H . .	13.1 (28.9)
K102	48	1FK7040-5AK71-1 ■■ 5 - Z	B14	G . .	H . .	13.1 (28.9)
K102	48	1FK7040-5AK71-1 ■■ 5 - Z	B15	G . .	H . .	13.1 (28.9)
K102	48	1FK7040-5AK71-1 ■■ 5 - Z	B16	G . .	H . .	13.1 (28.9)
K202	48	1FK7040-5AK71-1 ■■ 5 - Z	B27	G . .	H . .	20.6 (45.4)
K102	48	1FK7042-5AF71-1 ■■ 5 - Z	B11	G . .	H . .	14.4 (31.8)
K102	48	1FK7042-5AF71-1 ■■ 5 - Z	B12	G . .	H . .	14.4 (31.8)
K102	48	1FK7042-5AF71-1 ■■ 5 - Z	B13	G . .	H . .	14.4 (31.8)
K102	48	1FK7042-5AF71-1 ■■ 5 - Z	B14	G . .	H . .	14.4 (31.8)
K102	48	1FK7042-5AF71-1 ■■ 5 - Z	B15	G . .	H . .	14.4 (31.8)
K102	48	1FK7042-5AF71-1 ■■ 5 - Z	B16	G . .	H . .	14.4 (31.8)
K202	48	1FK7042-5AF71-1 ■■ 5 - Z	B26	G . .	H . .	21.9 (48.3)
K102	63	1FK7060-5AF71-1 ■■ 5 - Z	B11	G . .	H . .	17.1 (37.7)
K102	63	1FK7060-5AF71-1 ■■ 5 - Z	B12	G . .	H . .	17.1 (37.7)
K102	63	1FK7060-5AF71-1 ■■ 5 - Z	B13	G . .	H . .	17.1 (37.7)
K202	63	1FK7060-5AF71-1 ■■ 5 - Z	B24	G . .	H . .	24.6 (54.2)
K202	63	1FK7060-5AF71-1 ■■ 5 - Z	B25	G . .	H . .	24.6 (54.2)
K302	63	1FK7060-5AF71-1 ■■ 5 - Z	B35	G . .	H . .	29.6 (65.3)
K202	63	1FK7060-5AF71-1 ■■ 5 - Z	B26	G . .	H . .	24.6 (54.2)
K302	63	1FK7060-5AF71-1 ■■ 5 - Z	B36	G . .	H . .	29.6 (65.3)
K302	63	1FK7060-5AF71-1 ■■ 5 - Z	B37	G . .	H . .	29.6 (65.3)
K402	63	1FK7060-5AF71-1 ■■ 5 - Z	B47	G . .	H . .	43.1 (95.0)
K513	63	1FK7060-5AF71-1 ■■ 5 - Z	B58	G . .	H . .	48.9 (108)

Encoder systems for motors without DRIVE-CLiQ interface:	IC2048S/R encoder	A
	AM2048S/R encoder (from shaft height 48)	E
	AM512S/R encoder (shaft height 36 only)	H
	AM32S/R encoder (from shaft height 48)	G
	AM16S/R encoder (shaft height 36 only)	J
	Multi-pole resolver	S
	2-pole resolver	T
Encoder systems for motors with DRIVE-CLiQ interface:	IC22DQ encoder	D
	AM22DQ encoder (from shaft height 48)	F
	AM20DQ encoder (shaft height 36 only)	L
	AM16DQ encoder (from shaft height 48)	K
	AM15DQ encoder (shaft height 36 only)	V
	R15DQ resolver	U
	R14DQ resolver	P
Holding brake:	Motor without holding brake	U
	Motor with holding brake	V

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Order codes for type/ gear shaft extension and type of construction/mounting position/ connector mounting position, see page 4/86.

1FK7 bevel geared motors

Selection and ordering data

Power at duty type S3-60 %	Output speed at the gear shaft	Rated output torque gearbox at duty type S3-60 %	Acceleration torque, max. gearbox	Nominal ratio	Exact ratio	Cantilever force, perm., gear shaft extension	Overload factor
P_2	n_2	M_2	M_{2max}	i_{nom}	i_{exact}	$F_{rpermiss}$	f_B
kW (HP)	rpm	Nm (lb_f-ft)	Nm (lb_f-ft)			N (lb_f)	
Natural cooling – SH 63/SH 80/SH 100							
2.22 (2.98)	750	28.3 (20.9)	76 (56.1)	4	4/1	1494 (336)	1.8
	750	28.3 (20.9)	83 (61.2)	4	4/1	1793 (403)	2.0
	500	42.5 (31.3)	87 (64.2)	6	6/1	1710 (384)	1.4
	500	42.5 (31.3)	128 (94.4)	6	6/1	2394 (538)	2.0
	324	65.6 (48.4)	186 (137)	9.3	1075/116	2767 (622)	1.9
	178	119 (87.8)	219 (162)	17	2967/176	2895 (651)	1.2
	129	165 (122)	385 (284)	23	559/24	3762 (846)	1.5
	86	246 (181)	385 (284)	35	903/26	4298 (966)	1.0
	65	328 (242)	600 (443)	46	602/13	7570 (1702)	1.2
2.17 (2.91)	46	450 (332)	1000 (738)	65	12586/195	10154 (2283)	1.5
2.07 (2.78)	750	26.4 (19.5)	135 (99.6)	4	4/1	1793 (403)	4.4
	500	39.6 (29.2)	155 (114)	6	6/1	2052 (461)	3.3
	298	66.4 (49.0)	184 (136)	10	2881/286	2439 (548)	2.4
	177	112 (82.6)	384 (283)	17	559/33	3383 (761)	2.9
	129	153 (113)	220 (162)	23	2967/128	3220 (724)	1.2
	129	154 (114)	385 (284)	23	559/24	3762 (846)	2.1
	86	229 (169)	600 (443)	35	4171/120	6879 (1546)	2.2
2.03 (2.72)	62	313 (231)	1000 (738)	48	2697/56	9210 (2071)	2.7
	39	495 (365)	1600 (1180)	76	126697/1664	12763 (2869)	2.7
3.20 (4.29)	750	40.7 (30.0)	135 (99.6)	4	4/1	1793 (403)	2.2
	500	61.1 (45.1)	155 (114)	6	6/1	2052 (461)	1.7
	500	61.1 (45.1)	271 (200)	6	6/1	2394 (538)	2.9
	298	103 (76.0)	184 (136)	10	2881/286	2439 (548)	1.2
	324	94.4 (69.6)	314 (232)	9.3	1075/116	2767 (622)	2.2
	177	173 (128)	384 (283)	17	559/33	3383 (761)	1.5
	177	173 (128)	575 (424)	17	559/33	5414 (1217)	2.2
	129	237 (175)	385 (284)	23	559/24	3762 (846)	1.1
3.14 (4.21)	123	244 (180)	1000 (738)	24	11687/480	7337 (1649)	2.7
	93	324 (239)	1000 (738)	32	20677/640	8062 (1812)	2.0
	62	483 (356)	1000 (738)	48	2697/56	9210 (2071)	1.4
	63	479 (353)	1600 (1180)	48	39711/832	10923 (2456)	2.2
	46	648 (478)	1000 (738)	65	12586/195	10154 (2283)	1.0
	46	651 (480)	2574 (1899)	65	33201/512	16635 (3740)	2.6
3.19 (4.28)	86	354 (261)	600 (443)	35	4171/120	6879 (1546)	1.1
3.66 (4.91)	750	46.6 (34.4)	356 (263)	4	4/1	3346 (752)	5.1
	500	69.8 (51.5)	407 (300)	6	6/1	3830 (861)	3.9
	297	118 (87.0)	484 (357)	10	1333/132	4556 (1024)	2.7
	177	197 (145)	575 (424)	17	559/33	5414 (1217)	1.9
	129	271 (200)	600 (443)	23	559/24	6020 (1353)	1.5
3.60 (4.83)	123	279 (206)	1000 (738)	24	11687/480	7337 (1649)	2.4
	93	371 (274)	1000 (738)	32	20677/640	8062 (1812)	1.8
	87	397 (293)	1600 (1180)	35	35441/1024	9813 (2206)	2.7
	60	572 (422)	2600 (1918)	50	166005/3328	15242 (3427)	3.0
	46	744 (549)	2600 (1918)	65	33201/512	16635 (3740)	2.3

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Gearbox size	Motor shaft height	1FK7 bevel geared motors	Gearbox type	Type/gear shaft extension	Type of construction/ mounting position/ connector mounting position	Gearbox weight, approx.
	SH	Order No.	Order codes			kg (lb)
K102	63	1FK7063-5AF71-1 ■■ 5 - Z	B11	G . .	H . .	20.8 (45.9)
K202	63	1FK7063-5AF71-1 ■■ 5 - Z	B21	G . .	H . .	28.3 (62.4)
K102	63	1FK7063-5AF71-1 ■■ 5 - Z	B12	G . .	H . .	20.8 (45.9)
K302	63	1FK7063-5AF71-1 ■■ 5 - Z	B32	G . .	H . .	33.3 (73.4)
K302	63	1FK7063-5AF71-1 ■■ 5 - Z	B33	G . .	H . .	33.3 (73.4)
K202	63	1FK7063-5AF71-1 ■■ 5 - Z	B24	G . .	H . .	28.3 (62.4)
K302	63	1FK7063-5AF71-1 ■■ 5 - Z	B35	G . .	H . .	33.3 (73.4)
K302	63	1FK7063-5AF71-1 ■■ 5 - Z	B36	G . .	H . .	33.3 (73.4)
K402	63	1FK7063-5AF71-1 ■■ 5 - Z	B47	G . .	H . .	46.8 (103)
K513	63	1FK7063-5AF71-1 ■■ 5 - Z	B58	G . .	H . .	52.6 (116)
K202	80	1FK7080-5AF71-1 ■■ 5 - Z	B21	G . .	H . .	28.0 (61.7)
K202	80	1FK7080-5AF71-1 ■■ 5 - Z	B22	G . .	H . .	28.0 (61.7)
K202	80	1FK7080-5AF71-1 ■■ 5 - Z	B23	G . .	H . .	28.0 (61.7)
K302	80	1FK7080-5AF71-1 ■■ 5 - Z	B34	G . .	H . .	33.0 (72.8)
K202	80	1FK7080-5AF71-1 ■■ 5 - Z	B25	G . .	H . .	28.0 (61.7)
K302	80	1FK7080-5AF71-1 ■■ 5 - Z	B35	G . .	H . .	33.0 (72.8)
K402	80	1FK7080-5AF71-1 ■■ 5 - Z	B46	G . .	H . .	46.5 (103)
K513	80	1FK7080-5AF71-1 ■■ 5 - Z	B57	G . .	H . .	52.3 (115)
K613	80	1FK7080-5AF71-1 ■■ 5 - Z	B68	G . .	H . .	73.8 (163)
K202	80	1FK7083-5AF71-1 ■■ 5 - Z	B21	G . .	H . .	33.2 (73.2)
K202	80	1FK7083-5AF71-1 ■■ 5 - Z	B22	G . .	H . .	33.2 (73.2)
K302	80	1FK7083-5AF71-1 ■■ 5 - Z	B32	G . .	H . .	38.2 (84.2)
K202	80	1FK7083-5AF71-1 ■■ 5 - Z	B23	G . .	H . .	33.2 (73.2)
K302	80	1FK7083-5AF71-1 ■■ 5 - Z	B33	G . .	H . .	38.2 (84.2)
K302	80	1FK7083-5AF71-1 ■■ 5 - Z	B34	G . .	H . .	38.2 (84.2)
K402	80	1FK7083-5AF71-1 ■■ 5 - Z	B44	G . .	H . .	51.7 (114)
K302	80	1FK7083-5AF71-1 ■■ 5 - Z	B35	G . .	H . .	38.2 (84.2)
K513	80	1FK7083-5AF71-1 ■■ 5 - Z	B55	G . .	H . .	57.5 (127)
K513	80	1FK7083-5AF71-1 ■■ 5 - Z	B56	G . .	H . .	57.5 (127)
K513	80	1FK7083-5AF71-1 ■■ 5 - Z	B57	G . .	H . .	57.5 (127)
K613	80	1FK7083-5AF71-1 ■■ 5 - Z	B67	G . .	H . .	79.0 (174)
K513	80	1FK7083-5AF71-1 ■■ 5 - Z	B58	G . .	H . .	57.5 (127)
K713	80	1FK7083-5AF71-1 ■■ 5 - Z	B78	G . .	H . .	107.3 (237)
K402	80	1FK7083-5AF71-1 ■■ 5 - Z	B46	G . .	H . .	51.7 (114)
K402	100	1FK7100-5AF71-1 ■■ 5 - Z	B41	G . .	H . .	53.9 (119)
K402	100	1FK7100-5AF71-1 ■■ 5 - Z	B42	G . .	H . .	53.9 (119)
K402	100	1FK7100-5AF71-1 ■■ 5 - Z	B43	G . .	H . .	53.9 (119)
K402	100	1FK7100-5AF71-1 ■■ 5 - Z	B44	G . .	H . .	53.9 (119)
K402	100	1FK7100-5AF71-1 ■■ 5 - Z	B45	G . .	H . .	53.9 (119)
K513	100	1FK7100-5AF71-1 ■■ 5 - Z	B55	G . .	H . .	59.7 (132)
K513	100	1FK7100-5AF71-1 ■■ 5 - Z	B56	G . .	H . .	59.7 (132)
K613	100	1FK7100-5AF71-1 ■■ 5 - Z	B66	G . .	H . .	81.2 (179)
K713	100	1FK7100-5AF71-1 ■■ 5 - Z	B77	G . .	H . .	109.5 (241)
K713	100	1FK7100-5AF71-1 ■■ 5 - Z	B78	G . .	H . .	109.5 (241)

Encoder systems for motors without DRIVE-CLiQ interface:	IC2048S/R encoder	A
	AM2048S/R encoder	E
	AM32S/R encoder	G
	Multi-pole resolver	S
	2-pole resolver	T
Encoder systems for motors with DRIVE-CLiQ interface:	IC22DQ encoder	D
	AM22DQ encoder	F
	AM16DQ encoder	K
	R15DQ resolver	U
	R14DQ resolver	P
Holding brake:	Motor without holding brake	U
	Motor with holding brake	V

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Order codes for type/ gear shaft extension and type of construction/mounting position/ connector mounting position, see page 4/86.

1FK7 bevel geared motors

Selection and ordering data

Power at duty type S3-60 %	Output speed at the gear shaft	Rated output torque gearbox at duty type S3-60 %	Acceleration torque, max. gearbox	Nominal ratio	Exact ratio	Cantilever force, perm., gear shaft extension	Overload factor
P_2	n_2	M_2	M_{2max}	i_{nom}	i_{exact}	$F_{rpermiss}$	f_B
kW (HP)	rpm	Nm (lb_f-ft)	Nm (lb_f-ft)			N (lb_f)	
Natural cooling – SH 100							
4.72 (6.33)	750	60.1 (44.3)	356 (263)	4	4/1	3346 (752)	3.4
	500	90.2 (66.5)	407 (300)	6	6/1	3830 (861)	2.6
	297	152 (112)	484 (357	10	1333/132	4556 (1024)	1.8
	177	255 (188)	575 (424)	17	559/33	5414 (1217)	1.3
4.66 (6.25)	186	238 (176)	1000 (738)	16	26071/1620	6391 (1437)	2.4
	123	361 (266)	1000 (738)	24	11687/480	7337 (1649)	1.6
	125	356 (263)	1584 (1168)	24	24583/1024	8687 (1953)	2.6
	87	513 (378)	1600 (1180)	35	35441/1024	9813 (2206)	1.8
	85	525 (387)	2600 (1918)	35	567/16	13600 (3057)	2.8
4.64 (6.22)	60	739 (545)	2600 (1918)	50	166005/3328	15242 (3427)	2.0
4.63 (6.21)	46	961 (709)	2600 (1918)	65	33201/512	16635 (3740)	1.6
4.67 (6.26)	46	969 (714)	4650 (3430)	65	188387/2880	21991 (4944)	2.8
5.17 (6.93)	625	79 (58.3)	356 (263)	4	4/1	3346 (752)	2.5
5.20 (6.97)	417	119 (87.8)	407 (300)	6	6/1	3830 (861)	1.9
5.19 (6.96)	248	200 (148)	484 (357)	10	1333/132	4556 (1024)	1.4
5.13 (6.88)	246	199 (147)	900 (664)	10	203/20	5481 (1232)	2.6
	155	315 (232)	1000 (738)	16	26071/1620	6391 (1437)	1.8
	158	310 (229)	1380 (1018)	16	54839/3456	7567 (1701)	2.5
	103	477 (352)	1000 (738)	24	11687/480	7337 (1649)	1.2
	104	470 (347)	1584 (1168)	24	24583/1024	8687 (1953)	1.9
	72	678 (500)	1600 (1180)	35	35441/1024	9813 (2206)	1.3
5.16 (6.92)	71	694 (512)	2600 (1918)	35	567/16	13600 (3057)	2.1
5.12 (6.87)	50	978 (721)	2600 (1918)	50	166005/3328	15242 (3427)	1.5
5.13 (6.88)	51	960 (708)	4650 (3430)	49	5487/112	19971 (4490)	2.8
5.19 (6.96)	39	1271 (938)	2600 (1918)	65	33201/512	16635 (3740)	1.2
5.09 (6.83)	38	1280 (944)	4650 (3430)	65	188387/2880	21991 (4944)	2.1
7.93 (10.6)	750	101 (74.5)	356 (263)	4	4/1	3346 (752)	1.9
	500	151 (111)	407 (300)	6	6/1	3830 (861)	1.5
7.81 (10.5)	296	252 (186)	900 (664)	10	203/20	5481 (1232)	1.9
7.93 (10.6)	297	255 (188)	484 (357)	10	1333/132	4556 (1024)	1.0
7.80 (10.5)	189	394 (291)	1380 (1018)	16	54839/3456	7567 (1701)	1.9
	186	400 (295)	1000 (738)	16	26071/1620	6391 (1437)	1.4
	125	597 (440)	1584 (1168)	24	24583/1024	8687 (1953)	1.4
	119	626 (462)	2600 (1918)	25	64449/2560	12135 (2728)	2.3
7.84 (10.5)	85	881 (650)	2600 (1918)	35	567/16	3276 (736)	1.6
7.80 (10.5)	83	898 (662)	4255 (3139)	36	2891/80	18045 (4057)	2.6
	61	1218 (898)	4650 (3430)	49	5487/112	19971 (4490)	2.1
	60	1240 (915)	2600 (1918)	50	166005/3328	15242 (3427)	1.1
7.83 (10.5)	46	1626 (1199)	4650 (3430)	65	188387/2880	21991 (4944)	1.5

4

Gearbox size	Motor shaft height	1FK7 bevel geared motors	Gearbox type	Type/gear shaft extension	Type of construction/ mounting position/ connector mounting position	Gearbox weight, approx.
	SH	Order No.	Order codes			kg (lb)
K402	100	1FK7101-5AF71-1 ■■ 5 - Z	B41	G . .	H . .	59.5 (131)
K402	100	1FK7101-5AF71-1 ■■ 5 - Z	B42	G . .	H . .	59.5 (131)
K402	100	1FK7101-5AF71-1 ■■ 5 - Z	B43	G . .	H . .	59.5 (131)
K402	100	1FK7101-5AF71-1 ■■ 5 - Z	B44	G . .	H . .	59.5 (131)
K513	100	1FK7101-5AF71-1 ■■ 5 - Z	B54	G . .	H . .	65.3 (144)
K513	100	1FK7101-5AF71-1 ■■ 5 - Z	B55	G . .	H . .	65.3 (144)
K613	100	1FK7101-5AF71-1 ■■ 5 - Z	B65	G . .	H . .	86.8 (191)
K613	100	1FK7101-5AF71-1 ■■ 5 - Z	B66	G . .	H . .	86.8 (191)
K713	100	1FK7101-5AF71-1 ■■ 5 - Z	B76	G . .	H . .	115.1 (254)
K713	100	1FK7101-5AF71-1 ■■ 5 - Z	B77	G . .	H . .	115.1 (254)
K713	100	1FK7101-5AF71-1 ■■ 5 - Z	B78	G . .	H . .	115.1 (254)
K813	100	1FK7101-5AF71-1 ■■ 5 - Z	B88	G . .	H . .	168.5 (372)
K402	100	1FK7103-5AF71-1 ■■ 5 - Z	B41	G . .	H . .	66.1 (146)
K402	100	1FK7103-5AF71-1 ■■ 5 - Z	B42	G . .	H . .	66.1 (146)
K402	100	1FK7103-5AF71-1 ■■ 5 - Z	B43	G . .	H . .	66.1 (146)
K513	100	1FK7103-5AF71-1 ■■ 5 - Z	B53	G . .	H . .	71.9 (159)
K513	100	1FK7103-5AF71-1 ■■ 5 - Z	B54	G . .	H . .	71.9 (159)
K613	100	1FK7103-5AF71-1 ■■ 5 - Z	B64	G . .	H . .	93.4 (206)
K513	100	1FK7103-5AF71-1 ■■ 5 - Z	B55	G . .	H . .	71.9 (159)
K613	100	1FK7103-5AF71-1 ■■ 5 - Z	B65	G . .	H . .	93.4 (206)
K613	100	1FK7103-5AF71-1 ■■ 5 - Z	B66	G . .	H . .	93.4 (206)
K713	100	1FK7103-5AF71-1 ■■ 5 - Z	B76	G . .	H . .	121.7 (268)
K713	100	1FK7103-5AF71-1 ■■ 5 - Z	B77	G . .	H . .	121.7 (268)
K813	100	1FK7103-5AF71-1 ■■ 5 - Z	B87	G . .	H . .	175.1 (386)
K713	100	1FK7103-5AF71-1 ■■ 5 - Z	B78	G . .	H . .	121.7 (268)
K813	100	1FK7103-5AF71-1 ■■ 5 - Z	B88	G . .	H . .	175.1 (386)
K402	100	1FK7105-5AF71-1 ■■ 5 - Z	B41	G . .	H . .	76.1 (168)
K402	100	1FK7105-5AF71-1 ■■ 5 - Z	B42	G . .	H . .	76.1 (168)
K513	100	1FK7105-5AF71-1 ■■ 5 - Z	B53	G . .	H . .	82.0 (181)
K402	100	1FK7105-5AF71-1 ■■ 5 - Z	B43	G . .	H . .	76.1 (168)
K613	100	1FK7105-5AF71-1 ■■ 5 - Z	B64	G . .	H . .	103 (227)
K513	100	1FK7105-5AF71-1 ■■ 5 - Z	B54	G . .	H . .	82.0 (181)
K613	100	1FK7105-5AF71-1 ■■ 5 - Z	B65	G . .	H . .	103 (227)
K713	100	1FK7105-5AF71-1 ■■ 5 - Z	B75	G . .	H . .	132 (291)
K713	100	1FK7105-5AF71-1 ■■ 5 - Z	B76	G . .	H . .	132 (291)
K813	100	1FK7105-5AF71-1 ■■ 5 - Z	B86	G . .	H . .	185 (408)
K813	100	1FK7105-5AF71-1 ■■ 5 - Z	B87	G . .	H . .	185 (408)
K713	100	1FK7105-5AF71-1 ■■ 5 - Z	B77	G . .	H . .	132 (291)
K813	100	1FK7105-5AF71-1 ■■ 5 - Z	B88	G . .	H . .	185 (408)

Encoder systems for motors without DRIVE-CLiQ interface:	IC2048S/R encoder	A
	AM2048S/R encoder	E
	AM32S/R encoder	G
	Multi-pole resolver	S
	2-pole resolver	T
Encoder systems for motors with DRIVE-CLiQ interface:	IC22DQ encoder	D
	AM22DQ encoder	F
	AM16DQ encoder	K
	R15DQ resolver	U
	R14DQ resolver	P
Holding brake:	Motor without holding brake	U
	Motor with holding brake	V

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Order codes for type/ gear shaft extension and type of construction/mounting position/ connector mounting position, see page 4/86.

1FK7 worm geared motors

Selection and ordering data

Power at duty type S3-60 %	Output speed at the gear shaft	Rated output torque gearbox at duty type S3-60 %	Acceleration torque, max. gearbox	Nominal ratio	Exact ratio	Cantilever force, perm., gear shaft extension	Overload factor
P_2	n_2	M_2	M_{2max}	i_{nom}	i_{exact}	$F_{rpermiss}$	f_B
kW (HP)	rpm	Nm (lb_f-ft)	Nm (lb_f-ft)			N (lb_f)	
Natural cooling – SH 36/SH 48/SH 63							
0.28 (0.38)	312	8.5 (6.27)	43 (31.7)	9.6	1107/115	1689 (380)	4.1
	172	15.3 (11.3)	73 (53.8)	17.5	297/17	1938 (436)	3.9
0.27 (0.36)	128	20.2 (14.9)	82 (60.5)	23	117/5	2271 (511)	3.3
	86	30.0 (22.1)	125 (92.2)	35	873/25	2441 (549)	3.4
0.24 (0.32)	51	45.6 (33.6)	88 (64.9)	59	117/2	3082 (693)	1.6
	52	45.8 (33.8)	172 (126.9)	58	405/7	2889 (649)	3.1
	40	57.7 (42.6)	96 (70.8)	75	747/10	3343 (752)	1.4
	43	54.8 (40.4)	184 (136)	70	279/4	3075 (691)	2.7
0.38 (0.51)	172	21.2 (15.6)	110 (81.1)	17.5	297/17	1938 (436)	4.4
	86	41.6 (30.7)	150 (111)	35	873/25	2441 (549)	3.0
0.35 (0.47)	52	63.4 (46.8)	172 (127)	58	405/7	2889 (649)	2.3
	43	75.9 (56.0)	184 (136)	70	279/4	3075 (691)	2.0
0.73 (0.98)	172	40.8 (30.1)	110 (81.1)	17.5	297/17	1938 (436)	2.3
	130	53.6 (39.5)	132 (97.4)	23	162/7	2128 (478)	2.1
0.72 (0.97)	86	80.1 (59.1)	150 (111)	35	873/25	2441 (549)	1.6
	86	79.9 (58.9)	252 (186)	35	243/7	3411 (767)	2.7
0.66 (0.89)	52	122 (90.0)	172 (127)	58	405/7	2889 (649)	1.2
0.69 (0.93)	52	126 (92.9)	302 (223)	58	1863/32	4053 (911)	2.1
0.66 (0.89)	43	146 (108)	184 (136)	70	279/4	3075 (691)	1.1
0.68 (0.91)	43	151 (111)	324 (239)	70	351/5	4314 (970)	1.9
1.35 (1.81)	326	39.5 (29.1)	74 (54.6)	9.2	46/5	1565 (352)	1.5
1.33 (1.78)	172	73.7 (54.4)	110 (81.1)	17.5	297/17	1938 (436)	1.2
	171	74.4 (54.9)	217 (160)	17.5	351/20	2717 (611)	2.3
1.31 (1.76)	129	97.9 (72.2)	259 (191)	23	1863/80	2986 (671)	2.1
	86	144 (106)	310 (229)	35	243/7	3411 (767)	1.7
	86	146 (108)	498 (367)	35	2268/65	4881 (1097)	2.7
1.24 (1.66)	52	227 (167)	302 (233)	58	1863/32	4053 (911)	1.0
	51	232 (171)	561 (414)	59	117/2	5799 (1304)	1.9
	43	275 (203)	609 (449)	70	2241/32	6157 (1384)	1.7
	43	277 (204)	791 (583)	70	279/4	7994 (1797)	2.2

Gearbox size	Motor shaft height SH	1FK7 worm geared motors Order No.	Gearbox type Order codes	Type/gear shaft extension	Type of construction/ mounting position/ connector mounting position	Gearbox weight, approx. kg (lb)
S002 S102	36 36	**1FK7032-5AK71-1 ■■ 5 - Z** **1FK7032-5AK71-1 ■■ 5 - Z**	**E03** **E14**	**G . .** **G . .**	**H . .** **H . .**	6.6 (14.6) 12.9 (28.4)
S002 S102	36 36	**1FK7032-5AK71-1 ■■ 5 - Z** **1FK7032-5AK71-1 ■■ 5 - Z**	**E05** **E16**	**G . .** **G . .**	**H . .** **H . .**	6.6 (14.6) 12.9 (28.4)
S002 S102	36 36	**1FK7032-5AK71-1 ■■ 5 - Z** **1FK7032-5AK71-1 ■■ 5 - Z**	**E07** **E17**	**G . .** **G . .**	**H . .** **H . .**	6.6 (14.6) 12.9 (28.4)
S002 S102	36 36	**1FK7032-5AK71-1 ■■ 5 - Z** **1FK7032-5AK71-1 ■■ 5 - Z**	**E08** **E18**	**G . .** **G . .**	**H . .** **H . .**	6.6 (14.6) 12.9 (28.4)
S102 S102	48 48	**1FK7040-5AK71-1 ■■ 5 - Z** **1FK7040-5AK71-1 ■■ 5 - Z**	**E14** **E16**	**G . .** **G . .**	**H . .** **H . .**	13.7 (30.2) 13.7 (30.2)
S102 S102	48 48	**1FK7040-5AK71-1 ■■ 5 - Z** **1FK7040-5AK71-1 ■■ 5 - Z**	**E17** **E18**	**G . .** **G . .**	**H . .** **H . .**	13.7 (30.2) 13.7 (30.2)
S102 S102	48 48	**1FK7042-5AF71-1 ■■ 5 - Z** **1FK7042-5AF71-1 ■■ 5 - Z**	**E14** **E15**	**G . .** **G . .**	**H . .** **H . .**	15.0 (33.1) 15.0 (33.1)
S102 S202	48 48	**1FK7042-5AF71-1 ■■ 5 - Z** **1FK7042-5AF71-1 ■■ 5 - Z**	**E16** **E26**	**G . .** **G . .**	**H . .** **H . .**	15.0 (33.1) 22.5 (49.6)
S102	48	**1FK7042-5AF71-1 ■■ 5 - Z**	**E17**	**G . .**	**H . .**	15.0 (33.1)
S202	48	**1FK7042-5AF71-1 ■■ 5 - Z**	**E27**	**G . .**	**H . .**	22.5 (49.6)
S102	48	**1FK7042-5AF71-1 ■■ 5 - Z**	**E18**	**G . .**	**H . .**	15.0 (33.1)
S202	48	**1FK7042-5AF71-1 ■■ 5 - Z**	**E28**	**G . .**	**H . .**	22.5 (49.6)
S102	63	**1FK7060-5AF71-1 ■■ 5 - Z**	**E13**	**G . .**	**H . .**	17.7 (39.0)
S102 S202	63 63	**1FK7060-5AF71-1 ■■ 5 - Z** **1FK7060-5AF71-1 ■■ 5 - Z**	**E14** **E24**	**G . .** **G . .**	**H . .** **H . .**	17.7 (39.0) 25.2 (55.6)
S202 S202 S302	63 63 63	**1FK7060-5AF71-1 ■■ 5 - Z** **1FK7060-5AF71-1 ■■ 5 - Z** **1FK7060-5AF71-1 ■■ 5 - Z**	**E25** **E26** **E36**	**G . .** **G . .** **G . .**	**H . .** **H . .** **H . .**	25.2 (55.6) 25.2 (55.6) 34.4 (75.9)
S202 S302	63 63	**1FK7060-5AF71-1 ■■ 5 - Z** **1FK7060-5AF71-1 ■■ 5 - Z**	**E27** **E37**	**G . .** **G . .**	**H . .** **H . .**	25.2 (55.6) 34.4 (75.9)
S302 S402	63 63	**1FK7060-5AF71-1 ■■ 5 - Z** **1FK7060-5AF71-1 ■■ 5 - Z**	**E38** **E48**	**G . .** **G . .**	**H . .** **H . .**	34.4 (75.9) 43.6 (96.1)

Encoder systems for motors without DRIVE-CLiQ interface:	IC2048S/R encoder	**A**
	AM2048S/R encoder (from shaft height 48)	**E**
	AM512S/R encoder (shaft height 36 only)	**H**
	AM32S/R encoder (from shaft height 48)	**G**
	AM16S/R encoder (shaft height 36 only)	**J**
	Multi-pole resolver	**S**
	2-pole resolver	**T**
Encoder systems for motors with DRIVE-CLiQ interface:	IC22DQ encoder	**D**
	AM22DQ encoder (from shaft height 48)	**F**
	AM20DQ encoder (shaft height 36 only)	**L**
	AM16DQ encoder (from shaft height 48)	**K**
	AM15DQ encoder (shaft height 36 only)	**V**
	R15DQ resolver	**U**
	R14DQ resolver	**P**
Holding brake:	Motor without holding brake	**U**
	Motor with holding brake	**V**

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Order codes for type/ gear shaft extension and type of construction/mounting position/ connector mounting position, see page 4/86.

1FK7 worm geared motors

Selection and ordering data

Power at duty type S3-60 %	Output speed at the gear shaft	Rated output torque gearbox at duty type S3-60 %	Acceleration torque, max. gearbox	Nominal ratio	Exact ratio	Cantilever force, perm., gear shaft extension	Overload factor
P_2	n_2	M_2	M_{2max}	i_{nom}	i_{exact}	$F_{rpermiss}$	f_B
kW (HP)	rpm	Nm (lb_f-ft)	Nm (lb_f-ft)			N (lb_f)	
Natural cooling – SH 63/SH 80/SH 100							
2.11 (2.83)	325	61.9 (45.7)	126 (92.9)	9.2	1431/155	2194 (493)	1.4
2.08 (2.79)	171	116 (85.6)	217 (160)	17.5	351/20	2717 (611)	1.2
2.05 (2.75)	129 86	152 (112) 227 (167)	259 (191) 498 (367)	23 35	1863/80 2268/65	2986 (671) 4881 (1097)	1.1 1.5
1.92 (2.57)	51	360 (266)	561 (414)	59	117/2	5799 (1304)	1.0
1.94 (2.60)	43	430 (317)	791 (583)	70	279/4	7994 (1797)	1.2
1.93 (2.59)	171	108 (79.7)	217 (160)	17.5	351/20	2717 (611)	1.7
	173 129	107 (78.9) 142 (105)	373 (275) 259 (191)	17.5 23	1998/115 1863/80	3869 (870) 2986 (671)	3.0 1.6
	128 86	144 (106) 213 (157)	458 (338) 720 (531)	23 35	117/5 873/25	4273 (961) 6347 (1427)	2.7 2.9
1.79 (2.40)	51 43	335 (247) 399 (294)	561 (414) 609 (449)	59 70	117/2 2241/32	5799 (1304) 6157 (1384)	1.4 1.3
3.05 (4.09)	322	90.5 (66.8)	216 (159)	9.3	270/29	3143 (707)	1.6
3.01 (4.04)	173	166 (122)	373 (275)	17.5	1998/115	3869 (870)	1.5
3.03 (4.06)	172	168 (124)	557 (411)	17.5	612/35	5040 (1133)	2.2
2.98 (4.00)	128 128	222 (164) 222 (164)	458 (338) 685 (505)	23 23	117/5 117/5	4273 (961) 5554 (1249)	1.4 2.0
2.95 (3.96)	86	328 (242)	720 (531)	35	873/25	6347 (1427)	1.4
3.47 (4.65)	259	128 (94.4)	371 (274)	11.5	81/7	4392 (987)	1.9
3.44 (4.61)	172	191 (141)	557 (411)	17.5	612/35	5040 (1133)	1.9
4.50 (6.03)	259	166 (122)	371 (274)	11.5	81/7	4392 (987)	1.3
4.45 (5.97)	172	247 (182)	557 (411)	17.5	612/35	5040 (1133)	1.3

Gearbox size	Motor shaft height	1FK7 worm geared motors	Gearbox type	Type/gear shaft extension	Type of construction/ mounting position/ connector mounting position	Gearbox weight, approx.
	SH	Order No.	Order codes			kg (lb)
S202	63	1FK7063-5AF71-1 ■■ 5 - Z	E23	G . .	H . .	28.9 (63.7)
S202	63	1FK7063-5AF71-1 ■■ 5 - Z	E24	G . .	H . .	28.9 (63.7)
S202 S302	63 63	1FK7063-5AF71-1 ■■ 5 - Z 1FK7063-5AF71-1 ■■ 5 - Z	E25 E36	G . . G . .	H . . H . .	28.9 (63.7) 38.1 (84.0)
S302	63	1FK7063-5AF71-1 ■■ 5 - Z	E37	G . .	H . .	38.1 (84.0)
S402	63	1FK7063-5AF71-1 ■■ 5 - Z	E48	G . .	H . .	47.3 (104)
S202	80	1FK7080-5AF71-1 ■■ 5 - Z	E24	G . .	H . .	28.6 (63.1)
S302 S202	80 80	1FK7080-5AF71-1 ■■ 5 - Z 1FK7080-5AF71-1 ■■ 5 - Z	E34 E25	G . . G . .	H . . H . .	37.8 (83.4) 28.6 (63.1)
S302 S402	80 80	1FK7080-5AF71-1 ■■ 5 - Z 1FK7080-5AF71-1 ■■ 5 - Z	E35 E46	G . . G . .	H . . H . .	37.8 (83.4) 47 (104)
S302 S302	80 80	1FK7080-5AF71-1 ■■ 5 - Z 1FK7080-5AF71-1 ■■ 5 - Z	E37 E38	G . . G . .	H . . H . .	37.8 (83.4) 37.8 (83.4)
S302	80	1FK7083-5AF71-1 ■■ 5 - Z	E33	G . .	H . .	43 (94.8)
S302	80	1FK7083-5AF71-1 ■■ 5 - Z	E34	G . .	H . .	43 (94.8)
S402	80	1FK7083-5AF71-1 ■■ 5 - Z	E44	G . .	H . .	52.2 (115)
S302 S402	80 80	1FK7083-5AF71-1 ■■ 5 - Z 1FK7083-5AF71-1 ■■ 5 - Z	E35 E45	G . . G . .	H . . H . .	43 (94.8) 52.2 (115)
S402	80	1FK7083-5AF71-1 ■■ 5 - Z	E46	G . .	H . .	52.2 (115)
S402	100	1FK7100-5AF71-1 ■■ 5 - Z	E43	G . .	H . .	54.4 (120)
S402	100	1FK7100-5AF71-1 ■■ 5 - Z	E44	G . .	H . .	54.4 (120)
S402	100	1FK7101-5AF71-1 ■■ 5 - Z	E43	G . .	H . .	60 (132)
S402	100	1FK7101-5AF71-1 ■■ 5 - Z	E44	G . .	H . .	60 (132)

Encoder systems for motors without DRIVE-CLiQ interface:	IC2048S/R encoder	**A**
	AM2048S/R encoder	**E**
	AM32S/R encoder	**G**
	Multi-pole resolver	**S**
	2-pole resolver	**T**
Encoder systems for motors with DRIVE-CLiQ interface:	IC22DQ encoder	**D**
	AM22DQ encoder	**F**
	AM16DQ encoder	**K**
	R15DQ resolver	**U**
	R14DQ resolver	**P**
Holding brake:	Motor without holding brake	**U**
	Motor with holding brake	**V**

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Order codes for type/ gear shaft extension and type of construction/mounting position/ connector mounting position, see page 4/86.

Order No. supplements – Order codes

When ordering a geared servomotor with options, **-Z** should be added to the order number.
The order code should also be specified for each additional required option.
The description of the option must not be repeated in plain text in the order.

1st Order code: Gearbox type

• Bevel gearbox K102 to K813	**B..**
• Offset-shaft gearbox F202 to F602	**C..**
• Helical gearbox C002 to C812	**D..**
• Worm gearbox S002 to S402	**E..**

Complete order code for gearbox type, refer to selection and ordering data

2nd order code, 1st and 2nd positions: Type

• Foot-mounted	**G 1** ■
• Tapped hole group	**G 2** ■
• Flange (round)	**G 3** ■
• Foot-mounted and flange (round)	**G 5** ■
• Foot-mounted and tapped hole group	**G 6** ■

2. order code, 3rd position: Gear shaft extension

Helical gearbox:	Offset-shaft gearbox:	Bevel and worm gearboxes:	
• Solid shaft with fitted key	• Solid shaft with fitted key, gearbox side 5	• Solid shaft with fitted key, gearbox side 4	**1**
	• Hollow shaft with keyway, insertion side 5	• Hollow shaft with keyway, insertion side 4	**3**
	• Hollow shaft with clamping element, shrink disk side 6, insertion side 5	• Hollow shaft with clamping element, shrink disk side 4, insertion side 3	**4**
		• Solid shaft with fitted key, gearbox side 3	**5**
		• Hollow shaft with keyway, insertion side 3	**7**
		• Hollow shaft with clamping element, shrink disk side 3, insertion side 4	**8**

3rd order code, 1st and 2nd positions: Type of construction/mounting position

Type of construction for helical gearboxes:	Mounting position for offset-shaft, bevel and worm gearboxes:	
• IM B3 / IM B5 / IM B14 / IM B34 / IM B35	• EL 1	**H 1** ■
• IM B7	• EL 2	**H 2** ■
• IM B8	• EL 3	**H 3** ■
• IM B6	• EL 4	**H 4** ■
• IM V1	• EL 5	**H 5** ■
• IM V3 / IM V6 / IM V19	• EL 6	**H 6** ■
• IM V5	–	**H 7** ■
• IM V18	–	**H 8** ■

3rd order code, 3rd position: Connector mounting position

• Connector position on gearbox side 2, top	**1**
• Connector position on gearbox side 4, right	**2**
• Connector position on gearbox side 1, below	**3**
• Connector position on gearbox side 3, left	**4**

For a diagram of the connector mounting position, see page 4/88.

Order No. supplements – Order codes

Permissible combinations for option Q.. with G2.

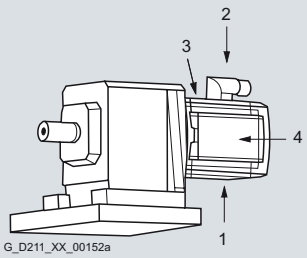
4th Order code: Torque bracket for bevel and worm gearboxes						
Torque bracket position	Gearbox type and size					
Side 1, eye side 4	K102/S102	**Q12**	**and**	**G23**	**or**	**G28**
Side 1, eye side 3	K102/S102	**Q13**		**G27**		**G24**
Side 5, eye side 4	K102/S102	**Q14**		**G23**		**G28**
Side 5, eye side 3	K102/S102	**Q15**		**G27**		**G24**
Side 2, eye side 4	K102	**Q16**		**G23**		**G28**
Side 2, eye side 3	K102	**Q17**		**G27**		**G24**
Side 1, eye side 4	K202/S202	**Q22**		**G23**		**G28**
Side 1, eye side 3	K202/S202	**Q23**		**G27**		**G24**
Side 5, eye side 4	K202/S202	**Q24**		**G23**		**G28**
Side 5, eye side 3	K202/S202	**Q25**		**G27**		**G24**
Side 1, eye side 4	K302/S302	**Q32**		**G23**		**G28**
Side 1, eye side 3	K302/S302	**Q33**		**G27**		**G24**
Side 5, eye side 4	K302/S302	**Q34**		**G23**		**G28**
Side 5, eye side 3	K302/S302	**Q35**		**G27**		**G24**
Side 1, eye side 4	K402/S402	**Q42**		**G23**		**G28**
Side 1, eye side 3	K402/S402	**Q43**		**G27**		**G24**
Side 5, eye side 4	K402/S402	**Q44**		**G23**		**G28**
Side 5, eye side 3	K402/S402	**Q45**		**G27**		**G24**
Side 1, eye side 4	K513	**Q52**		**G23**		**G28**
Side 1, eye side 3	K513	**Q53**		**G27**		**G24**
Side 5, eye side 4	K513	**Q54**		**G23**		**G28**
Side 5, eye side 3	K513	**Q55**		**G27**		**G24**
Side 1, eye side 4	K613	**Q62**		**G23**		**G28**
Side 1, eye side 3	K613	**Q63**		**G27**		**G24**
Side 5, eye side 4	K613	**Q64**		**G23**		**G28**
Side 5, eye side 3	K613	**Q65**		**G27**		**G24**
Side 1, eye side 4	K713	**Q72**		**G23**		**G28**
Side 1, eye side 3	K713	**Q73**		**G27**		**G24**
Side 5, eye side 4	K713	**Q74**		**G23**		**G28**
Side 5, eye side 3	K713	**Q75**		**G27**		**G24**
Side 1, eye side 4	K813	**Q82**		**G23**		**G28**
Side 1, eye side 3	K813	**Q83**		**G27**		**G24**
Side 5, eye side 4	K813	**Q84**		**G23**		**G28**
Side 5, eye side 3	K813	**Q85**		**G27**		**G24**

For a diagram with position of the torque bracket and position of the fixing eye, see page 4/88.

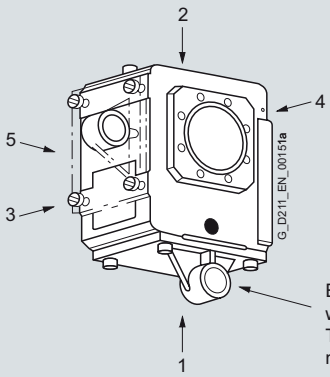
Order No. supplements – Order codes

5th order code, other options	
Paint finish: Jet black, matt RAL9005	**X01**
Paint finish: Cream white RAL 9001	**X02**
Paint finish: Reseda green RAL 6011	**X03**
Paint finish: Pebble gray RAL 7032	**X04**
Paint finish: Sky blue RAL 5015	**X05**
Paint finish: Light ivory RAL 1015	**X06**
Paint finish: Ash gray RAL 7000	**X07**
Paint finish: White aluminum RAL 9006	**X08**
Paint finish: Gentian blue RAL 5010	**X12**
Paint finish: Pure orange RAL 2004	**X19**
Food-grade gear oil	**Q90**

For option Q90, the Order No. for the geared servomotor must also be changed in the 16th position from 5 to 7: 1FK7...-5A.71-1..**7**-Z



Connector mounting position



Gearbox sides shown with position of the torque bracket and position of the fixing eye

Order No. supplements – Order codes

Permissible combinations for option G.. with H.. and Q..

Order code	Description	Permissible G options for gearbox type			Permissible H-Q options for gearbox type		
		Helical gear	Offset-shaft	Bevel gear/ worm	Helical gear	Offset-shaft	Bevel gear/ worm
G11	Foot-mounted, solid shaft with fitted key	✔			**H1. to H4. H6./H7.**		
G13	Footed-mounted, hollow shaft with keyway (insertion gearbox side 4)						
G14	Footed-mounted, hollow shaft with shrink disk (insertion gearbox side 4)						
G15	Foot-mounted, solid shaft with fitted key (gearbox side 3)						
G17	Footed-mounted, hollow shaft with keyway (insertion gearbox side 3)						
G18	Footed-mounted, hollow shaft with shrink disk (gearbox side 3)						
G21	Tapped hole group, solid shaft with keyway (gearbox side 4 for bevel and worm)	✔		✔ 1)	**H1./H6./H8.**		**H1. to H6.**
G23	Tapped hole group, hollow shaft with keyway (insertion gearbox side 5 for offset-shaft gearbox, insertion side 4 for bevel and worm)		✔	✔ 1)		**H1. to H6.**	**H1. to H6. Q..**
G24	Tapped hole group, hollow shaft with shrink disk (shrink disk on gearbox side 6 and insertion side 5 for offset-shaft gearbox; shrink disk on gearbox side 4 and insertion side 3 for bevel and worm)		✔	✔ 1)			
G25	Tapped hole group, solid shaft with fitted key (gearbox side 3)			✔ 1)			**H1. to H6.**
G27	Tapped hole group, hollow shaft with fitted key (insertion gearbox side 3)			✔ 1)			**H1. to H6. Q..**
G28	Tapped hole group, hollow shaft with clamping element (shrink disk on gearbox side 3 and insertion side 4 for bevel and worm)			✔ 1)			
G31	Flange (round), solid shaft with fitted key (gearbox side 5 for offset-shaft gearbox; side 4 for bevel and worm)	✔	✔	✔ 1)	**H1./H5./H6.**	**H1. to H6.**	**H1. to H6.**
G33	Flange (round), hollow shaft with keyway (insertion gearbox side 4)		✔	✔ 1)			
G34	Flange (round), hollow shaft with shrink disk, shrink disk on gearbox side 6 and insertion side 5 for offset-shaft gearbox; shrink disk on gearbox side 4 and insertion side 3 for bevel and worm)		✔	✔ 1)			
G35	Flange (round), solid shaft with fitted key (gearbox side 3)			✔ 1)			
G37	Flange (round), hollow shaft with keyway (insertion gearbox side 3)			✔ 1)			
G38	Flange (round), hollow shaft with clamping element (shrink disk on gearbox side 3 and insertion side 4 for bevel and worm)			✔			

1) Not for worm gear of gearbox size S002 (gearbox type E0.).

Order No. supplements – Order codes

Permissible combinations for option G.. with H..

Order code	Description	Permissible G options for gearbox type		Permissible H options for gearbox type	
		Helical gear	Bevel gear/ worm	Helical gear	Bevel gear/ worm
G51	Foot-mounted and flange (round), solid shaft with fitted key (gearbox side 4 for bevel and worm)	✔ 1)	✔ 2)	**H1./H2.**	**H1. to H6.**
G53	Foot-mounted and flange (round), hollow shaft with keyway (insertion gearbox side 4)		✔ 2)		
G54	Foot-mounted and flange (round), hollow shaft with clamping element (shrink disk on gearbox side 4 and insertion side 4 for bevel and worm)		✔ 2)		
G55	Foot-mounted and flange (round), solid shaft with fitted key (gearbox side 3)		✔ 2)		
G57	Foot-mounted and flange (round), hollow shaft with keyway (insertion gearbox side 3)		✔ 2)		
G58	Foot-mounted and flange (round), hollow shaft with clamping element (shrink disk on gearbox side 3 and insertion side 4 for bevel and worm)		✔ 2)		
G61	Foot-mounted and tapped hole group, solid shaft with fitted key (gearbox side 4 for bevel and worm)	✔	✔	**H1./H2.**	**H1. to H6.**
G63	Foot-mounted and tapped hole group, hollow shaft with keyway (insertion gearbox side 4)		✔		
G64	Foot-mounted and tapped hole group, hollow shaft with clamping element (shrink disk on gearbox side 4 and insertion side 4 for bevel and worm)		✔		
G65	Foot-mounted and tapped hole group, solid shaft with fitted key (gearbox side 3)		✔		
G67	Foot-mounted and tapped hole group, hollow shaft with keyway (insertion gearbox side 3)		✔		
G68	Foot-mounted and tapped hole group, hollow shaft with clamping element (shrink disk on gearbox side 3 and insertion side 4 for bevel and worm)		✔		

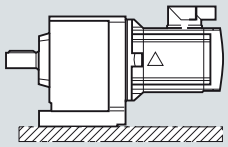
1) The flange diameter for helical gearboxes with foot mounting and flange is one diameter grade smaller in each case than the diameter for helical gearboxes with flange only (without foot mounting).

2) Only for 1FK706 to 1FK710 with gearbox sizes K513 to K813 (gearbox types B5. to B8.).

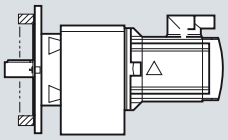
Selection guides

Helical geared motors – Types of construction

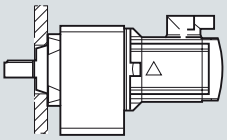
IM B3



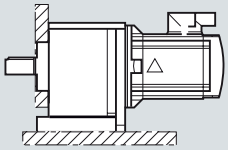
IM B5



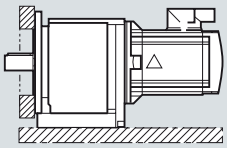
IM B14



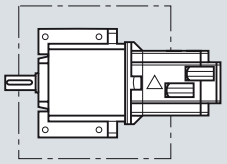
IM B34



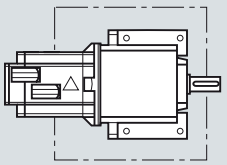
IM B35



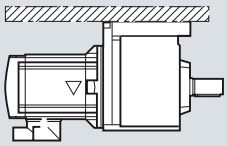
IM B6



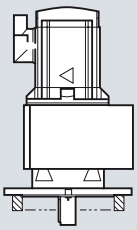
IM B7



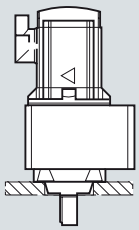
IM B8



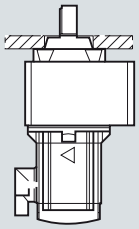
IM V1



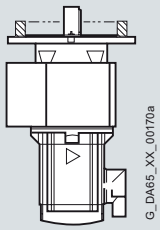
IM V18



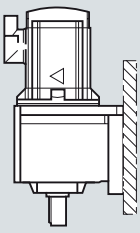
IM V19



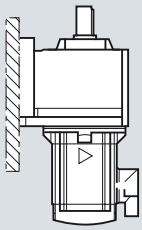
IM V3



IM V5

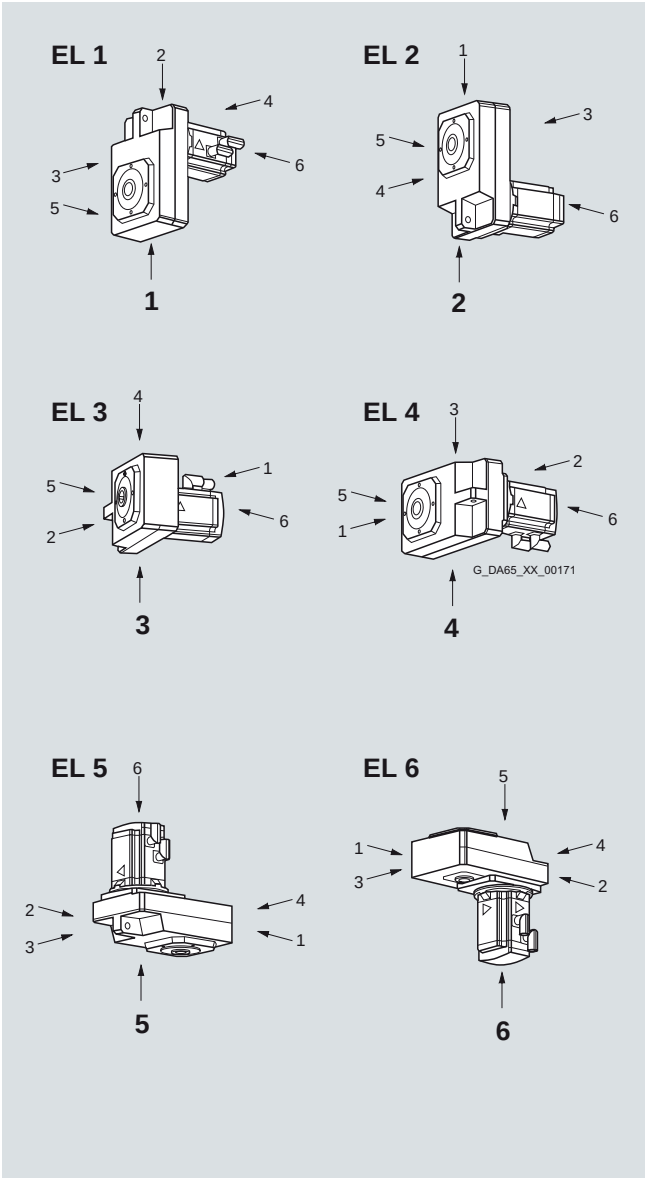


IM V6



Selection guides

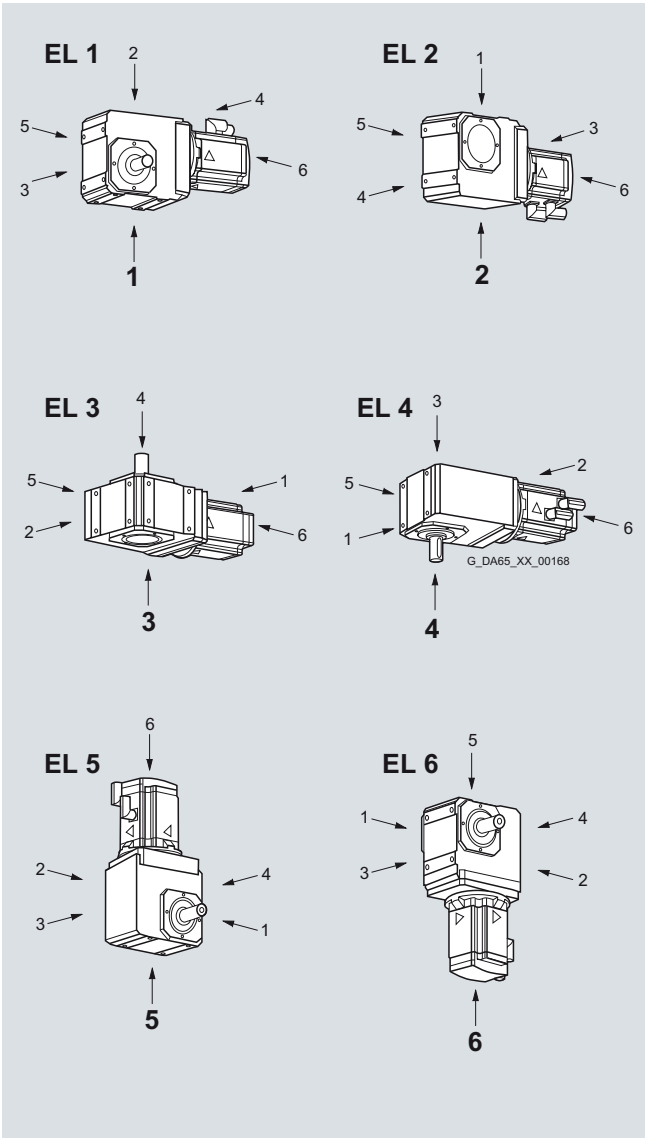
Offset-shaft geared motors – Mounting positions EL 1 to EL 6



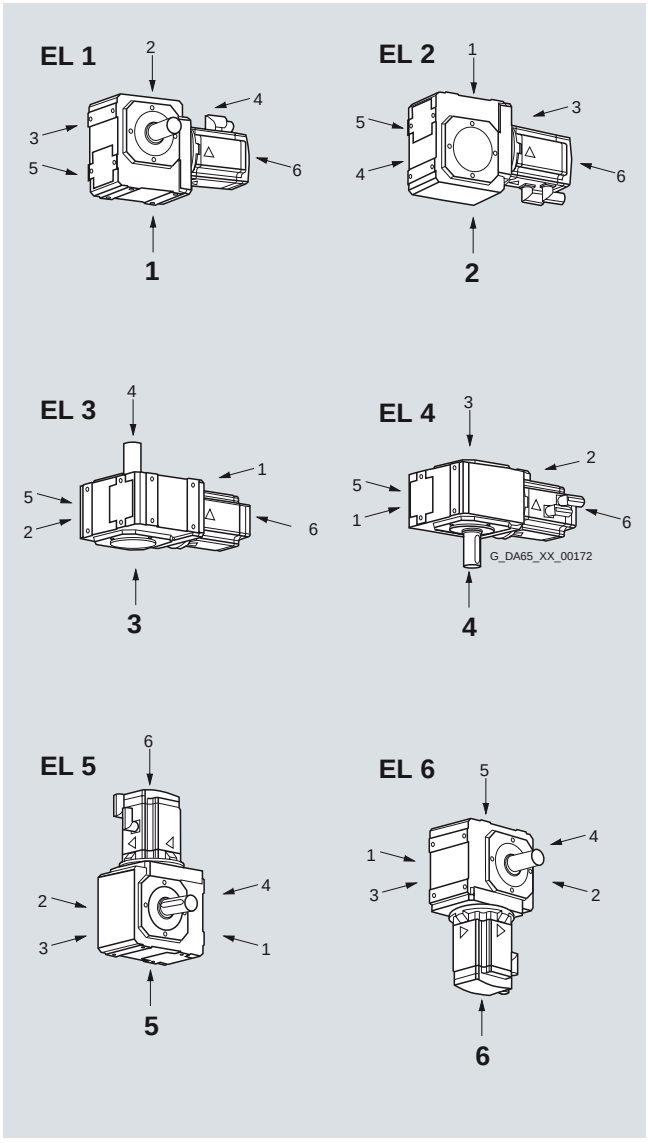
Selection guides

Bevel geared motors – Mounting positions EL 1 to EL 6

Gearbox sizes K102 to K402



Gearbox sizes K513 to K813

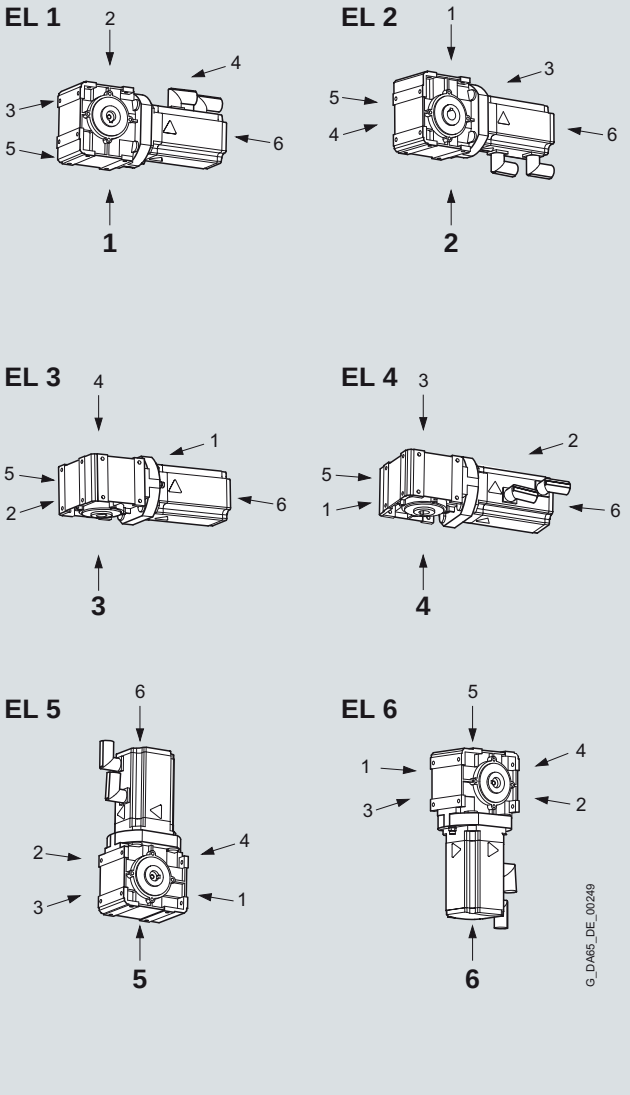


4

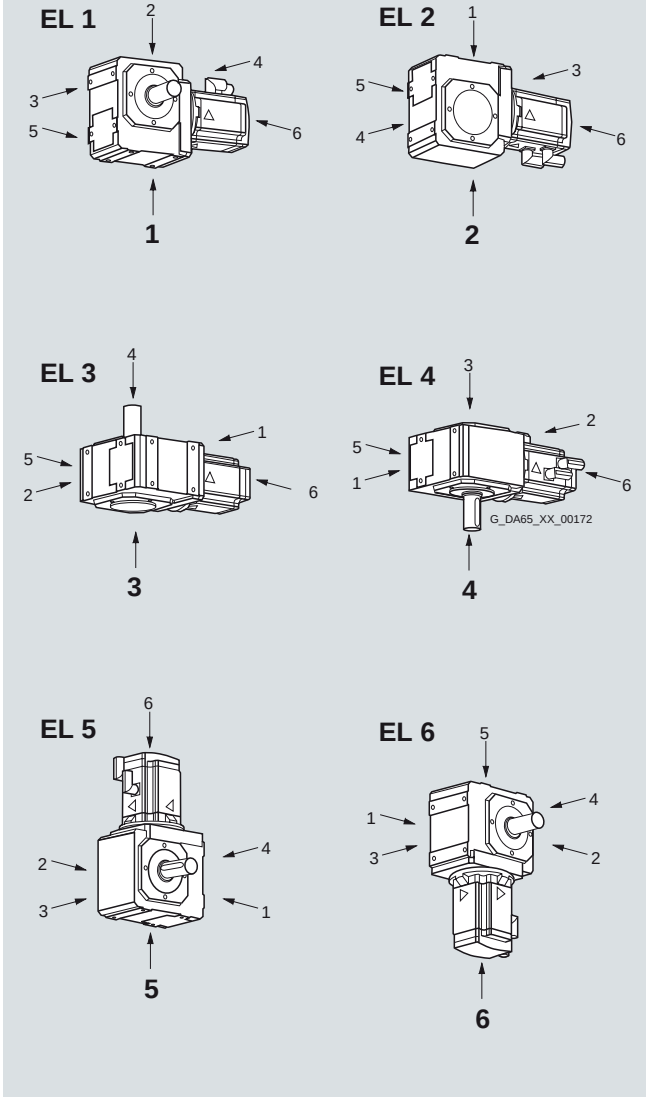
Selection guides

Worm geared motors – Mounting positions EL 1 to EL 6

Gearbox size S002



Gearbox sizes S102 to S402



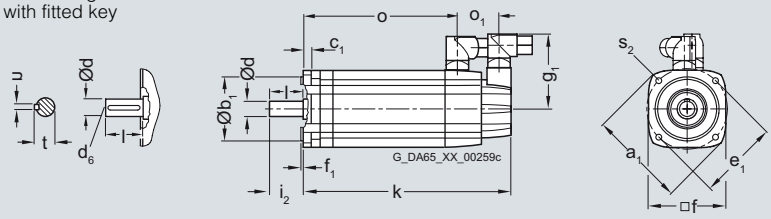
Dimensional drawings

For motor			Dimensions in mm (inches)										Flange 1 (1FT6-compatible)			
													without brake		with brake	
Shaft height	Type	DIN IEC	a_1 P	b_1 N	c_1 LA	e_1 M	f AB	f_1 T	g_1 –	o_1 –	s_2 S	i_2 –	k LB	o –	k LB	o –
1FT7 Compact, type of construction IM B5, natural cooling, with connector, with/without brake																
36	1FT7034		90 (3.54)	60 (2.36)	8 (0.31)	75 (2.95)	72 (2.83)	3 (0.12)	80 (3.15)	48 (1.89)	6.5 (0.26)	30 (1.18)	195 (7.68)	133 (5.24)	222 (8.74)	160 (6.30)
	1FT7036												243 (9.57)	181 (7.13)	270 (10.63)	208 (8.19)
48	1FT7042		120 (4.72)	80 (3.15)	10 (0.39)	100 (3.94)	96 (3.78)	3 (0.12)	93 (3.66)	53 (2.09)	6.5 (0.26)	40 (1.57)	169 (6.65)	102 (4.02)	201 (7.91)	134 (5.28)
	1FT7044												219 (8.62)	152 (5.98)	251 (9.88)	184 (7.24)
	1FT7046												259 (10.20)	192 (7.56)	291 (11.46)	224 (8.82)
63	1FT7062		155 (6.10)	110 (4.33)	10 (0.39)	130 (5.12)	126 (4.96)	3.5 (0.14)	108 (4.25)	53 (2.09)	9 (0.35)	50 (1.97)	173 (6.81)	106 (4.17)	208 (8.19)	141 (5.55)
	1FT7064												205 (8.07)	137 (5.39)	240 (9.45)	173 (6.81)
	1FT7066												236 (9.29)	169 (6.65)	272 (10.71)	204 (8.03)
	1FT7068												284 (11.18)	216 (8.50)	319 (12.56)	252 (9.92)

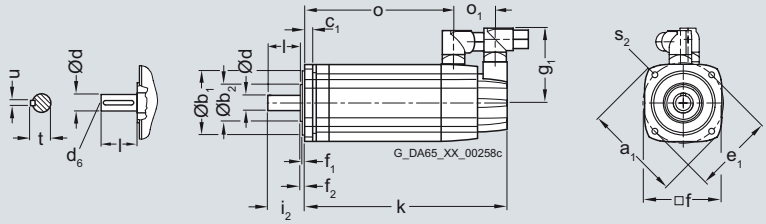
			Flange 0							Shaft extension DE				
						without brake		with brake						
Shaft height	Type	DIN IEC	b_2 –	f_2 –	i_2 –	k LB	o –	k LB	o –	**d D**	d_6 –	l E	t GA	u F
36	1FT7034		36 (1.42)	5.5 (0.22)	36.5 (1.44)	189 (7.44)	127 (5.00)	216 (8.50)	154 (6.06)	**14 (0.55)**	M5	30 (1.18)	16 (0.63)	5 (0.20)
	1FT7036					237 (9.33)	175 (6.89)	264 (10.39)	202 (7.95)					
48	1FT7042		46 (1.81)	5.5 (0.22)	46 (1.81)	163 (6.42)	96 (3.78)	195 (7.68)	128 (5.04)	**19 (0.75)**	M6	40 (1.57)	21.5 (0.85)	6 (0.24)
	1FT7044					213 (8.39)	146 (5.75)	245 (9.65)	178 (7.01)					
	1FT7046					253 (9.96)	186 (7.32)	285 (11.22)	218 (8.58)					
63	1FT7062		51 (2.01)	6 (0.24)	56.5 (2.22)	167 (6.57)	99 (3.90)	202 (7.95)	135 (5.31)	**24 (0.94)**	M8	50 (1.97)	27 (1.06)	8 (0.31)
	1FT7064					198 (7.80)	131 (5.16)	233 (9.17)	166 (6.54)					
	1FT7066					230 (9.06)	162 (6.38)	265 (10.43)	198 (7.80)					
	1FT7068					277 (10.91)	210 (8.27)	312 (12.28)	245 (9.65)					

Flange 1
(1FT6-compatible)
1FT703
1FT704
1FT706

Shaft design
with fitted key



Flange 0
1FT703
1FT704
1FT706



1FT7 Compact motors with/without DRIVE-CLiQ
Natural cooling

Dimensional drawings

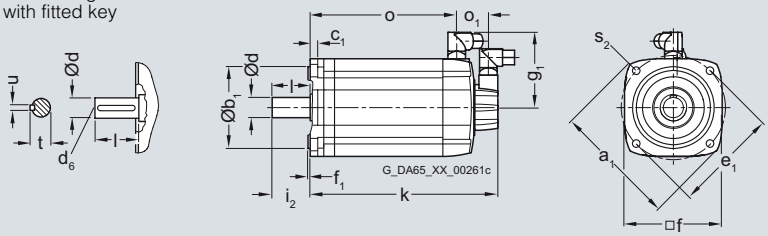
For motor — Dimensions in mm (inches)

Shaft height	Type	DIN IEC	a_1 P	b_1 N	c_1 LA	e_1 M	f AB	f_1 T	Connector Size 1 g_1 –	Connector Size 1.5 g_1 –	o_1 –	s_2 S	Flange 1 (1FT6-compatible) i_2 –	without brake k LB	without brake o –	with brake k LB	with brake o –
1FT7 Compact, type of construction IM B5, natural cooling, with connector, with/without brake																	
80	1FT7082		195 (7.68)	130 (5.12)	11.5 (0.45)	165 (6.50)	155 (6.10)	3.5 (0.14)	119 (4.69)	141 (5.55)	51 (2.01)	11 (0.43)	58 (2.28)	196 (7.72)	130 (5.12)	248 (9.76)	183 (7.20)
	1FT7084													247 (9.72)	182 (7.17)	299 (11.77)	234 (9.21)
	1FT7086													299 (11.77)	234 (9.21)	351 (13.82)	286 (11.26)
100	1FT7102		245 (9.65)	180 (7.09)	13 (0.51)	215 (8.46)	196 (7.72)	4 (0.16)	–	161 (6.34)	56 (2.20)	14 (0.55)	80 (3.15)	221 (8.70)	151 (5.94)	273 (10.75)	203 (7.99)
	1FT7105													307 (12.09)	238 (9.37)	360 (14.17)	290 (11.42)
	1FT7108													377 (14.84)	307 (12.09)	429 (16.89)	359 (14.13)

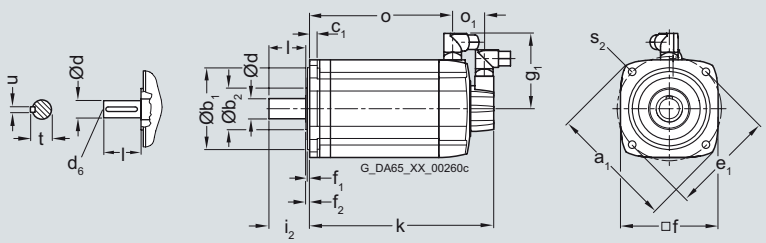
Shaft height	Type	DIN IEC	Flange 0 b_2 –	f_2 –	i_2 –	without brake k LB	without brake o –	with brake k LB	with brake o –	Shaft extension DE **d** **D**	d_6 –	l E	t GA	u F
80	1FT7082		66 (2.60)	6 (0.24)	64.5 (2.54)	189 (7.44)	124 (4.88)	241 (9.49)	176 (6.93)	**32 (1.26)**	M12	58 (2.28)	35 (1.38)	10 (0.39)
	1FT7084					241 (9.49)	175 (6.89)	293 (11.54)	228 (8.98)					
	1FT7086					292 (11.50)	227 (8.94)	345 (13.58)	279 (10.98)					
100	1FT7102		81 (3.19)	6.5 (0.26)	87 (3.43)	214 (8.43)	144 (5.67)	266 (10.47)	196 (7.72)	**38 (1.50)**	M12	80 (3.15)	41 (1.61)	10 (0.39)
	1FT7105					301 (11.85)	231 (9.09)	353 (13.90)	283 (11.14)					
	1FT7108					370 (14.57)	300 (11.81)	422 (16.61)	352 (13.86)					

Flange 1
(1FT6-compatible)
1FT708
1FT710

Shaft design
with fitted key



Flange 0
1FT708
1FT710



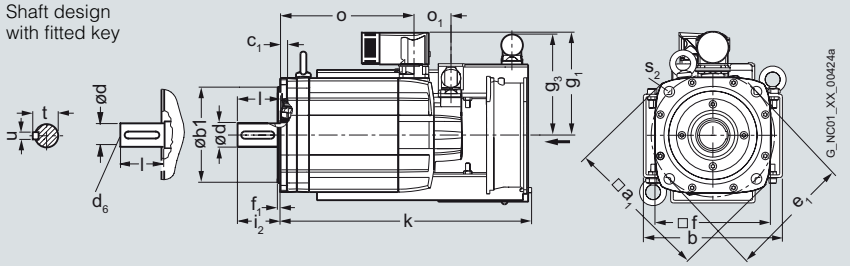
Dimensional drawings

For motor		Dimensions in mm (inches)															
										Connector					Fan		
										Size 1.5	Size 3						
Shaft height	Type	DIN IEC	a_1 P	b –	b_1 N	c_1 LA	e_1 M	f AB	f_1 T	g_1 –	g_1 –	g_3 –	h H	h_1 –	h_2 –	o_1 –	s_2 S
1FT7 Compact, type of construction IM B5, forced ventilation, with connector, with/without brake																	
80	1FT7084		194 (7.64)	186 (7.32)	130 (5.12)	11.5 (0.45)	165 (6.50)	155 (6.10)	3.5 (0.14)	139 (5.47)	–	137.5 (5.41)	27 (1.06)	177 (6.97)	186.5 (7.34)	50 (1.97)	11 (0.43)
	1FT7086																
100	1FT7105		245 (9.65)	224 (8.82)	180 (7.09)	13 (0.51)	215 (8.46)	196 (7.72)	4 (0.16)	159 (6.26)	187 (7.36)	151 (5.94)	27 (1.06)	220 (8.66)	222 (8.74)	55 (2.17)	14 (0.55)
	1FT7108																

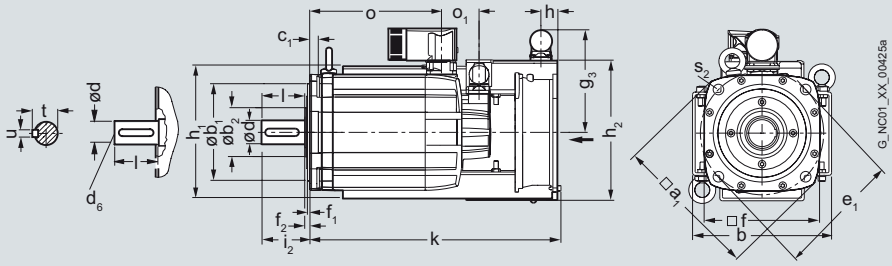
			Flange 1 (1FT6-compatible)					Flange 0							Shaft extension DE				
				without brake		with brake					without brake		with brake						
Shaft height	Type	DIN IEC	i_2 –	k LB	o –	k LB	o –	b_2 –	f_2 –	i_2 –	k LB	o –	k LB	o –	**d** **D**	d_6 –	l E	t GA	u F
80	1FT7084		58 (2.28)	342 (13.46)	182 (7.17)	394 (15.51)	234 (9.21)	66 (2.60)	6 (0.24)	64.5 (2.54)	335.5 (13.21)	175 (6.89)	387.5 (15.26)	228 (8.98)	**32** **(1.26)**	M12	58 (2.28)	35 (1.38)	10 (0.39)
	1FT7086			393.5 (15.49)	234 (9.21)	446 (17.56)	286 (11.26)				387 (15.24)	227 (8.94)	439.5 (17.30)	279 (10.98)					
100	1FT7105		80 (3.15)	403.5 (15.89)	238 (9.37)	455.5 (17.93)	290 (11.42)	81 (3.19)	6.5 (0.26)	87 (3.43)	396.5 (15.61)	231 (9.09)	448.5 (17.66)	283 (11.14)	**38** **(1.50)**	M12	80 (3.15)	41 (1.61)	10 (0.39)
	1FT7108			473 (18.62)	307 (12.09)	525 (20.57)	359 (14.13)				466 (18.35)	300 (11.81)	518 (20.39)	352 (13.86)					

Flange 1
(1FT6-compatible)
1FT708
1FT710

Shaft design
with fitted key



Flange 0
1FT708
1FT710



1FT7 Compact motors with/without DRIVE-CLiQ
Water cooling

Dimensional drawings

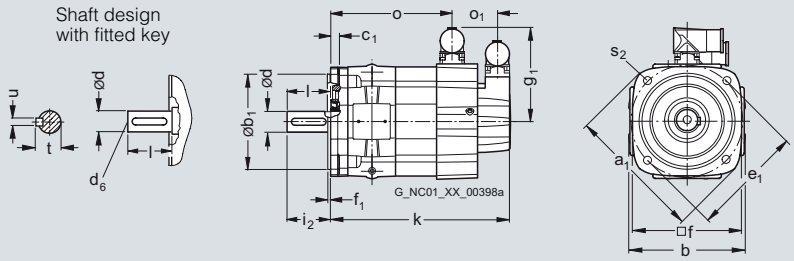
For motor — Dimensions in mm (inches)

Shaft height	Type	DIN IEC	a_1 P	b –	b_1 N	c_1 LA	e_1 M	f AB	f_1 T	Connector Size 1 g_1 –	Connector Size 1.5 g_1 –	Connector Size 3 g_1 –	Connector Size 1 o_1 –	Connector Size 1.5 o_1 –	Connector Size 3 o_1 –	s_2 S
1FT7 Compact, type of construction IM B5, water cooling, with connector, with/without brake																
63	1FT7062 1FT7064 1FT7066 1FT7068		155 (6.10)	135 (5.31)	110 (4.33)	10 (0.39)	130 (5.12)	126 (4.96)	3.5 (0.14)	108 (4.25)	–	–	52 (2.05)	–	–	9 (0.35)
80	1FT7082 1FT7084 1FT7086		195 (7.68)	165 (6.50)	130 (5.12)	11.5 (0.45)	165 (6.50)	155 (6.10)	3.5 (0.14)	–	140 (5.51)	–	–	50 (1.97)	–	11 (0.43)
100	1FT7102		245 (9.65)	206 (8.11)	180 (7.09)	13 (0.51)	215 (8.46)	196 (7.72)	4 (0.16)	–	160 (6.30)	–	–	55 (2.17)	–	14 (0.55)
	1FT7105 1FT7108										–	187 (7.36)		–	72 (2.83)	

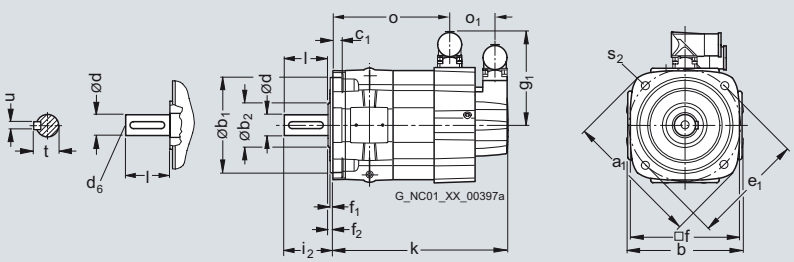
Shaft height	Type	DIN IEC	Flange 1 (1FT6-compatible) without/with brake, Connector Size 1: i_2 –	k LB	o –	Size 1.5: o –	Size 3: o –	Flange 0 without/with brake, Connector Size 1: b_2 –	f_2 –	i_2 –	k LB	o –	Size 1.5: o –	Size 3: o –	Shaft extension DE: **d D**	d_6 –	l E	t GA	u F
63	1FT7062		50 (1.97)	208 (8.19)	141 (5.55)	–	–	51 (2.01)	6 (0.24)	56.5 (2.22)	202 (7.95)	135 (5.31)	–	–	**24** **(0.94)**	M8	50 (1.97)	27 (1.06)	8 (0.31)
	1FT7064			240 (9.45)	173 (6.81)	–	–				233 (9.17)	166 (6.54)	–	–					
	1FT7066			272 (10.71)	204 (8.03)	–	–				265 (10.43)	198 (7.80)	–	–					
	1FT7068			319 (12.56)	252 (9.92)	–	–				312 (12.28)	245 (9.65)	–	–					
80	1FT7082		58 (2.28)	248 (9.76)	–	183 (7.20)	–	66 (2.60)	6 (0.24)	64.5 (2.54)	241 (9.49)	–	176 (6.93)	–	**32** **(1.26)**	M12	58 (2.28)	35 (1.38)	10 (0.39)
	1FT7084			299 (11.77)	–	234 (9.21)	–				293 (11.54)	–	228 (8.98)	–					
	1FT7086			351 (13.82)	–	286 (11.26)	–				345 (13.58)	–	279 (10.98)	–					
100	1FT7102		80 (3.15)	273 (10.75)	–	203 (7.99)	–	81 (3.19)	6.5 (0.26)	87 (3.43)	266 (10.47)	–	196 (7.72)	–	**38** **(1.50)**	M12	80 (3.15)	41 (1.61)	10 (0.39)
	1FT7105			360 (14.17)	–	290 (11.42)	273 (10.75)				353 (13.90)	–	283 (11.14)	266 (10.47)					
	1FT7108			429 (16.89)	–	359 (14.13)	342 (13.46)				422 (16.61)	–	352 (13.86)	335 (13.19)					

Flange 1
(1FT6-compatible)
1FT706
1FT708
1FT710

Shaft design
with fitted key



Flange 0
1FT706
1FT708
1FT710

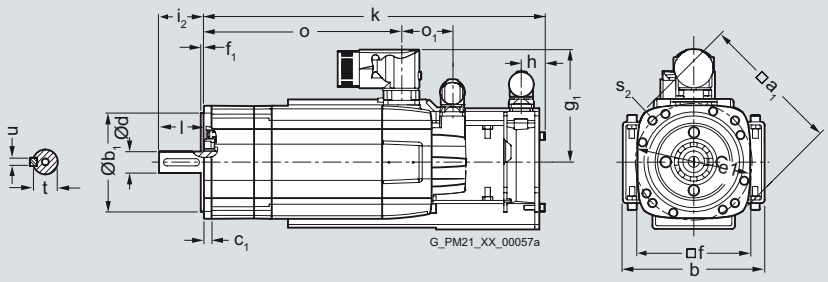


Dimensional drawings

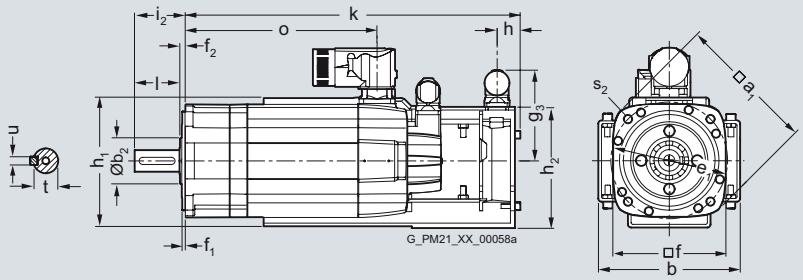
For motor		Dimensions in mm (inches)														
									Connector Size 1.5				Fan			
Shaft height	Type	DIN IEC	a_1 P	b A	b_1 N	c_1 LA	e_1 M	f AB	f_1 T	g_1 –	g_3 –	h H	h_1 –	h_2 –	o_1 –	s_2 S
1FT7 High Dynamic, forced ventilation, with connector, with/without brake																
63	1FT7065		155 (6.10)	158 (6.22)	110 (4.33)	10 (0.39)	130 (5.12)	126 (4.96)	3.5 (0.14)	125 (4.92)	101.5 (4.00)	26 (1.02)	143 (5.63)	135 (5.31)	57 (2.24)	9 (0.35)
	1FT7067															

			Flange 1 (1FT6-compatible)					Flange 0							Shaft extension DE				
				without brake		with brake					without brake		with brake						
Shaft height	Type	DIN IEC	i_2 –	k LB	o –	k LB	o –	b_2 –	f_2 –	i_2 –	k LB	o –	k LB	o –	**d D**	d_6 –	l E	t GA	u F
63	1FT7065		50 (1.97)	380 (14.96)	220 (8.66)	380 (14.96)	220 (8.66)	51 (2.01)	6 (0.24)	56.5 (2.22)	373.5 (14.70)	214 (8.43)	373.5 (14.70)	214 (8.43)	**24 (0.94)**	M8	50 (1.97)	27 (1.06)	8 (0.31)
	1FT7067			420 (16.54)	260 (10.24)	420 (16.54)	260 (10.24)				413.5 (16.28)	254 (10.00)	413.5 (16.28)	254 (10.00)					

Flange 1
(1FT6-compatible)
1FT706



Flange 0
1FT706



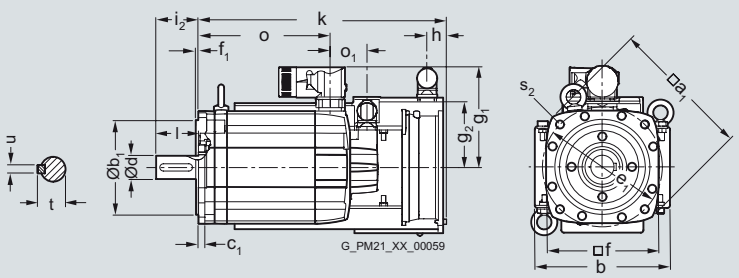
1FT7 High Dynamic motors with/without DRIVE-CLiQ – Forced ventilation

Dimensional drawings

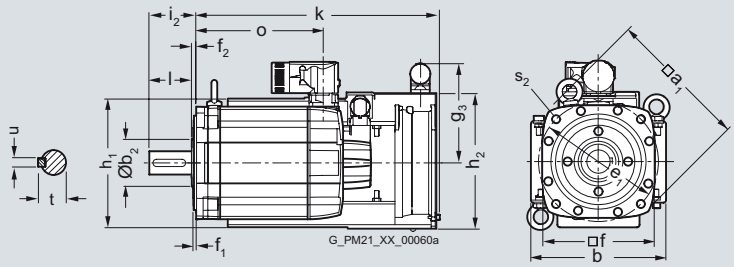
For motor		Dimensions in mm (inches)															
									Connector Size					Fan			
									1	3							
Shaft height	Type	DIN IEC	a_1 P	b A	b_1 N	c_1 LA	e_1 M	f AB	f_1 T	g_1 –	g_1 –	g_3 –	h H	h_1 –	h_2 –	o_1 –	s_2 S
1FT7 High Dynamic, forced ventilation, with connector, with/without brake																	
80	1FT7085		194 (7.64)	186 (7.32)	130 (5.12)	11.5 (0.45)	165 (6.50)	155 (6.10)	3.5 (0.14)	139 (5.47)	166.5 (6.56)	137.5 (5.41)	27 (1.06)	177 (6.97)	186.5 (7.34)	50 (1.97)	11 (0.43)
	1FT7087										166.5 (6.56)						

			Flange 1 (1FT6-compatible)					Flange 0							Shaft extension DE				
				without brake		with brake					without brake		with brake						
Shaft height	Type	DIN IEC	i_2 –	k LB	o –	k LB	o –	b_2 –	f_2 –	i_2 –	k LB	o –	k LB	o –	**d** **D**	d_6 –	l E	t GA	u F
80	1FT7085		58 (2.28)	414 (16.30)	254 (10.00)	414 (16.30)	254 (10.00)	66 (2.60)	6 (0.24)	64.5 (2.54)	407.5 (16.04)	247 (9.72)	407.5 (16.04)	247 (9.72)	**32** **(1.26)**	M12	58 (2.28)	35 (1.38)	10 (0.39)
	1FT7087			474 (18.66)	314 (12.36)	474 (18.66)	314 (12.36)				467.5 (18.41)	307 (12.09)	467.5 (18.41)	307 (12.09)					

Flange 1
(1FT6-compatible)
1FT708



Flange 0
1FT708

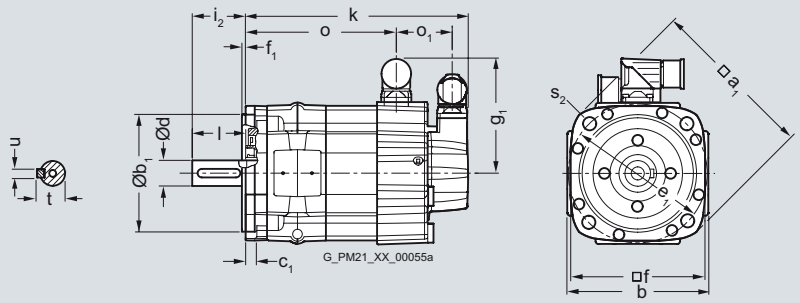


Dimensional drawings

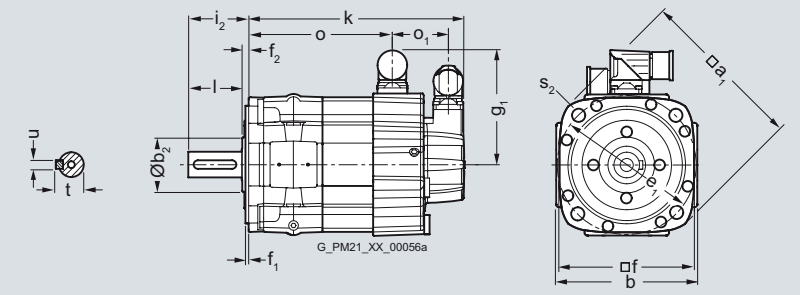
For motor		Dimensions in mm (inches)										
									Connector Size			
									1.5	3		
Shaft height	Type	DIN IEC	a_1 P	b A	b_1 N	c_1 LA	e_1 M	f AB	f_1 T	g_1 –	g_1 –	o_1 –	s_2 S
1FT7 High Dynamic, water cooling, with connector, with/without brake												
63	1FT7065		155 (6.10)	135 (5.31)	110 (4.33)	10 (0.39)	130 (5.12)	126 (4.96)	3.5 (0.14)	132.5 (5.22)	–	57 (2.24)	9 (0.35)
	1FT7067												
80	1FT7085		194 (7.64)	165 (6.50)	130 (5.12)	11.5 (0.45)	165 (6.50)	155 (6.10)	3.5 (0.14)	140.5 (5.53)	168.5 (6.63)	50 (1.97)	11 (0.43)
	1FT7087												

			Flange 1 (1FT6-compatible)				Flange 0							Shaft extension DE				
			without brake		with brake					without brake		with brake						
Shaft height	Type	DIN IEC	i_2 –	k LB	o –	k LB	o –	b_2 –	f_2 –	i_2 –	k LB	o –	k LB	o –	**d** **D**	d_6 –	l E	t GA	u F
63	1FT7065		50 (1.97)	292 (11.50)	220 (8.66)	292 (11.50)	220 (8.66)	51 (2.01)	6 (0.24)	56.5 (2.22)	285.5 (11.24)	214 (8.43)	285.5 (11.24)	214 (8.43)	**24** **(0.94)**	M8	50 (1.97)	27 (1.06)	8 (0.31)
	1FT7067			332 (13.07)	260 (10.24)	332 (13.07)	260 (10.24)				325.5 (12.81)	254 (10.00)	325.5 (12.81)	254 (10.00)					
80	1FT7085		58 (2.28)	319 (12.56)	254 (10.00)	319 (12.56)	254 (10.00)	66 (2.60)	6 (0.24)	64.5 (2.54)	312.5 (12.30)	247 (9.72)	312.5 (12.30)	247 (9.72)	**32** **(1.26)**	M12	58 (2.28)	35 (1.38)	10 (0.39)
	1FT7087			379 (14.92)	314 (12.36)	379 (14.92)	314 (12.36)				372.5 (14.67)	307 (12.09)	372.5 (14.67)	307 (12.09)					

Flange 1
(1FT6-compatible)
1FT706
1FT708



Flange 0
1FT706
1FT708



1FK7 Compact motors with/without DRIVE-CLiQ
Natural cooling

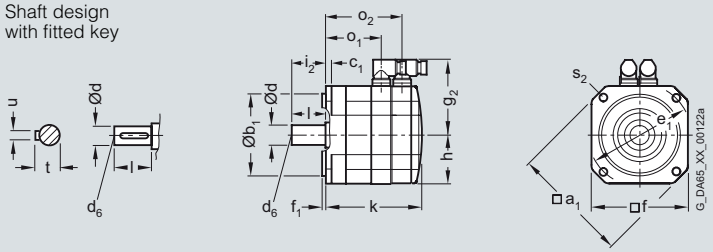
Dimensional drawings

For motor		Dimensions in mm (inches)																	
													Encoder system: Resolver Absolute encoder AM16S/R / AM15DQ						
													without brake			with brake			
Shaft height	Type	DIN IEC	a_1 P	b_1 N	c_1 LA	e_1 M	f AB	f_1 T	g_2 –	h H	i_2 –	s_2 S	k LB	o_1 –	o_2 –	k LB	o_1 –	o_2 –
1FK7 Compact, type of construction IM B5, natural cooling, with connector, with/without brake																			
20	1FK7011-5		–	30 (1.18)	7 (0.28)	46 (1.81)	40 (1.57)	2.5 (0.10)	65.5 (2.58)	20 (0.79)	18 (0.71)	4.5 (0.18)	140 (5.51)	89 (3.50)	118 (4.65)	140 (5.51)	89 (3.50)	118 (4.65)
	1FK7015-5												165 (6.50)	114 (4.49)	143 (5.63)	165 (6.50)	114 (4.49)	143 (5.63)
28	1FK7022-5		–	40 (1.57)	10 (0.39)	63 (2.48)	55 (2.17)	2.5 (0.10)	75 (2.95)	27.5 (1.08)	20 (0.79)	5.4 (0.21)	153 (6.02)	95 (3.74)	128 (5.04)	175 (6.89)	95 (3.74)	150 (5.91)
36	1FK7032-5		92 (3.62)	60 (2.36)	8 (0.31)	75 (2.95)	72 (2.83)	3 (0.12)	81 (3.19)	36 (1.42)	30 (1.18)	6.5 (0.26)	150 (5.91)	90 (3.54)	125 (4.92)	175 (6.89)	90 (3.54)	149 (5.87)
	1FK7034-5												175 (6.89)	115 (4.53)	150 (5.91)	200 (7.87)	115 (4.53)	174 (6.85)
48	1FK7040-5		120 (4.72)	80 (3.15)	10 (0.39)	100 (3.94)	96 (3.78)	3 (0.12)	90 (3.54)	48 (1.89)	40 (1.57)	7 (0.28)	134 (5.28)	73 (2.87)	106 (4.17)	163 (6.42)	73 (2.87)	135 (5.31)
	1FK7042-5												162 (6.38)	101 (3.98)	134 (5.28)	191 (7.52)	101 (3.98)	163 (6.42)
63	1FK7060-5		155 (6.10)	110 (4.33)	10 (0.39)	130 (5.12)	126 (4.96)	3.5 (0.14)	105 (4.13)	63 (2.48)	50 (1.97)	9 (0.35)	157 (6.18)	94 (3.70)	126 (4.96)	200 (7.87)	94 (3.70)	169 (6.65)
	1FK7063-5												202 (7.95)	139 (5.47)	171 (6.73)	245 (9.65)	139 (5.47)	214 (8.43)

		Encoder system: Incremental encoder IC2048S/R / IC22DQ Absolute encoder AM2048S/R / AM22DQ AM512S/R / AM20DQ AM32S/R / AM16DQ						Shaft extension DE				
		without brake			with brake							
Shaft height	Type	k LB	o_1 –	o_2 –	k LB	o_1 –	o_2 –	**d D**	d_6 –	l E	t GA	u F
20	1FK7011-5	155 (6.10)	89 (3.50)	118 (4.65)	155 (6.10)	89 (3.50)	118 (4.65)	**8 (0.31)**	–	18 (0.71)	8.8 (0.35)	2 (0.08)
	1FK7015-5	180 (7.09)	114 (4.49)	143 (5.63)	180 (7.09)	114 (4.49)	143 (5.63)					
28	1FK7022-5	178 (7.01)	95 (3.74)	128 (5.04)	200 (7.87)	95 (3.74)	150 (5.91)	**9 (0.35)**	M3	20 (0.79)	10.2 (0.40)	3 (0.12)
36	1FK7032-5	175 (6.89)	90 (3.54)	125 (4.92)	200 (7.87)	90 (3.54)	149 (5.87)	**14 (0.55)**	M5	30 (1.18)	16 (0.63)	5 (0.20)
	1FK7034-5	200 (7.87)	115 (4.53)	150 (5.91)	225 (8.86)	115 (4.53)	174 (6.85)					
48	1FK7040-5	155 (6.10)	73 (2.87)	106 (4.17)	184 (7.24)	73 (2.87)	135 (5.31)	**19 (0.75)**	M6	40 (1.57)	21.5 (0.85)	6 (0.24)
	1FK7042-5	182 (7.17)	101 (3.98)	134 (5.28)	211 (8.31)	101 (3.98)	163 (6.42)					
63	1FK7060-5	180 (7.09)	94 (3.70)	126 (4.96)	223 (8.78)	94 (3.70)	169 (6.65)	**24 (0.94)**	M8	50 (1.97)	27 (1.06)	8 (0.31)
	1FK7063-5	225 (8.86)	139 (5.47)	171 (6.73)	268 (10.55)	139 (5.47)	214 (8.43)					

1FK701.-5
1FK702.-5
1FK703.-5
1FK704.-5
1FK706.-5

Shaft design with fitted key



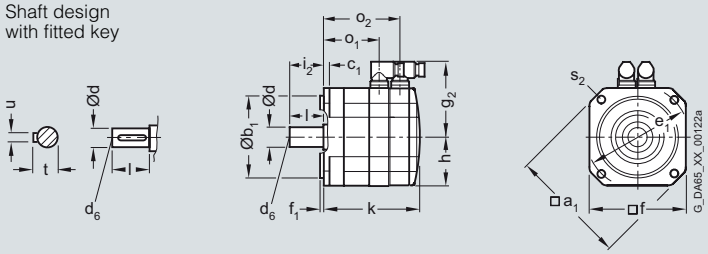
Dimensional drawings

For motor		Dimensions in mm (inches)																	
													Encoder system: Resolver						
													without brake			with brake			
Shaft height	Type	DIN IEC	a_1 P	b_1 N	c_1 LA	e_1 M	f AB	f_1 T	g_2 –	h H	i_2 –	s_2 S	k LB	o_1 –	o_2 –	k LB	o_1 –	o_2 –
1FK7 Compact, type of construction IM B5, natural cooling, with connector, with/without brake																			
80	1FK7080-5		186 (7.32)	130 (5.12)	13 (0.51)	165 (6.50)	155 (6.10)	3.5 (0.14)	119.5 (4.70)	77.5 (3.05)	58 (2.28)	11 (0.43)	156 (6.14)	91 (3.58)	124 (4.88)	184 (7.24)	91 (3.58)	151 (5.94)
	1FK7083-5												194 (7.64)	129 (5.08)	162 (6.38)	245 (9.65)	129 (5.08)	207 (8.15)
100	1FK7100-5		240 (9.45)	180 (7.09)	13 (0.51)	215 (8.46)	192 (7.56)	4 (0.16)	138 (5.43)	96 (3.78)	80 (3.15)	14 (0.55)	185 (7.28)	113 (4.45)	153 (6.02)	204 (8.03)	113 (4.45)	172 (6.77)
	1FK7101-5												211 (8.31)	139 (5.47)	179 (7.05)	240 (9.45)	139 (5.47)	208 (8.19)
	1FK7103-5												237 (9.33)	165 (6.50)	205 (8.07)	266 (10.47)	165 (6.50)	234 (9.21)
	1FK7105-5												289 (11.38)	217 (8.54)	257 (10.12)	318 (12.52)	217 (8.54)	286 (11.26)

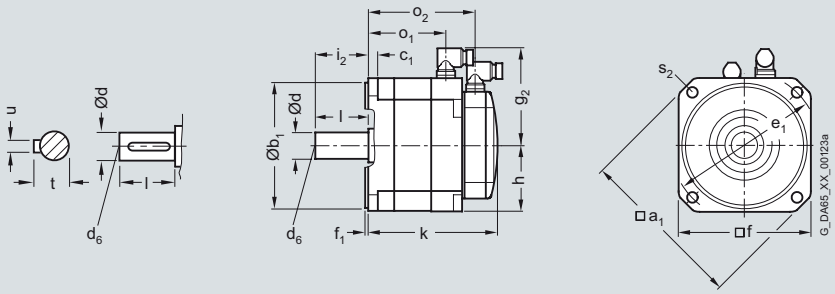
		Encoder system: Incremental encoder IC2048S/R / IC22DQ Absolute encoder AM2048S/R / AM22DQ AM32S/R / AM16DQ						Shaft extension DE				
		without brake			with brake							
Shaft height	Type	k LB	o_1 –	o_2 –	k LB	o_1 –	o_2 –	**d** D	d_6 –	l E	t GA	u F
80	1FK7080-5	179 (7.05)	91 (3.58)	124 (4.88)	206 (8.11)	91 (3.58)	151 (5.94)	**32 (1.26)**	M12	58 (2.28)	35 (1.38)	10 (0.39)
	1FK7083-5	217 (8.54)	129 (5.08)	162 (6.38)	268 (10.55)	153 (6.02)	213 (8.39)					
100	1FK7100-5	208 (8.19)	113 (4.45)	153 (6.02)	227 (8.94)	113 (4.45)	172 (6.77)	**38 (1.50)**	M12	80 (3.15)	41 (1.61)	10 (0.39)
	1FK7101-5	234 (9.21)	139 (5.47)	179 (7.05)	263 (10.35)	139 (5.47)	208 (8.19)					
	1FK7103-5	260 (10.24)	165 (6.50)	205 (8.07)	289 (11.38)	165 (6.50)	234 (9.21)					
	1FK7105-5	312 (12.28)	217 (8.54)	257 (10.12)	341 (13.43)	217 (8.54)	286 (11.26)					

1FK708.-5

Shaft design with fitted key



1FK7100-5
1FK7101-5
1FK7103-5
1FK7105-5



1FK7 High Dynamic motors with/without DRIVE-CLiQ – Natural cooling

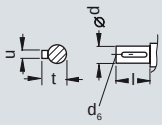
Dimensional drawings

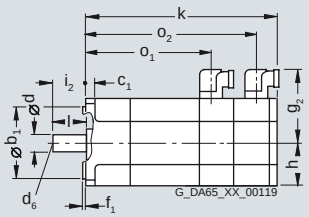
For motor		Dimensions in mm (inches)											Encoder system: Resolver Absolute encoder AM16S/R / AM15DQ without/with brake		
Shaft height	Type	DIN IEC	a_1 P	b_1 N	c_1 LA	e_1 M	f AB	f_1 T	g_2 –	h H	i_2 –	s_2 S	k LB	o_1 –	o_2 –
1FK7 High Dynamic, type of construction IM B5, natural cooling, with connector, with/without brake															
36	1FK7033-7		92 (3.62)	60 (2.36)	8 (0.31)	75 (2.95)	72 (2.83)	3 (0.12)	78 (3.07)	36 (1.42)	30 (1.18)	6.5 (0.26)	170/195 (6.69/7.68)	108/108 (4.25/4.25)	145/170 (5.71/6.69)
48	1FK7043-7		120 (4.72)	80 (3.15)	10 (0.39)	100 (3.94)	96 (3.78)	3 (0.12)	90 (3.54)	48 (1.89)	40 (1.57)	7 (0.28)	191/220 (7.52/8.66)	130/130 (5.12/5.12)	163/192 (6.42/7.56)
	1FK7044-7												216/245 (8.51/9.65)	155/155 (6.10/6.10)	188/217 (7.40/8.54)
63	1FK7061-7		155 (6.10)	110 (4.33)	10 (0.39)	130 (5.12)	126 (4.96)	3.5 (0.14)	105 (4.13)	63 (2.48)	50 (1.97)	9 (0.35)	185/228 (7.28/8.98)	121/121 (4.76/4.76)	153/196 (6.02/7.72)
	1FK7064-7												249/292 (9.80/11.50)	185/185 (7.28/7.28)	217/260 (8.54/10.24)
80	1FK7085-7		186 (7.32)	130 (5.12)	13 (0.51)	165 (6.50)	155 (6.10)	3.5 (0.14)	141.5 (5.57)	77.5 (3.05)	58 (2.28)	11 (0.43)	261/303 (10.28/11.93)	192/192 (7.56/7.56)	229/272 (9.02/10.71)
	1FK7086-7								140.5 (5.53)						

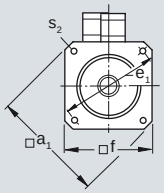
			Encoder system: Incremental encoder IC2048S/R / IC22DQ Absolute encoder AM2048S/R / AM22DQ AM512S/R / AM20DQ AM32S/R / AM16DQ without/with brake			Shaft extension DE				
Shaft height	Type	DIN IEC	k LB	o_1 –	o_2 –	**d** **D**	d_6 –	l E	t GA	u F
36	1FK7033-7		194/219 (7.64/8.62)	109/109 (4.29/4.29)	144/168 (5.67/6.61)	**14** **(0.55)**	M5	30 (1.18)	16 (0.63)	5 (0.20)
48	1FK7043-7		212/241 (8.35/9.49)	130/130 (5.12/5.12)	163/192 (6.42/7.56)	**19** **(0.75)**	M6	40 (1.57)	21.5 (0.85)	6 (0.24)
	1FK7044-7		237/266 (9.33/10.47)	155/155 (6.10/6.10)	188/217 (7.40/8.54)					
63	1FK7061-7		208/251 (8.19/9.88)	121/121 (4.76/4.76)	154/197 (6.06/7.76)	**24** **(0.94)**	M8	50 (1.97)	27 (1.06)	8 (0.31)
	1FK7064-7		272/315 (10.71/12.40)	185/185 (7.28/7.28)	218/261 (8.58/10.28)					
80	1FK7085-7		283/326 (11.14/12.83)	192/192 (7.56/7.56)	229/272 (9.02/10.71)	**32** **(1.26)**	M12	58 (2.28)	35 (1.38)	10 (0.39)
	1FK7086-7									

1FK703.-7
1FK704.-7
1FK706.-7
1FK708.-7

Shaft design with fitted key







Dimensional drawings

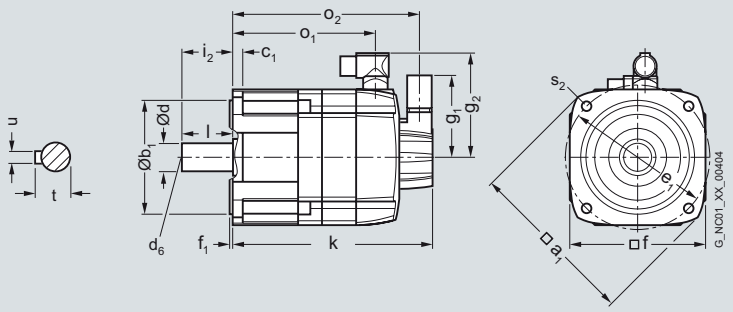
For motor — Dimensions in mm (inches)

Shaft height	Type	DIN IEC	a_1 P	b_1 N	c_1 LA	e_1 M	f AB	f_1 T	g_1 –	g_2 –	i_2 –	s_2 S	Encoder system: Incremental encoder Absolute encoder — without brake: k LB	o_1 –	o_2 –	with brake: k LB	o_1 –	o_2 –
1FK7 High Inertia, natural cooling, with connector, with/without brake																		
48	1FK7042-3B		120 (4.72)	80 (3.15)	10 (0.39)	100 (3.94)	96 (3.78)	3 (0.12)	94 (3.7)	90 (3.54)	40 (1.57)	6.5 (0.26)	192 (7.56)	125 (4.92)	177 (6.97)	224 (8.82)	157 (6.18)	209 (8.23)
63	1FK7060-3B		155 (6.1)	110 (4.33)	10 (0.39)	130 (5.12)	126 (4.96)	3.5 (0.14)	102 (4.02)	104 (4.09)	50 (1.97)	9 (0.35)	187 (7.36)	120 (4.72)	172 (6.77)	222 (8.74)	155 (6.1)	207 (8.15)
	1FK7062-3B												221 (8.7)	153 (6.02)	205 (8.07)	256 (10.08)	189 (7.44)	241 (9.49)
80	1FK7081-3B		194 (7.64)	130 (5.12)	11.5 (0.45)	165 (6.5)	155 (6.1)	3.5 (0.14)	94 (3.7)	119 (4.69)	58 (2.28)	11 (0.43)	216 (8.5)	151 (5.94)	201 (7.91)	269 (10.59)	203 (7.99)	253 (9.96)
	1FK7084-3B												275 (10.8)	209 (8.23)	259 (10.2)	327 (12.87)	262 (10.3)	312 (12.28)

Shaft extension DE

Shaft height	Type	**d** **D**	d_6 –	l E	t GA	u F
48	1FK7042-3B	**19** **(0.75)**	M6	40 (1.57)	21.5 (0.85)	6 (0.24)
63	1FK7060-3B	**24** **(0.94)**	M8	50 (1.97)	27 (1.06)	8 (0.31)
	1FK7062-3B					
80	1FK7081-3B	**32** **(1.26)**	M12	58 (2.28)	35 (1.38)	10 (0.38)
	1FK7084-3B					

1FK7042-3B
1FK706.-3B
1FK708.-3B

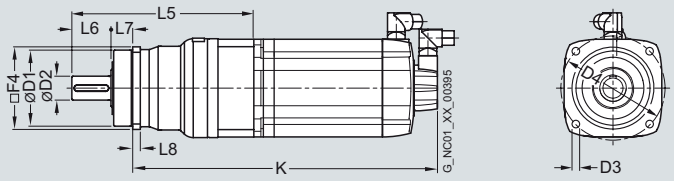


1FT7 Compact motors with/without DRIVE-CLiQ with SP+ planetary gearbox, single-stage

Dimensional drawings

For motors				Dimensions in mm (inches)								Encoder system: Incremental encoder Absolute encoder	
			Planetary gearbox									without brake	with brake
Shaft height	Type	F4	Type	D1	D2	D3	D4	L5	L6	L7	L8	K	K
1FT7 Compact with SP+ planetary gearbox, single-stage, type of construction IM B5, natural cooling, with connector, with/without brake													
36	1FT7034	62 (2.44)	SP060S-MF1	60 (2.36)	16 (0.63)	5.5 (0.22)	68 (2.68)	142 (5.59)	28 (1.10)	20 (0.79)	6 (0.24)	347 (13.66)	374 (14.72)
	1FT7034	76 (2.99)	SP075S-MF1	70 (2.76)	22 (0.87)	6.6 (0.26)	85 (3.35)	163.8 (6.45)	36 (1.42)	20 (0.79)	7 (0.28)	361 (14.21)	388 (15.28)
	1FT7036											297 (11.69)	324 (12.76)
48	1FT7042							167.5 (6.59)				275 (10.83)	307 (12.09)
	1FT7044											325 (12.80)	357 (14.06)
	1FT7046											365 (14.37)	397 (15.63)
	1FT7046	101 (3.98)	SP100S-MF1	90 (3.54)	32 (1.26)	9 (0.35)	120 (4.72)	210 (8.27)	58 (2.28)	30 (1.18)	10 (0.39)	375 (14.76)	407 (16.02)
63	1FT7062							217 (8.54)				296 (11.65)	331 (13.03)
	1FT7064											327 (12.87)	362 (14.25)
	1FT7066											359 (14.13)	394 (15.51)
	1FT7068											406 (15.98)	441 (17.36)
	1FT7068	141 (5.55)	SP140S-MF1	130 (5.12)	40 (1.57)	11 (0.43)	165 (6.50)	274.3 (10.80)	82 (3.23)	30 (1.18)	12 (0.47)	439 (17.28)	474 (18.66)
80	1FT7082							283.3 (11.15)				361 (14.21)	413 (16.26)
	1FT7084											412 (16.22)	464 (18.27)
	1FT7086											464 (18.27)	516 (20.31)
	1FT7086	182 (7.17)	SP180S-MF1	160 (6.30)	55 (2.17)	13.5 (0.53)	215 (8.46)	310 (12.20)	82 (3.23)	30 (1.18)	15 (0.59)	491 (19.33)	543 (21.38)
100	1FT7102											412 (16.22)	464 (18.27)
	1FT7105											498 (19.61)	550 (21.65)
	1FT7108											568 (22.36)	620 (24.41)
	1FT7105	215 (8.46)	SP210S-MF1	180 (7.09)	75 (2.95)	17 (0.67)	250 (9.84)	385 (15.16)	105 (4.13)	38 (1.50)	17 (0.67)	542 (21.34)	594 (23.39)
	1FT7108											612 (24.09)	664 (26.14)

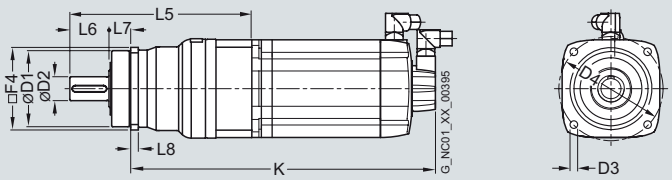
1FT703
1FT704
1FT706
1FT708
1FT710



Dimensional drawings

For motor				Dimensions in mm (inches)								Encoder system: Incremental encoder Absolute encoder	
			Planetary gearbox									without brake	with brake
Shaft height	Type	F4	Type	D1	D2	D3	D4	L5	L6	L7	L8	K	K
1FT7 Compact with SP+ planetary gearbox, 2-stage, type of construction IM B5, natural cooling, with connector, with/without brake													
36	1FT7034	76 (2.99)	SP075S-MF2	70 (2.76)	22 (0.87)	6.6 (0.26)	85 (3.35)	179.4 (7.06)	36 (1.42)	20 (0.79)	7 (0.28)	376 (14.80)	403 (15.87)
	1FT7036											312 (12.28)	339 (13.35)
48	1FT7042							192 (7.56)				331 (13.03)	331 (13.03)
36	1FT7034	101 (3.98)	SP100S-MF2	90 (3.54)	32 (1.26)	9 (0.35)	120 (4.72)	230.3 (9.07)	58 (2.28)	30 (1.18)	10 (0.39)	395 (15.55)	422 (16.61)
	1FT7036											331 (13.03)	358 (14.09)
48	1FT7042							234 (9.21)				341 (13.43)	341 (13.43)
	1FT7044											359 (14.13)	391 (15.39)
	1FT7046											431 (16.97)	431 (16.97)
	1FT7044	141 (5.55)	SP140S-MF2	130 (5.12)	40 (1.58)	11 (0.43)	165 (6.50)	298.3 (11.74)	82 (3.23)	30 (1.18)	12 (0.47)	399 (15.71)	431 (16.97)
	1FT7046											471 (18.54)	471 (18.54)

1FT703
1FT704

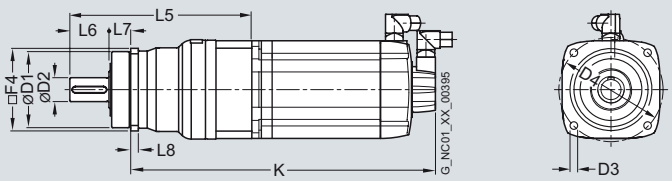


1FT7 Compact motors with/without DRIVE-CLiQ with SP+ planetary gearbox, 2-stage

Dimensional drawings

For motor				Dimensions in mm (inches)								Encoder system: Incremental encoder Absolute encoder	
			Planetary gearbox									without brake	with brake
Shaft height	Type	F4	Type	D1	D2	D3	D4	L5	L6	L7	L8	K	K
1FT7 Compact with SP+ planetary gearbox, 2-stage, type of construction IM B5, natural cooling, with connector, with/without brake													
63	1FT7062	101 (3.98)	SP100S-MF2	90 (3.54)	32 (1.26)	9 (0.35)	120 (4.72)	252 (9.92)	58 (2.28)	30 (1.18)	10 (0.39)	331 (13.03)	366 (14.41)
	1FT7064											362 (14.25)	397 (15.63)
	1FT7062	141 (5.55)	SP140S-MF2	130 (5.12)	40 (1.57)	11 (0.43)	165 (6.50)	305 (12.01)	82 (3.23)	30 (1.18)	12 (0.47)	360 (14.17)	395 (15.55)
	1FT7064											391 (15.39)	426 (16.77)
	1FT7066											458 (18.03)	458 (18.03)
	1FT7068											505 (19.88)	505 (19.88)
80	1FT7082							332 (13.07)				410 (16.14)	462 (18.19)
	1FT7084											461 (18.15)	513 (20.20)
63	1FT7064	182 (7.17)	SP180S-MF2	160 (6.30)	55 (2.17)	13.5 (0.53)	215 (8.46)	346 (13.62)	82 (3.23)	30 (1.18)	15 (0.59)	432 (17.01)	467 (18.39)
	1FT7066											499 (19.65)	499 (19.65)
	1FT7068											546 (21.50)	546 (21.50)
80	1FT7082							355 (13.98)				433 (17.05)	485 (19.09)
	1FT7084											536 (21.10)	536 (21.10)
	1FT7086											536 (21.10)	588 (23.15)
100	1FT7102											457 (17.99)	509 (20.04)
80	1FT7084	215 (8.46)	SP210S-MF2	180 (7.09)	75 (2.95)	17 (0.67)	250 (9.84)	415 (16.34)	105 (4.13)	38 (1.50)	17 (0.67)	565 (22.24)	565 (22.24)
	1FT7086											617 (24.29)	617 (24.29)
100	1FT7102											538 (21.18)	538 (21.18)
	1FT7105											572 (22.52)	624 (24.57)
	1FT7108											694 (27.32)	694 (27.32)
80	1FT7086	245 (9.65)	SP240S-MF2	200 (7.87)	85 (3.35)	17 (0.67)	290 (11.42)	467.5 (18.41)	130 (5.12)	40 (1.57)	20 (0.79)	643 (25.31)	643 (25.31)
100	1FT7102											512 (20.16)	564 (22.20)
	1FT7105											598 (23.54)	650 (25.59)
	1FT7108											668 (26.30)	720 (28.35)

1FT706
1FT708
1FT710

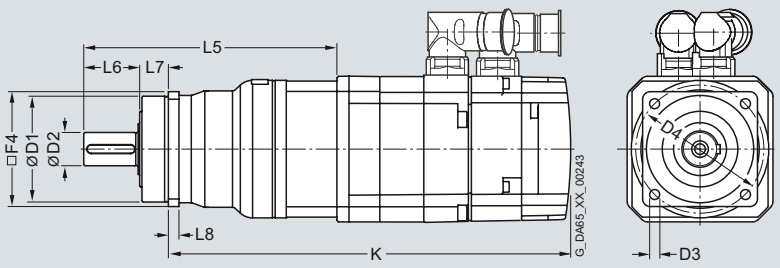


Dimensional drawings

For motor — Dimensions in mm (inches)

Shaft height	Type	F4	Planetary gearbox Type	D1	D2	D3	D4	L5	L6	L7	L8	Encoder system: Resolver, Absolute encoder AM16S/R AM15DQ — K without brake	K with brake	Incremental encoder, Absolute encoder — K without brake	K with brake (IC2048S/R, IC22DQ, AM2048S/R, AM22DQ, AM512S/R, AM20DQ, AM32S/R, AM16DQ)
1FK7 Compact with SP+ planetary gearbox, single-stage, type of construction IM B5, natural cooling, with connector, with/without brake															
28	1FK7022-5	62 (2.44)	SP060S-MF1	60 (2.36)	16 (0.63)	5.5 (0.22)	68 (2.68)	137 (5.39)	28 (1.10)	20 (0.79)	6 (0.24)	242 (9.53)	264 (10.39)	267 (10.51)	289 (11.38)
36	1FK7032-5	62 (2.44)	SP060S-MF1	60 (2.36)	16 (0.63)	5.5 (0.22)	68 (2.68)	142 (5.59)	28 (1.10)	20 (0.79)	6 (0.24)	244 (9.61)	269 (10.59)	269 (10.59)	294 (11.57)
	1FK7034-5											269 (10.59)	294 (11.57)	294 (11.57)	319 (12.56)
48	1FK7040-5	76 (2.99)	SP075S-MF1	70 (2.76)	22 (0.87)	6.6 (0.26)	85 (3.35)	168 (6.61)	36 (1.42)	20 (0.79)	7 (0.28)	246 (9.69)	275 (10.83)	267 (10.51)	296 (11.65)
	1FK7042-5											274 (10.79)	303 (11.93)	294 (11.57)	323 (12.72)
63	1FK7060-5	101 (3.98)	SP100S-MF1	90 (3.54)	32 (1.26)	9 (0.35)	120 (4.72)	217 (8.54)	58 (2.28)	30 (1.18)	10 (0.39)	286 (11.26)	329 (12.95)	309 (12.17)	352 (13.86)
	1FK7063-5											331 (13.03)	374 (14.72)	354 (13.94)	397 (15.63)
80	1FK7080-5	141 (5.55)	SP140S-MF1	130 (5.12)	40 (1.58)	11 (0.43)	165 (6.50)	283 (11.14)	82 (3.23)	30 (1.18)	12 (0.47)	327 (12.87)	355 (13.98)	350 (13.78)	377 (14.84)
	1FK7083-5											365 (14.37)	416 (16.38)	388 (15.28)	439 (17.28)
100	1FK7100-5	182 (7.17)	SP180S-MF1	160 (6.30)	55 (2.17)	13.5 (0.53)	215 (8.47)	310 (12.20)	82 (3.23)	30 (1.18)	15 (0.59)	383 (15.08)	402 (15.83)	406 (15.98)	425 (16.73)
	1FK7101-5											409 (16.10)	438 (17.24)	432 (17.01)	461 (18.15)
	1FK7103-5											435 (17.13)	464 (18.27)	458 (18.03)	487 (19.17)
	1FK7105-5	182 (7.17)	SP180S-MF1	160 (6.30)	55 (2.17)	13.5 (0.55)	215 (8.47)	310 (12.20)	82 (3.23)	30 (1.18)	15 (0.59)	487 (19.17)	516 (20.31)	510 (20.08)	539 (21.22)
	1FK7105-5	215 (8.46)	SP210S-MF1	180 (7.09)	75 (2.95)	17 (0.67)	250 (9.84)	385 (15.16)	105 (4.13)	38 (1.50)	17 (0.67)	531 (20.91)	560 (22.05)	554 (21.81)	583 (22.95)

1FK702.-5
1FK703.-5
1FK704.-5
1FK706.-5
1FK708.-5
1FK710.-5

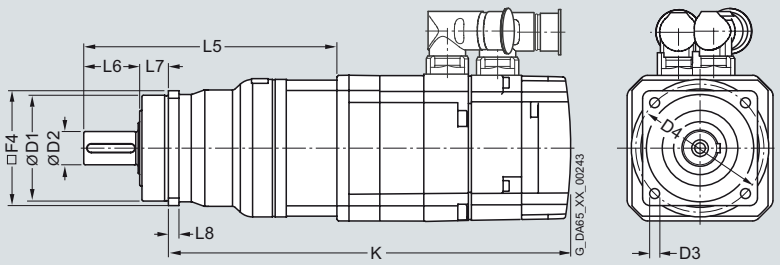


1FK7 High Dynamic motors with/without DRIVE-CLiQ with SP+ planetary gearbox, single-stage

Dimensional drawings

For motor				Dimensions in mm (inches)											
												Encoder system: Resolver Absolute encoder AM16S/R AM15DQ		Incremental encoder Absolute encoder	IC2048S/R IC22DQ AM2048S/R AM22DQ AM512S/R AM20DQ AM32S/R AM16DQ
			Planetary gearbox									without brake	with brake	without brake	with brake
Shaft height	Type	F4	Type	D1	D2	D3	D4	L5	L6	L7	L8	K	K	K	K
1FK7 High Dynamic with SP+ planetary gearbox, single-stage, type of construction IM B5, natural cooling, with connector, with/without brake															
36	1FK7033-7	62 (2.44)	SP060S-MF1	60 (2.36)	16 (0.63)	5.5 (0.22)	68 (2.68)	142 (5.59)	28 (1.10)	20 (0.79)	6 (0.24)	263 (10.35)	288 (11.34)	288 (11.34)	313 (12.32)
48	1FK7043-7	76 (2.99)	SP075S-MF1	70 (2.76)	22 (0.87)	6.6 (0.26)	85 (3.35)	168 (6.61)	36 (1.42)	20 (0.79)	7 (0.28)	303 (11.93)	332 (13.07)	324 (12.76)	353 (13.90)
	1FK7044-7											328 (12.91)	357 (14.06)	349 (13.74)	378 (14.88)
63	1FK7061-7	101 (3.98)	SP100S-MF1	90 (3.54)	32 (1.26)	9 (0.35)	120 (4.72)	217 (8.54)	58 (2.28)	30 (1.18)	10 (0.39)	314 (12.36)	357 (14.06)	337 (13.27)	380 (14.96)
	1FK7064-7											378 (14.88)	421 (16.57)	401 (15.79)	444 (17.48)
80	1FK7085-7 1FK7086-7	141 (5.55)	SP140S-MF1	130 (5.12)	40 (1.57)	11 (0.43)	165 (6.50)	283 (11.14)	82 (3.23)	30 (1.18)	12 (0.47)	432 (17.01)	474 (18.66)	454 (17.87)	497 (19.57)

1FK703.-7
1FK704.-7
1FK706.-7
1FK708.-7



Dimensional drawings

For motor				Dimensions in mm (inches)											
												Encoder system: Resolver Absolute encoder AM16S/R AM15DQ		Incremental encoder Absolute encoder	IC2048S/R IC22DQ AM2048S/R AM22DQ AM512S/R AM20DQ AM32S/R AM16DQ
			Planetary gearbox									without brake	with brake	without brake	with brake
Shaft height	Type	F4	Type	D1	D2	D3	D4	L5	L6	L7	L8	K	K	K	K
1FK7 Compact with SP+ planetary gearbox, two-stage, type of construction IM B5, natural cooling, with connector, with/without brake															
28	1FK7022-5	62 (2.44)	SP060S-MF2	60 (2.36)	16 (0.63)	5.5 (0.22)	68 (2.68)	156 (6.14)	28 (1.10)	20 (0.79)	6 (0.24)	261 (10.28)	283 (11.14)	286 (11.26)	308 (12.13)
		76 (2.99)	SP075S-MF2	70 (2.76)	22 (0.87)	6.6 (0.26)	85 (3.35)	175 (6.89)	36 (1.42)	20 (0.79)	7 (0.28)	272 (10.71)	294 (11.57)	297 (11.69)	319 (12.56)
		101 (3.98)	SP100S-MF2	90 (3.54)	32 (1.26)	9 (0.35)	120 (4.72)	230 (9.06)	58 (2.28)	30 (1.18)	10 (0.39)	295 (11.61)	317 (12.48)	320 (12.60)	342 (13.46)
36	1FK7032-5	62 (2.44)	SP060S-MF2	60 (2.36)	16 (0.63)	5.5 (0.22)	68 (2.68)	164 (6.46)	28 (1.10)	20 (0.79)	6 (0.24)	266 (10.47)	291 (11.46)	291 (11.46)	316 (12.44)
		76 (2.99)	SP075S-MF2	70 (2.76)	22 (0.87)	6.6 (0.26)	85 (3.35)	179 (7.05)	36 (1.42)	20 (0.79)	7 (0.28)	273 (10.75)	298 (11.73)	298 (11.73)	323 (12.72)
		101 (3.98)	SP100S-MF2	90 (3.54)	32 (1.26)	9 (0.35)	120 (4.72)	230 (9.06)	58 (2.28)	30 (1.18)	10 (0.39)	292 (11.50)	317 (12.48)	317 (12.48)	342 (13.46)
	1FK7034-5	76 (2.99)	SP075S-MF2	70 (2.76)	22 (0.87)	6.6 (0.26)	85 (3.35)	179 (7.05)	36 (1.42)	20 (0.79)	7 (0.28)	298 (11.73)	323 (12.72)	323 (12.72)	348 (13.70)
		101 (3.98)	SP100S-MF2	90 (3.54)	32 (1.26)	9 (0.35)	120 (4.72)	230 (9.06)	58 (2.28)	30 (1.18)	10 (0.39)	317 (12.48)	342 (13.46)	342 (13.46)	367 (14.45)
48	1FK7040-5	76 (2.99)	SP075S-MF2	70 (2.76)	22 (0.87)	6.6 (0.26)	85 (3.35)	192 (7.56)	36 (1.42)	20 (0.79)	7 (0.28)	270 (10.63)	299 (11.77)	291 (11.46)	320 (12.60)
		101 (3.98)	SP100S-MF2	90 (3.54)	32 (1.26)	9 (0.35)	120 (4.72)	234 (9.21)	58 (2.28)	30 (1.18)	10 (0.39)	280 (11.02)	309 (12.17)	301 (11.85)	330 (12.99)
		141 (5.55)	SP140S-MF2	130 (5.12)	40 (1.57)	11 (0.43)	165 (6.50)	298 (11.73)	82 (3.23)	30 (1.18)	12 (0.47)	320 (12.60)	349 (13.74)	341 (13.43)	370 (14.57)
	1FK7042-5	76 (2.99)	SP075S-MF2	70 (2.76)	22 (0.87)	6.6 (0.26)	85 (3.35)	192 (7.56)	36 (1.42)	20 (0.79)	7 (0.28)	298 (11.73)	327 (12.87)	298 (11.73)	347 (13.66)
		101 (3.98)	SP100S-MF2	90 (3.54)	32 (1.26)	9 (0.35)	120 (4.72)	234 (9.21)	58 (2.28)	30 (1.18)	10 (0.39)	308 (12.13)	337 (13.27)	308 (12.13)	357 (14.06)
		141 (5.55)	SP140S-MF2	130 (5.12)	40 (1.57)	11 (0.43)	165 (6.50)	298 (11.73)	82 (3.23)	30 (1.18)	12 (0.47)	348 (13.71)	377 (14.84)	368 (14.49)	397 (15.63)
63	1FK7060-5	101 (3.98)	SP100S-MF2	90 (3.54)	32 (1.26)	9 (0.35)	120 (4.72)	252 (9.92)	58 (2.28)	30 (1.18)	10 (0.39)	321 (12.64)	364 (14.33)	344 (13.54)	387 (15.24)
		141 (5.55)	SP140S-MF2	130 (5.12)	40 (1.57)	11 (0.43)	165 (6.50)	305 (12.01)	82 (3.23)	30 (1.18)	12 (0.47)	350 (13.78)	393 (15.47)	373 (14.69)	416 (16.38)
	1FK7063-5	141 (5.55)	SP140S-MF2	130 (5.12)	40 (1.57)	11 (0.43)	165 (6.50)	305 (12.01)	82 (3.23)	30 (1.18)	12 (0.47)	395 (15.55)	438 (17.24)	418 (16.46)	461 (18.15)
		182 (7.17)	SP180S-MF2	160 (6.30)	55 (2.17)	13.5 (0.53)	215 (8.46)	346 (13.62)	82 (3.23)	30 (1.18)	15 (0.59)	436 (17.17)	479 (18.86)	459 (18.07)	502 (19.76)

1FK702.-5
1FK703.-5
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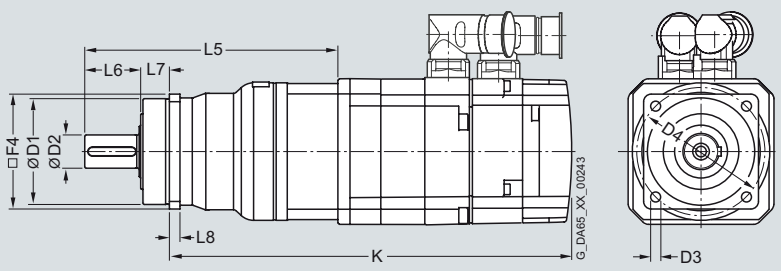
1FK706.-5

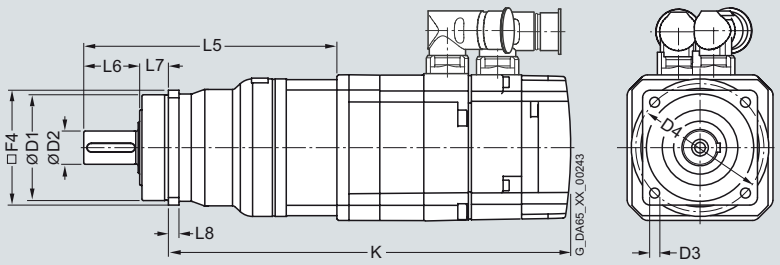


1FK7 Compact motors with/without DRIVE-CLiQ with SP+ planetary gearbox, two-stage

Dimensional drawings

For motor				Dimensions in mm (inches)											
												Encoder system: Resolver		Incremental encoder IC2048S/R IC22DQ Absolute encoder AM2048S/R AM22DQ AM32S/R AM16DQ	
			Planetary gearbox									without brake	with brake	without brake	with brake
Shaft height	Type	F4	Type	D1	D2	D3	D4	L5	L6	L7	L8	K	K	K	K
1FK7 Compact with SP+ planetary gearbox, two-stage, type of construction IM B5, natural cooling, with connector, with/without brake															
80	1FK7080-5	141 (5.55)	SP140S-MF2	130 (5.12)	40 (1.57)	11 (0.43)	165 (6.50)	332 (13.07)	82 (3.23)	30 (1.18)	12 (0.47)	376 (14.80)	404 (15.91)	399 (15.71)	426 (16.77)
		182 (7.17)	SP180S-MF2	160 (6.30)	55 (2.17)	13.5 (0.53)	215 (8.46)	355 (13.98)	82 (3.23)	30 (1.18)	15 (0.59)	399 (15.71)	427 (16.81)	422 (16.61)	449 (17.68)
		215 (8.46)	SP210S-MF2	180 (7.09)	75 (2.95)	17 (0.67)	250 (9.84)	415 (16.34)	105 (4.13)	38 (1.50)	17 (0.67)	428 (16.85)	456 (17.95)	451 (17.76)	478 (18.82)
	1FK7083-5	141 (5.55)	SP140S-MF2	130 (5.12)	40 (1.57)	11 (0.43)	165 (6.50)	332 (13.07)	82 (3.23)	30 (1.18)	12 (0.47)	414 (16.30)	465 (18.31)	437 (17.20)	488 (19.21)
		182 (7.17)	SP180S-MF2	160 (6.30)	55 (2.17)	13.5 (0.53)	215 (8.46)	355 (13.98)	82 (3.23)	30 (1.18)	15 (0.59)	437 (17.20)	488 (19.21)	460 (18.11)	511 (20.12)
		215 (8.46)	SP210S-MF2	180 (7.09)	75 (2.95)	17 (0.67)	250 (9.84)	415 (16.34)	105 (4.13)	38 (1.50)	17 (0.67)	466 (18.35)	517 (20.35)	489 (19.25)	540 (21.26)
100	1FK7100-5	182 (7.17)	SP180S-MF2	160 (6.30)	55 (2.17)	13.5 (0.53)	215 (8.46)	310 (12.20)	82 (3.23)	30 (1.18)	15 (0.59)	383 (15.08)	402 (15.83)	406 (15.98)	425 (16.73)
		215 (8.46)	SP210S-MF2	180 (7.09)	75 (2.95)	17 (0.67)	250 (9.84)	415 (16.34)	105 (4.13)	38 (1.50)	17 (0.67)	457 (17.99)	476 (18.74)	480 (18.90)	499 (19.65)
	1FK7101-5	182 (7.17)	SP180S-MF2	160 (6.30)	55 (2.17)	13.5 (0.53)	215 (8.46)	310 (12.20)	82 (3.23)	30 (1.18)	15 (0.59)	409 (16.10)	438 (17.24)	432 (17.01)	461 (18.15)
		215 (8.46)	SP210S-MF2	180 (7.09)	75 (2.95)	17 (0.67)	250 (9.84)	415 (16.34)	105 (4.13)	38 (1.50)	17 (0.67)	483 (19.02)	512 (20.16)	506 (19.92)	535 (21.06)
		245 (9.65)	SP240S-MF2	200 (7.87)	85 (3.35)	17 (0.67)	290 (11.42)	467.5 (18.41)	130 (5.12)	40 (1.57)	20 (0.79)	509 (20.04)	538 (21.18)	531 (20.91)	561 (22.09)
	1FK7103-5	182 (7.17)	SP180S-MF2	160 (6.30)	55 (2.17)	13.5 (0.53)	215 (8.46)	310 (12.20)	82 (3.23)	30 (1.18)	15 (0.59)	435 (17.13)	464 (18.27)	458 (18.03)	487 (19.19)
		215 (8.46)	SP210S-MF2	180 (7.09)	75 (2.95)	17 (0.67)	250 (9.84)	415 (16.34)	105 (4.13)	38 (1.50)	17 (0.67)	509 (20.04)	538 (21.18)	532 (20.94)	561 (22.09)
		245 (9.56)	SP240S-MF2	200 (7.87)	85 (3.35)	17 (0.67)	290 (11.42)	467.5 (18.41)	130 (5.12)	40 (1.57)	20 (0.79)	535 (21.06)	564 (22.20)	557 (21.93)	587 (23.11)
	1FK7105-5	215 (8.46)	SP210S-MF2	180 (7.09)	75 (2.95)	17 (0.67)	250 (9.84)	415 (16.34)	105 (4.13)	38 (1.50)	17 (0.67)	561 (22.09)	590 (23.23)	584 (22.99)	613 (24.13)
		245 (9.65)	SP240S-MF2	200 (7.87)	85 (3.35)	17 (0.67)	290 (11.42)	467.5 (18.41)	130 (5.12)	40 (1.57)	20 (0.79)	587 (23.11)	616 (24.25)	610 (24.02)	639 (25.16)

1FK708.-5
1FK710.-5



Dimensional drawings

For motor				Dimensions in mm (inches)											
												Encoder system: Resolver Absolute encoder AM16S/R AM15DQ		Incremental encoder Absolute encoder	IC2048S/R IC22DQ AM2048S/R AM22DQ AM512S/R AM20DQ AM32S/R AM16DQ
			Planetary gearbox									without brake	with brake	without brake	with brake
Shaft height	Type	F4	Type	D1	D2	D3	D4	L5	L6	L7	L8	K	K	K	K
1FK7 High Dynamic with SP+ planetary gearbox, two-stage, type of construction IM B5, natural cooling, with connector, with/without brake															
36	1FK7033-7	62 (2.44)	SP060S-MF2	60 (2.36)	16 (0.63)	5.5 (0.22)	68 (2.68)	164 (6.46)	28 (1.10)	20 (0.79)	6 (0.24)	285 (11.22)	310 (12.20)	310 (12.20)	335 (13.19)
		76 (2.99)	SP075S-MF2	70 (2.76)	22 (0.87)	6.6 (0.26)	85 (3.35)	179 (7.05)	36 (1.42)	20 (0.79)	7 (0.28)	292 (11.50)	317 (12.48)	317 (12.48)	342 (13.46)
		101 (3.98)	SP100S-MF2	90 (3.54)	32 (1.26)	9 (0.35)	120 (4.72)	230 (9.06)	58 (2.28)	30 (1.18)	10 (0.39)	311 (12.24)	336 (13.23)	336 (13.23)	361 (14.21)
48	1FK7043-7	76 (2.99)	SP075S-MF2	70 (2.76)	22 (0.87)	6.6 (0.26)	85 (3.35)	192 (7.56)	36 (1.42)	20 (0.79)	7 (0.28)	327 (12.87)	356 (14.02)	348 (13.70)	377 (14.84)
		101 (3.98)	SP100S-MF2	90 (3.54)	32 (1.26)	9 (0.35)	120 (4.72)	234 (9.21)	58 (2.28)	30 (1.18)	10 (0.39)	337 (13.27)	366 (14.41)	358 (14.09)	387 (15.24)
		141 (5.55)	SP140S-MF2	130 (5.12)	40 (1.57)	11 (0.43)	165 (6.50)	298 (11.74)	82 (3.23)	30 (1.18)	12 (0.47)	377 (14.84)	406 (15.98)	398 (15.67)	427 (16.81)
	1FK7044-7	101 (3.98)	SP100S-MF2	90 (3.54)	32 (1.26)	9 (0.35)	120 (4.72)	234 (9.21)	58 (2.28)	30 (1.18)	10 (0.39)	362 (14.25)	391 (15.39)	383 (15.08)	412 (16.22)
		141 (5.55)	SP140S-MF2	130 (5.12)	40 (1.57)	11 (0.43)	165 (6.50)	298 (11.73)	82 (3.23)	30 (1.18)	12 (0.47)	402 (15.83)	431 (16.97)	432 (17.01)	452 (17.80)
63	1FK7061-7	101 (3.98)	SP100S-MF2	90 (3.54)	32 (1.26)	9 (0.35)	120 (4.72)	252 (9.92)	58 (2.28)	30 (1.18)	10 (0.39)	349 (13.74)	392 (15.43)	372 (14.65)	415 (16.34)
	1FK7061-7	141 (5.55)	SP140S-MF2	130 (5.12)	40 (1.57)	11 (0.43)	165 (6.50)	305 (12.01)	82 (3.23)	30 (1.18)	12 (0.47)	378 (14.88)	421 (16.57)	401 (15.79)	444 (17.48)
	1FK7064-7											442 (17.40)	485 (19.09)	465 (18.31)	508 (20.00)
	1FK7064-7	182 (7.17)	SP180S-MF2	160 (6.30)	55 (2.17)	14 (0.55)	215 (8.46)	346 (13.62)	82 (3.23)	30 (1.18)	15 (0.59)	483 (19.02)	526 (20.71)	506 (19.92)	549 (21.61)
80	1FK7085-7	182 (7.17)	SP180S-MF2	160 (6.30)	55 (2.17)	13.5 (0.53)	215 (8.46)	355 (13.98)	82 (3.23)	30 (1.18)	15 (0.59)	504 (19.84)	546 (21.50)	526 (20.71)	569 (22.40)
		215 (8.46)	SP210S-MF2	180 (7.09)	75 (2.95)	17 (0.67)	250 (9.84)	415 (16.34)	105 (4.13)	38 (1.50)	17 (0.67)	533 (20.98)	575 (22.64)	555 (21.85)	598 (23.54)
	1FK7086-7	182 (7.17)	SP180S-MF2	160 (6.30)	55 (2.17)	13.5 (0.53)	215 (8.46)	355 (13.98)	82 (3.23)	30 (1.18)	15 (0.59)	504 (19.84)	546 (21.50)	526 (20.71)	569 (22.40)
		215 (8.46)	SP210S-MF2	180 (7.09)	75 (2.95)	17 (0.67)	250 (9.84)	415 (16.34)	105 (4.13)	38 (1.50)	17 (0.67)	533 (20.98)	575 (22.64)	555 (21.85)	598 (23.54)

1FK703.-7
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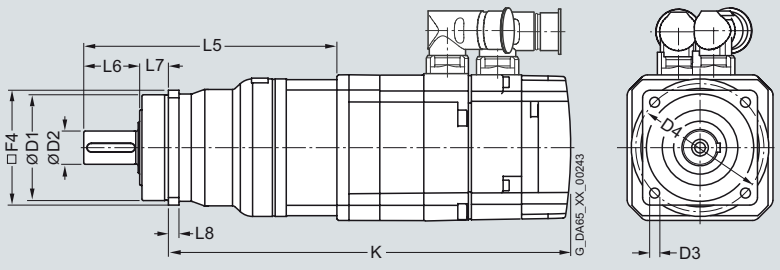
1FK706.-7
1FK708.-7



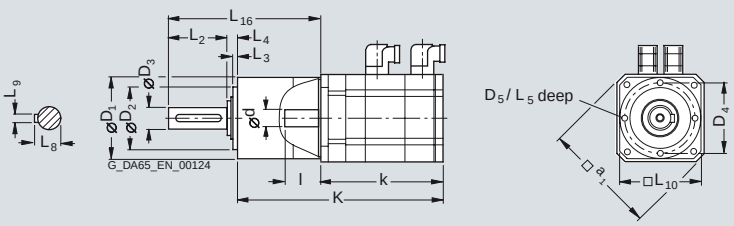
1FK7 Compact motors with/without DRIVE-CLiQ with LP+ planetary gearbox, single-stage

Dimensional drawings

For motor			Dimensions in mm (inches)												
Shaft height	Type	Planetary gearbox Type	D_1 –	D_2 –	D_3 –	D_4 –	D_5 –	L_2 –	L_3 –	L_4 –	L_5 –	L_8 –	L_9 –	L_{10} –	L_{16} –
1FK7 Compact with LP+ planetary gearbox, single-stage, type of construction IM B5, natural cooling, with connector, with/without brake															
28	1FK7022-5	LP050-MO1	50 (1.97)	35 (1.38)	12 (0.47)	44 (1.73)	M4	18 (0.71)	4 (0.16)	7 (0.28)	8 (0.31)	14 (0.55)	4 (0.16)	50 (1.97)	88 (3.46)
	1FK7022-5	LP070-MO1	70 (2.76)	52 (2.05)	16 (0.63)	62 (2.44)	M5	28 (1.10)	5 (0.20)	8 (0.31)	10 (0.39)	18 (0.71)	5 (0.20)	70 (2.76)	119 (4.69)
36	1FK7032-5	LP070-MO1	70 (2.76)	52 (2.05)	16 (0.63)	62 (2.44)	M5	28 (1.10)	5 (0.20)	8 (0.31)	10 (0.39)	18 (0.71)	5 (0.20)	70 (2.76)	126 (4.96)
	1FK7034-5														
48	1FK7040-5	LP090-MO1	90 (3.54)	68 (2.68)	22 (0.87)	80 (3.15)	M6	36 (1.42)	5 (0.20)	10 (0.39)	12 (0.47)	25 (0.98)	6 (0.24)	90 (3.54)	158 (6.22)
	1FK7042-5														
63	1FK7060-5	LP120-MO1	120 (4.72)	90 (3.54)	32 (1.26)	108 (4.25)	M8	58 (2.28)	6 (0.24)	12 (0.47)	16 (0.63)	35 (1.38)	10 (0.39)	120 (4.72)	210 (8.27)
	1FK7063-5														
80	1FK7080-5	LP155-MO1	155 (6.10)	120 (4.72)	40 (1.57)	140 (5.51)	M10	82 (3.23)	8 (0.31)	15 (0.59)	20 (0.79)	43 (1.69)	12 (0.47)	150 (5.91)	266 (10.47)
	1FK7083-5														

			Encoder system: Resolver / Absolute encoder AM16S/R AM15DQ				Incremental encoder IC2048S/R / IC22DQ / Absolute encoder AM2048S/R / AM22DQ AM512S/R / AM20DQ AM32S/R / AM16DQ						
			without brake		with brake		without brake		with brake				
Shaft height	Type	DIN IEC	k LB	K –	k LB	K –	k LB	K –	k LB	K –	l E	d D	a_1 P
28	1FK7022-5		153 (6.02)	216 (8.50)	175 (6.89)	238 (9.37)	178 (7.01)	241 (9.49)	200 (7.87)	263 (10.35)	20 (0.79)	9 (0.35)	-
	1FK7022-5			236 (9.29)		258 (10.16)		261 (10.28)		283 (11.14)			
36	1FK7032-5		150 (5.91)	240 (9.45)	175 (6.89)	265 (10.43)	175 (6.89)	265 (10.43)	200 (7.87)	290 (11.42)	30 (1.18)	14 (0.55)	92 (3.62)
	1FK7034-5		175 (6.89)	265 (10.43)	200 (7.87)	290 (11.42)	200 (7.87)	290 (11.42)	225 (8.86)	315 (12.40)			
48	1FK7040-5		135 (5.31)	247 (9.72)	164 (6.46)	276 (10.87)	155 (6.10)	267 (10.51)	184 (7.24)	296 (11.65)	40 (1.57)	19 (0.75)	120 (4.72)
	1FK7042-5		162 (6.38)	274 (10.79)	191 (7.52)	303 (11.93)	183 (7.20)	295 (11.61)	212 (8.35)	324 (12.76)			
63	1FK7060-5		157 (6.18)	297 (11.69)	200 (7.87)	340 (13.39)	180 (7.09)	320 (12.60)	223 (8.78)	363 (14.29)	50 (1.97)	24 (0.94)	155 (6.10)
	1FK7063-5		202 (7.95)	342 (13.46)	245 (9.65)	385 (15.16)	225 (8.86)	365 (14.37)	268 (10.55)	408 (16.06)			
80	1FK7080-5		156 (6.14)	325 (12.80)	184 (7.24)	353 (13.90)	179 (7.05)	347 (13.66)	206 (8.11)	375 (14.76)	58 (2.28)	32 (1.26)	186 (7.32)
	1FK7083-5		194 (7.64)	363 (14.29)	245 (9.65)	414 (16.30)	217 (8.54)	385 (15.16)	268 (10.55)	436 (17.17)			

1FK702.-5
1FK703.-5
1FK704.-5
1FK706.-5
1FK708.-5

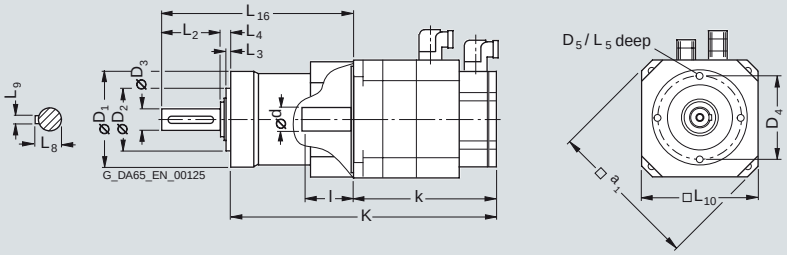


Dimensional drawings

For motor			Dimensions in mm (inches)												
		Planetary gearbox													
Shaft height	Type	Type	D_1 –	D_2 –	D_3 –	D_4 –	D_5 –	L_2 –	L_3 –	L_4 –	L_5 –	L_8 –	L_9 –	L_{10} –	L_{16} –
1FK7 Compact with LP+ planetary gearbox, single-stage, type of construction IM B5, natural cooling, with connector, with/without brake															
100	1FK710.-5	LP155-MO1	155 (6.10)	120 (4.72)	40 (1.57)	140 (5.51)	M10	82 (3.23)	8 (0.31)	15 (0.59)	20 (0.79)	43 (1.69)	12 (0.47)	150 (5.91)	286 (11.26)

			Encoder system: Resolver				Incremental encoder Absolute encoder IC2048S/R / IC22DQ AM2048S/R / AM22DQ AM32S/R / AM16DQ						
			without brake		with brake		without brake		with brake				
Shaft height	Type	DIN IEC	k LB	K –	k LB	K –	k LB	K –	k LB	K –	l E	d D	a_1 P
100	1FK7100-5		185 (7.28)	374 (14.72)	204 (8.03)	393 (15.47)	208 (8.19)	396 (15.59)	227 (8.94)	415 (16.34)	80 (3.15)	38 (1.50)	240 (9.45)
	1FK7101-5		211 (8.31)	400 (15.75)	240 (9.45)	429 (16.89)	234 (9.21)	422 (16.61)	263 (10.35)	452 (17.80)			
	1FK7103-5		237 (9.33)	426 (16.77)	266 (10.47)	455 (17.91)	260 (10.24)	448 (17.64)	289 (11.38)	478 (18.82)			
	1FK7105-5		289 (11.38)	478 (18.82)	318 (12.52)	507 (19.96)	312 (12.28)	500 (19.69)	341 (13.43)	530 (20.87)			

1FK710.-5



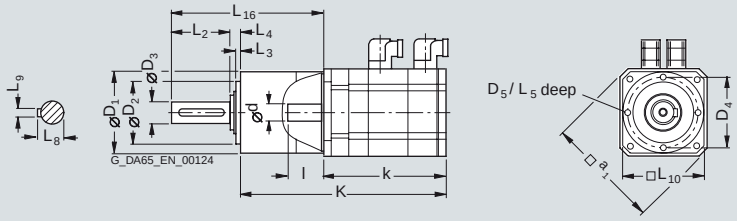
1FK7 High Dynamic motors with/without DRIVE-CLiQ with LP+ planetary gearbox, single-stage

Dimensional drawings

For motor		Planetary gearbox	Dimensions in mm (inches)												
Shaft height	Type	Type	D_1 –	D_2 –	D_3 –	D_4 –	D_5 –	L_2 –	L_3 –	L_4 –	L_5 –	L_8 –	L_9 –	L_{10} –	L_{16} –
1FK7 High Dynamic with LP+ planetary gearbox, single-stage, type of construction IM B5, natural cooling, with connector, with/without brake															
36	1FK7033-7	LP070-MO1	70 (2.76)	52 (2.05)	16 (0.63)	62 (2.44)	M5	28 (1.10)	5 (0.20)	8 (0.31)	10 (0.39)	18 (0.71)	5 (0.20)	70 (2.76)	126 (4.96)
48	1FK7043-7 1FK7044-7	LP090-MO1	90 (3.54)	68 (2.68)	22 (0.87)	80 (3.15)	M6	36 (1.42)	5 (0.20)	10 (0.39)	12 (0.47)	25 (0.98)	6 (0.24)	90 (3.54)	158 (6.22)
63	1FK7061-7 1FK7064-7	LP120-MO1	120 (4.72)	90 (3.54)	32 (1.26)	108 (4.25)	M8	58 (2.28)	6 (0.24)	12 (0.47)	16 (0.63)	35 (1.38)	10 (0.39)	120 (4.72)	210 (8.27)
80	1FK7085-7 1FK7086-7	LP155-MO1	155 (6.10)	120 (4.72)	40 (1.57)	140 (5.51)	M10	82 (3.23)	8 (0.31)	15 (0.59)	20 (0.79)	43 (1.69)	12 (0.47)	150 (5.91)	266 (10.47)

			Encoder system: Resolver / Absolute encoder AM16S/R AM15DQ				Incremental encoder / Absolute encoder IC2048S/R / IC22DQ AM2048S/R / AM22DQ AM512S/R / AM20DQ AM32S/R / AM16DQ						
			without brake		with brake		without brake		with brake				
Shaft height	Type	DIN IEC	k LB	K –	k LB	K –	k LB	K –	k LB	K –	l E	d D	a_1 P
36	1FK7033-7		170 (6.69)	260 (10.24)	195 (7.68)	285 (11.22)	195 (7.68)	285 (11.22)	220 (8.66)	310 (12.20)	30 (1.18)	14 (0.55)	92 (3.62)
48	1FK7043-7		191 (7.52)	303 (11.93)	220 (8.66)	332 (13.07)	212 (8.35)	324 (12.76)	240 (9.45)	352 (13.86)	40 (1.57)	19 (0.75)	120 (4.72)
	1FK7044-7		216 (8.50)	328 (12.91)	245 (9.65)	357 (14.06)	237 (9.33)	349 (13.74)	265 (10.43)	377 (14.84)			
63	1FK7061-7		185 (7.28)	325 (12.80)	228 (8.98)	368 (14.49)	208 (8.19)	348 (13.70)	251 (9.88)	391 (15.39)	50 (1.97)	24 (0.94)	155 (6.10)
	1FK7064-7		249 (9.80)	389 (15.31)	292 (11.50)	432 (17.01)	272 (10.71)	412 (16.22)	315 (12.40)	455 (17.91)			
80	1FK7085-7 1FK7086-7		261 (10.28)	430 (16.93)	304 (11.97)	473 (18.62)	284 (11.18)	453 (17.83)	326 (12.83)	495 (19.49)	58 (2.28)	32 (1.26)	186 (7.32)

1FK7033-7
1FK704.-7
1FK706.-7
1FK708.-7

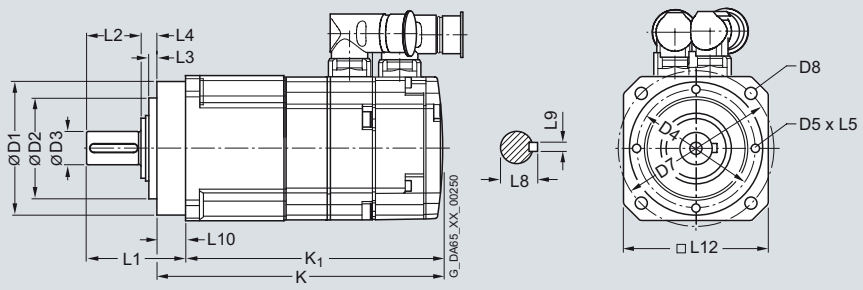


Dimensional drawings

For motor			Dimensions in mm (inches)															
Shaft height	Type	Planetary gearbox Type	D1	D2	D3	D4	D5	D7	D8	L1	L2	L3	L4	L5	L8	L9	L10	L12
1FK7-DYA with planetary gearbox, single-stage, type of construction IM B5, natural cooling, with connector, with/without brake																		
36	1FK7032-5	DYA70-10	70 (2.76)	52 (2.05)	16 (0.63)	62 (2.44)	M5	82 (3.23)	5.5 (0.22)	56 (2.20)	28 (1.10)	5 (0.20)	8 (0.31)	10 (0.39)	18 (0.71)	5 (0.20)	20 (0.79)	76 (2.99)
	1FK7034-5	DYA70-5																
48	1FK7040-5	DYA90-10	90 (3.54)	68 (2.68)	22 (0.87)	80 (3.15)	M6	105 (4.13)	7 (0.28)	66 (2.60)	36 (1.42)	5 (0.20)	10 (0.39)	12 (0.47)	24.5 (0.96)	6 (0.24)	20 (0.79)	101 (3.98)
	1FK7042-5	DYA90-5																
63	1FK7060-5	DYA120-10	120 (4.72)	90 (3.54)	32 (1.26)	108 (4.25)	M8	140 (5.51)	9 (0.35)	95 (3.74)	58 (2.28)	6 (0.24)	12 (0.47)	16 (0.63)	35 (1.38)	10 (0.39)	25 (0.98)	128 (5.04)
	1FK7063-5	DYA120-5																
80	1FK7080-5	DYA155-10	155 (6.10)	120 (4.72)	40 (1.57)	140 (5.51)	M10	170 (6.69)	11 (0.43)	127 (5.00)	82 (3.23)	8 (0.31)	15 (0.59)	20 (0.79)	43 (1.69)	12 (0.47)	30 (1.18)	161 (6.34)
	1FK7083-5	DYA155-5																

		Encoder system: Resolver / Absolute encoder		AM16S/R / AM15DQ		Incremental encoder / Absolute encoder		IC2048S/R / IC22DQ AM32S/R / AM16DQ		Absolute encoder		AM2048S/R / AM22DQ AM512S/R / AM20DQ	
		without brake		with brake		without brake		with brake		without brake		with brake	
Shaft height	Type	K	K1	K	K1	K	K1	K	K1	K	K1	K	K1
36	1FK7032-5	197 (7.76)	177 (6.97)	222 (8.74)	202 (7.95)	222 (8.74)	202 (7.95)	247 (9.72)	227 (8.94)	222 (8.74)	202 (7.95)	247 (9.72)	227 (8.94)
	1FK7034-5	222 (8.74)	202 (7.95)	247 (9.72)	227 (8.94)	247 (9.72)	227 (8.94)	272 (10.71)	252 (9.92)	247 (9.72)	227 (8.94)	272 (10.71)	252 (9.92)
48	1FK7040-5	194 (7.64)	174 (6.85)	223 (8.78)	203 (7.99)	214 (8.43)	194 (7.64)	243 (9.57)	223 (8.78)	223 (8.78)	203 (7.99)	252 (9.92)	232 (9.13)
	1FK7042-5	221 (8.70)	201 (7.91)	250 (9.84)	230 (9.06)	242 (9.53)	222 (8.74)	271 (10.67)	251 (9.88)	250 (9.84)	230 (9.06)	279 (10.98)	259 (10.20)
63	1FK7060-5	233 (9.17)	208 (8.19)	261 (10.28)	236 (9.29)	256 (10.08)	231 (9.09)	284 (11.18)	259 (10.20)	264 (10.39)	239 (9.41)	292 (11.50)	267 (10.51)
	1FK7063-5	278 (10.94)	253 (9.96)	306 (12.05)	281 (11.06)	301 (11.85)	276 (10.87)	329 (12.95)	304 (11.97)	309 (12.17)	284 (11.18)	337 (13.27)	312 (12.28)
80	1FK7080-5	250 (9.84)	220 (8.66)	278 (10.94)	248 (9.76)	273 (10.75)	243 (9.57)	300 (11.81)	270 (10.63)	281 (11.06)	251 (9.88)	309 (12.17)	279 (10.98)
	1FK7083-5	288 (11.34)	258 (10.16)	339 (13.35)	309 (12.17)	311 (12.24)	281 (11.06)	362 (14.25)	332 (13.07)	319 (12.56)	289 (11.38)	370 (14.57)	340 (13.39)

1FK703.-5
1FK704.-5
1FK706.-5
1FK708.-5



Notes

Main motors

5

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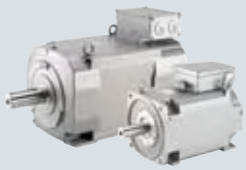
Main motors

Overview

Motor type	Features	Degree of protection	Cooling method
1PH8 asynchronous motor 	Three-phase squirrel-cage motor without housing High power density with small motor dimensions	IP55 IP23 IP55/IP65	Forced ventilation Forced ventilation Water cooling
1PH8 synchronous motor 	Permanent-magnet synchronous motor Excellent performance features Extremely high power density with small motor dimensions	IP55 IP55/IP65	Forced ventilation Water cooling
1PH7 asynchronous motor 	Three-phase squirrel-cage motor without housing High power density with small motor dimensions	IP55	Forced ventilation
1PL6 asynchronous motor 	Three-phase squirrel-cage motor without housing Extremely high power density with small motor dimensions	IP23	Forced ventilation

The selection and ordering data for the SINAMICS S120 Motor Modules are based on the booksize format by way of example. Other formats are also possible. The SIZER configuration tool is available for detailed configuration.

For technical definitions for AC motors, see chapter Servomotors.

Shaft height	Rated power P_{rated} for S1 duty kW [HP]	Rated torque M_{rated}	Page
SH 80/SH 100/SH 132/SH 160/ SH 355	2.8 [3.75] … 590 (730)[1] [791 (979)]	13 ... 5900 Nm [9.6 ... 4352 lb_f-ft] (13 ... 6860 Nm) [9.6 ... 5060 lb_f-ft][1]	5/8
SH 355	275 [369] (295) [396][1] … 1230 [1649] (1340) [1797][1]	4280 ... 11640 Nm [3157 ... 8586 lb_f-ft] (4730 ... 12435 Nm) [3489 ... 9172 lb_f-ft][1]	5/20
SH 80/SH 100/SH 132/SH 160/ SH 180/SH 225/SH 280	3.5 [4.70] … 460 [617]	20 ... 2610 Nm [14.8 ... 1925 lb_f-ft]	5/30
SH 132/SH 160	15.7 [21.0] … 99 [133]	94 ... 435 Nm [69.3 ... 321 lb_f-ft]	5/44
SH 132/SH 160/ SH 180/SH 225	15 [20.1] … 310 [416]	107 ... 1650 Nm [78.9 ... 1217 lb_f-ft]	5/46
SH 180/SH 225/SH 280	16.3 [21.9] … 385 [516]	265 ... 2480 Nm [196 ... 1829 lb_f-ft]	5/64
SH 180/SH 225/SH 280	20.5 [27.5] … 630 [845]	370 ... 3600 Nm [273 ... 2655 lb_f-ft]	5/82

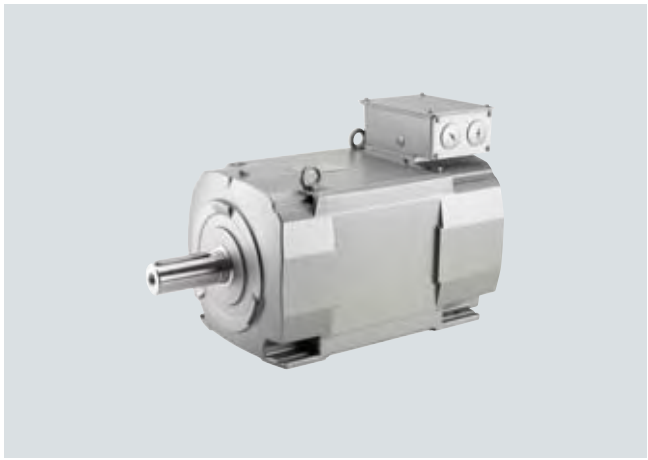
5

[1] Information in round brackets refers to data for shaft height 355 at 85 dB, for selection and ordering data see Catalog CR1.

1PH8 asynchronous and synchronous motors

Overview

1PH8 motors, forced ventilation, shaft heights 80 to 160



1PH8 motors, water cooling, shaft heights 180 to 280

1PH8 motors, water cooling, shaft heights 80 to 160

1PH8 motors, forced ventilation, shaft height 355

The 1PH8 motor series is a new motor generation for universal implementation in plants and machines that have been developed with Motion Control applications. The motors are available as an asynchronous variant as well as a compact synchronous variant with either forced ventilation or water cooling, based on a flexible building block principle. Comprehensive function expansions such as different bearing concepts expand the application range.

In comparison to the freely selectable performance of vector and servo control with the SINAMICS S120 drive system, it is possible to select between asynchronous or synchronous variants in the case of the 1PH8 motor series. This flexible interoperation of converter and motor makes it even easier to master extreme duty cycles, short control rise times and high precision in terms of speed, torque and positioning.

Because the 1PH8 motors are often used as the largest and central drive in the machine, they are known as "main motors".

Main motor = High performance +
Highly dynamic response +
High degree of precision

When developing the new 1PH8 motor series, we took special care to ensure maximum compatibility with the SINAMICS S120 drive system. For example, the specially harmonized power components, electronic rating plates, and the ability to integrate the motors via the DRIVE-CLiQ system interface ensure quick and easy commissioning as well as problem-free operation.

Benefits

- High power density with small motor dimensions
- Wide speed control ranges
- High degree of flexibility due to the choice of
  - Asynchronous or synchronous design
  - Forced ventilation or water cooling
  - Mechanical designs
- Long-life bearings
- High rotational accuracy, even at the lowest speeds
- Maximum thermal utilization over the complete speed range
- Low sound pressure level
- Optimized for the SINAMICS S120 drive system

Application

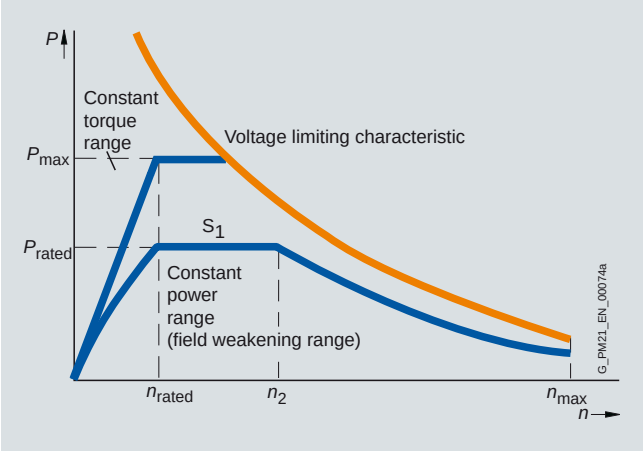
The application spectrum reaches across all sectors and comprises, for example:

- Main drives in presses and extruders
- Converting applications
- Rotary axes in the paper and printing industry
- Use in crane systems

The 1PH8 motors are suitable for installation in dry indoor areas without corrosive atmospheres.

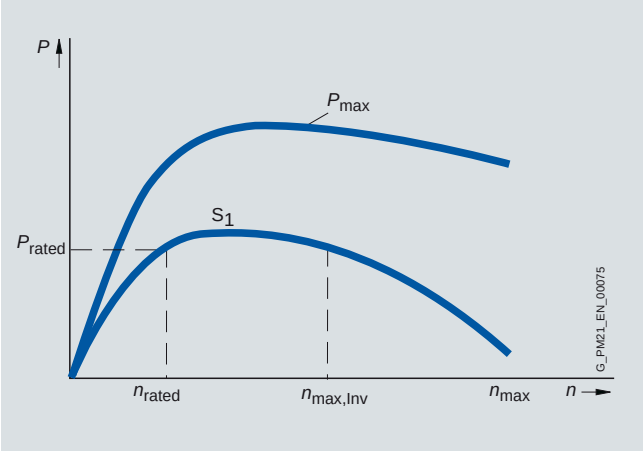
Characteristic curves

1PH8 asynchronous motor



Typical speed/power characteristic for 1PH8 asynchronous motors

1PH8 synchronous motor



Typical speed/power characteristic for 1PH8 synchronous motors

The characteristic curves show the typical relationship between motor speed and drive power for 1PH8 motors for duty type S1 (continuous duty) in accordance with IEC 60034-1.

The detailed characteristic curves for the corresponding voltage and winding variants can be found in the 1PH8 Configuration Manual.

1PH8 asynchronous and synchronous motors Forced ventilation

Technical specifications

1PH8 motor, forced ventilation	
Insulation of the stator winding in accordance with EN 60034-1 (IEC 60034-1)	For an ambient temperature of up to 40 °C (104°F) Temperature class 180 (H)
Cooling according to EN 60034-6 (IEC 60034-6) • 1PH808 to 1PH816 • 1PH835	Forced ventilation Fan mounted axially at NDE Fan mounted radially at NDE
Temperature monitoring • 1PH808 to 1PH816 • 1PH835	 Temperature sensor KTY84 in the stator winding 1 additional KTY84 as reserve
Motor fan ratings • 1PH808 • 1PH810 to 1PH835	 230 V 1 AC 50 Hz/265 V 1 AC 60 Hz 400 V 3 AC 50 Hz/480 V 3 AC 60 Hz
Type of construction in accordance with EN 60034-7 (IEC 60034-7) • 1PH808 • 1PH810 to 1PH816 • 1PH835	 IM B3, IM B5 IM B3, IM B5, IM B35 IM B3, IM B35
Degree of protection in accordance with EN 60034-5 (IEC 60034-5) • 1PH808 to 1PH835 • 1PH835	 IP55 IP23
Shaft extension on the drive end in accordance with DIN 748-3 (IEC 60072-1)	Plain shaft or fitted key full-key or half-key balancing for fitted key
Shaft and flange accuracy in accordance with DIN 42955 (IEC 60072-1)[1)] • 1PH808 to 1PH816 • 1PH835	 Tolerance R (reduced) Tolerance N (normal)
Vibration magnitude in accordance with Siemens/EN 60034-14 (IEC 60034-14)[1)] • 1PH808 to 1PH816 • 1PH835	 Grade R/A Grade A
Max. sound pressure level L_{pA} (1 m) in accordance with EN ISO 1680, max. Tolerance + 3 dB, external fan 50 Hz • 1PH808 to 1PH813 • 1PH816 • 1PH835	 70 dB at a rated pulse frequency of 4 kHz and a speed range up to 5000 rpm 73 dB at a rated pulse frequency of 4 kHz and a speed range up to 5000 rpm 77 dB at a rated pulse frequency of 2.5 kHz and a speed range up to 2800 rpm
Connection • 1PH808 to 1PH813 • 1PH816 • 1PH835	Connector for signals or DRIVE-CLiQ interface (mating connector is not included in the scope of supply) Terminal box NDE top/power connector Terminal box NDE top Terminal box DE right
Paint finish	Anthracite RAL 7016

[1)] Shaft extension run-out, concentricity of centering ring and shaft, and perpendicularity of flange to shaft.

Technical specifications (continued)

1PH8 motor, water cooling	
Insulation of the stator winding in accordance with EN 60034-1 (IEC 60034-1)	For a cooling water inlet temperature of up to 30 °C (86°F) Temperature class 180 (H)[2]
Cooling according to EN 60034-6 (IEC 60034-6)	Water cooling Max. cooling water pressure at inlet: 6 bar Connecting thread at NDE
Temperature monitoring • 1PH808 to 1PH816 • 1PH818 to 1PH828	 Temperature sensor KTY84 in the stator winding 1 additional KTY84 as reserve
Type of construction in accordance with EN 60034-7 (IEC 60034-7) • 1PH808 • 1PH810 to 1PH828	 IM B3, IM B5 IM B3, IM B5, IM B35
Degree of protection in accordance with EN 60034-5 (IEC 60034-5) • 1PH808 to 1PH816 • 1PH818 to 1PH828	 IP65 IP55
Shaft extension on the drive end in accordance with DIN 748-3 (IEC 60072-1)	Plain shaft or fitted key full-key or half-key balancing for fitted key
Shaft and flange accuracy in accordance with DIN 42955 (IEC 60072-1)[1] • 1PH808 to 1PH816 • 1PH818 to 1PH828	 Tolerance R (reduced) Tolerance N (normal)
Vibration magnitude in accordance with Siemens/EN 60034-14 (IEC 60034-14)[1] • 1PH808 to 1PH816 • 1PH818 to 1PH828	 Grade R/A Grade A
Sound pressure level L_{pA} (1 m) in accordance with EN ISO 1680, max. Tolerance +3 dB • 1PH808 to 1PH813 • 1PH816 • 1PH818 • 1PH822 • 1PH828	 68 dB at a rated pulse frequency of 4 kHz and a speed range up to 5000 rpm 69 dB at a rated pulse frequency of 4 kHz and a speed range up to 5000 rpm 70 dB at a rated pulse frequency of 2 or 4 kHz and a speed range up to 5000 rpm 70 dB at a rated pulse frequency of 2 or 4 kHz and a speed range up to 4500 rpm 72 dB at a rated pulse frequency of 2 kHz and a speed range up to 3300 rpm
Connection • 1PH808 to 1PH813 • 1PH816 to 1PH828	Connector for signals or DRIVE-CLiQ interface (mating connector is not included in the scope of supply) Terminal box NDE top/power connector Terminal box NDE top
Paint finish	Anthracite RAL 7016

[1] Shaft extension run-out, concentricity of centering ring and shaft, and perpendicularity of flange to shaft.

[2] The following motors are designed to conform to temperature class 155 (F):
1PH8107-1.F2
1PH8138-2.F2/1PH8138-2.G2
1PH8164/1PH8166/1PH8168

1PH8 asynchronous motors
Forced ventilation, IP55 degree of protection

Selection and ordering data

Rated speed	Shaft height	Rated power	Rated torque	Rated current	Rated voltage	Rated frequency	Operating speed during field weakening, max.[1]	Speed, max.[2]	1PH8 asynchronous motor Forced ventilation
n_{rated}	SH	P_{rated}	M_{rated}	I_{rated}	U_{rated}	f_{rated}	n_2	n_{max}	
rpm		kW (HP)	Nm (lb_f-ft)	A	V	Hz	rpm	rpm	Order No.
Line voltage 400 V 3 AC, Smart/Basic Line Module									
400	160	9.5 (12.74)	227 (167)	30	260	14.3	2150	6500	**1PH8163-1■B■■-...1**
		13 (17.43)	310 (229)	36	300	14.1	1750	6500	**1PH8165-1■B■■-...1**
1000	100	3.7 (4.96)	35 (25.8)	10	333	35.8	2550	9000	**1PH8103-1■D■■-...1**
		6.3 (8.45)	60 (44.3)	17.5	307	35.5	4300	9000	**1PH8107-1■D■■-...1**
	132	12 (16.1)	115 (84.8)	30	319	35.0	3000	8000	**1PH8133-1■D■■-...1**
		17 (22.8)	162 (119)	43	307	34.8	4300	8000	**1PH8137-1■D■■-...1**
	160	22 (29.5)	210 (155)	55	300	34.2	2800	6500	**1PH8163-1■D■■-...1**
		28 (37.55)	267 (197)	71	292	34.2	4600	6500	**1PH8165-1■D■■-...1**
1500	80	2.8 (3.75)	18 (13.3)	7.5	346	53.3	4700	10000	**1PH8083-1■F■■-...1**
		3.7 (4.96)	24 (17.7)	10	336	53.2	5200	10000	**1PH8087-1■F■■-...1**
	100	3.7 (4.96)	24 (17.7)	12.5	265	52.4	5000	9000	**1PH8101-1■F■■-...1**
		5.5 (7.38)	35 (25.8)	13.5	368	52.4	4200	9000	**1PH8103-1■F■■-...1**
		7.0 (9.39)	45 (33.2)	17.5	348	51.9	5250	9000	**1PH8105-1■F■■-...1**
		9.0 (12.1)	57 (42)	23.5	330	52.2	4500	9000	**1PH8107-1■F■■-...1**
	132	11 (14.75)	70 (51.6)	24	360	51.4	4800	8000	**1PH8131-1■F■■-...1**
		15 (20.12)	96 (70.8)	34	342	51.3	5500	8000	**1PH8133-1■F■■-...1**
		18.5 (24.81)	118 (87)	43	330	51.3	6150	8000	**1PH8135-1■F■■-...1**
		22 (29.5)	140 (103)	56	308	51.3	4300	8000	**1PH8137-1■F■■-...1**
	160	30 (40.23)	191 (141)	71	319	50.8	3500	6500	**1PH8163-1■F■■-...1**
		37 (49.62)	236 (174)	78	350	50.8	2800	6500	**1PH8165-1■F■■-...1**
2000	80	3.7 (4.96)	18 (13.3)	11.6	293	70.2	9200	10000	**1PH8083-1■G■■-...1**
		4.9 (6.57)	23 (17.0)	14.1	320	69.8	8400	10000	**1PH8087-1■G■■-...1**
	100	7 (9.39)	33 (24.3)	17.5	345	69.0	6000	9000	**1PH8103-1■G■■-...1**
		10.5 (14.18)	50 (36.9)	26	355	68.6	4000	9000	**1PH8107-1■G■■-...1**
	132	20 (26.82)	96 (70.8)	45	350	68.1	4000	8000	**1PH8133-1■G■■-...1**
		28 (37.55)	134 (98.8)	60	350	68.1	4000	8000	**1PH8137-1■G■■-...1**
	160	36 (48.28)	172 (127)	83	324	67.5	3000	6500	**1PH8163-1■G■■-...1**
		41 (54.98)	196 (145)	88	350	67.4	2750	6500	**1PH8165-1■G■■-...1**
3000	80	4.1 (5.50)	13 (9.59)	13.6	298	102.6	10000	10000	**1PH8083-1■M■■-...1**
		4.8 (6.44)	15 (11.1)	17.3	284	102.2	10000	10000	**1PH8087-1■M■■-...1**
	100	8.4 (11.3)	27 (20.0)	25.7	297	102.1	14250	9000	**1PH8103-1■M■■-...1**
		12 (16.1)	38 (28.0)	38	294	101.6	16500	9000	**1PH8107-1■M■■-...1**

For versions, see Order No. supplement and options on page 5/54.

Motor type (repeated)	Power factor	Magnetizing current	Efficiency	Moment of inertia	Weight, approx.	Terminal box	SINAMICS S120 Motor Module	
							Rated output current[3]	For additional versions and components see chapter SINAMICS S120 drive system
	$\cos \varphi$	I_μ	η	J			I_{rated}	
		A		kgm^2 (lb_f-in-s^2)	kg (lb)	Type	A	Order No.
1PH8163-1. B...	0.91	8.1	0.823	0.2160 (1.912)	196 (432)	gk863	30	**6SL312■-1TE23-0AA3**
1PH8165-1. B...	0.86	14.9	0.826	0.2320 (2.053)	230 (507)	gk863	45	**6SL312■-1TE24-5AA3**
1PH8103-1. D...	0.82	4.6	0.814	0.0172 (0.152)	51 (112)	gk813	18	**6SL312■-1TE21-8AA3**
1PH8107-1. D...	0.82	8.2	0.834	0.0289 (0.256)	73 (161)	gk813	18	**6SL312■-1TE21-8AA3**
1PH8133-1. D...	0.88	10.1	0.871	0.0760 (0.673)	106 (234)	gk833	30	**6SL312■-1TE23-0AA3**
1PH8137-1. D...	0.88	15.1	0.881	0.1090 (0.965)	141 (311)	gk833	45	**6SL312■-1TE24-5AA3**
1PH8163-1. D...	0.89	17.3	0.909	0.2160 (1.912)	196 (432)	gk863	60	**6SL312■-1TE26-0AA3**
1PH8165-1. D...	0.89	22.2	0.914	0.2320 (2.053)	230 (507)	gk863	85	**6SL312■-1TE28-5AA3**
1PH8083-1. F...	0.80	3.8	0.809	0.0064 (0.057)	32 (70.6)	gk803	9	**6SL312■-1TE21-0AA3**
1PH8087-1. F...	0.81	4.9	0.817	0.0089 (0.079)	39 (86.0)	gk803	18	**6SL312■-1TE21-8AA3**
1PH8101-1. F...	0.80	6.0	0.835	0.0138 (0.122)	42 (92.6)	gk813	18	**6SL312■-1TE21-8AA3**
1PH8103-1. F...	0.80	6.5	0.852	0.0172 (0.152)	51 (112)	gk813	18	**6SL312■-1TE21-8AA3**
1PH8105-1. F...	0.79	8.8	0.867	0.0252 (0.223)	65 (143)	gk813	18	**6SL312■-1TE21-8AA3**
1PH8107-1. F...	0.81	10.8	0.869	0.0289 (0.256)	73 (161)	gk813	30	**6SL312■-1TE23-0AA3**
1PH8131-1. F...	0.84	10.4	0.899	0.0590 (0.522)	89 (196)	gk833	30	**6SL312■-1TE23-0AA3**
1PH8133-1. F...	0.85	14.2	0.899	0.0760 (0.673)	106 (234)	gk833	45	**6SL312■-1TE24-5AA3**
1PH8135-1. F...	0.85	18.1	0.898	0.0940 (0.832)	125 (276)	gk833	45	**6SL312■-1TE24-5AA3**
1PH8137-1. F...	0.84	24.2	0.904	0.1090 (0.965)	141 (311)	gk833	60	**6SL312■-1TE26-0AA3**
1PH8163-1. F...	0.87	25.6	0.923	0.2160 (1.912)	196 (432)	gk863	85	**6SL312■-1TE28-5AA3**
1PH8165-1. F...	0.88	27.0	0.926	0.2320 (2.053)	230 (507)	gk863	85	**6SL312■-1TE28-5AA3**
1PH8083-1. G...	0.79	5.7	0.832	0.0064 (0.057)	32 (70.6)	gk803	18	**6SL312■-1TE21-8AA3**
1PH8087-1. G...	0.78	7.3	0.853	0.0089 (0.079)	39 (86.0)	gk803	18	**6SL312■-1TE21-8AA3**
1PH8103-1. G...	0.79	8.7	0.877	0.0172 (0.152)	51 (112)	gk813	18	**6SL312■-1TE21-8AA3**
1PH8107-1. G...	0.78	12.9	0.897	0.0289 (0.256)	73 (161)	gk813	30	**6SL312■-1TE23-0AA3**
1PH8133-1. G...	0.85	18.1	0.919	0.0760 (0.673)	106 (234)	gk833	45	**6SL312■-1TE24-5AA3**
1PH8137-1. G...	0.87	21.5	0.924	0.1090 (0.965)	141 (311)	gk833	60	**6SL312■-1TE26-0AA3**
1PH8163-1. G...	0.88	28.1	0.929	0.2160 (1.912)	196 (432)	gk863	85	**6SL312■-1TE28-5AA3**
1PH8165-1. G...	0.87	32.4	0.927	0.2320 (2.053)	230 (507)	gk863	85[4]	**6SL312■-1TE28-5AA3**
1PH8083-1. M...	0.74	7.3	0.869	0.0064 (0.057)	32 (70.6)	gk803	18	**6SL312■-1TE21-8AA3**
1PH8087-1. M...	0.72	9.6	0.871	0.0089 (0.079)	39 (86.0)	gk803	18	**6SL312■-1TE21-8AA3**
1PH8103-1. M...	0.78	12.2	0.900	0.0172 (0.152)	51 (112)	gk813	30	**6SL312■-1TE23-0AA3**
1PH8107-1. M...	0.76	19.2	0.900	0.0289 (0.256)	73 (161)	gk813	45	**6SL312■-1TE24-5AA3**

Cooling:	
Internal air cooling	**0**
External air cooling	**1**

1) n_2: Max. permissible thermal speed at constant power or speed which is at the voltage limit when $P = P_{rated}$.

2) n_{max}: Maximum speed that must not be exceeded (applicable to Standard: 14th data position B to D).

3) The rated pulse frequencies must be taken into account. The rated motor data is valid for 4 kHz. For lower power ratings, Motor Modules in blocksize format can be configured as an alternative (levels of output current: 7.7 A/10.2 A/18 A).

4) The rated output current of the Motor Module is lower than the rated motor current at 4 kHz.

1PH8 asynchronous motors
Forced ventilation, IP55 degree of protection

Selection and ordering data

Rated speed	Shaft height	Rated power	Rated torque	Rated current	Rated voltage	Rated frequency	Operating speed during field weakening, max.[1]	Speed, max.[2]	1PH8 asynchronous motor Forced ventilation
n_{rated}	SH	P_{rated}	M_{rated}	I_{rated}	U_{rated}	f_{rated}	n_2	n_{max}	
rpm		kW (HP)	Nm (lb_f-ft)	A	V	Hz	rpm	rpm	Order No.
Line voltage 400 V 3 AC, Active Line Module									
500	160	12 (16.1)	229 (169)	30	325	17.6	2200	6500	**1PH8163-1■B■■-...1**
		16 (21.5)	306 (221)	36	365	17.5	1850	6500	**1PH8165-1■B■■-...1**
1150	100	4.3 (5.77)	36 (26.6)	10	380	40.7	2450	9000	**1PH8103-1■D■■-...1**
		7.2 (9.66)	60 (44.3)	17.5	348	40.6	4750	9000	**1PH8107-1■D■■-...1**
	132	13.5 (18.1)	112 (82.6)	29	361	40.0	3000	8000	**1PH8133-1■D■■-...1**
		19.5 (26.1)	162 (119)	43	350	39.8	4000	8000	**1PH8137-1■D■■-...1**
	160	25 (33.5)	208 (153)	55	343	39.2	3550	6500	**1PH8163-1■D■■-...1**
		31 (41.6)	257 (190)	69	333	39.2	4850	6500	**1PH8165-1■D■■-...1**
1750	80	3.3 (4.43)	18 (13.3)	7.5	398	61.7	5200	10000	**1PH8083-1■F■■-...1**
		4.3 (5.77)	23 (17.0)	10	396	61.3	5850	10000	**1PH8087-1■F■■-...1**
	100	4.3 (5.77)	23 (17.0)	12.5	304	60.8	5000	9000	**1PH8101-1■F■■-...1**
		6.3 (8.45)	34 (25.1)	13.1	412	60.8	4000	9000	**1PH8103-1■F■■-...1**
		8 (10.7)	44 (32.5)	17.5	400	60.2	5900	9000	**1PH8105-1■F■■-...1**
		10 (13.4)	55 (40.6)	22	380	60.4	5000	9000	**1PH8107-1■F■■-...1**
	132	13 (17.4)	71 (52.4)	24	416	59.8	5150	8000	**1PH8131-1■F■■-...1**
		17.5 (23.5)	96 (70.8)	34	392	59.7	5000	8000	**1PH8133-1■F■■-...1**
		21.5 (28.8)	117 (86.3)	43	383	59.6	5500	8000	**1PH8135-1■F■■-...1**
		25 (33.5)	136 (100)	56	353	59.6	5000	8000	**1PH8137-1■F■■-...1**
	160	34 (45.6)	186 (137)	70	366	59.2	3050	6500	**1PH8163-1■F■■-...1**
		41 (55.0)	224 (165)	76	400	59.1	2650	6500	**1PH8165-1■F■■-...1**
2300	80	4.1 (5.50)	17 (12.5)	11.3	332	80.0	10000	10000	**1PH8083-1■G■■-...1**
		5.4 (7.24)	22 (16.2)	13.7	353	79.8	9650	10000	**1PH8087-1■G■■-...1**
	100	7.5 (10.1)	31 (22.9)	17	382	78.9	6000	9000	**1PH8103-1■G■■-...1**
		12.0 (16.1)	50 (36.9)	26	406	78.6	4600	9000	**1PH8107-1■G■■-...1**
	132	22.5 (30.2)	93 (68.6)	44	400	78.1	5000	8000	**1PH8133-1■G■■-...1**
		29 (38.9)	120 (88.5)	56	400	77.9	5000	8000	**1PH8137-1■G■■-...1**
	160	38 (51.0)	158 (116)	78	370	77.4	3200	6500	**1PH8163-1■G■■-...1**
		44 (59.0)	183 (135)	85	394	77.4	3000	6500	**1PH8165-1■G■■-...1**
3300	80	4.5 (6.03)	13 (9.59)	13.5	327	112.6	10000	10000	**1PH8083-1■M■■-...1**
		5.2 (6.97)	15 (11.1)	17.1	303	112.3	10000	10000	**1PH8087-1■M■■-...1**
	100	9.3 (12.5)	27 (20.0)	25.7	326	112.1	16000	9000	**1PH8103-1■M■■-...1**
		13 (17.4)	38 (28.0)	38	314	111.7	18000	9000	**1PH8107-1■M■■-...1**

For versions, see Order No. supplement and options on page 5/54.

Motor type (repeated)	Power factor	Magnetizing current	Efficiency	Moment of inertia	Weight, approx.	Terminal box	SINAMICS S120 Motor Module	
							Rated output current[3]	For additional versions and components see chapter SINAMICS S120 drive system
	$\cos \varphi$	I_μ	η	J			I_{rated}	
		A		kgm^2 (lb$_f$-in-s^2)	kg (lb)	Type	A	Order No.
1PH8163-1. B...	0.90	8.9	0.819	0.2160 (1.912)	196 (432)	gk863	30	**6SL312■-1TE23-0AA3**
1PH8165-1. B...	0.85	14.8	0.830	0.2320 (2.053)	230 (507)	gk863	45	**6SL312■-1TE24-5AA3**
1PH8103-1. D...	0.81	4.8	0.824	0.0172 (0.152)	51 (112)	gk813	18	**6SL312■-1TE21-8AA3**
1PH8107-1. D...	0.82	8.2	0.852	0.0289 (0.256)	73 (161)	gk813	18	**6SL312■-1TE21-8AA3**
1PH8133-1. D...	0.87	10.7	0.884	0.0760 (0.673)	106 (234)	gk833	30	**6SL312■-1TE23-0AA3**
1PH8137-1. D...	0.87	16.1	0.891	0.1090 (0.965)	141 (311)	gk833	45	**6SL312■-1TE24-5AA3**
1PH8163-1. D...	0.88	17.5	0.915	0.2160 (1.912)	196 (432)	gk863	60	**6SL312■-1TE26-0AA3**
1PH8165-1. D...	0.89	20.9	0.921	0.2320 (2.053)	230 (507)	gk863	85	**6SL312■-1TE28-5AA3**
1PH8083-1. F...	0.80	3.8	0.831	0.0064 (0.057)	32 (70.6)	gk803	9	**6SL312■-1TE21-0AA3**
1PH8087-1. F...	0.78	5.3	0.838	0.0089 (0.079)	39 (86.0)	gk803	18	**6SL312■-1TE21-8AA3**
1PH8101-1. F...	0.80	6.0	0.852	0.0138 (0.122)	42 (92.6)	gk813	18	**6SL312■-1TE21-8AA3**
1PH8103-1. F...	0.81	6.0	0.859	0.0172 (0.152)	51 (112)	gk813	18	**6SL312■-1TE21-8AA3**
1PH8105-1. F...	0.78	8.8	0.878	0.0252 (0.223)	65 (143)	gk813	18	**6SL312■-1TE21-8AA3**
1PH8107-1. F...	0.80	10.9	0.878	0.0289 (0.256)	73 (161)	gk813	30	**6SL312■-1TE23-0AA3**
1PH8131-1. F...	0.84	10.3	0.914	0.0590 (0.522)	89 (196)	gk833	30	**6SL312■-1TE23-0AA3**
1PH8133-1. F...	0.85	13.6	0.913	0.0760 (0.673)	106 (234)	gk833	45	**6SL312■-1TE24-5AA3**
1PH8135-1. F...	0.84	18.3	0.909	0.0940 (0.832)	125 (276)	gk833	45	**6SL312■-1TE24-5AA3**
1PH8137-1. F...	0.86	23.1	0.907	0.1090 (0.965)	141 (311)	gk833	60	**6SL312■-1TE26-0AA3**
1PH8163-1. F...	0.87	24.6	0.926	0.2160 (1.912)	196 (432)	gk863	85	**6SL312■-1TE28-5AA3**
1PH8165-1. F...	0.88	25.8	0.934	0.2320 (2.053)	230 (507)	gk863	85	**6SL312■-1TE28-5AA3**
1PH8083-1. G...	0.78	5.7	0.852	0.0064 (0.057)	32 (70.6)	gk803	18	**6SL312■-1TE21-8AA3**
1PH8087-1. G...	0.79	6.8	0.859	0.0089 (0.079)	39 (86.0)	gk803	18	**6SL312■-1TE21-8AA3**
1PH8103-1. G...	0.79	8.1	0.891	0.0172 (0.152)	51 (112)	gk813	18	**6SL312■-1TE21-8AA3**
1PH8107-1. G...	0.78	13.0	0.909	0.0289 (0.256)	73 (161)	gk813	30	**6SL312■-1TE23-0AA3**
1PH8133-1. G...	0.84	18.1	0.933	0.0760 (0.673)	106 (234)	gk833	45	**6SL312■-1TE24-5AA3**
1PH8137-1. G...	0.86	21.9	0.929	0.1090 (0.965)	141 (311)	gk833	60	**6SL312■-1TE26-0AA3**
1PH8163-1. G...	0.87	28.2	0.935	0.2160 (1.912)	196 (432)	gk863	85	**6SL312■-1TE28-5AA3**
1PH8165-1. G...	0.86	31.0	0.932	0.2320 (2.053)	230 (507)	gk863	85	**6SL312■-1TE28-5AA3**
1PH8083-1. M...	0.74	7.3	0.875	0.0064 (0.057)	32 (70.6)	gk803	18	**6SL312■-1TE21-8AA3**
1PH8087-1. M...	0.73	9.2	0.878	0.0089 (0.079)	39 (86.0)	gk803	18	**6SL312■-1TE21-8AA3**
1PH8103-1. M...	0.78	12.2	0.900	0.0172 (0.152)	51 (112)	gk813	30	**6SL312■-1TE23-0AA3**
1PH8107-1. M...	0.78	12.2	0.900	0.0289 (0.256)	73 (161)	gk813	45	**6SL312■-1TE24-5AA3**

Cooling:	
Internal air cooling	**0**
External air cooling	**1**

1) n_2: Max. permissible thermal speed at constant power or speed which is at the voltage limit when $P = P_{rated}$.
2) n_{max}: Maximum speed that must not be exceeded (applicable to Standard; 14th data position B to D).
3) The rated pulse frequencies must be taken into account. The rated motor data is valid for 4 kHz. For lower power ratings, Motor Modules in blocksize format can be configured as an alternative (levels of output current: 7.7 A/10.2 A/18 A).

1PH8 asynchronous motors
Forced ventilation, IP55 degree of protection

Selection and ordering data

Rated speed	Shaft height	Rated power	Rated torque	Rated current	Rated voltage	Rated frequency	Operating speed during field weakening, max.[1]	Speed, max.[2]	1PH8 asynchronous motor Forced ventilation
n_{rated}	SH	P_{rated}	M_{rated}	I_{rated}	U_{rated}	f_{rated}	n_2	n_{max}	
rpm		kW (HP)	Nm (lb_f-ft)	A	V	Hz	rpm	rpm	Order No.
Line voltage 480 V 3 AC, Smart/Basic/Active Line Module									
600	160	14.5 (19.4)	231 (170)	30	370	21.0	2150	6500	**1PH8163-1■B■■-...1**
		19 (25,5)	302 (223)	35	420	20.8	1800	6500	**1PH8165-1■B■■-...1**
1350	100	4.7 (6.30)	33 (24.3)	9.7	423	47.3	3500	9000	**1PH8103-1■D■■-...1**
		8 (10.7)	57 (42.0)	17	400	47.1	5045	9000	**1PH8107-1■D■■-...1**
	132	15 (20.1)	106 (78.2)	28	417	46.5	3500	8000	**1PH8133-1■D■■-...1**
		22 (29.5)	156 (115)	42	404	46.4	4000	8000	**1PH8137-1■D■■-...1**
	160	28 (37.6)	198 (146)	52	400	45.8	4000	6500	**1PH8163-1■D■■-...1**
		34 (45.6)	241 (178)	66	387	45.8	5600	6500	**1PH8165-1■D■■-...1**
2000	80	3.7 (4.96)	18 (13.3)	7.6	447	70.0	5550	10000	**1PH8083-1■F■■-...1**
		4.9 (6.57)	23 (17.0)	10	435	69.9	6100	10000	**1PH8087-1■F■■-...1**
	100	4.7 (6.30)	22 (16.2)	12.5	343	69.0	7500	9000	**1PH8101-1■F■■-...1**
		7 (9.39)	33 (24.3)	12.7	460	69.1	4100	9000	**1PH8103-1■F■■-...1**
		9 (12.1)	43 (31.7)	17	453	68.5	6180	9000	**1PH8105-1■F■■-...1**
		11 (14.8)	53 (39.1)	21.5	428	68.6	5500	9000	**1PH8107-1■F■■-...1**
	132	15 (20.1)	72 (53.1)	24	460	68.2	5300	8000	**1PH8131-1■F■■-...1**
		20 (26.8)	96 (70.8)	34	445	68.0	6200	8000	**1PH8133-1■F■■-...1**
		24 (32.2)	115 (84.8)	43	434	67.9	7100	8000	**1PH8135-1■F■■-...1**
		28 (37.6)	134 (98.8)	55	401	67.9	4000	8000	**1PH8137-1■F■■-...1**
	160	37 (49.6)	177 (131)	68	416	67.4	3550	6500	**1PH8163-1■F■■-...1**
		45 (60.4)	215 (159)	75	440	67.5	3300	6500	**1PH8165-1■F■■-...1**
2650	80	4.6 (6.17)	17 (12.5)	11.2	376	91.6	10000	10000	**1PH8083-1■G■■-...1**
		6 (8.05)	22 (16.2)	13.6	390	91.6	10000	10000	**1PH8087-1■G■■-...1**
	100	8 (10.7)	29 (21.4)	16	434	90.4	7500	9000	**1PH8103-1■G■■-...1**
		13 (17.4)	47 (34.7)	24	460	90.0	7000	9000	**1PH8107-1■G■■-...1**
	132	24 (32.2)	86 (63.4)	41	456	89.6	7000	8000	**1PH8133-1■G■■-...1**
		30 (40.2)	108 (79.7)	52	460	89.4	4250	8000	**1PH8137-1■G■■-...1**
	160	40 (53.6)	144 (106)	76	390	89.2	3500	6500	**1PH8163-1■G■■-...1**
		50 (67.1)	180 (133)	85	440	89.0	3250	6500	**1PH8165-1■G■■-...1**
3600	80	4.9 (6.57)	13 (9.59)	14	355	122.6	10000	10000	**1PH8083-1■M■■-...1**
		5.7 (7.64)	15 (11.1)	17.1	329	122.4	10000	10000	**1PH8087-1■M■■-...1**
	100	10 (13.4)	27 (19.9)	25.4	355	122.1	17650	9000	**1PH8103-1■M■■-...1**
		14 (18.8)	37 (27.3)	37.5	350	121.6	18000	9000	**1PH8107-1■M■■-...1**

For versions, see Order No. supplement and options on page 5/54.

Motor type (repeated)	Power factor	Magnetizing current	Efficiency	Moment of inertia	Weight, approx.	Terminal box	SINAMICS S120 Motor Module	
							Rated output current[3]	For additional versions and components see chapter SINAMICS S120 drive system
	$\cos \varphi$	I_μ	η	J			I_{rated}	
		A		kgm^2 (lb$_f$-in-s^2)	kg (lb)	Type	A	Order No.
1PH8163-1.B...	0.90	8.1	0.851	0.2160 (1.912)	196 (432)	gk863	30	6SL312■-1TE23-0AA3
1PH8165-1.B...	0.88	12.0	0.850	0.2320 (2.053)	230 (507)	gk863	45	6SL312■-1TE24-5AA3
1PH8103-1.D...	0.82	4.4	0.848	0.0172 (0.152)	51 (112)	gk813	18	6SL312■-1TE21-8AA3
1PH8107-1.D...	0.80	8.2	0.867	0.0289 (0.256)	73 (161)	gk813	18	6SL312■-1TE21-8AA3
1PH8133-1.D...	0.86	10.7	0.904	0.0760 (0.673)	106 (234)	gk833	30	6SL312■-1TE23-0AA3
1PH8137-1.D...	0.86	15.9	0.902	0.1090 (0.965)	141 (311)	gk833	45	6SL312■-1TE24-5AA3
1PH8163-1.D...	0.88	17.7	0.924	0.2160 (1.912)	196 (432)	gk863	60	6SL312■-1TE26-0AA3
1PH8165-1.D...	0.86	22.5	0.928	0.2320 (2.053)	230 (507)	gk863	85	6SL312■-1TE28-5AA3
1PH8083-1.F...	0.79	3.7	0.850	0.0064 (0.057)	32 (70.6)	gk803	9	6SL312■-1TE21-0AA3
1PH8087-1.F...	0.80	4.9	0.864	0.0089 (0.079)	39 (86.0)	gk803	18	6SL312■-1TE21-8AA3
1PH8101-1.F...	0.79	6.0	0.871	0.0138 (0.122)	42 (92.6)	gk813	18	6SL312■-1TE21-8AA3
1PH8103-1.F...	0.81	5.8	0.894	0.0172 (0.152)	51 (112)	gk813	18	6SL312■-1TE21-8AA3
1PH8105-1.F...	0.78	8.7	0.911	0.0252 (0.223)	65 (143)	gk813	18	6SL312■-1TE21-8AA3
1PH8107-1.F...	0.79	10.8	0.901	0.0289 (0.256)	73 (161)	gk813	30	6SL312■-1TE23-0AA3
1PH8131-1.F...	0.86	9.2	0.931	0.0590 (0.522)	89 (196)	gk833	30	6SL312■-1TE23-0AA3
1PH8133-1.F...	0.85	13.5	0.933	0.0760 (0.673)	106 (234)	gk833	45	6SL312■-1TE24-5AA3
1PH8135-1.F...	0.84	18.1	0.929	0.0940 (0.832)	125 (276)	gk833	45	6SL312■-1TE24-5AA3
1PH8137-1.F...	0.84	23.1	0.931	0.1090 (0.965)	141 (311)	gk833	60	6SL312■-1TE26-0AA3
1PH8163-1.F...	0.86	24.6	0.932	0.2160 (1.912)	196 (432)	gk863	85	6SL312■-1TE28-5AA3
1PH8165-1.F...	0.89	23.6	0.936	0.2320 (2.053)	230 (507)	gk863	85	6SL312■-1TE28-5AA3
1PH8083-1.G...	0.78	5.7	0.862	0.0064 (0.057)	32 (70.6)	gk803	18	6SL312■-1TE21-8AA3
1PH8087-1.G...	0.79	6.5	0.884	0.0089 (0.079)	39 (86.0)	gk803	18	6SL312■-1TE21-8AA3
1PH8103-1.G...	0.78	8.1	0.913	0.0172 (0.152)	51 (112)	gk813	18	6SL312■-1TE21-8AA3
1PH8107-1.G...	0.77	12.8	0.932	0.0289 (0.256)	73 (161)	gk813	30	6SL312■-1TE23-0AA3
1PH8133-1.G...	0.83	18.1	0.949	0.0760 (0.673)	106 (234)	gk833	45	6SL312■-1TE24-5AA3
1PH8137-1.G...	0.83	22.4	0.941	0.1090 (0.965)	141 (311)	gk833	60	6SL312■-1TE26-0AA3
1PH8163-1.G...	0.89	23.1	0.936	0.2160 (1.912)	196 (432)	gk863	85	6SL312■-1TE28-5AA3
1PH8165-1.G...	0.87	28.9	0.932	0.2320 (2.053)	230 (507)	gk863	85	6SL312■-1TE28-5AA3
1PH8083-1.M...	0.74	7.3	0.881	0.0064 (0.057)	32 (70.6)	gk803	18	6SL312■-1TE21-8AA3
1PH8087-1.M...	0.73	9.2	0.878	0.0089 (0.079)	39 (86.0)	gk803	18	6SL312■-1TE21-8AA3
1PH8103-1.M...	0.77	12.3	0.910	0.0172 (0.152)	51 (112)	gk813	30	6SL312■-1TE23-0AA3
1PH8107-1.M...	0.77	12.3	0.910	0.0289 (0.256)	73 (161)	gk813	45	6SL312■-1TE24-5AA3

Cooling:	
Internal air cooling	**0**
External air cooling	**1**

1) n_2: Max. permissible thermal speed at constant power or speed which is at the voltage limit when $P = P_{rated}$.
2) n_{max}: Maximum speed that must not be exceeded (applicable to Standard: 14th data position B to D).
3) The rated pulse frequencies must be taken into account. The rated motor data is valid for 4 kHz. For lower power ratings, Motor Modules in blocksize format can be configured as an alternative (levels of output current: 7.7 A/10.2 A/18 A).

1PH8 asynchronous motors
Forced ventilation, IP55 degree of protection

Selection and ordering data

Rated speed	Shaft height	Rated power	Rated torque	Rated current	Rated voltage	Rated frequency	Operating speed during field weakening, max.[1]	Speed, max.[2]	1PH8 asynchronous motor Forced ventilation
n_{rated}	SH	P_{rated}	M_{rated}	I_{rated}	U_{rated}	f_{rated}	n_2	n_{max}	
rpm		kW (HP)	Nm (lb_f-ft)	A	V	Hz	rpm	rpm	Order No.
Line voltage 400 V 3 AC, Active Line Module (noise value 77 dB)									
480	355	160 (215)	3183 (2348)	315	400	24.2	1150	2800	**1PH8350-1■B1■-...0**
		190 (255)	3780 (2788)	375	400	24.2	1150	2800	**1PH8352-1■B1■-...0**
		225 (302)	4477 (3302)	420	400	24.2	1150	2800	**1PH8354-1■B1■-...0**
		255 (342)	5073 (3742)	485	400	24.2	1150	2800	**1PH8356-1■B1■-...0**
		295 (396)	5869 (4329)	560	400	24.2	1150	2800	**1PH8358-1■B1■-...0**
640	355	210 (282)	3134 (2312)	405	400	32.2	1150	2800	**1PH8350-1■Q1■-...0**
		250 (335)	3730 (2751)	475	400	32.2	1150	2800	**1PH8352-1■Q1■-...0**
		290 (389)	4327 (3192)	560	400	32.2	1150	2800	**1PH8354-1■Q1■-...0**
		335 (449)	4999 (3687)	640	400	32.2	1150	2800	**1PH8356-1■Q1■-...0**
		385 (516)	5745 (4238)	700	400	32.2	1150	2800	**1PH8358-1■Q1■-...0**
800	355	250 (335)	2984 (2201)	490	400	40.2	1200	2800	**1PH8350-1■C1■-...0**
		305 (409)	3641 (2686)	570	400	40.2	1200	2800	**1PH8352-1■C1■-...0**
		355 (476)	4238 (3126)	650	400	40.2	1200	2800	**1PH8354-1■C1■-...0**
		410 (550)	4894 (3610)	750	400	40.2	1300	2800	**1PH8356-1■C1■-...0**
830	355	475 (637)	5444 (4015)	920	400	41.9	1350	2800	**1PH8358-1■C1■-...0**
1080	355	270 (362)	2388 (1761)	495	400	54.2	1450	2800	**1PH8350-1■D1■-...0**
		330 (443)	2918 (2152)	620	400	54.2	1450	2800	**1PH8352-1■D1■-...0**
		375 (503)	3316 (2446)	670	400	54.2	1400	2800	**1PH8354-1■D1■-...0**
		440 (590)	3891 (2870)	810	400	54.2	1400	2800	**1PH8356-1■D1■-...0**
		470 (630)	4156 (3065)	880	400	54.2	1400	2800	**1PH8358-1■D1■-...0**

For versions, see Order No. supplement and options on page 5/58.

Motor type (repeated)	Power factor	Magnetizing current	Efficiency	Moment of inertia	Weight, approx.	Terminal box	SINAMICS S120 Motor Module	
							Rated output current[3]	For additional versions and components see chapter SINAMICS S120 drive system
	cos φ	I_μ	η	J			I_{rated}	
		A		kgm² (lb$_f$-in-s²)	kg (lb)	Type	A	Order No.
1PH8350-1.B1...	0.76	194	0.955	14.74 (130)	2235 (4928)	1XB7712-P01	380	**6SL3320-1TE33-8AA3**
1PH8352-1.B1...	0.77	223	0.957	17.40 (154)	2560 (5645)	1XB7712-P01	490	**6SL3320-1TE35-0AA3**
1PH8354-1.B1...	0.79	236	0.959	20.66 (183)	2889 (6370)	1XB7712-P03	490	**6SL3320-1TE35-0AA3**
1PH8356-1.B1...	0.78	285	0.961	24.22 (214)	3256 (7179)	1XB7712-P03	745	**6SL3320-1TE37-5AA3**
1PH8358-1.B1...	0.79	316	0.962	27.79 (246)	3629 (8002)	1XB7712-P03	840	**6SL3320-1TE38-4AA3**
1PH8350-1.Q1...	0.77	235	0.961	14.74 (130)	2235 (4928)	1XB7712-P01	490	**6SL3320-1TE35-0AA3**
1PH8352-1.Q1...	0.78	267	0.964	17.40 (154)	2560 (5645)	1XB7712-P03	745	**6SL3320-1TE37-5AA3**
1PH8354-1.Q1...	0.77	334	0.965	20.66 (183)	2889 (6370)	1XB7712-P03	840	**6SL3320-1TE38-4AA3**
1PH8356-1.Q1...	0.78	380	0.966	24.22 (214)	3256 (7179)	1XB7712-P03	840	**6SL3320-1TE38-4AA3**
1PH8358-1.Q1...	0.82	359	0.967	27.79 (246)	3629 (8002)	1XB7712-P03	985	**6SL3320-1TE41-0AA3**
1PH8350-1.C1...	0.76	294	0.965	14.74 (130)	2235 (4928)	1XB7712-P01	745	**6SL3320-1TE37-5AA3**
1PH8352-1.C1...	0.80	302	0.967	17.40 (154)	2560 (5645)	1XB7712-P03	840	**6SL3320-1TE38-4AA3**
1PH8354-1.C1...	0.81	328	0.968	20.66 (183)	2889 (6370)	1XB7712-P03	840	**6SL3320-1TE38-4AA3**
1PH8356-1.C1...	0.80	410	0.969	24.22 (214)	3256 (7179)	1XB7712-P03	985	**6SL3320-1TE41-0AA3**
1PH8358-1.C1...	0.76	567	0.969	27.79 (246)	3629 (8002)	1XB7712-P03	1260	**6SL3320-1TE41-2AA3**
1PH8350-1.D1...	0.82	235	0.968	14.74 (130)	2235 (4928)	1XB7712-P03	745	**6SL3320-1TE37-5AA3**
1PH8352-1.D1...	0.79	338	0.969	17.40 (154)	2560 (5645)	1XB7712-P03	840	**6SL3320-1TE38-4AA3**
1PH8354-1.D1...	0.83	314	0.970	20.66 (183)	2889 (6370)	1XB7712-P03	840[4]	**6SL3320-1TE38-4AA3**
1PH8356-1.D1...	0.80	433	0.970	24.22 (214)	3256 (7179)	1XB7712-P03	985	**6SL3320-1TE41-0AA3**
1PH8358-1.D1...	0.79	489	0.970	27.79 (246)	3629 (8002)	1XB7712-P03	1260	**6SL3320-1TE41-2AA3**

1) n_2: Max. permissible thermal speed at constant power or speed which is at the voltage limit when $P = P_{rated}$.
2) n_{max}: Maximum speed that must not be exceeded (applicable to Standard: 14th data position A, B, E or F).
3) The rated pulse frequencies must be taken into account. The rated motor data is valid for 2.5 kHz.
4) The rated output current of the Motor Module is lower than the rated motor current at 2.5 kHz.

1PH8 asynchronous motors
Forced ventilation, IP55 degree of protection

Selection and ordering data

Rated speed	Shaft height	Rated power	Rated torque	Rated current	Rated voltage	Rated frequency	Operating speed during field weakening, max.[1]	Speed, max.[2]	1PH8 asynchronous motor Forced ventilation
n_{rated}	SH	P_{rated}	M_{rated}	I_{rated}	U_{rated}	f_{rated}	n_2	n_{max}	
rpm		kW (HP)	Nm (lb_f-ft)	A	V	Hz	rpm	rpm	Order No.
Line voltage 480 V 3 AC, Smart/Basic Line Module (noise value 77 dB)									
550	355	185 (248)	3212 (2369)	320	460	27.7	1400	2800	**1PH8350-1■B1■-...0**
		220 (295)	3820 (2818)	375	460	27.7	1400	2800	**1PH8352-1■B1■-...0**
		255 (342)	4428 (3266)	420	460	27.7	1400	2800	**1PH8354-1■B1■-...0**
		295 (396)	5122 (3778)	490	460	27.7	1400	2800	**1PH8356-1■B1■-...0**
		340 (456)	5904 (4355)	560	460	27.7	1400	2800	**1PH8358-1■B1■-...0**
750	355	245 (329)	3120 (2301)	405	465	37.7	1400	2800	**1PH8350-1■Q1■-...0**
		295 (396)	3756 (2770)	475	465	37.7	1400	2800	**1PH8352-1■Q1■-...0**
		340 (456)	4329 (3193)	560	465	37.7	1400	2800	**1PH8354-1■Q1■-...0**
		395 (530)	5030 (3710)	640	465	37.7	1400	2800	**1PH8356-1■Q1■-...0**
		450 (603)	5730 (4226)	700	465	37.7	1400	2800	**1PH8358-1■Q1■-...0**
900	355	280 (375)	2971 (2191)	490	450	45.2	1500	2800	**1PH8350-1■C1■-...0**
		340 (456)	3608 (2661)	560	450	45.2	1500	2800	**1PH8352-1■C1■-...0**
		400 (536)	4244 (3130)	650	450	45.2	1500	2800	**1PH8354-1■C1■-...0**
		460 (617)	4881 (3600)	760	450	45.2	1600	2800	**1PH8356-1■C1■-...0**
		515 (691)	5465 (4031)	920	430	45.2	1600	2800	**1PH8358-1■C1■-...0**
1250	355	315 (422)	2407 (1775)	495	460	62.7	1800	2800	**1PH8350-1■D1■-...0**
		380 (510)	2903 (2141)	620	460	62.7	1800	2800	**1PH8352-1■D1■-...0**
		435 (583)	3323 (2451)	670	460	62.7	1700	2800	**1PH8354-1■D1■-...0**
		510 (684)	3896 (2874)	810	460	62.7	1700	2800	**1PH8356-1■D1■-...0**
		545 (731)	4164 (3071)	880	460	62.7	1700	2800	**1PH8358-1■D1■-...0**
Line voltage 480 V 3 AC, Active Line Module (noise value 77 dB)									
600	355	200 (268)	3183 (2348)	315	500	30.2	1400	2800	**1PH8350-1■B1■-...0**
		240 (322)	3820 (2818)	375	500	30.2	1400	2800	**1PH8352-1■B1■-...0**
		280 (375)	4457 (3287)	420	500	30.2	1400	2800	**1PH8354-1■B1■-...0**
		320 (429)	5093 (3757)	485	500	30.2	1400	2800	**1PH8356-1■B1■-...0**
		370 (496)	5889 (4344)	560	500	30.2	1400	2800	**1PH8358-1■B1■-...0**
800	355	260 (349)	3104 (2290)	405	500	40.2	1400	2800	**1PH8350-1■Q1■-...0**
		315 (422)	3760 (2773)	475	500	40.2	1400	2800	**1PH8352-1■Q1■-...0**
		365 (489)	4357 (3214)	560	500	40.2	1400	2800	**1PH8354-1■Q1■-...0**
		420 (563)	5014 (3698)	640	500	40.2	1400	2800	**1PH8356-1■Q1■-...0**
		480 (644)	5730 (4226)	700	500	40.2	1400	2800	**1PH8358-1■Q1■-...0**
1000	355	310 (416)	2961 (2184)	490	500	50.2	1500	2800	**1PH8350-1■C1■-...0**
		380 (510)	3629 (2677)	570	500	50.2	1500	2800	**1PH8352-1■C1■-...0**
		445 (597)	4250 (3135)	650	500	50.2	1500	2800	**1PH8354-1■C1■-...0**
		510 (684)	4871 (3593)	750	500	50.2	1600	2800	**1PH8356-1■C1■-...0**
		570 (764)	5444 (4015)	920	480	50.2	1600	2800	**1PH8358-1■C1■-...0**
1350	355	340 (456)	2405 (1774)	495	500	67.7	1800	2800	**1PH8350-1■D1■-...0**
		410 (550)	2900 (2139)	620	500	67.7	1800	2800	**1PH8352-1■D1■-...0**
		470 (630)	3325 (2453)	670	500	67.7	1700	2800	**1PH8354-1■D1■-...0**
		550 (738)	3891 (2870)	810	500	67.7	1700	2800	**1PH8356-1■D1■-...0**
		590 (791)	4174 (3079)	880	500	67.7	1700	2800	**1PH8358-1■D1■-...0**

For versions, see Order No. supplement and options on page 5/58.

Motor type (repeated)	Power factor	Magnetizing current	Efficiency	Moment of inertia	Weight, approx.	Terminal box	SINAMICS S120 Motor Module	
							Rated output current[3]	For additional versions and components see chapter SINAMICS S120 drive system
	cos φ	I_μ	η	J			I_{rated}	
		A		kgm² (lbf-in-s²)	kg (lb)	Type	A	Order No.
1PH8350-1. B 1...	0.75	197	0.958	14.74 (130)	2235 (4928)	1XB7712-P01	380	6SL3320-1TE33-8AA3
1PH8352-1. B 1...	0.77	225	0.960	17.40 (154)	2560 (5645)	1XB7712-P01	490	6SL3320-1TE35-0AA3
1PH8354-1. B 1...	0.79	238	0.962	20.66 (183)	2889 (6370)	1XB7712-P03	490	6SL3320-1TE35-0AA3
1PH8356-1. B 1...	0.78	287	0.963	24.22 (214)	3256 (7179)	1XB7712-P03	745	6SL3320-1TE37-5AA3
1PH8358-1. B 1...	0.79	321	0.965	27.79 (246)	3629 (8002)	1XB7712-P03	840	6SL3320-1TE38-4AA3
1PH8350-1. Q 1...	0.77	231	0.964	14.74 (130)	2235 (4928)	1XB7712-P01	490	6SL3320-1TE35-0AA3
1PH8352-1. Q 1...	0.79	262	0.966	17.40 (154)	2560 (5645)	1XB7712-P03	745	6SL3320-1TE37-5AA3
1PH8354-1. Q 1...	0.78	328	0.967	20.66 (183)	2889 (6370)	1XB7712-P03	840	6SL3320-1TE38-4AA3
1PH8356-1. Q 1...	0.78	372	0.968	24.22 (214)	3256 (7179)	1XB7712-P03	840	6SL3320-1TE38-4AA3
1PH8358-1. Q 1...	0.82	351	0.969	27.79 (246)	3629 (8002)	1XB7712-P03	985	6SL3320-1TE41-0AA3
1PH8350-1. C 1...	0.76	295	0.966	14.74 (130)	2235 (4928)	1XB7712-P01	745	6SL3320-1TE37-5AA3
1PH8352-1. C 1...	0.80	303	0.968	17.40 (154)	2560 (5645)	1XB7712-P03	840	6SL3320-1TE38-4AA3
1PH8354-1. C 1...	0.81	328	0.969	20.66 (183)	2889 (6370)	1XB7712-P03	840	6SL3320-1TE38-4AA3
1PH8356-1. C 1...	0.80	410	0.970	24.22 (214)	3256 (7179)	1XB7712-P03	985	6SL3320-1TE41-0AA3
1PH8358-1. C 1...	0.77	557	0.970	27.79 (246)	3629 (8002)	1XB7712-P03	1260	6SL3320-1TE41-2AA3
1PH8350-1. D 1...	0.82	232	0.969	14.74 (130)	2235 (4928)	1XB7712-P03	745	6SL3320-1TE37-5AA3
1PH8352-1. D 1...	0.79	329	0.969	17.40 (154)	2560 (5645)	1XB7712-P03	840	6SL3320-1TE38-4AA3
1PH8354-1. D 1...	0.83	311	0.971	20.66 (183)	2889 (6370)	1XB7712-P03	840[4]	6SL3320-1TE38-4AA3
1PH8356-1. D 1...	0.81	427	0.971	24.22 (214)	3256 (7179)	1XB7712-P03	985	6SL3320-1TE41-0AA3
1PH8358-1. D 1...	0.80	484	0.971	27.79 (246)	3629 (8002)	1XB7712-P03	1260	6SL3320-1TE41-2AA3
1PH8350-1. B 1...	0.75	194	0.960	14.74 (130)	2235 (4928)	1XB7712-P01	380	6SL3320-1TE33-8AA3
1PH8352-1. B 1...	0.77	223	0.962	17.40 (154)	2560 (5645)	1XB7712-P01	490	6SL3320-1TE35-0AA3
1PH8354-1. B 1...	0.79	236	0.964	20.66 (183)	2889 (6370)	1XB7712-P03	490	6SL3320-1TE35-0AA3
1PH8356-1. B 1...	0.78	285	0.965	24.22 (214)	3256 (7179)	1XB7712-P03	745	6SL3320-1TE37-5AA3
1PH8358-1. B 1...	0.79	316	0.966	27.79 (246)	3629 (8002)	1XB7712-P03	840	6SL3320-1TE38-4AA3
1PH8350-1. Q 1...	0.77	235	0.965	14.74 (130)	2235 (4928)	1XB7712-P01	490	6SL3320-1TE35-0AA3
1PH8352-1. Q 1...	0.78	267	0.967	17.40 (154)	2560 (5645)	1XB7712-P03	745	6SL3320-1TE37-5AA3
1PH8354-1. Q 1...	0.77	334	0.967	20.66 (183)	2889 (6370)	1XB7712-P03	840	6SL3320-1TE38-4AA3
1PH8356-1. Q 1...	0.78	380	0.968	24.22 (214)	3256 (7179)	1XB7712-P03	840	6SL3320-1TE38-4AA3
1PH8358-1. Q 1...	0.82	359	0.970	27.79 (246)	3629 (8002)	1XB7712-P03	985	6SL3320-1TE41-0AA3
1PH8350-1. C 1...	0.75	294	0.967	14.74 (130)	2235 (4928)	1XB7712-P01	745	6SL3320-1TE37-5AA3
1PH8352-1. C 1...	0.80	302	0.969	17.40 (154)	2560 (5645)	1XB7712-P03	840	6SL3320-1TE38-4AA3
1PH8354-1. C 1...	0.81	328	0.970	20.66 (183)	2889 (6370)	1XB7712-P03	840	6SL3320-1TE38-4AA3
1PH8356-1. C 1...	0.80	410	0.970	24.22 (214)	3256 (7179)	1XB7712-P03	985	6SL3320-1TE41-0AA3
1PH8358-1. C 1...	0.76	567	0.970	27.79 (246)	3629 (8002)	1XB7712-P03	1260	6SL3320-1TE41-2AA3
1PH8350-1. D 1...	0.82	235	0.969	14.74 (130)	2235 (4928)	1XB7712-P03	745	6SL3320-1TE37-5AA3
1PH8352-1. D 1...	0.79	338	0.969	17.40 (154)	2560 (5645)	1XB7712-P03	840	6SL3320-1TE38-4AA3
1PH8354-1. D 1...	0.83	314	0.971	20.66 (183)	2889 (6370)	1XB7712-P03	840[4]	6SL3320-1TE38-4AA3
1PH8356-1. D 1...	0.80	433	0.971	24.22 (214)	3256 (7179)	1XB7712-P03	985	6SL3320-1TE41-0AA3
1PH8358-1. D 1...	0.79	489	0.970	27.79 (246)	3629 (8002)	1XB7712-P03	1260	6SL3320-1TE41-2AA3

1) n_2: Max. permissible thermal speed at constant power or speed which is at the voltage limit when $P = P_{rated}$.
2) n_{max}: Maximum speed that must not be exceeded (applicable to Standard: 14th data position A, B, E or F).
3) The rated pulse frequencies must be taken into account. The rated motor data is valid for 2.5 kHz.
4) The rated output current of the Motor Module is lower than the rated motor current at 2.5 kHz.

1PH8 asynchronous motors
Forced ventilation, IP55 degree of protection

Selection and ordering data

Rated speed	Shaft height	Rated power	Rated torque	Rated current	Rated voltage	Rated frequency	Operating speed during field weakening, max.[1]	Speed, max.[2]	1PH8 asynchronous motor Forced ventilation
n_{rated}	SH	P_{rated}	M_{rated}	I_{rated}	U_{rated}	f_{rated}	n_2	n_{max}	
rpm		kW (HP)	Nm (lb_f-ft)	A	V	Hz	rpm	rpm	Order No.
Line voltage 690 V 3 AC, Basic Line Module (noise value 77 dB)									
550	355	185 (248)	3212 (2369)	230	635	27.7	1400	2800	**1PH8350-1■H1■-...0**
		220 (295)	3820 (2818)	265	635	27.7	1400	2800	**1PH8352-1■H1■-...0**
		255 (342)	4428 (3266)	305	635	27.7	1400	2800	**1PH8354-1■H1■-...0**
		295 (396)	5122 (3778)	355	635	27.7	1400	2800	**1PH8356-1■H1■-...0**
		340 (456)	5904 (4355)	410	635	27.7	1400	2800	**1PH8358-1■H1■-...0**
750	355	245 (329)	3120 (2301)	290	650	37.7	1400	2800	**1PH8350-1■K1■-...0**
		295 (396)	3756 (2770)	350	650	37.7	1400	2800	**1PH8352-1■K1■-...0**
		340 (456)	4329 (3193)	390	650	37.7	1400	2800	**1PH8354-1■K1■-...0**
		395 (530)	5030 (3710)	455	650	37.7	1400	2800	**1PH8356-1■K1■-...0**
		450 (603)	5730 (4226)	510	650	37.7	1400	2800	**1PH8358-1■K1■-...0**
900	355	280 (375)	2971 (2191)	355	620	45.2	1500	2800	**1PH8350-1■U1■-...0**
		340 (456)	3608 (2661)	415	620	45.2	1500	2800	**1PH8352-1■U1■-...0**
		400 (536)	4244 (3130)	480	620	45.2	1500	2800	**1PH8354-1■U1■-...0**
		460 (617)	4881 (3600)	540	620	45.2	1600	2800	**1PH8356-1■U1■-...0**
		515 (691)	5465 (4031)	620	620	45.2	1600	2800	**1PH8358-1■U1■-...0**
1250	355	315 (422)	2407 (1775)	360	640	62.7	1800	2800	**1PH8350-1■V1■-...0**
		380 (510)	2903 (2141)	430	640	62.7	1800	2800	**1PH8352-1■V1■-...0**
		435 (583)	3323 (2451)	480	640	62.7	1700	2800	**1PH8354-1■V1■-...0**
		510 (684)	3896 (2874)	590	640	62.7	1700	2800	**1PH8356-1■V1■-...0**
		545 (731)	4164 (3071)	620	640	62.7	1700	2800	**1PH8358-1■V1■-...0**
Line voltage 690 V 3 AC, Active Line Module (noise value 77 dB)									
600	355	200 (268)	3183 (2348)	230	690	30.2	1400	2800	**1PH8350-1■H1■-...0**
		240 (322)	3820 (2818)	265	690	30.2	1400	2800	**1PH8352-1■H1■-...0**
		280 (375)	4457 (3287)	310	690	30.2	1400	2800	**1PH8354-1■H1■-...0**
		320 (429)	5093 (3757)	355	690	30.2	1400	2800	**1PH8356-1■H1■-...0**
		370 (496)	5889 (4344)	410	690	30.2	1400	2800	**1PH8358-1■H1■-...0**
800	355	260 (349)	3104 (2290)	290	690	40.2	1400	2800	**1PH8350-1■K1■-...0**
		315 (422)	3760 (2773)	350	690	40.2	1400	2800	**1PH8352-1■K1■-...0**
		365 (489)	4357 (3214)	395	690	40.2	1400	2800	**1PH8354-1■K1■-...0**
		420 (563)	5014 (3698)	453	690	40.2	1400	2800	**1PH8356-1■K1■-...0**
		480 (644)	5730 (4226)	510	690	40.2	1400	2800	**1PH8358-1■K1■-...0**
1000	355	310 (416)	2961 (2184)	355	690	50.2	1500	2800	**1PH8350-1■U1■-...0**
		380 (510)	3629 (2677)	415	690	50.2	1500	2800	**1PH8352-1■U1■-...0**
		445 (597)	4250 (3135)	480	690	50.2	1500	2800	**1PH8354-1■U1■-...0**
		510 (684)	4871 (3593)	540	690	50.2	1600	2800	**1PH8356-1■U1■-...0**
		570 (764)	5444 (4015)	610	690	50.2	1600	2800	**1PH8358-1■U1■-...0**
1350	355	340 (456)	2405 (1774)	360	690	67.7	1800	2800	**1PH8350-1■V1■-...0**
		410 (550)	2900 (2139)	430	690	67.7	1800	2800	**1PH8352-1■V1■-...0**
		470 (630)	3325 (2453)	485	690	67.7	1700	2800	**1PH8354-1■V1■-...0**
		550 (738)	3891 (2870)	590	690	67.7	1700	2800	**1PH8356-1■V1■-...0**
		590 (791)	4174 (3079)	620	690	67.7	1700	2800	**1PH8358-1■V1■-...0**

For versions, see Order No. supplement and options on page 5/58.

Motor type (repeated)	Power factor	Magnetizing current	Efficiency	Moment of inertia	Weight, approx.	Terminal box	SINAMICS S120 Motor Module	
							Rated output current[3]	For additional versions and components see chapter SINAMICS S120 drive system
	cos φ	I_μ	η	J			I_{rated}	
		A		kgm² (lb$_f$-in-s²)	kg (lb)	Type	A	Order No.
1PH8350-1.H1...	0.76	140	0.959	14.74 (130)	2235 (4928)	1XB7712-P01	260[4]	6SL3320-1TG32-6AA3
1PH8352-1.H1...	0.78	151	0.960	17.40 (154)	2560 (5645)	1XB7712-P01	330	6SL3320-1TG33-3AA3
1PH8354-1.H1...	0.78	178	0.962	20.66 (183)	2889 (6370)	1XB7712-P01	410	6SL3320-1TG34-1AA3
1PH8356-1.H1...	0.78	211	0.964	24.22 (214)	3256 (7179)	1XB7712-P01	465	6SL3320-1TG34-7AA3
1PH8358-1.H1...	0.78	247	0.964	27.79 (246)	3629 (8002)	1XB7712-P01	465[4]	6SL3320-1TG34-7AA3
1PH8350-1.K1...	0.78	164	0.964	14.74 (130)	2235 (4928)	1XB7712-P01	410	6SL3320-1TG34-1AA3
1PH8352-1.K1...	0.77	210	0.965	17.40 (154)	2560 (5645)	1XB7712-P01	465	6SL3320-1TG34-7AA3
1PH8354-1.K1...	0.79	218	0.967	20.66 (183)	2889 (6370)	1XB7712-P01	465	6SL3320-1TG34-7AA3
1PH8356-1.K1...	0.80	252	0.968	24.22 (214)	3256 (7179)	1XB7712-P03	575	6SL3320-1TG35-8AA3
1PH8358-1.K1...	0.81	275	0.969	27.79 (246)	3629 (8002)	1XB7712-P03	735	6SL3320-1TG37-4AA3
1PH8350-1.U1...	0.75	216	0.966	14.74 (130)	2235 (4928)	1XB7712-P01	465	6SL3320-1TG34-7AA3
1PH8352-1.U1...	0.79	231	0.968	17.40 (154)	2560 (5645)	1XB7712-P01	575	6SL3320-1TG35-8AA3
1PH8354-1.U1...	0.79	268	0.969	20.66 (183)	2889 (6370)	1XB7712-P03	575	6SL3320-1TG35-8AA3
1PH8356-1.U1...	0.81	283	0.970	24.22 (214)	3256 (7179)	1XB7712-P03	735	6SL3320-1TG37-4AA3
1PH8358-1.U1...	0.80	338	0.971	27.79 (246)	3629 (8002)	1XB7712-P03	810	6SL3320-1TG38-1AA3
1PH8350-1.V1...	0.81	179	0.969	14.74 (130)	2235 (4928)	1XB7712-P01	465	6SL3320-1TG34-7AA3
1PH8352-1.V1...	0.82	208	0.970	17.40 (154)	2560 (5645)	1XB7712-P01	575	6SL3320-1TG35-8AA3
1PH8354-1.V1...	0.83	220	0.971	20.66 (183)	2889 (6370)	1XB7712-P03	575	6SL3320-1TG35-8AA3
1PH8356-1.V1...	0.80	319	0.971	24.22 (214)	3256 (7179)	1XB7712-P03	735[4]	6SL3320-1TG37-4AA3
1PH8358-1.V1...	0.81	322	0.971	27.79 (246)	3629 (8002)	1XB7712-P03	810	6SL3320-1TG38-1AA3
1PH8350-1.H1...	0.76	139	0.961	14.74 (130)	2235 (4928)	1XB7712-P01	260[4]	6SL3320-1TG32-6AA3
1PH8352-1.H1...	0.78	149	0.961	17.40 (154)	2560 (5645)	1XB7712-P01	330	6SL3320-1TG33-3AA3
1PH8354-1.H1...	0.79	176	0.964	20.66 (183)	2889 (6370)	1XB7712-P01	410	6SL3320-1TG34-1AA3
1PH8356-1.H1...	0.78	209	0.965	24.22 (214)	3256 (7179)	1XB7712-P01	465	6SL3320-1TG34-7AA3
1PH8358-1.H1...	0.78	242	0.966	27.79 (246)	3629 (8002)	1XB7712-P01	465[4]	6SL3320-1TG34-7AA3
1PH8350-1.K1...	0.78	162	0.965	14.74 (130)	2235 (4928)	1XB7712-P01	410	6SL3320-1TG34-1AA3
1PH8352-1.K1...	0.77	207	0.966	17.40 (154)	2560 (5645)	1XB7712-P01	465	6SL3320-1TG34-7AA3
1PH8354-1.K1...	0.80	215	0.968	20.66 (183)	2889 (6370)	1XB7712-P01	465	6SL3320-1TG34-7AA3
1PH8356-1.K1...	0.80	249	0.969	24.22 (214)	3256 (7179)	1XB7712-P03	575	6SL3320-1TG35-8AA3
1PH8358-1.K1...	0.81	272	0.970	27.79 (246)	3629 (8002)	1XB7712-P03	735	6SL3320-1TG37-4AA3
1PH8350-1.U1...	0.75	216	0.967	14.74 (130)	2235 (4928)	1XB7712-P01	465	6SL3320-1TG34-7AA3
1PH8352-1.U1...	0.78	232	0.968	17.40 (154)	2560 (5645)	1XB7712-P01	575	6SL3320-1TG35-8AA3
1PH8354-1.U1...	0.79	269	0.969	20.66 (183)	2889 (6370)	1XB7712-P03	575	6SL3320-1TG35-8AA3
1PH8356-1.U1...	0.81	283	0.971	24.22 (214)	3256 (7179)	1XB7712-P03	735	6SL3320-1TG37-4AA3
1PH8358-1.U1...	0.80	339	0.971	27.79 (246)	3629 (8002)	1XB7712-P03	810	6SL3320-1TG38-1AA3
1PH8350-1.V1...	0.81	178	0.969	14.74 (130)	2235 (4928)	1XB7712-P01	465	6SL3320-1TG34-7AA3
1PH8352-1.V1...	0.82	208	0.970	17.40 (154)	2560 (5645)	1XB7712-P01	575	6SL3320-1TG35-8AA3
1PH8354-1.V1...	0.84	219	0.971	20.66 (183)	2889 (6370)	1XB7712-P03	575	6SL3320-1TG35-8AA3
1PH8356-1.V1...	0.80	317	0.970	24.22 (214)	3256 (7179)	1XB7712-P03	735[4]	6SL3320-1TG37-4AA3
1PH8358-1.V1...	0.81	322	0.971	27.79 (246)	3629 (8002)	1XB7712-P03	810	6SL3320-1TG38-1AA3

[1] n_2: Max. permissible thermal speed at constant power or speed which is at the voltage limit when $P = P_{rated}$.
[2] n_{max}: Maximum speed that must not be exceeded (applicable to Standard: 14th data position A, B, E or F).
[3] The rated pulse frequencies must be taken into account. The rated motor data is valid for 2.5 kHz.
[4] The rated output current of the Motor Module is lower than the rated motor current at 2.5 kHz.

1PH8 asynchronous motors
Forced ventilation, IP23 degree of protection

Selection and ordering data

Rated speed	Shaft height	Rated power	Rated torque	Rated current	Rated voltage	Rated frequency	Operating speed during field weakening, max.[1]	Speed, max.[2]	1PH8 asynchronous motor Forced ventilation
n_{rated}	SH	P_{rated}	M_{rated}	I_{rated}	U_{rated}	f_{rated}	n_2	n_{max}	
rpm		kW (HP)	Nm (lb_f-ft)	A	V	Hz	rpm	rpm	Order No.
Line voltage 400 V 3 AC, Active Line Module (noise value 77 dB)									
480	355	275 (369)	5471 (4035)	495	400	24.4	850	2800	**1PH8350-1■B4■-...0**
		310 (416)	6168 (4550)	550	400	24.5	850	2800	**1PH8351-1■B4■-...0**
		370 (496)	7361 (5429)	650	400	24.5	800	2800	**1PH8352-1■B4■-...0**
		435 (583)	8655 (6384)	750	400	24.5	800	2800	**1PH8354-1■B4■-...0**
		510 (684)	10147 (7484)	880	400	24.4	700	2800	**1PH8356-1■B4■-...0**
		585 (784)	11639 (8585)	990	400	24.4	700	2800	**1PH8358-1■B4■-...0**
640	355	340 (456)	5073 (3742)	600	400	32.4	1100	2800	**1PH8350-1■Q4■-...0**
		375 (503)	5596 (4128)	660	400	32.4	1100	2800	**1PH8351-1■Q4■-...0**
		455 (610)	6789 (5008)	790	400	32.4	1000	2800	**1PH8352-1■Q4■-...0**
		535 (717)	7983 (5888)	930	400	32.4	1000	2800	**1PH8354-1■Q4■-...0**
		625 (838)	9326 (6879)	1060	400	32.4	950	2800	**1PH8356-1■Q4■-...0**
		705 (945)	10520 (7760)	1180	400	32.4	950	2800	**1PH8358-1■Q4■-...0**
800	355	435 (583)	5193 (3830)	770	400	40.4	1200	2800	**1PH8350-1■C4■-...0**
		490 (657)	5849 (4314)	860	400	40.4	1200	2800	**1PH8351-1■C4■-...0**
		570 (764)	6804 (5019)	980	400	40.5	1100	2800	**1PH8352-1■C4■-...0**
		665 (892)	7938 (5855)	1120	400	40.4	1000	2800	**1PH8354-1■C4■-...0**
		760 (1019)	9073 (6692)	1280	400	40.4	950	2800	**1PH8356-1■C4■-...0**
830	355	915 (1227)	10486 (7734)	1560	400	42.0	1000	2800	**1PH8358-1■C4■-...0**
1080	355	485 (650)	4289 (3164)	830	400	54.4	1350	2800	**1PH8350-1■D4■-...0**
		545 (731)	4819 (3554)	940	400	54.5	1350	2800	**1PH8351-1■D4■-...0**
		655 (878)	5792 (4272)	1120	400	54.4	1350	2800	**1PH8352-1■D4■-...0**
		760 (1019)	6720 (4957)	1280	400	54.5	1100	2800	**1PH8354-1■D4■-...0**
		855 (1147)	7560 (5576)	1440	400	54.4	1100	2800	**1PH8356-1■D4■-...0**
		985 (1321)	8710 (6424)	1640	400	54.4	1100	2800	**1PH8358-1■D4■-...0**

For versions, see Order No. supplement and options on page 5/58.

Motor type (repeated)	Power factor	Magnetizing current	Efficiency	Moment of inertia	Weight, approx.	Terminal box	SINAMICS S120 Motor Module	
							Rated output current[3]	For additional versions and components see chapter SINAMICS S120 drive system
	cos φ	I_μ	η	J			I_{rated}	
		A		kgm² (lb$_f$-in-s²)	kg (lb)	Type	A	Order No.
1PH8350-1. B 4...	0.84	194	0.944	14.74 (130)	2235 (4928)	1XB7712-P03	745	**6SL3320-1TE37-5AA3**
1PH8351-1. B 4...	0.85	194	0.938	14.74 (130)	2235 (4928)	1XB7712-P03	840	**6SL3320-1TE38-4AA3**
1PH8352-1. B 4...	0.86	223	0.942	17.40 (154)	2560 (5645)	1XB7712-P03	840	**6SL3320-1TE38-4AA3**
1PH8354-1. B 4...	0.88	236	0.943	20.66 (183)	2889 (6370)	1XB7712-P03	985	**6SL3320-1TE41-0AA3**
1PH8356-1. B 4...	0.88	285	0.946	24.22 (214)	3256 (7179)	1XB7712-P03	1260	**6SL3320-1TE41-2AA3**
1PH8358-1. B 4...	0.89	316	0.948	27.79 (246)	3629 (8002)	1XB7712-P03	1260	**6SL3320-1TE41-2AA3**
1PH8350-1. Q 4...	0.84	235	0.956	14.74 (130)	2235 (4928)	1XB7712-P03	840	**6SL3320-1TE38-4AA3**
1PH8351-1. Q 4...	0.85	235	0.953	14.74 (130)	2235 (4928)	1XB7712-P03	840	**6SL3320-1TE38-4AA3**
1PH8352-1. Q 4...	0.86	267	0.955	17.40 (154)	2560 (5645)	1XB7712-P03	985	**6SL3320-1TE41-0AA3**
1PH8354-1. Q 4...	0.86	334	0.958	20.66 (183)	2889 (6370)	1XB7712-P03	1260	**6SL3320-1TE41-2AA3**
1PH8356-1. Q 4...	0.87	380	0.959	24.22 (214)	3256 (7179)	1XB7712-P03	1260	**6SL3320-1TE41-2AA3**
1PH8358-1. Q 4...	0.89	359	0.958	27.79 (246)	3629 (8002)	1XB7820-P00	1405	**6SL3320-1TE41-4AA3**
1PH8350-1. C 4...	0.84	294	0.961	14.74 (130)	2235 (4928)	1XB7712-P03	985	**6SL3320-1TE41-0AA3**
1PH8351-1. C 4...	0.85	294	0.958	14.74 (130)	2235 (4928)	1XB7712-P03	985[4]	**6SL3320-1TE41-0AA3**
1PH8352-1. C 4...	0.87	302	0.960	17.40 (154)	2560 (5645)	1XB7712-P03	1260	**6SL3320-1TE41-2AA3**
1PH8354-1. C 4...	0.88	328	0.961	20.66 (183)	2889 (6370)	1XB7712-P03	1260[4]	**6SL3320-1TE41-2AA3**
1PH8356-1. C 4...	0.88	410	0.964	24.22 (214)	3256 (7179)	1XB7820-P00	1405	**6SL3320-1TE41-4AA3**
1PH8358-1. C 4...	0.87	567	0.967	27.79 (246)	3629 (8002)	1XB7820-P00	2 × 985	**2 × 6SL3320-1TE41-0AA3**
1PH8350-1. D 4...	0.86	235	0.965	14.74 (130)	2235 (4928)	1XB7712-P03	985	**6SL3320-1TE41-0AA3**
1PH8351-1. D 4...	0.86	235	0.963	14.74 (130)	2235 (4928)	1XB7712-P03	1260	**6SL3320-1TE41-2AA3**
1PH8352-1. D 4...	0.87	338	0.967	17.40 (154)	2560 (5645)	1XB7712-P03	1260[4]	**6SL3320-1TE41-2AA3**
1PH8354-1. D 4...	0.88	314	0.966	20.66 (183)	2889 (6370)	1XB7820-P00	1405	**6SL3320-1TE41-4AA3**
1PH8356-1. D 4...	0.88	433	0.970	24.22 (214)	3256 (7179)	1XB7820-P00	2 × 985	**2 × 6SL3320-1TE41-0AA3**
1PH8358-1. D 4...	0.89	489	0.971	27.79 (246)	3629 (8002)	1XB7820-P00	2 × 985[4]	**2 × 6SL3320-1TE41-0AA3**

1) n_2: Max. permissible thermal speed at constant power or speed which is at the voltage limit when $P = P_{rated}$.
2) n_{max}: Maximum speed that must not be exceeded (applicable to Standard: 14th data position A, B, E or F).
3) The rated pulse frequencies must be taken into account. The rated motor data is valid for 2.5 kHz.
4) The rated output current of the Motor Module is lower than the rated motor current at 2.5 kHz.

1PH8 asynchronous motors
Forced ventilation, IP23 degree of protection

Selection and ordering data

Rated speed	Shaft height	Rated power	Rated torque	Rated current	Rated voltage	Rated frequency	Operating speed during field weakening, max.[1]	Speed, max.[2]	1PH8 asynchronous motor Forced ventilation
n_{rated}	SH	P_{rated}	M_{rated}	I_{rated}	U_{rated}	f_{rated}	n_2	n_{max}	
rpm		kW (HP)	Nm (lb_f-ft)	A	V	Hz	rpm	rpm	Order No.
Line voltage 480 V 3 AC, Smart/Basic Line Module (noise value 77 dB)									
550	355	315 (422)	5470 (4035)	490	460	27.9	1100	2800	**1PH8350-1■B4■-...0**
		355 (476)	6164 (4547)	550	460	28.0	1100	2800	**1PH8351-1■B4■-...0**
		420 (563)	7293 (5379)	640	460	27.9	1000	2800	**1PH8352-1■B4■-...0**
		500 (671)	8682 (6404)	750	460	28.0	1000	2800	**1PH8354-1■B4■-...0**
		585 (784)	10158 (7493)	870	460	27.9	900	2800	**1PH8356-1■B4■-...0**
		670 (898)	11634 (8581)	990	460	27.9	900	2800	**1PH8358-1■B4■-...0**
750	355	400 (536)	5093 (3757)	610	465	37.9	1400	2800	**1PH8350-1■Q4■-...0**
		440 (590)	5603 (4133)	670	465	37.9	1400	2800	**1PH8351-1■Q4■-...0**
		535 (717)	6812 (5025)	800	465	37.9	1300	2800	**1PH8352-1■Q4■-...0**
		630 (845)	8022 (5917)	930	465	37.9	1300	2800	**1PH8354-1■Q4■-...0**
		730 (979)	9295 (6856)	1080	465	37.9	1200	2800	**1PH8356-1■Q4■-...0**
		825 (1106)	10505 (7748)	1200	465	37.9	1200	2800	**1PH8358-1■Q4■-...0**
900	355	490 (657)	5199 (3835)	770	450	45.4	1500	2800	**1PH8350-1■C4■-...0**
		550 (738)	5836 (4305)	860	450	45.4	1500	2800	**1PH8351-1■C4■-...0**
		640 (858)	6791 (5009)	980	450	45.5	1400	2800	**1PH8352-1■C4■-...0**
		745 (999)	7905 (5831)	1120	450	45.4	1300	2800	**1PH8354-1■C4■-...0**
		855 (1147)	9073 (6692)	1280	450	45.4	1200	2800	**1PH8356-1■C4■-...0**
		990 (1328)	10505 (7748)	1560	430	45.4	1200	2800	**1PH8358-1■C4■-...0**
1250	355	560 (751)	4278 (3155)	840	460	62.9	1700	2800	**1PH8350-1■D4■-...0**
		630 (845)	4813 (3550)	940	460	63.0	1700	2800	**1PH8351-1■D4■-...0**
		760 (1019)	5806 (4283)	1120	460	62.9	1700	2800	**1PH8352-1■D4■-...0**
		880 (1180)	6723 (4959)	1280	460	63.0	1400	2800	**1PH8354-1■D4■-...0**
		990 (1328)	7564 (5579)	1440	460	62.9	1400	2800	**1PH8356-1■D4■-...0**
		1140 (1529)	8710 (6424)	1660	460	62.9	1400	2800	**1PH8358-1■D4■-...0**

For versions, see Order No. supplement and options on page 5/58.

Motor type (repeated)	Power factor	Magnetizing current	Efficiency	Moment of inertia	Weight, approx.	Terminal box	SINAMICS S120 Motor Module	
							Rated output current[3]	For additional versions and components see chapter SINAMICS S120 drive system
	cos φ	I_μ	η	J			I_{rated}	
		A		kgm² (lb$_f$-in-s²)	kg (lb)	Type	A	Order No.
1PH8350-1. B 4...	0.84	197	0.950	14.74 (130)	2235 (4928)	1XB7712-P03	745	**6SL3320-1TE37-5AA3**
1PH8351-1. B 4...	0.85	197	0.945	14.74 (130)	2235 (4928)	1XB7712-P03	840	**6SL3320-1TE38-4AA3**
1PH8352-1. B 4...	0.86	225	0.949	17.40 (154)	2560 (5645)	1XB7712-P03	840	**6SL3320-1TE38-4AA3**
1PH8354-1. B 4...	0.88	238	0.949	20.66 (183)	2889 (6370)	1XB7712-P03	985	**6SL3320-1TE41-0AA3**
1PH8356-1. B 4...	0.88	287	0.952	24.22 (214)	3256 (7179)	1XB7712-P03	1260	**6SL3320-1TE41-2AA3**
1PH8358-1. B 4...	0.88	321	0.953	27.79 (246)	3629 (8002)	1XB7712-P03	1260	**6SL3320-1TE41-2AA3**
1PH8350-1. Q 4...	0.84	231	0.960	14.74 (130)	2235 (4928)	1XB7712-P03	840	**6SL3320-1TE38-4AA3**
1PH8351-1. Q 4...	0.85	231	0.958	14.74 (130)	2235 (4928)	1XB7712-P03	840[4]	**6SL3320-1TE38-4AA3**
1PH8352-1. Q 4...	0.86	262	0.959	17.40 (154)	2560 (5645)	1XB7712-P03	985	**6SL3320-1TE41-0AA3**
1PH8354-1. Q 4...	0.87	328	0.962	20.66 (183)	2889 (6370)	1XB7712-P03	1260	**6SL3320-1TE41-2AA3**
1PH8356-1. Q 4...	0.87	372	0.963	24.22 (214)	3256 (7179)	1XB7712-P03	1260	**6SL3320-1TE41-2AA3**
1PH8358-1. Q 4...	0.89	351	0.962	27.79 (246)	3629 (8002)	1XB7820-P00	1405	**6SL3320-1TE41-4AA3**
1PH8350-1. C 4...	0.84	295	0.964	14.74 (130)	2235 (4928)	1XB7712-P03	985	**6SL3320-1TE41-0AA3**
1PH8351-1. C 4...	0.85	295	0.961	14.74 (130)	2235 (4928)	1XB7712-P03	985[4]	**6SL3320-1TE41-0AA3**
1PH8352-1. C 4...	0.87	303	0.963	17.40 (154)	2560 (5645)	1XB7712-P03	1260	**6SL3320-1TE41-2AA3**
1PH8354-1. C 4...	0.88	328	0.964	20.66 (183)	2889 (6370)	1XB7712-P03	1260[4]	**6SL3320-1TE41-2AA3**
1PH8356-1. C 4...	0.88	410	0.966	24.22 (214)	3256 (7179)	1XB7820-P00	1405	**6SL3320-1TE41-4AA3**
1PH8358-1. C 4...	0.87	557	0.968	27.79 (246)	3629 (8002)	1XB7820-P00	2 × 985	**2 × 6SL3320-1TE41-0AA3**
1PH8350-1. D 4...	0.86	232	0.968	14.74 (130)	2235 (4928)	1XB7712-P03	985	**6SL3320-1TE41-0AA3**
1PH8351-1. D 4...	0.86	232	0.966	14.74 (130)	2235 (4928)	1XB7712-P03	1260	**6SL3320-1TE41-2AA3**
1PH8352-1. D 4...	0.87	329	0.969	17.40 (154)	2560 (5645)	1XB7712-P03	1260[4]	**6SL3320-1TE41-2AA3**
1PH8354-1. D 4...	0.88	311	0.969	20.66 (183)	2889 (6370)	1XB7820-P00	1405	**6SL3320-1TE41-4AA3**
1PH8356-1. D 4...	0.88	427	0.972	24.22 (214)	3256 (7179)	1XB7820-P00	2 × 985	**2 × 6SL3320-1TE41-0AA3**
1PH8358-1. D 4...	0.89	484	0.972	27.79 (246)	3629 (8002)	1XB7820-P00	2 × 985[4]	**2 × 6SL3320-1TE41-0AA3**

1) n_2: Max. permissible thermal speed at constant power or speed which is at the voltage limit when $P = P_{rated}$.
2) n_{max}: Maximum speed that must not be exceeded (applicable to Standard: 14th data position A, B, E or F).
3) The rated pulse frequencies must be taken into account. The rated motor data is valid for 2.5 kHz.
4) The rated output current of the Motor Module is lower than the rated motor current at 2.5 kHz.

1PH8 asynchronous motors
Forced ventilation, IP23 degree of protection

Selection and ordering data

Rated speed	Shaft height	Rated power	Rated torque	Rated current	Rated voltage	Rated frequency	Operating speed during field weakening, max.[1]	Speed, max.[2]	1PH8 asynchronous motor Forced ventilation
n_{rated}	SH	P_{rated}	M_{rated}	I_{rated}	U_{rated}	f_{rated}	n_2	n_{max}	
rpm		kW (HP)	Nm (lb_f-ft)	A	V	Hz	rpm	rpm	Order No.
Line voltage 480 V 3 AC, Active Line Module (noise value 77 dB)									
600	355	345 (463)	5491 (4050)	495	500	30.4	1100	2800	**1PH8350-1■B4■-...0**
		385 (516)	6128 (4520)	550	500	30.5	1100	2800	**1PH8351-1■B4■-...0**
		460 (617)	7322 (5401)	650	500	30.4	1000	2800	**1PH8352-1■B4■-...0**
		545 (731)	8675 (6399)	750	500	30.5	1000	2800	**1PH8354-1■B4■-...0**
		640 (858)	10187 (7514)	880	500	30.4	900	2800	**1PH8356-1■B4■-...0**
		730 (979)	11619 (8570)	990	500	30.4	900	2800	**1PH8358-1■B4■-...0**
800	355	425 (570)	5073 (3742)	600	500	40.4	1400	2800	**1PH8350-1■Q4■-...0**
		470 (630)	5611 (4139)	660	500	40.4	1400	2800	**1PH8351-1■Q4■-...0**
		570 (764)	6804 (5019)	790	500	40.4	1300	2800	**1PH8352-1■Q4■-...0**
		670 (898)	7998 (5899)	930	500	40.4	1300	2800	**1PH8354-1■Q4■-...0**
		780 (1046)	9311 (6868)	1060	500	40.4	1200	2800	**1PH8356-1■Q4■-...0**
		880 (1180)	10505 (7748)	1180	500	40.4	1200	2800	**1PH8358-1■Q4■-...0**
1000	355	545 (731)	5205 (3839)	770	500	50.4	1500	2800	**1PH8350-1■C4■-...0**
		610 (818)	5826 (4297)	860	500	50.4	1500	2800	**1PH8351-1■C4■-...0**
		710 (952)	6781 (5002)	980	500	50.5	1400	2800	**1PH8352-1■C4■-...0**
		830 (1113)	7927 (5847)	1120	500	50.4	1300	2800	**1PH8354-1■C4■-...0**
		950 (1274)	9073 (6692)	1280	500	50.4	1200	2800	**1PH8356-1■C4■-...0**
		1100 (1475)	10505 (7748)	1560	480	50.4	1200	2800	**1PH8358-1■C4■-...0**
1350	355	605 (811)	4280 (3157)	830	500	67.9	1700	2800	**1PH8350-1■D4■-...0**
		680 (912)	4810 (3548)	940	500	68.0	1700	2800	**1PH8351-1■D4■-...0**
		820 (1100)	5801 (4279)	1120	500	67.9	1700	2800	**1PH8352-1■D4■-...0**
		950 (1274)	6720 (4957)	1280	500	68.0	1400	2800	**1PH8354-1■D4■-...0**
		1070 (1435)	7569 (5583)	1440	500	67.9	1400	2800	**1PH8356-1■D4■-...0**
		1230 (1649)	8701 (6418)	1640	500	67.9	1400	2800	**1PH8358-1■D4■-...0**

For versions, see Order No. supplement and options on page 5/58.

Motor type (repeated)	Power factor	Magnetizing current	Efficiency	Moment of inertia	Weight, approx.	Terminal box	SINAMICS S120 Motor Module	
							Rated output current[3]	For additional versions and components see chapter SINAMICS S120 drive system
	cos φ	I_μ	η	J			I_{rated}	
		A		kgm² (lb$_f$-in-s²)	kg (lb)	Type	A	Order No.
1PH8350-1. B 4...	0.84	194	0.953	14.74 (130)	2235 (4928)	1XB7712-P03	745	**6SL3320-1TE37-5AA3**
1PH8351-1. B 4...	0.85	194	0.949	14.74 (130)	2235 (4928)	1XB7712-P03	840	**6SL3320-1TE38-4AA3**
1PH8352-1. B 4...	0.86	223	0.951	17.40 (154)	2560 (5645)	1XB7712-P03	840	**6SL3320-1TE38-4AA3**
1PH8354-1. B 4...	0.87	236	0.952	20.66 (183)	2889 (6370)	1XB7712-P03	985	**6SL3320-1TE41-0AA3**
1PH8356-1. B 4...	0.88	285	0.954	24.22 (214)	3256 (7179)	1XB7712-P03	1260	**6SL3320-1TE41-2AA3**
1PH8358-1. B 4...	0.88	316	0.956	27.79 (246)	3629 (8002)	1XB7712-P03	1260	**6SL3320-1TE41-2AA3**
1PH8350-1. Q 4...	0.84	235	0.962	14.74 (130)	2235 (4928)	1XB7712-P03	840	**6SL3320-1TE38-4AA3**
1PH8351-1. Q 4...	0.85	235	0.960	14.74 (130)	2235 (4928)	1XB7712-P03	840	**6SL3320-1TE38-4AA3**
1PH8352-1. Q 4...	0.86	267	0.961	17.40 (154)	2560 (5645)	1XB7712-P03	985	**6SL3320-1TE41-0AA3**
1PH8354-1. Q 4...	0.86	334	0.964	20.66 (183)	2889 (6370)	1XB7712-P03	1260	**6SL3320-1TE41-2AA3**
1PH8356-1. Q 4...	0.87	380	0.965	24.22 (214)	3256 (7179)	1XB7712-P03	1260	**6SL3320-1TE41-2AA3**
1PH8358-1. Q 4...	0.89	359	0.964	27.79 (246)	3629 (8002)	1XB7820-P00	1405	**6SL3320-1TE41-4AA3**
1PH8350-1. C 4...	0.84	294	0.966	14.74 (130)	2235 (4928)	1XB7712-P03	985	**6SL3320-1TE41-0AA3**
1PH8351-1. C 4...	0.85	294	0.964	14.74 (130)	2235 (4928)	1XB7712-P03	985[4]	**6SL3320-1TE41-0AA3**
1PH8352-1. C 4...	0.86	302	0.965	17.40 (154)	2560 (5645)	1XB7712-P03	1260	**6SL3320-1TE41-2AA3**
1PH8354-1. C 4...	0.88	328	0.966	20.66 (183)	2889 (6370)	1XB7712-P03	1260[4]	**6SL3320-1TE41-2AA3**
1PH8356-1. C 4...	0.88	410	0.968	24.22 (214)	3256 (7179)	1XB7820-P00	1405	**6SL3320-1TE41-4AA3**
1PH8358-1. C 4...	0.87	567	0.970	27.79 (246)	3629 (8002)	1XB7820-P00	2 × 985	**2 × 6SL3320-1TE41-0AA3**
1PH8350-1. D 4...	0.86	235	0.969	14.74 (130)	2235 (4928)	1XB7712-P03	985	**6SL3320-1TE41-0AA3**
1PH8351-1. D 4...	0.86	235	0.967	14.74 (130)	2235 (4928)	1XB7712-P03	1260	**6SL3320-1TE41-2AA3**
1PH8352-1. D 4...	0.87	338	0.970	17.40 (154)	2560 (5645)	1XB7712-P03	1260[4]	**6SL3320-1TE41-2AA3**
1PH8354-1. D 4...	0.88	314	0.970	20.66 (183)	2889 (6370)	1XB7820-P00	1405	**6SL3320-1TE41-4AA3**
1PH8356-1. D 4...	0.88	433	0.973	24.22 (214)	3256 (7179)	1XB7820-P00	2 × 985	**2 × 6SL3320-1TE41-0AA3**
1PH8358-1. D 4...	0.89	489	0.973	27.79 (246)	3629 (8002)	1XB7820-P00	2 × 985[4]	**2 × 6SL3320-1TE41-0AA3**

1) n_2: Max. permissible thermal speed at constant power or speed which is at the voltage limit when $P = P_{rated}$.
2) n_{max}: Maximum speed that must not be exceeded (applicable to Standard: 14th data position A, B, E or F).
3) The rated pulse frequencies must be taken into account. The rated motor data is valid for 2.5 kHz.
4) The rated output current of the Motor Module is lower than the rated motor current at 2.5 kHz.

1PH8 asynchronous motors
Forced ventilation, IP23 degree of protection

Selection and ordering data

Rated speed	Shaft height	Rated power	Rated torque	Rated current	Rated voltage	Rated frequency	Operating speed during field weakening, max.[1]	Speed, max.[2]	1PH8 asynchronous motor Forced ventilation
n_{rated}	SH	P_{rated}	M_{rated}	I_{rated}	U_{rated}	f_{rated}	n_2	n_{max}	
rpm		kW (HP)	Nm (lb_f-ft)	A	V	Hz	rpm	rpm	Order No.
Line voltage 690 V 3 AC, Basic Line Module (noise value 77 dB)									
550	355	315 (422)	5470 (4035)	355	635	28.0	1100	2800	**1PH8350-1■H4■-...0**
		355 (476)	6164 (4547)	400	635	28.0	1100	2800	**1PH8351-1■H4■-...0**
		420 (563)	7293 (5379)	465	635	28.0	1000	2800	**1PH8352-1■H4■-...0**
		500 (671)	8682 (6404)	550	635	28.0	1000	2800	**1PH8354-1■H4■-...0**
		585 (784)	10158 (7493)	630	635	27.9	900	2800	**1PH8356-1■H4■-...0**
		670 (898)	11634 (8581)	720	635	27.9	900	2800	**1PH8358-1■H4■-...0**
750	355	400 (536)	5093 (3757)	435	650	37.9	1400	2800	**1PH8350-1■K4■-...0**
		440 (590)	5603 (4133)	475	650	37.9	1400	2800	**1PH8351-1■K4■-...0**
		535 (717)	6812 (5025)	580	650	37.9	1300	2800	**1PH8352-1■K4■-...0**
		630 (845)	8022 (5917)	660	650	37.9	1300	2800	**1PH8354-1■K4■-...0**
		730 (979)	9295 (6856)	760	650	37.9	1200	2800	**1PH8356-1■K4■-...0**
		825 (1106)	10505 (7748)	880	650	37.8	1200	2800	**1PH8358-1■K4■-...0**
900	355	490 (657)	5199 (3835)	560	620	45.4	1500	2800	**1PH8350-1■U4■-...0**
		550 (738)	5836 (4305)	620	620	45.4	1500	2800	**1PH8351-1■U4■-...0**
		640 (858)	6791 (5009)	710	620	45.4	1400	2800	**1PH8352-1■U4■-...0**
		745 (999)	7905 (5831)	820	620	45.4	1300	2800	**1PH8354-1■U4■-...0**
		855 (1147)	9073 (6692)	930	620	45.4	1200	2800	**1PH8356-1■U4■-...0**
		990 (1328)	10505 (7748)	1080	620	45.4	1200	2800	**1PH8358-1■U4■-...0**
1250	355	560 (751)	4278 (3155)	600	640	63.0	1700	2800	**1PH8350-1■V4■-...0**
		630 (845)	4813 (3550)	680	640	63.0	1700	2800	**1PH8351-1■V4■-...0**
		760 (1019)	5806 (4283)	810	640	63.0	1700	2800	**1PH8352-1■V4■-...0**
		880 (1180)	6723 (4959)	920	640	63.0	1400	2800	**1PH8354-1■V4■-...0**
		990 (1328)	7564 (5579)	1040	640	62.9	1400	2800	**1PH8356-1■V4■-...0**
		1140 (1529)	8710 (6424)	1180	640	62.9	1400	2800	**1PH8358-1■V4■-...0**

For versions, see Order No. supplement and options on page 5/58.

Motor type (repeated)	Power factor	Magnetizing current	Efficiency	Moment of inertia	Weight, approx.	Terminal box	SINAMICS S120 Motor Module	
							Rated output current[3]	For additional versions and components see chapter SINAMICS S120 drive system
	cos φ	I_μ	η	J			I_{rated}	
		A		kgm² (lb$_f$-in-s²)	kg (lb)	Type	A	Order No.
1PH8350-1.H 4...	0.85	140	0.946	14.74 (130)	2235 (4928)	1XB7712-P01	465	**6SL3320-1TG34-7AA3**
1PH8351-1.H 4...	0.85	140	0.946	14.74 (130)	2235 (4928)	1XB7712-P01	465	**6SL3320-1TG34-7AA3**
1PH8352-1.H 4...	0.87	151	0.946	17.40 (154)	2560 (5645)	1XB7712-P03	575	**6SL3320-1TG35-8AA3**
1PH8354-1.H 4...	0.87	178	0.949	20.66 (183)	2889 (6370)	1XB7712-P03	735	**6SL3320-1TG37-4AA3**
1PH8356-1.H 4...	0.88	211	0.952	24.22 (214)	3256 (7179)	1XB7712-P03	810	**6SL3320-1TG38-1AA3**
1PH8358-1.H 4...	0.88	247	0.954	27.79 (246)	3629 (8002)	1XB7712-P03	810	**6SL3320-1TG38-1AA3**
1PH8350-1.K 4...	0.85	164	0.958	14.74 (130)	2235 (4928)	1XB7712-P03	575	**6SL3320-1TG35-8AA3**
1PH8351-1.K 4...	0.85	164	0.958	14.74 (130)	2235 (4928)	1XB7712-P03	575	**6SL3320-1TG35-8AA3**
1PH8352-1.K 4...	0.85	210	0.960	17.40 (154)	2560 (5645)	1XB7712-P03	735	**6SL3320-1TG37-4AA3**
1PH8354-1.K 4...	0.87	218	0.961	20.66 (183)	2889 (6370)	1XB7712-P03	810	**6SL3320-1TG38-1AA3**
1PH8356-1.K 4...	0.88	252	0.963	24.22 (214)	3256 (7179)	1XB7712-P03	810	**6SL3320-1TG38-1AA3**
1PH8358-1.K 4...	0.86	275	0.966	27.79 (246)	3629 (8002)	1XB7712-P03	1025	**6SL3320-1TG41-0AA3**
1PH8350-1.U 4...	0.85	216	0.962	14.74 (130)	2235 (4928)	1XB7712-P03	735	**6SL3320-1TG37-4AA3**
1PH8351-1.U 4...	0.85	216	0.962	14.74 (130)	2235 (4928)	1XB7712-P03	810	**6SL3320-1TG38-1AA3**
1PH8352-1.U 4...	0.86	231	0.963	17.40 (154)	2560 (5645)	1XB7712-P03	810	**6SL3320-1TG38-1AA3**
1PH8354-1.U 4...	0.87	268	0.965	20.66 (183)	2889 (6370)	1XB7712-P03	1025	**6SL3320-1TG41-0AA3**
1PH8356-1.U 4...	0.88	283	0.966	24.22 (214)	3256 (7179)	1XB7712-P03	1270	**6SL3320-1TG41-3AA3**
1PH8358-1.U 4...	0.88	338	0.967	27.79 (246)	3629 (8002)	1XB7712-P03	2 × 735	**2 × 6SL3320-1TG37-4AA3**
1PH8350-1.V 4...	0.86	179	0.966	14.74 (130)	2235 (4928)	1XB7712-P03	735[4]	**6SL3320-1TG37-4AA3**
1PH8351-1.V 4...	0.86	179	0.966	14.74 (130)	2235 (4928)	1XB7712-P03	810	**6SL3320-1TG38-1AA3**
1PH8352-1.V 4...	0.87	208	0.968	17.40 (154)	2560 (5645)	1XB7712-P03	910[4]	**6SL3320-1TG38-8AA3**
1PH8354-1.V 4...	0.88	220	0.969	20.66 (183)	2889 (6370)	1XB7712-P03	1270	**6SL3320-1TG41-3AA3**
1PH8356-1.V 4...	0.88	319	0.972	24.22 (214)	3256 (7179)	1XB7712-P03	1270[4]	**6SL3320-1TG41-3AA3**
1PH8358-1.V 4...	0.89	322	0.972	27.79 (246)	3629 (8002)	1XB7820-P00	2 × 810	**2 × 6SL3320-1TG38-1AA3**

1) n_2: Max. permissible thermal speed at constant power or speed which is at the voltage limit when $P = P_{rated}$.
2) n_{max}: Maximum speed that must not be exceeded (applicable to Standard: 14th data position A, B, E or F).
3) The rated pulse frequencies must be taken into account. The rated motor data is valid for 2.5 kHz.
4) The rated output current of the Motor Module is lower than the rated motor current at 2.5 kHz.

1PH8 asynchronous motors
Forced ventilation, IP23 degree of protection

Selection and ordering data

Rated speed	Shaft height	Rated power	Rated torque	Rated current	Rated voltage	Rated frequency	Operating speed during field weakening, max.[1]	Speed, max.[2]	1PH8 asynchronous motor Forced ventilation
n_{rated}	SH	P_{rated}	M_{rated}	I_{rated}	U_{rated}	f_{rated}	n_2	n_{max}	
rpm		kW (HP)	Nm (lb_f-ft)	A	V	Hz	rpm	rpm	Order No.
Line voltage 690 V 3 AC, Active Line Module (noise value 77 dB)									
600	355	345 (463)	5491 (4050)	355	690	30.5	1100	2800	**1PH8350-1■H4■-...0**
		385 (516)	6128 (4520)	395	690	30.5	1100	2800	**1PH8351-1■H4■-...0**
		460 (617)	7322 (5401)	465	690	30.5	1000	2800	**1PH8352-1■H4■-...0**
		545 (731)	8675 (6399)	550	690	30.5	1000	2800	**1PH8354-1■H4■-...0**
		640 (858)	10187 (7514)	640	690	30.4	900	2800	**1PH8356-1■H4■-...0**
		730 (979)	11619 (8570)	720	690	30.4	900	2800	**1PH8358-1■H4■-...0**
800	355	425 (570)	5073 (3742)	435	690	40.4	1400	2800	**1PH8350-1■K4■-...0**
		470 (630)	5611 (4139)	480	690	40.4	1400	2800	**1PH8351-1■K4■-...0**
		570 (764)	6804 (5019)	580	690	40.4	1300	2800	**1PH8352-1■K4■-...0**
		670 (898)	7998 (5899)	660	690	40.4	1300	2800	**1PH8354-1■K4■-...0**
		780 (1046)	9311 (6868)	770	690	40.4	1200	2800	**1PH8356-1■K4■-...0**
		880 (1180)	10505 (7748)	880	690	40.3	1200	2800	**1PH8358-1■K4■-...0**
1000	355	545 (731)	5205 (3839)	560	690	50.4	1500	2800	**1PH8350-1■U4■-...0**
		610 (818)	5826 (4297)	620	690	50.4	1500	2800	**1PH8351-1■U4■-...0**
		710 (952)	6781 (5002)	710	690	50.4	1400	2800	**1PH8352-1■U4■-...0**
		830 (1113)	7927 (5847)	820	690	50.4	1300	2800	**1PH8354-1■U4■-...0**
		950 (1274)	9073 (6692)	930	690	50.4	1200	2800	**1PH8356-1■U4■-...0**
		1100 (1475)	10505 (7748)	1080	690	50.4	1200	2800	**1PH8358-1■U4■-...0**
1350	355	605 (811)	4280 (3157)	600	690	68.0	1700	2800	**1PH8350-1■V4■-...0**
		680 (912)	4810 (3548)	680	690	68.0	1700	2800	**1PH8351-1■V4■-...0**
		820 (1100)	5801 (4279)	810	690	68.0	1700	2800	**1PH8352-1■V4■-...0**
		950 (1274)	6720 (4957)	920	690	68.0	1400	2800	**1PH8354-1■V4■-...0**
		1070 (1435)	7569 (5583)	1040	690	67.9	1400	2800	**1PH8356-1■V4■-...0**
		1230 (1649)	8701 (6418)	1180	690	67.9	1400	2800	**1PH8358-1■V4■-...0**

For versions, see Order No. supplement and options on page 5/58.

Motor type (repeated)	Power factor	Magnetizing current	Efficiency	Moment of inertia	Weight, approx.	Terminal box	SINAMICS S120 Motor Module	
							Rated output current[3]	For additional versions and components see chapter SINAMICS S120 drive system
	$\cos \varphi$	I_μ	η	J			I_{rated}	
		A		kgm^2 (lb$_f$-in-s^2)	kg (lb)	Type	A	Order No.
1PH8350-1.H4...	0.85	139	0.949	14.74 (130)	2235 (4928)	1XB7712-P01	465	**6SL3320-1TG34-7AA3**
1PH8351-1.H4...	0.85	139	0.949	14.74 (130)	2235 (4928)	1XB7712-P01	465	**6SL3320-1TG34-7AA3**
1PH8352-1.H4...	0.87	149	0.949	17.40 (154)	2560 (5645)	1XB7712-P03	575	**6SL3320-1TG35-8AA3**
1PH8354-1.H4...	0.87	176	0.952	20.66 (183)	2889 (6370)	1XB7712-P03	735	**6SL3320-1TG37-4AA3**
1PH8356-1.H4...	0.88	209	0.955	24.22 (214)	3256 (7179)	1XB7712-P03	810	**6SL3320-1TG38-1AA3**
1PH8358-1.H4...	0.88	245	0.957	27.79 (246)	3629 (8002)	1XB7712-P03	810	**6SL3320-1TG38-1AA3**
1PH8350-1.K4...	0.85	162	0.959	14.74 (130)	2235 (4928)	1XB7712-P03	575	**6SL3320-1TG35-8AA3**
1PH8351-1.K4...	0.85	162	0.959	14.74 (130)	2235 (4928)	1XB7712-P03	575	**6SL3320-1TG35-8AA3**
1PH8352-1.K4...	0.86	207	0.961	17.40 (154)	2560 (5645)	1XB7712-P03	735	**6SL3320-1TG37-4AA3**
1PH8354-1.K4...	0.87	215	0.962	20.66 (183)	2889 (6370)	1XB7712-P03	810	**6SL3320-1TG38-1AA3**
1PH8356-1.K4...	0.88	249	0.964	24.22 (214)	3256 (7179)	1XB7712-P03	810	**6SL3320-1TG38-1AA3**
1PH8358-1.K4...	0.86	272	0.967	27.79 (246)	3629 (8002)	1XB7712-P03	1025	**6SL3320-1TG41-0AA3**
1PH8350-1.U4...	0.85	216	0.964	14.74 (130)	2235 (4928)	1XB7712-P03	735	**6SL3320-1TG37-4AA3**
1PH8351-1.U4...	0.85	216	0.964	14.74 (130)	2235 (4928)	1XB7712-P03	810	**6SL3320-1TG38-1AA3**
1PH8352-1.U4...	0.86	232	0.965	17.40 (154)	2560 (5645)	1XB7712-P03	810	**6SL3320-1TG38-1AA3**
1PH8354-1.U4...	0.87	269	0.967	20.66 (183)	2889 (6370)	1XB7712-P03	1025	**6SL3320-1TG41-0AA3**
1PH8356-1.U4...	0.88	283	0.968	24.22 (214)	3256 (7179)	1XB7712-P03	1270	**6SL3320-1TG41-3AA3**
1PH8358-1.U4...	0.88	339	0.969	27.79 (246)	3629 (8002)	1XB7712-P03	2 × 735	**2 × 6SL3320-1TG37-4AA3**
1PH8350-1.V4...	0.86	178	0.967	14.74 (130)	2235 (4928)	1XB7712-P03	735[4]	**6SL3320-1TG37-4AA3**
1PH8351-1.V4...	0.86	178	0.967	14.74 (130)	2235 (4928)	1XB7712-P03	810	**6SL3320-1TG38-1AA3**
1PH8352-1.V4...	0.87	208	0.969	17.40 (154)	2560 (5645)	1XB7712-P03	910[4]	**6SL3320-1TG38-8AA3**
1PH8354-1.V4...	0.88	219	0.969	20.66 (183)	2889 (6370)	1XB7712-P03	1270	**6SL3320-1TG41-3AA3**
1PH8356-1.V4...	0.88	317	0.973	24.22 (214)	3256 (7179)	1XB7712-P03	1270[4]	**6SL3320-1TG41-3AA3**
1PH8358-1.V4...	0.89	322	0.973	27.79 (246)	3629 (8002)	1XB7820-P00	2 × 810	**2 × 6SL3320-1TG38-1AA3**

1) n_2: Max. permissible thermal speed at constant power or speed which is at the voltage limit when $P = P_{rated}$.
2) n_{max}: Maximum speed that must not be exceeded (applicable to Standard: 14th data position A, B, E or F).
3) The rated pulse frequencies must be taken into account. The rated motor data is valid for 2.5 kHz.
4) The rated output current of the Motor Module is lower than the rated motor current at 2.5 kHz.

1PH8 asynchronous motors
Water cooling, IP65 degree of protection

Selection and ordering data

Rated speed	Shaft height	Rated power	Rated torque	Rated current	Rated voltage	Rated frequency	Operating speed during field weakening, max.[1]	Speed, max.[2]	1PH8 asynchronous motor Water cooling
n_{rated}	SH	P_{rated}	M_{rated}	I_{rated}	U_{rated}	f_{rated}	n_2	n_{max}	
rpm		kW (HP)	Nm lb_f-ft	A	V	Hz	rpm	rpm	Order No.
Line voltage 400 V 3 AC, Smart/Basic Line Module									
1500	80	3.5 (4.69)	22 (16.2)	8.9	357	54.5	3550	10000	**1PH8083-1■F2■-...1**
		4.6 (6.17)	29 (21.4)	13.7	316	53.3	6000	10000	**1PH8087-1■F2■-...1**
	100	5 (6.71)	32 (23.6)	12.8	357	53.1	2500	9000	**1PH8101-1■F2■-...1**
		7.1 (9.52)	45 (33.2)	19.7	317	53.0	4000	9000	**1PH8103-1■F2■-...1**
		11 (14.8)	70 (51.6)	28.5	340	52.8	3500	9000	**1PH8105-1■F2■-...1**
		14 (18.8)	89 (65.6)	43.7	277	53.3	5600	9000	**1PH8107-1■F2■-...1**
	132	15 (20.1)	96 (70.8)	30	380	52.3	2500	8000	**1PH8131-1■F2■-...1**
		17 (22.8)	108 (79.7)	38	345	51.5	3500	8000	**1PH8133-1■F2■-...1**
		22 (29.5)	140 (103)	51	342	51.5	4000	8000	**1PH8135-1■F2■-...1**
		27 (36.2)	172 (127)	67	315	51.6	4000	8000	**1PH8137-1■F2■-...1**
		30 (40.2)	191 (141)	80	289	51.9	5000	8000	**1PH8138-1■F2■-...1**
	160	37 (49.62)	236 (174)	84	328	51.1	3000	6500	**1PH8163-1■F2■-...1**
		46 (61.7)	293 (216)	104	330	50.9	3050	6500	**1PH8165-1■F2■-...1**
		52 (69.7)	331 (224)	116	332	51.2	3050	6500	**1PH8166-1■F2■-...1**
2000	80	4.3 (5.8)	21 (15.5)	12	322	70.4	7200	10000	**1PH8083-1■G2■-...1**
		6.1 (8.2)	29 (21.4)	17.5	312	70.3	7950	10000	**1PH8087-1■G2■-...1**
	100	6.4 (8.6)	31 (22.9)	16.8	335	69.8	4000	9000	**1PH8101-1■G2■-...1**
		9.5 (12.7)	45 (33.2)	23.8	343	69.8	3000	9000	**1PH8103-1■G2■-...1**
		13.0 (17.4)	62 (45.7)	34.5	326	69.3	4000	9000	**1PH8105-1■G2■-...1**
	132	18 (24.1)	86 (63.4)	40	352	69.1	4000	8000	**1PH8131-1■G2■-...1**
		22 (29.5)	105 (77.4)	52	336	68.2	5000	8000	**1PH8133-1■G2■-...1**
		29 (38.9)	138 (102)	64	348	68.3	4500	8000	**1PH8135-1■G2■-...1**
	160	42 (56.3)	201 (148)	93	335	67.6	5000	6500	**1PH8163-1■G2■-...1**
		53 (71.1)	253 (187)	110	352	67.6	3500	6500	**1PH8165-1■G2■-...1**
		64 (85.8)	306 (221)	125	376	67.8	3000	6500	**1PH8166-1■G2■-...1**
3000	100	10.6 (14.2)	34 (25.1)	30	309	102.4	11900	9000	**1PH8103-1■M2■-...1**
		16.8 (22.5)	53 (39.1)	45	324	102.3	8050	9000	**1PH8105-1■M2■-...1**
		18 (24.1)	57 (42.0)	60	264	102.2	17000	9000	**1PH8107-1■M2■-...1**

For versions, see Order No. supplement and options on page 5/54.

Motor type (repeated)	Power factor	Magnetizing current	Efficiency	Moment of inertia	Weight, approx.	Terminal box	SINAMICS S120 Motor Module	
							Rated output current[3]	For additional versions and components see chapter SINAMICS S120 drive system
	$\cos \varphi$	I_μ	η	J			I_{rated}	
		A		kgm^2 (lb$_f$-in-s^2)	kg (lb)	Type	A	Order No.
1PH8083-1. F 2...	0.84	3.6	0.784	0.0064 (0.057)	36 (79.4)	gk803	9	**6SL312■-1TE21-0AA3**
1PH8087-1. F 2...	0.78	7.2	0.814	0.0089 (0.079)	44 (97.0)	gk803	18	**6SL312■-1TE21-8AA3**
1PH8101-1. F 2...	0.81	6.0	0.813	0.0138 (0.122)	51 (112)	gk823	18	**6SL312■-1TE21-8AA3**
1PH8103-1. F 2...	0.82	8.6	0.827	0.0172 (0.152)	60 (132)	gk823	30	**6SL312■-1TE23-0AA3**
1PH8105-1. F 2...	0.81	13.3	0.843	0.0252 (0.223)	74 (163)	gk823	30	**6SL312■-1TE23-0AA3**
1PH8107-1. F 2...	0.83	17.8	0.829	0.0289 (0.256)	83 (183)	gk823	45	**6SL312■-1TE24-5AA3**
1PH8131-1. F 2...	0.89	9.2	0.883	0.0590 (0.522)	105 (232)	gk843	30	**6SL312■-1TE23-0AA3**
1PH8133-1. F 2...	0.86	14.2	0.897	0.0760 (0.673)	123 (271)	gk843	45	**6SL312■-1TE24-5AA3**
1PH8135-1. F 2...	0.85	20.3	0.901	0.0940 (0.832)	141 (311)	gk843	60	**6SL312■-1TE26-0AA3**
1PH8137-1. F 2...	0.86	25.3	0.900	0.1090 (0.965)	157 (346)	gk843	85	**6SL312■-1TE28-5AA3**
1PH8138-1. F 2...	0.88	27.1	0.882	0.1090 (0.965)	157 (346)	gk843	85	**6SL312■-1TE28-5AA3**
1PH8163-1. F 2...	0.88	27.4	0.916	0.2160 (1.912)	229 (505)	gk873	85	**6SL312■-1TE28-5AA3**
1PH8165-1. F 2...	0.87	37.2	0.930	0.2320 (2.053)	264 (582)	gk873	132	**6SL312■-1TE31-3AA3**
1PH8166-1. F 2...	0.88	36.7	0.936	0.2320 (2.053)	269 (593)	gk873	132	**6SL312■-1TE31-3AA3**
1PH8083-1. G 2...	0.80	5.9	0.833	0.0064 (0.057)	36 (79.4)	gk803	18	**6SL312■-1TE21-8AA3**
1PH8087-1. G 2...	0.80	8.4	0.843	0.0089 (0.079)	44 (97.0)	gk803	18	**6SL312■-1TE21-8AA3**
1PH8101-1. G 2...	0.81	7.6	0.857	0.0138 (0.122)	51 (112)	gk823	18	**6SL312■-1TE21-8AA3**
1PH8103-1. G 2...	0.82	10.3	0.857	0.0172 (0.152)	60 (132)	gk823	30	**6SL312■-1TE23-0AA3**
1PH8105-1. G 2...	0.81	15.6	0.879	0.0252 (0.223)	74 (163)	gk823	45	**6SL312■-1TE24-5AA3**
1PH8131-1. G 2...	0.85	15.5	0.908	0.0590 (0.522)	105 (232)	gk843	45	**6SL312■-1TE24-5AA3**
1PH8133-1. G 2...	0.84	22.2	0.909	0.0760 (0.673)	123 (271)	gk843	60	**6SL312■-1TE26-0AA3**
1PH8135-1. G 2...	0.86	23.9	0.924	0.0940 (0.832)	141 (311)	gk843	85	**6SL312■-1TE28-5AA3**
1PH8163-1. G 2...	0.88	30.8	0.937	0.2160 (1.912)	229 (505)	gk873	132	**6SL312■-1TE31-3AA3**
1PH8165-1. G 2...	0.89	32.1	0.938	0.2320 (2.053)	264 (582)	gk873	132	**6SL312■-1TE31-3AA3**
1PH8166-1. G 2...	0.88	39.3	0.937	0.2320 (2.053)	269 (593)	gk873	132	**6SL312■-1TE31-3AA3**
1PH8103-1. M 2...	0.80	13.0	0.900	0.0172 (0.152)	60 (132)	gk823	30	**6SL312■-1TE23-0AA3**
1PH8105-1. M 2...	0.80	20.3	0.900	0.0252 (0.223)	74 (163)	gk823	45	**6SL312■-1TE24-5AA3**
1PH8107-1. M 2...	0.80	26.0	0.900	0.0289 (0.256)	83 (183)	gk823	60	**6SL312■-1TE26-0AA3**

Cooling:	
Internal air cooling	**0**
External air cooling	**1**

1) n_2: Max. permissible thermal speed at constant power or speed which is at the voltage limit when $P = P_{rated}$.
2) n_{max}: Maximum speed that must not be exceeded (applicable to Standard: 14th data position B to D).
3) The rated pulse frequencies must be taken into account. The rated motor data is valid for 4 kHz. For lower power ratings, Motor Modules in blocksize format can be configured as an alternative (levels of output current: 7.7 A/10.2 A/18 A).

1PH8 asynchronous motors
Water cooling, IP65 degree of protection

Selection and ordering data

Rated speed	Shaft height	Rated power	Rated torque	Rated current	Rated voltage	Rated frequency	Operating speed during field weakening, max.[1]	Speed, max.[2]	1PH8 asynchronous motor Water cooling
n_{rated}	SH	P_{rated}	M_{rated}	I_{rated}	U_{rated}	f_{rated}	n_2	n_{max}	
rpm		kW (HP)	Nm (lb_f-ft)	A	V	Hz	rpm	rpm	Order No.
Line voltage 400 V 3 AC, Active Line Module									
1750	80	4.0 (5.36)	22 (16.2)	8.7	416	62.4	4100	10000	**1PH8083-1■F2■-...1**
		5.4 (7.24)	29 (21.4)	13.7	358	61.8	6600	10000	**1PH8087-1■F2■-...1**
	100	5.8 (7.78)	32 (23.6)	12.8	400	61.7	2500	9000	**1PH8101-1■F2■-...1**
		8.2 (11.0	45 (33.2)	19.7	364	61.4	5000	9000	**1PH8103-1■F2■-...1**
		12.5 (16.8)	68 (50.2)	28.5	380	61.2	3400	9000	**1PH8105-1■F2■-...1**
		15.5 (20.8)	85 (62.7)	42	314	61.4	4500	9000	**1PH8107-1■F2■-...1**
	132	17 (22.8)	93 (68.6)	30	425	60.7	2500	8000	**1PH8131-1■F2■-...1**
		19.5 (26.1)	106 (78.2)	38	403	59.8	3500	8000	**1PH8133-1■F2■-...1**
		25.5 (34.2)	139 (103)	51	395	59.8	4000	8000	**1PH8135-1■F2■-...1**
		31.5 (42.2)	172 (127)	67	365	59.9	4500	8000	**1PH8137-1■F2■-...1**
		33 (44.3)	180 (133)	77	332	60.0	5000	8000	**1PH8138-1■F2■-...1**
	160	43 (57.7)	235 (173)	84	380	59.4	3500	6500	**1PH8163-1■F2■-...1**
		53 (71.1)	289 (213)	104	374	59.3	3050	6500	**1PH8165-1■F2■-...1**
		61 (81.8)	333 (246)	116	381	59.5	3050	6500	**1PH8166-1■F2■-...1**
2300	80	4.9 (6.57)	20 (14.8)	12	362	80.5	8150	10000	**1PH8083-1■G2■-...1**
		7.0 (9.39)	29 (21.4)	17.7	355	80.3	8850	10000	**1PH8087-1■G2■-...1**
	100	7.3 (9.79)	30 (22.1)	16.8	382	79.7	5000	9000	**1PH8101-1■G2■-...1**
		10.9 (14.6)	45 (33.2)	23.8	390	79.8	3000	9000	**1PH8103-1■G2■-...1**
		15 (20.1)	62 (45.7)	34	370	79.3	3500	9000	**1PH8105-1■G2■-...1**
	132	20 (26.8)	83 (61.2)	39	400	78.5	4000	8000	**1PH8131-1■G2■-...1**
		25 (33.5)	104 (76.7)	52	373	78.3	6000	8000	**1PH8133-1■G2■-...1**
		31 (41.6)	129 (95.2)	61	397	78.1	4500	8000	**1PH8135-1■G2■-...1**
	160	48 (64.4)	199 (147)	93	382	77.6	4000	6500	**1PH8163-1■G2■-...1**
		60 (80.5)	249 (184)	107	410	77.6	3000	6500	**1PH8165-1■G2■-...1**
		72 (96.6)	299 (221)	124	420	77.8	3000	6500	**1PH8166-1■G2■-...1**
3300	100	11.7 (15.7)	34 (25.1)	30	340	112.4	13550	9000	**1PH8103-1■M2■-...1**
		18.5 (24.81)	54 (39.8)	45	355	112.4	9050	9000	**1PH8105-1■M2■-...1**
		20 (26.82)	58 (42.8)	60	290	112.6	18050	9000	**1PH8107-1■M2■-...1**

For versions, see Order No. supplement and options on page 5/54.

Motor type (repeated)	Power factor	Magnetizing current	Efficiency	Moment of inertia	Weight, approx.	Terminal box	SINAMICS S120 Motor Module	
							Rated output current[3]	For additional versions and components see chapter SINAMICS S120 drive system
	$\cos \varphi$	I_μ	η	J			I_{rated}	
		A		kgm^2 (lb$_f$-in-s^2)	kg (lb)	Type	A	Order No.
1PH8083-1. F 2...	0.82	4.0	0.808	0.0064 (0.057)	36 (79.4)	gk803	9	**6SL312■-1TE21-0AA3**
1PH8087-1. F 2...	0.80	6.8	0.831	0.0089 (0.079)	44 (97.0)	gk803	18	**6SL312■-1TE21-8AA3**
1PH8101-1. F 2...	0.83	5.4	0.834	0.0138 (0.122)	51 (112)	gk823	18	**6SL312■-1TE21-8AA3**
1PH8103-1. F 2...	0.82	8.6	0.851	0.0172 (0.152)	60 (132)	gk823	30	**6SL312■-1TE23-0AA3**
1PH8105-1. F 2...	0.81	12.1	0.862	0.0252 (0.223)	74 (163)	gk823	30	**6SL312■-1TE23-0AA3**
1PH8107-1. F 2...	0.83	17.5	0.847	0.0289 (0.256)	83 (183)	gk823	45	**6SL312■-1TE24-5AA3**
1PH8131-1. F 2...	0.89	8.2	0.897	0.0590 (0.522)	105 (232)	gk843	30	**6SL312■-1TE23-0AA3**
1PH8133-1. F 2...	0.85	14.9	0.913	0.0760 (0.673)	123 (271)	gk843	45	**6SL312■-1TE24-5AA3**
1PH8135-1. F 2...	0.85	20.1	0.914	0.0940 (0.832)	141 (311)	gk843	60	**6SL312■-1TE26-0AA3**
1PH8137-1. F 2...	0.86	24.8	0.911	0.1090 (0.965)	157 (346)	gk843	85	**6SL312■-1TE28-5AA3**
1PH8138-1. F 2...	0.87	27.1	0.898	0.1090 (0.965)	157 (346)	gk843	85	**6SL312■-1TE28-5AA3**
1PH8163-1. F 2...	0.88	27.3	0.924	0.2160 (1.912)	229 (505)	gk873	85	**6SL312■-1TE28-5AA3**
1PH8165-1. F 2...	0.88	33.8	0.935	0.2320 (2.053)	264 (582)	gk873	132	**6SL312■-1TE31-3AA3**
1PH8166-1. F 2...	0.89	35.2	0.940	0.2320 (2.053)	269 (593)	gk873	132	**6SL312■-1TE31-3AA3**
1PH8083-1. G 2...	0.80	5.8	0.846	0.0064 (0.057)	36 (79.4)	gk803	18	**6SL312■-1TE21-8AA3**
1PH8087-1. G 2...	0.79	8.6	0.860	0.0089 (0.079)	44 (97.0)	gk803	18	**6SL312■-1TE21-8AA3**
1PH8101-1. G 2...	0.80	7.8	0.874	0.0138 (0.122)	51 (112)	gk823	18	**6SL312■-1TE21-8AA3**
1PH8103-1. G 2...	0.82	10.3	0.883	0.0172 (0.152)	60 (132)	gk823	30	**6SL312■-1TE23-0AA3**
1PH8105-1. G 2...	0.81	15.1	0.891	0.0252 (0.223)	74 (163)	gk823	45	**6SL312■-1TE24-5AA3**
1PH8131-1. G 2...	0.85	15.4	0.920	0.0590 (0.522)	105 (232)	gk843	45	**6SL312■-1TE24-5AA3**
1PH8133-1. G 2...	0.86	19.4	0.923	0.0760 (0.673)	123 (271)	gk843	60	**6SL312■-1TE26-0AA3**
1PH8135-1. G 2...	0.85	24.1	0.933	0.0940 (0.832)	141 (311)	gk843	85	**6SL312■-1TE28-5AA3**
1PH8163-1. G 2...	0.88	30.2	0.939	0.2160 (1.912)	229 (505)	gk873	132	**6SL312■-1TE31-3AA3**
1PH8165-1. G 2...	0.88	33.7	0.946	0.2320 (2.053)	264 (582)	gk873	132	**6SL312■-1TE31-3AA3**
1PH8166-1. G 2...	0.89	35.5	0.946	0.2320 (2.053)	269 (593)	gk873	132	**6SL312■-1TE31-3AA3**
1PH8103-1. M 2...	0.80	13.2	0.900	0.0172 (0.152)	60 (132)	gk823	30	**6SL312■-1TE23-0AA3**
1PH8105-1. M 2...	0.80	20.2	0.910	0.0252 (0.223)	74 (163)	gk823	45	**6SL312■-1TE24-5AA3**
1PH8107-1. M 2...	0.80	26.1	0.900	0.0289 (0.256)	83 (183)	gk823	60	**6SL312■-1TE26-0AA3**

Cooling:	
Internal air cooling	**0**
External air cooling	**1**

1) n_2: Max. permissible thermal speed at constant power or speed which is at the voltage limit when $P = P_{rated}$.
2) n_{max}: Maximum speed that must not be exceeded (applicable to Standard: 14th data position B to D).
3) The rated pulse frequencies must be taken into account. The rated motor data is valid for 4 kHz. For lower power ratings, Motor Modules in blocksize format can be configured as an alternative (levels of output current: 7.7 A/10.2 A/18 A).

1PH8 asynchronous motors
Water cooling, IP65 degree of protection

Selection and ordering data

Rated speed	Shaft height	Rated power	Rated torque	Rated current	Rated voltage	Rated frequency	Operating speed during field weakening, max.[1]	Speed, max.[2]	1PH8 asynchronous motor Water cooling
n_{rated}	SH	P_{rated}	M_{rated}	I_{rated}	U_{rated}	f_{rated}	n_2	n_{max}	
rpm		kW (HP)	Nm (lb_f-ft)	A	V	Hz	rpm	rpm	Order No.
Line voltage 480 V 3 AC, Smart/Basic/Active Line Module									
2000	80	4.6 (6.17)	22 (16.2)	8.7	457	71.0	4250	10000	**1PH8083-1■F2■-...1**
		6.1 (8.18)	29 (21.4)	13.7	402	70.0	6950	10000	**1PH8087-1■F2■-...1**
	100	6.6 (8.85)	32 (23.6)	12.5	450	69.9	2500	9000	**1PH8101-1■F2■-...1**
		9.4 (12.6)	45 (33.2)	19.7	411	69.7	5000	9000	**1PH8103-1■F2■-...1**
		14 (18.8)	67 (49.4)	27.5	426	69.5	3000	9000	**1PH8105-1■F2■-...1**
		18 (24.1)	86 (63.4)	42.6	363	69.7	3000	9000	**1PH8107-1■F2■-...1**
	132	18.5 (24.8)	88 (64.9)	30	460	68.7	2500	8000	**1PH8131-1■F2■-...1**
		22.5 (30.2)	107 (78.9)	38	452	68.2	4000	8000	**1PH8133-1■F2■-...1**
		29 (38.9)	138 (102)	52	448	68.2	4500	8000	**1PH8135-1■F2■-...1**
		36 (48.3)	172 (127)	67	415	68.3	4000	8000	**1PH8137-1■F2■-...1**
		37 (49.62)	177 (131)	76	380	68.4	6000	8000	**1PH8138-1■F2■-...1**
	160	49 (65.7)	234 (173)	84	430	67.7	3500	6500	**1PH8163-1■F2■-...1**
		60 (80.5)	287 (212)	103	426	67.6	3050	6500	**1PH8165-1■F2■-...1**
		68 (91.2)	325 (240)	116	426	67.9	3050	6500	**1PH8166-1■F2■-...1**
2650	80	5.6 (7.51)	20 (14.8)	12	425	91.8	8500	10000	**1PH8083-1■G2■-...1**
		8.1 (10.9)	29 (21.4)	17.8	415	91.8	9150	10000	**1PH8087-1■G2■-...1**
	100	8.4 (11.3)	30 (22.1)	16.8	435	91.4	4000	9000	**1PH8101-1■G2■-...1**
		12.5 (16.8)	45 (33.2)	23.5	454	91.2	4000	9000	**1PH8103-1■G2■-...1**
		17 (22.8)	61 (45.0)	33.5	424	90.9	4500	9000	**1PH8105-1■G2■-...1**
	132	23 (30.8)	83 (61.2)	39	458	90.1	4500	8000	**1PH8131-1■G2■-...1**
		28 (37.5)	101 (74.5)	50	427	89.9	6000	8000	**1PH8133-1■G2■-...1**
		32 (42.9)	115 (84.8)	58	448	89.6	5500	8000	**1PH8135-1■G2■-...1**
	160	55 (73.8)	198 (146)	90	450	89.2	5000	6500	**1PH8163-1■G2■-...1**
		65 (87.2)	234 (173)	100	460	89.2	4000	6500	**1PH8165-1■G2■-...1**
		83 (111)	299 (221)	125	460	89.6	3000	6500	**1PH8166-1■G2■-...1**
3600	100	12.7 (17.0)	34 (25.1)	29.7	368	122.5	17650	9000	**1PH8103-1■M2■-...1**
		20 (26.8)	53 (39.1)	45	375	122.5	10000	9000	**1PH8105-1■M2■-...1**
		21 (28.2)	56 (41.3)	59	315	122.1	17650	9000	**1PH8107-1■M2■-...1**

For versions, see Order No. supplement and options on page 5/54.

Motor type (repeated)	Power factor	Magnetizing current	Efficiency	Moment of inertia	Weight, approx.	Terminal box	SINAMICS S120 Motor Module	
							Rated output current[3]	For additional versions and components see chapter SINAMICS S120 drive system
	$\cos \varphi$	I_μ	η	J			I_{rated}	
		A		kgm^2 (lb$_f$-in-s^2)	kg (lb)	Type	A	Order No.
1PH8083-1. F 2...	0.83	3.8	0.839	0.0064 (0.057)	36 (79.4)	gk803	9	**6SL312■-1TE21-0AA3**
1PH8087-1. F 2...	0.79	6.8	0.868	0.0089 (0.079)	44 (97.0)	gk803	18	**6SL312■-1TE21-8AA3**
1PH8101-1. F 2...	0.82	4.4	0.858	0.0138 (0.122)	51 (112)	gk823	18	**6SL312■-1TE21-8AA3**
1PH8103-1. F 2...	0.82	8.5	0.869	0.0172 (0.152)	60 (132)	gk823	30	**6SL312■-1TE23-0AA3**
1PH8105-1. F 2...	0.82	11.7	0.894	0.0252 (0.223)	74 (163)	gk823	30	**6SL312■-1TE23-0AA3**
1PH8107-1. F 2...	0.81	19.1	0.873	0.0289 (0.256)	83 (183)	gk823	45	**6SL312■-1TE24-5AA3**
1PH8131-1. F 2...	0.90	7.2	0.912	0.0590 (0.522)	105 (232)	gk843	30	**6SL312■-1TE23-0AA3**
1PH8133-1. F 2...	0.86	14.4	0.938	0.0760 (0.673)	123 (271)	gk843	45	**6SL312■-1TE24-5AA3**
1PH8135-1. F 2...	0.85	19.9	0.931	0.0940 (0.832)	141 (311)	gk843	60	**6SL312■-1TE26-0AA3**
1PH8137-1. F 2...	0.86	25.4	0.928	0.1090 (0.965)	157 (346)	gk843	85	**6SL312■-1TE28-5AA3**
1PH8138-1. F 2...	0.86	28.4	0.920	0.1090 (0.965)	157 (346)	gk843	85	**6SL312■-1TE28-5AA3**
1PH8163-1. F 2...	0.88	26.9	0.925	0.2160 (1.912)	229 (505)	gk873	85	**6SL312■-1TE28-5AA3**
1PH8165-1. F 2...	0.88	34.0	0.940	0.2320 (2.053)	264 (582)	gk873	132	**6SL312■-1TE31-3AA3**
1PH8166-1. F 2...	0.89	32.8	0.941	0.2320 (2.053)	269 (593)	gk873	132	**6SL312■-1TE31-3AA3**
1PH8083-1. G 2...	0.76	6.5	0.862	0.0064 (0.057)	36 (79.4)	gk803	18	**6SL312■-1TE21-8AA3**
1PH8087-1. G 2...	0.77	9.3	0.871	0.0089 (0.079)	44 (97.0)	gk803	18	**6SL312■-1TE21-8AA3**
1PH8101-1. G 2...	0.80	7.7	0.888	0.0138 (0.122)	51 (112)	gk823	18	**6SL312■-1TE21-8AA3**
1PH8103-1. G 2...	0.79	11.3	0.904	0.0172 (0.152)	60 (132)	gk823	30	**6SL312■-1TE23-0AA3**
1PH8105-1. G 2...	0.81	15.3	0.911	0.0252 (0.223)	74 (163)	gk823	45	**6SL312■-1TE24-5AA3**
1PH8131-1. G 2...	0.85	15.4	0.938	0.0590 (0.522)	105 (232)	gk843	45	**6SL312■-1TE24-5AA3**
1PH8133-1. G 2...	0.85	19.5	0.933	0.0760 (0.673)	123 (271)	gk843	60	**6SL312■-1TE26-0AA3**
1PH8135-1. G 2...	0.84	23.0	0.942	0.0940 (0.832)	141 (311)	gk843	85	**6SL312■-1TE28-5AA3**
1PH8163-1. G 2...	0.86	33.6	0.940	0.2160 (1.912)	229 (505)	gk873	132	**6SL312■-1TE31-3AA3**
1PH8165-1. G 2...	0.89	31.9	0.948	0.2320 (2.053)	264 (582)	gk873	132	**6SL312■-1TE31-3AA3**
1PH8166-1. G 2...	0.90	35.7	0.948	0.2320 (2.053)	269 (593)	gk873	132	**6SL312■-1TE31-3AA3**
1PH8103-1. M 2...	0.80	13.0	0.910	0.0172 (0.152)	60 (132)	gk823	30	**6SL312■-1TE23-0AA3**
1PH8105-1. M 2...	0.81	18.6	0.920	0.0252 (0.223)	74 (163)	gk823	45	**6SL312■-1TE24-5AA3**
1PH8107-1. M 2...	0.79	26.1	0.910	0.0289 (0.256)	83 (183)	gk823	60	**6SL312■-1TE26-0AA3**

Cooling:	
Internal air cooling	**0**
External air cooling	**1**

1) n_2: Max. permissible thermal speed at constant power or speed which is at the voltage limit when $P = P_{rated}$.
2) n_{max}: Maximum speed that must not be exceeded (applicable to Standard: 14th data position B to D).
3) The rated pulse frequencies must be taken into account; the rated motor data is valid for 4 kHz. For lower power ratings, Motor Modules in blocksize format can be configured as an alternative (levels of output current: 7.7 A/10.2 A/18 A).

1PH8 asynchronous motors
Water cooling, IP55 degree of protection

Selection and ordering data

Rated speed	Shaft height	Rated power	Rated torque	Rated current	Rated voltage	Rated frequency	Operating speed during field weakening, max.[1]	Speed, max.[2]	1PH8 asynchronous motor Water cooling
n_{rated}	SH	P_{rated}	M_{rated}	I_{rated}	U_{rated}	f_{rated}	n_2	n_{max}	
rpm		kW (HP)	Nm (lb_f-ft)	A	V	Hz	rpm	rpm	Order No.
Line voltage 400 V 3 AC, Smart/Basic Line Module									
400	180	17 (22.8)	406 (299)	50	271	14.0	1500	5000	**1PH8184-1■B2■-...1**
		23 (30.8)	549 (405)	68	268	13.9	1800	5000	**1PH8186-1■B2■-...1**
	225	36 (48.3)	859 (634)	100	268	14.0	1400	4500	**1PH8224-1■B2■-...1**
		47 (63.0)	1122 (828)	130	264	14.0	1600	4500	**1PH8226-1■B2■-...1**
		58 (77.8)	1385 (1022)	154	272	13.9	1700	4500	**1PH8228-1■B2■-...1**
	280	71 (95.2)	1695 (1250)	170	295	13.8	2200	3300	**1PH8284-1■B2■-...1**
		89 (119)	2125 (1567)	210	300	13.7	2200	3300	**1PH8286-1■B2■-...1**
		109 (146)	2602 (1919)	260	295	13.7	2200	3300	**1PH8288-1■B2■-...1**
700	180	33 (44.3)	450 (332)	77	320	24.2	2500	5000	**1PH8184-1■C2■-...1**
		43 (57.7)	587 (433)	97	330	23.9	3000	5000	**1PH8186-1■C2■-...1**
	225	61 (81.8)	832 (614)	128	340	24.0	2100	4500	**1PH8224-1■C2■-...1**
		81 (109)	1105 (815)	184	310	23.9	2300	4500	**1PH8226-1■C2■-...1**
		96 (129)	1310 (966)	210	315	23.9	2500	4500	**1PH8228-1■C2■-...1**
	280	123 (165)	1678 (1238)	260	330	23.7	2200	3300	**1PH8284-1■C2■-...1**
		153 (205)	2087 (1539)	320	325	23.7	2200	3300	**1PH8286-1■C2■-...1**
		188 (252)	2565 (1892)	400	324	23.6	2200	3300	**1PH8288-1■C2■-...1**
1000	180	47 (63.0)	449 (331)	114	300	34.2	5000	5000	**1PH8184-1■D2■-...1**
		64 (85.8)	611 (451)	148	320	34.0	5000	5000	**1PH8186-1■D2■-...1**
	225	89 (119)	850 (627)	188	335	33.9	2800	4500	**1PH8224-1■D2■-...1**
		115 (154)	1098 (810)	235	340	33.9	2400	4500	**1PH8226-1■D2■-...1**
		141 (189)	1346 (993)	280	340	33.9	2300	4500	**1PH8228-1■D2■-...1**
	280	172 (231)	1643 (1212)	350	335	33.7	2200	3300	**1PH8284-1■D2■-...1**
		214 (287)	2044 (1508)	460	330	33.6	2200	3300	**1PH8286-1■D2■-...1**
		264 (354)	2521 (1859)	550	335	33.6	2200	3300	**1PH8288-1■D2■-...1**
1500	180	70 (93.9)	446 (329)	150	335	51.0	5000	5000	**1PH8184-1■F2■-...1**
		93 (125)	592 (437)	198	330	51.0	5000	5000	**1PH8186-1■F2■-...1**
	225	119 (160)	758 (559)	240	340	50.6	3500	4500	**1PH8224-1■F2■-...1**
		145 (194)	923 (681)	295	340	50.5	3700	4500	**1PH8226-1■F2■-...1**
		192 (257)	1222 (901)	390	340	50.5	3700	4500	**1PH8228-1■F2■-...1**
	280	227 (304)	1445 (1066)	445	343	50.4	2200	3300	**1PH8284-1■F2■-...1**
		281 (377)	1789 (1320)	540	343	50.4	2200	3300	**1PH8286-1■F2■-...1**
		345 (463)	2197 (1621)	660	345	50.3	2200	3300	**1PH8288-1■F2■-...1**
2500	180	95 (127)	363 (268)	196	340	85.2	5000	5000	**1PH8184-1■L2■-...1**
		120 (161)	458 (338)	250	335	83.9	5000	5000	**1PH8186-1■L2■-...1**
	225	153 (205)	584 (431)	310	340	83.8	3200	4500	**1PH8224-1■L2■-...1**
		185 (248)	707 (521)	380	335	83.8	3200	4500	**1PH8226-1■L2■-...1**
		226 (303)	863 (637)	455	340	83.7	3200	4500	**1PH8228-1■L2■-...1**

For versions, see Order No. supplement and options on page 5/56.

Motor type (repeated)	Power factor	Magnetizing current	Efficiency	Moment of inertia	Weight, approx.	Terminal box	SINAMICS S120 Motor Module	
							Rated output current[3]	For additional versions and components see chapter SINAMICS S120 drive system
	cos φ	I_μ	η	J			I_{rated}	
		A		kgm² (lb$_f$-in-s²)	kg (lb)	Type	A	Order No.
1PH8184-1. B 2...	0.87	28	0.831	0.489 (4.3)	340 (750)	1XB7322-P05	60	**6SL3120-1TE26-0AA3**
1PH8186-1. B 2...	0.86	42	0.845	0.652 (5.8)	410 (904)	1XB7322-P05	85	**6SL3120-1TE28-5AA3**
1PH8224-1. B 2...	0.91	37	0.858	1.45 (12.8)	610 (1345)	1XB7322-P05	132	**6SL3120-1TE31-3AA3**
1PH8226-1. B 2...	0.90	49	0.875	1.90 (16.8)	740 (1632)	1XB7322-P05	132	**6SL3120-1TE31-3AA3**
1PH8228-1. B 2...	0.90	62	0.886	2.35 (20.8)	870 (1918)	1XB7322-P05	200	**6SL3120-1TE32-0AA3**
1PH8284-1. B 2...	0.89	70	0.914	4.21 (37.3)	1280 (2822)	1XB7322-P05	200	**6SL3120-1TE32-0AA3**
1PH8286-1. B 2...	0.89	83	0.916	5.16 (45.7)	1490 (3285)	1XB7322-P05	210	**6SL3320-1TE32-1AA3**
1PH8288-1. B 2...	0.89	110	0.925	6.29 (55.7)	1750 (3859)	1XB7700-P02	260	**6SL3320-1TE32-6AA3**
1PH8184-1. C 2...	0.89	33	0.872	0.489 (4.3)	340 (750)	1XB7322-P05	85	**6SL3120-1TE28-5AA3**
1PH8186-1. C 2...	0.86	49	0.898	0.652 (5.8)	410 (904)	1XB7322-P05	132	**6SL3120-1TE31-3AA3**
1PH8224-1. C 2...	0.89	48	0.914	1.45 (12.8)	610 (1345)	1XB7322-P05	132	**6SL3120-1TE31-3AA3**
1PH8226-1. C 2...	0.88	79	0.928	1.90 (16.8)	740 (1632)	1XB7322-P05	200	**6SL3120-1TE32-0AA3**
1PH8228-1. C 2...	0.90	82	0.930	2.35 (20.8)	870 (1918)	1XB7322-P05	210	**6SL3320-1TE32-1AA3**
1PH8284-1. C 2...	0.87	108	0.945	4.21 (37.3)	1280 (2822)	1XB7700-P02	260	**6SL3320-1TE32-6AA3**
1PH8286-1. C 2...	0.89	123	0.948	5.16 (45.7)	1490 (3285)	1XB7700-P02	380	**6SL3320-1TE33-8AA3**
1PH8288-1. C 2...	0.88	172	0.952	6.29 (55.7)	1750 (3859)	1XB7700-P02	490	**6SL3320-1TE35-0AA3**
1PH8184-1. D 2...	0.88	45	0.904	0.489 (4.3)	340 (750)	1XB7322-P05	132	**6SL3120-1TE31-3AA3**
1PH8186-1. D 2...	0.85	78	0.920	0.652 (5.8)	410 (904)	1XB7322-P05	200	**6SL3120-1TE32-0AA3**
1PH8224-1. D 2...	0.87	79	0.937	1.45 (12.8)	610 (1345)	1XB7322-P05	200	**6SL3120-1TE32-0AA3**
1PH8226-1. D 2...	0.89	87	0.938	1.90 (16.8)	740 (1632)	1XB7422-P06	260	**6SL3320-1TE32-6AA3**
1PH8228-1. D 2...	0.91	98	0.943	2.35 (20.8)	870 (1918)	1XB7700-P02	310	**6SL3320-1TE33-1AA3**
1PH8284-1. D 2...	0.88	144	0.957	4.21 (37.3)	1280 (2822)	1XB7700-P02	380	**6SL3320-1TE33-8AA3**
1PH8286-1. D 2...	0.85	215	0.960	5.16 (45.7)	1490 (3285)	1XB7700-P02	490	**6SL3320-1TE35-0AA3**
1PH8288-1. D 2...	0.86	251	0.962	6.29 (55.7)	1750 (3859)	1XB7712-P03	745	**6SL3320-1TE37-5AA3**
1PH8184-1. F 2...	0.87	66	0.928	0.489 (4.3)	340 (750)	1XB7322-P05	200	**6SL3120-1TE32-0AA3**
1PH8186-1. F 2...	0.88	85	0.935	0.652 (5.8)	410 (904)	1XB7322-P05	200	**6SL3120-1TE32-0AA3**
1PH8224-1. F 2...	0.89	87	0.951	1.45 (12.8)	610 (1345)	1XB7422-P06	260	**6SL3320-1TE32-6AA3**
1PH8226-1. F 2...	0.87	119	0.957	1.90 (16.8)	740 (1632)	1XB7700-P02	310	**6SL3320-1TE33-1AA3**
1PH8228-1. F 2...	0.87	169	0.959	2.35 (20.8)	870 (1918)	1XB7700-P02	490	**6SL3320-1TE35-0AA3**
1PH8284-1. F 2...	0.89	161	0.964	4.21 (37.3)	1280 (2822)	1XB7700-P02	490	**6SL3320-1TE35-0AA3**
1PH8286-1. F 2...	0.90	181	0.966	5.16 (45.7)	1490 (3285)	1XB7712-P03	745	**6SL3320-1TE37-5AA3**
1PH8288-1. F 2...	0.90	234	0.967	6.29 (55.7)	1750 (3859)	1XB7712-P03	840	**6SL3320-1TE38-4AA3**
1PH8184-1. L 2...	0.87	75	0.945	0.489 (4.3)	340 (750)	1XB7322-P05	200	**6SL3120-1TE32-0AA3**
1PH8186-1. L 2...	0.87	109	0.948	0.652 (5.8)	410 (904)	1XB7422-P06	260	**6SL3320-1TE32-6AA3**
1PH8224-1. L 2...	0.87	113	0.961	1.45 (12.8)	610 (1345)	1XB7700-P02	310	**6SL3320-1TE33-1AA3**
1PH8226-1. L 2...	0.87	151	0.963	1.90 (16.8)	740 (1632)	1XB7700-P02	380	**6SL3320-1TE33-8AA3**
1PH8228-1. L 2...	0.87	181	0.964	2.35 (20.8)	870 (1918)	1XB7700-P02	490	**6SL3320-1TE35-0AA3**

1) n_2: Max. permissible thermal speed at constant power or speed which is at the voltage limit when $P = P_{rated}$.
2) n_{max}: Maximum speed that must not be exceeded (applicable to Standard: 14th data position A to D, E and F).
3) The rated pulse frequencies must be taken into account. The rated motor data is valid for 4 kHz or 2 kHz.

1PH8 asynchronous motors
Water cooling, IP55 degree of protection

Selection and ordering data

Rated speed	Shaft height	Rated power	Rated torque	Rated current	Rated voltage	Rated frequency	Operating speed during field weakening, max.[1]	Speed, max.[2]	1PH8 asynchronous motor Water cooling
n_{rated}	SH	P_{rated}	M_{rated}	I_{rated}	U_{rated}	f_{rated}	n_2	n_{max}	
rpm		kW (HP)	Nm (lb_f-ft)	A	V	Hz	rpm	rpm	Order No.
Line voltage 400 V 3 AC, Active Line Module									
500	180	23 (30.8)	439 (324)	54	335	17.4	1800	5000	**1PH8184-1■B2■-...1**
		30 (40.2)	573 (423)	70	335	17.3	2200	5000	**1PH8186-1■B2■-...1**
	225	46 (61.7)	879 (648)	100	335	17.3	1500	4500	**1PH8224-1■B2■-...1**
		59 (79.1)	1127 (831)	128	330	17.3	1700	4500	**1PH8226-1■B2■-...1**
		72 (96.6)	1375 (1014)	150	340	17.2	1800	4500	**1PH8228-1■B2■-...1**
	280	89 (119)	1700 (1254)	172	365	17.1	2200	3300	**1PH8284-1■B2■-...1**
		111 (149)	2120 (1564)	205	375	17.0	2200	3300	**1PH8286-1■B2■-...1**
		136 (182)	2598 (1916)	260	365	17.0	2200	3300	**1PH8288-1■B2■-...1**
800	180	38 (51.0)	454 (335)	77	365	27.5	2900	5000	**1PH8184-1■C2■-...1**
		49 (65.7)	585 (431)	99	360	27.4	3500	5000	**1PH8186-1■C2■-...1**
	225	70 (93.9)	836 (617)	130	380	27.3	2300	4500	**1PH8224-1■C2■-...1**
		93 (125)	1110 (819)	186	350	27.2	2500	4500	**1PH8226-1■C2■-...1**
		110 (148)	1313 (968)	210	360	27.2	2700	4500	**1PH8228-1■C2■-...1**
	280	141 (189)	1683 (1241)	260	375	27.0	2200	3300	**1PH8284-1■C2■-...1**
		175 (235)	2089 (1541)	320	375	27.0	2200	3300	**1PH8286-1■C2■-...1**
		215 (288)	2567 (1893)	405	370	27.0	2200	3300	**1PH8288-1■C2■-...1**
1150	180	54 (72.4)	448 (330)	112	350	39.2	5000	5000	**1PH8184-1■D2■-...1**
		74 (99.2)	615 (454)	148	370	38.9	5000	5000	**1PH8186-1■D2■-...1**
	225	101 (135)	839 (619)	186	385	38.9	3000	4500	**1PH8224-1■D2■-...1**
		131 (176)	1088 (803)	230	390	38.9	2700	4500	**1PH8226-1■D2■-...1**
		161 (216)	1337 (986)	280	390	38.9	2500	4500	**1PH8228-1■D2■-...1**
	280	198 (266)	1644 (1213)	355	385	38.7	2200	3300	**1PH8284-1■D2■-...1**
		246 (330)	2043 (1507)	455	380	38.6	2200	3300	**1PH8286-1■D2■-...1**
		304 (408)	2525 (1862)	550	385	38.6	2300	3300	**1PH8288-1■D2■-...1**
1750	180	82 (110)	447 (330)	150	390	59.3	5000	5000	**1PH8184-1■F2■-...1**
		111 (149)	606 (447)	200	385	59.3	5000	5000	**1PH8186-1■F2■-...1**
	225	138 (185)	753 (555)	240	395	58.9	3800	4500	**1PH8224-1■F2■-...1**
		169 (227)	922 (680)	295	390	58.8	3900	4500	**1PH8226-1■F2■-...1**
		221 (296)	1206 (890)	390	390	58.8	3900	4500	**1PH8228-1■F2■-...1**
	280	265 (355)	1446 (1067)	445	400	58.7	2200	3300	**1PH8284-1■F2■-...1**
		328 (440)	1790 (1320)	540	400	58.7	2300	3300	**1PH8286-1■F2■-...1**
		403 (540)	2199 (1622)	670	400	58.7	2400	3300	**1PH8288-1■F2■-...1**
2900	180	102 (137)	336 (248)	182	395	97.5	5000	5000	**1PH8184-1■L2■-...1**
		135 (181)	445 (328)	245	385	97.3	5000	5000	**1PH8186-1■L2■-...1**
	225	164 (220)	540 (398)	285	395	97.1	3600	4500	**1PH8224-1■L2■-...1**
		204 (274)	672 (496)	360	390	97.1	3600	4500	**1PH8226-1■L2■-...1**
		237 (318)	780 (575)	415	395	97.0	3600	4500	**1PH8228-1■L2■-...1**

For versions, see Order No. supplement and options on page 5/56.

Motor type (repeated)	Power factor	Magnetizing current	Efficiency	Moment of inertia	Weight, approx.	Terminal box	SINAMICS S120 Motor Module	
							Rated output current[3]	For additional versions and components see chapter SINAMICS S120 drive system
	cos φ	I_μ	η	J			I_{rated}	
		A		kgm² (lb$_f$-in-s²)	kg (lb)	Type	A	Order No.
1PH8184-1. B 2...	0.86	27	0.850	0.489 (4.3)	340 (750)	1XB7322-P05	60	**6SL3120-1TE26-0AA3**
1PH8186-1. B 2...	0.85	43	0.868	0.652 (5.8)	410 (904)	1XB7322-P05	85	**6SL3120-1TE28-5AA3**
1PH8224-1. B 2...	0.90	38	0.883	1.45 (12.8)	610 (1345)	1XB7322-P05	132	**6SL3120-1TE31-3AA3**
1PH8226-1. B 2...	0.90	50	0.899	1.90 (16.8)	740 (1632)	1XB7322-P05	132	**6SL3120-1TE31-3AA3**
1PH8228-1. B 2...	0.90	63	0.908	2.35 (20.8)	870 (1918)	1XB7322-P05	200	**6SL3120-1TE32-0AA3**
1PH8284-1. B 2...	0.88	69	0.929	4.21 (37.3)	1280 (2822)	1XB7322-P05	200	**6SL3120-1TE32-0AA3**
1PH8286-1. B 2...	0.89	84	0.931	5.16 (45.7)	1490 (3285)	1XB7322-P05	210	**6SL3320-1TE32-1AA3**
1PH8288-1. B 2...	0.88	109	0.938	6.29 (55.7)	1750 (3859)	1XB7700-P02	260	**6SL3320-1TE32-6AA3**
1PH8184-1. C 2...	0.88	33	0.885	0.489 (4.3)	340 (750)	1XB7322-P05	85	**6SL3120-1TE28-5AA3**
1PH8186-1. C 2...	0.88	44	0.904	0.652 (5.8)	410 (904)	1XB7322-P05	132	**6SL3120-1TE31-3AA3**
1PH8224-1. C 2...	0.89	46	0.920	1.45 (12.8)	610 (1345)	1XB7322-P05	132	**6SL3120-1TE31-3AA3**
1PH8226-1. C 2...	0.88	77	0.934	1.90 (16.8)	740 (1632)	1XB7322-P05	200	**6SL3120-1TE32-0AA3**
1PH8228-1. C 2...	0.90	82	0.937	2.35 (20.8)	870 (1918)	1XB7322-P05	210	**6SL3320-1TE32-1AA3**
1PH8284-1. C 2...	0.88	108	0.950	4.21 (37.3)	1280 (2822)	1XB7700-P02	260	**6SL3320-1TE32-6AA3**
1PH8286-1. C 2...	0.88	126	0.953	5.16 (45.7)	1490 (3285)	1XB7700-P02	380	**6SL3320-1TE33-8AA3**
1PH8288-1. C 2...	0.87	172	0.956	6.29 (55.7)	1750 (3859)	1XB7700-P02	490	**6SL3320-1TE35-0AA3**
1PH8184-1. D 2...	0.87	46	0.915	0.489 (4.3)	340 (750)	1XB7322-P05	132	**6SL3120-1TE31-3AA3**
1PH8186-1. D 2...	0.84	80	0.927	0.652 (5.8)	410 (904)	1XB7322-P05	200	**6SL3120-1TE32-0AA3**
1PH8224-1. D 2...	0.86	79	0.944	1.45 (12.8)	610 (1345)	1XB7322-P05	200	**6SL3120-1TE32-0AA3**
1PH8226-1. D 2...	0.89	87	0.945	1.90 (16.8)	740 (1632)	1XB7422-P06	260	**6SL3320-1TE32-6AA3**
1PH8228-1. D 2...	0.90	98	0.948	2.35 (20.8)	870 (1918)	1XB7700-P02	310	**6SL3320-1TE33-1AA3**
1PH8284-1. D 2...	0.87	144	0.960	4.21 (37.3)	1280 (2822)	1XB7700-P02	380	**6SL3320-1TE33-8AA3**
1PH8286-1. D 2...	0.85	216	0.962	5.16 (45.7)	1490 (3285)	1XB7700-P02	490	**6SL3320-1TE35-0AA3**
1PH8288-1. D 2...	0.86	251	0.964	6.29 (55.7)	1750 (3859)	1XB7712-P03	745	**6SL3320-1TE37-5AA3**
1PH8184-1. F 2...	0.87	65	0.933	0.489 (4.3)	340 (750)	1XB7322-P05	200	**6SL3120-1TE32-0AA3**
1PH8186-1. F 2...	0.89	85	0.939	0.652 (5.8)	410 (904)	1XB7322-P05	200	**6SL3120-1TE32-0AA3**
1PH8224-1. F 2...	0.88	87	0.954	1.45 (12.8)	610 (1345)	1XB7422-P06	260	**6SL3320-1TE32-6AA3**
1PH8226-1. F 2...	0.88	116	0.959	1.90 (16.8)	740 (1632)	1XB7700-P02	310	**6SL3320-1TE33-1AA3**
1PH8228-1. F 2...	0.87	165	0.961	2.35 (20.8)	870 (1918)	1XB7700-P02	490	**6SL3320-1TE35-0AA3**
1PH8284-1. F 2...	0.89	161	0.966	4.21 (37.3)	1280 (2822)	1XB7700-P02	490	**6SL3320-1TE35-0AA3**
1PH8286-1. F 2...	0.90	182	0.967	5.16 (45.7)	1490 (3285)	1XB7712-P03	745	**6SL3320-1TE37-5AA3**
1PH8288-1. F 2...	0.90	232	0.968	6.29 (55.7)	1750 (3859)	1XB7712-P03	840	**6SL3320-1TE38-4AA3**
1PH8184-1. L 2...	0.87	77	0.945	0.489 (4.3)	340 (750)	1XB7322-P05	200	**6SL3120-1TE32-0AA3**
1PH8186-1. L 2...	0.87	108	0.948	0.652 (5.8)	410 (904)	1XB7422-P06	260	**6SL3320-1TE32-6AA3**
1PH8224-1. L 2...	0.88	114	0.961	1.45 (12.8)	610 (1345)	1XB7700-P02	310	**6SL3320-1TE33-1AA3**
1PH8226-1. L 2...	0.87	152	0.962	1.90 (16.8)	740 (1632)	1XB7700-P02	380	**6SL3320-1TE33-8AA3**
1PH8228-1. L 2...	0.87	182	0.963	2.35 (20.8)	870 (1918)	1XB7700-P02	490	**6SL3320-1TE35-0AA3**

1) n_2: Max. permissible thermal speed at constant power or speed which is at the voltage limit when $P = P_{rated}$.
2) n_{max}: Maximum speed that must not be exceeded (applicable to Standard: 14th data position A to D, E and F).
3) The rated pulse frequencies must be taken into account. The rated motor data is valid for 4 kHz or 2 kHz.

1PH8 asynchronous motors
Water cooling, IP55 degree of protection

Selection and ordering data

Rated speed	Shaft height	Rated power	Rated torque	Rated current	Rated voltage	Rated frequency	Operating speed during field weakening, max.[1]	Speed, max.[2]	1PH8 asynchronous motor Water cooling
n_{rated}	SH	P_{rated}	M_{rated}	I_{rated}	U_{rated}	f_{rated}	n_2	n_{max}	
rpm		kW (HP)	Nm (lb_f-ft)	A	V	Hz	rpm	rpm	Order No.
Line voltage 480 V 3 AC, Smart/Basic/Active Line Module									
600	180	29 (38.9)	462 (341)	55	405	20.8	1800	5000	**1PH8184-1■B2■-...1**
		38 (51.0)	605 (446)	73	405	20.6	2500	5000	**1PH8186-1■B2■-...1**
	225	53 (71.1)	844 (623)	94	410	20.6	1900	4500	**1PH8224-1■B2■-...1**
		70 (93.9)	1114 (822)	122	410	20.5	2000	4500	**1PH8226-1■B2■-...1**
		85 (114)	1353 (998)	148	410	20.5	2100	4500	**1PH8228-1■B2■-...1**
	280	107 (143)	1703 (1256)	170	440	20.4	2200	3300	**1PH8284-1■B2■-...1**
		133 (178)	2117 (1561)	205	445	20.4	2200	3300	**1PH8286-1■B2■-...1**
		164 (220)	2610 (1925)	260	440	20.3	2200	3300	**1PH8288-1■B2■-...1**
1000	180	48 (64)	458 (338)	77	460	34.1	3100	5000	**1PH8184-1■C2■-...1**
		61 (82)	583 (430)	98	450	34.0	3700	5000	**1PH8186-1■C2■-...1**
	225	87 (117)	831 (613)	132	460	34.0	2500	4500	**1PH8224-1■C2■-...1**
		116 (156)	1108 (817)	184	440	33.9	2700	4500	**1PH8226-1■C2■-...1**
		138 (185)	1318 (972)	210	450	33.9	2900	4500	**1PH8228-1■C2■-...1**
	280	176 (236)	1681 (1240)	265	455	33.7	2200	3300	**1PH8284-1■C2■-...1**
		219 (294)	2091 (1542)	325	455	33.7	2200	3300	**1PH8286-1■C2■-...1**
		269 (361)	2569 (1895)	405	460	33.6	2200	3300	**1PH8288-1■C2■-...1**
1350	180	64 (85.8)	453 (334)	112	410	45.8	5000	5000	**1PH8184-1■D2■-...1**
		86 (115)	608 (448)	148	420	45.7	5000	5000	**1PH8186-1■D2■-...1**
	225	115 (154)	813 (600)	180	450	45.5	3400	4500	**1PH8224-1■D2■-...1**
		150 (201)	1061 (783)	225	460	45.5	3200	4500	**1PH8226-1■D2■-...1**
		184 (247)	1302 (960)	270	460	45.5	3000	4500	**1PH8228-1■D2■-...1**
	280	232 (311)	1641 (1210)	355	450	45.4	2200	3300	**1PH8284-1■D2■-...1**
		289 (388)	2044 (1508)	460	445	45.3	2300	3300	**1PH8286-1■D2■-...1**
		357 (479)	2525 (1862)	550	450	45.3	2400	3300	**1PH8288-1■D2■-...1**
2000	180	95 (127)	454 (335)	152	450	67.3	5000	5000	**1PH8184-1■F2■-...1**
		126 (169)	602 (444)	200	445	67.3	5000	5000	**1PH8186-1■F2■-...1**
	225	155 (208)	740 (546)	235	460	67.2	4200	4500	**1PH8224-1■F2■-...1**
		191 (256)	912 (673)	290	450	67.1	4100	4500	**1PH8226-1■F2■-...1**
		245 (329)	1170 (863)	380	450	67.1	4100	4500	**1PH8228-1■F2■-...1**
	280	303 (406)	1447 (1067)	445	455	67.0	2300	3300	**1PH8284-1■F2■-...1**
		375 (503)	1791 (1321)	550	455	67.0	2400	3300	**1PH8286-1■F2■-...1**
		460 (617)	2197 (1621)	670	455	67.0	2500	3300	**1PH8288-1■F2■-...1**
3400	180	100 (134)	281 (207)	158	460	114.0	5000	5000	**1PH8184-1■L2■-...1**
		121 (162)	340 (251)	200	455	113.5	5000	5000	**1PH8186-1■L2■-...1**
	225	164 (220)	461 (340)	255	460	114.0	4100	4500	**1PH8224-1■L2■-...1**
		199 (267)	559 (412)	310	460	114.0	4100	4500	**1PH8226-1■L2■-...1**
		237 (318)	666 (491)	370	460	114.0	4100	4500	**1PH8228-1■L2■-...1**

For versions, see Order No. supplement and options on page 5/56.

Motor type (repeated)	Power factor	Magnetizing current	Efficiency	Moment of inertia	Weight, approx.	Terminal box	SINAMICS S120 Motor Module	
							Rated output current[3]	For additional versions and components see chapter SINAMICS S120 drive system
	cos φ	I_μ	η	J			I_{rated}	
		A		kgm² (lb$_f$-in-s²)	kg (lb)	Type	A	Order No.
1PH8184-1. B 2...	0.86	28	0.869	0.489 (4.3)	340 (750)	1XB7322-P05	60	**6SL3120-1TE26-0AA3**
1PH8186-1. B 2...	0.84	44	0.883	0.652 (5.8)	410 (904)	1XB7322-P05	85	**6SL3120-1TE28-5AA3**
1PH8224-1. B 2...	0.87	40	0.908	1.45 (12.8)	610 (1345)	1XB7322-P05	132	**6SL3120-1TE31-3AA3**
1PH8226-1. B 2...	0.88	55	0.919	1.90 (16.8)	740 (1632)	1XB7322-P05	132	**6SL3120-1TE31-3AA3**
1PH8228-1. B 2...	0.88	64	0.923	2.35 (20.8)	870 (1918)	1XB7322-P05	200	**6SL3120-1TE32-0AA3**
1PH8284-1. B 2...	0.88	71	0.939	4.21 (37.3)	1280 (2822)	1XB7322-P05	200	**6SL3120-1TE32-0AA3**
1PH8286-1. B 2...	0.89	83	0.940	5.16 (45.7)	1490 (3285)	1XB7322-P05	210	**6SL3320-1TE32-1AA3**
1PH8288-1. B 2...	0.88	111	0.946	6.29 (55.7)	1750 (3859)	1XB7700-P02	260	**6SL3320-1TE32-6AA3**
1PH8184-1. C 2...	0.86	34	0.905	0.489 (4.3)	340 (750)	1XB7322-P05	85	**6SL3120-1TE28-5AA3**
1PH8186-1. C 2...	0.87	44	0.920	0.652 (5.8)	410 (904)	1XB7322-P05	132	**6SL3120-1TE31-3AA3**
1PH8224-1. C 2...	0.89	44	0.931	1.45 (12.8)	610 (1345)	1XB7322-P05	132	**6SL3120-1TE31-3AA3**
1PH8226-1. C 2...	0.88	79	0.944	1.90 (16.8)	740 (1632)	1XB7322-P05	200	**6SL3120-1TE32-0AA3**
1PH8228-1. C 2...	0.89	83	0.946	2.35 (20.8)	870 (1918)	1XB7322-P05	210	**6SL3320-1TE32-1AA3**
1PH8284-1. C 2...	0.88	102	0.956	4.21 (37.3)	1280 (2822)	1XB7700-P02	260	**6SL3320-1TE32-6AA3**
1PH8286-1. C 2...	0.89	120	0.958	5.16 (45.7)	1490 (3285)	1XB7700-P02	380	**6SL3320-1TE33-8AA3**
1PH8288-1. C 2...	0.87	171	0.961	6.29 (55.7)	1750 (3859)	1XB7700-P02	490	**6SL3320-1TE35-0AA3**
1PH8184-1. D 2...	0.87	46	0.924	0.489 (4.3)	340 (750)	1XB7322-P05	132	**6SL3120-1TE31-3AA3**
1PH8186-1. D 2...	0.86	73	0.933	0.652 (5.8)	410 (904)	1XB7322-P05	200	**6SL3120-1TE32-0AA3**
1PH8224-1. D 2...	0.86	79	0.950	1.45 (12.8)	610 (1345)	1XB7322-P05	200	**6SL3120-1TE32-0AA3**
1PH8226-1. D 2...	0.88	88	0.951	1.90 (16.8)	740 (1632)	1XB7422-P06	260	**6SL3320-1TE32-6AA3**
1PH8228-1. D 2...	0.90	99	0.954	2.35 (20.8)	870 (1918)	1XB7700-P02	310	**6SL3320-1TE33-1AA3**
1PH8284-1. D 2...	0.87	143	0.963	4.21 (37.3)	1280 (2822)	1XB7700-P02	380	**6SL3320-1TE33-8AA3**
1PH8286-1. D 2...	0.85	216	0.964	5.16 (45.7)	1490 (3285)	1XB7700-P02	490	**6SL3320-1TE35-0AA3**
1PH8288-1. D 2...	0.86	249	0.966	6.29 (55.7)	1750 (3859)	1XB7712-P03	745	**6SL3320-1TE37-5AA3**
1PH8184-1. F 2...	0.85	68	0.938	0.489 (4.3)	340 (750)	1XB7322-P05	200	**6SL3120-1TE32-0AA3**
1PH8186-1. F 2...	0.87	89	0.943	0.652 (5.8)	410 (904)	1XB7322-P05	200	**6SL3120-1TE32-0AA3**
1PH8224-1. F 2...	0.86	90	0.958	1.45 (12.8)	610 (1345)	1XB7422-P06	260	**6SL3320-1TE32-6AA3**
1PH8226-1. F 2...	0.88	118	0.961	1.90 (16.8)	740 (1632)	1XB7700-P02	310	**6SL3320-1TE33-1AA3**
1PH8228-1. F 2...	0.86	169	0.963	2.35 (20.8)	870 (1918)	1XB7700-P02	490	**6SL3320-1TE35-0AA3**
1PH8284-1. F 2...	0.89	160	0.967	4.21 (37.3)	1280 (2822)	1XB7700-P02	490	**6SL3320-1TE35-0AA3**
1PH8286-1. F 2...	0.90	180	0.968	5.16 (45.7)	1490 (3285)	1XB7712-P03	745	**6SL3320-1TE37-5AA3**
1PH8288-1. F 2...	0.90	230	0.969	6.29 (55.7)	1750 (3859)	1XB7712-P03	840	**6SL3320-1TE38-4AA3**
1PH8184-1. L 2...	0.84	76	0.944	0.489 (4.3)	340 (750)	1XB7322-P05	200	**6SL3120-1TE32-0AA3**
1PH8186-1. L 2...	0.81	110	0.942	0.652 (5.8)	410 (904)	1XB7422-P06	260	**6SL3320-1TE32-6AA3**
1PH8224-1. L 2...	0.84	113	0.959	1.45 (12.8)	610 (1345)	1XB7700-P02	310	**6SL3320-1TE33-1AA3**
1PH8226-1. L 2...	0.84	153	0.958	1.90 (16.8)	740 (1632)	1XB7700-P02	380	**6SL3320-1TE33-8AA3**
1PH8228-1. L 2...	0.84	180	0.959	2.35 (20.8)	870 (1918)	1XB7700-P02	490	**6SL3320-1TE35-0AA3**

1) n_2: Max. permissible thermal speed at constant power or speed which is at the voltage limit when $P = P_{rated}$.
2) n_{max}: Maximum speed that must not be exceeded (applicable to Standard: 14th data position A to D, E and F).
3) The rated pulse frequencies must be taken into account. The rated motor data is valid for 4 kHz or 2 kHz.

1PH8 asynchronous motors
Water cooling, IP55 degree of protection

Selection and ordering data

Rated speed	Shaft height	Rated power	Rated torque	Rated current	Rated voltage	Rated frequency	Operating speed during field weakening, max.[1]	Speed, max.[2]	1PH8 asynchronous motor Water cooling
n_{rated}	SH	P_{rated}	M_{rated}	I_{rated}	U_{rated}	f_{rated}	n_2	n_{max}	
rpm		kW (HP)	Nm (lb_f-ft)	A	V	Hz	rpm	rpm	Order No.
Line voltage 690 V 3 AC, Basic Line Module									
400	280	68 (91.2)	1624 (1198)	89	555	13.7	2000	3300	**1PH8284-1■H2■-...1**
		85 (114)	2029 (1497)	108	555	13.7	2000	3300	**1PH8286-1■H2■-...1**
		105 (141)	2507 (1849)	134	555	13.7	2000	3300	**1PH8288-1■H2■-...1**
700	280	119 (160)	1624 (1197)	136	605	23.7	2200	3300	**1PH8284-1■K2■-...1**
		148 (198)	2019 (1489)	174	605	23.6	2200	3300	**1PH8286-1■K2■-...1**
		182 (244)	2483 (1831)	205	605	23.7	2200	3300	**1PH8288-1■K2■-...1**
1000	280	167 (224)	1595 (1176)	196	600	33.6	2200	3300	**1PH8284-1■U2■-...1**
		208 (279)	1986 (1465)	260	570	33.6	2200	3300	**1PH8286-1■U2■-...1**
		256 (343)	2445 (1803)	310	580	33.6	2200	3300	**1PH8288-1■U2■-...1**
1500	280	220 (295)	1401 (1033)	250	590	50.4	2200	3300	**1PH8284-1■W2■-...1**
		273 (366)	1738 (1282)	310	590	50.4	2200	3300	**1PH8286-1■W2■-...1**
		335 (449)	2133 (1573)	375	590	50.3	2200	3300	**1PH8288-1■W2■-...1**
Line voltage 690 V 3 AC, Active Line Module									
500	280	85 (114)	1624 (1198)	89	690	17.0	2000	3300	**1PH8284-1■H2■-...1**
		106 (142)	2025 (1494)	108	690	17.0	2000	3300	**1PH8286-1■H2■-...1**
		131 (176)	2502 (1845)	134	690	17.0	2000	3300	**1PH8288-1■H2■-...1**
800	280	137 (184)	1635 (1206)	138	690	27.0	2200	3300	**1PH8284-1■K2■-...1**
		170 (228)	2029 (1497)	176	690	27.0	2200	3300	**1PH8286-1■K2■-...1**
		209 (280)	2495 (1840)	205	690	27.0	2200	3300	**1PH8288-1■K2■-...1**
1150	280	192 (257)	1594 (1176)	198	690	38.6	2200	3300	**1PH8284-1■U2■-...1**
		239 (320)	1985 (1464)	260	655	38.6	2200	3300	**1PH8286-1■U2■-...1**
		295 (396)	2450 (1807)	310	665	38.6	2300	3300	**1PH8288-1■U2■-...1**
1750	280	257 (345)	1401 (1033)	250	690	58.7	2200	3300	**1PH8284-1■W2■-...1**
		318 (426)	1735 (1280)	305	690	58.7	2300	3300	**1PH8286-1■W2■-...1**
		391 (524)	2134 (1574)	375	690	58.7	2400	3300	**1PH8288-1■W2■-...1**

For versions, see Order No. supplement and options on page 5/56.

Motor type (repeated)	Power factor	Magnetizing current	Efficiency	Moment of inertia	Weight, approx.	Terminal box	SINAMICS S120 Motor Module	
							Rated output current[3]	For additional versions and components see chapter SINAMICS S120 drive system
	cos φ	I_μ	η	J			I_{rated}	
		A		kgm² (lb_f-in-s²)	kg (lb)	Type	A	Order No.
1PH8284-1.H2...	0.87	41	0.917	4.21 (37.3)	1280 (2822)	1XB7322-P05	100	**6SL3320-1TG31-0AA3**
1PH8286-1.H2...	0.89	45	0.917	5.16 (45.7)	1490 (3285)	1XB7322-P05	120	**6SL3320-1TG31-2AA3**
1PH8288-1.H2...	0.88	58	0.923	6.29 (55.7)	1750 (3859)	1XB7322-P05	150	**6SL3320-1TG31-5AA3**
1PH8284-1.K2...	0.88	54	0.942	4.21 (37.3)	1280 (2822)	1XB7322-P05	150	**6SL3320-1TG31-5AA3**
1PH8286-1.K2...	0.85	84	0.950	5.16 (45.7)	1490 (3285)	1XB7322-P05	215	**6SL3320-1TG32-2AA3**
1PH8288-1.K2...	0.90	77	0.946	6.29 (55.7)	1750 (3859)	1XB7322-P05	260	**6SL3320-1TG32-6AA3**
1PH8284-1.U2...	0.86	89	0.956	4.21 (37.3)	1280 (2822)	1XB7322-P05	215	**6SL3320-1TG32-2AA3**
1PH8286-1.U2...	0.85	123	0.959	5.16 (45.7)	1490 (3285)	1XB7700-P02	330	**6SL3320-1TG33-3AA3**
1PH8288-1.U2...	0.86	145	0.961	6.29 (55.7)	1750 (3859)	1XB7700-P02	410	**6SL3320-1TG34-1AA3**
1PH8284-1.W2...	0.89	92	0.963	4.21 (37.3)	1280 (2822)	1XB7422-P06	330	**6SL3320-1TG33-3AA3**
1PH8286-1.W2...	0.90	104	0.965	5.16 (45.7)	1490 (3285)	1XB7700-P02	410	**6SL3320-1TG34-1AA3**
1PH8288-1.W2...	0.90	132	0.966	6.29 (55.7)	1750 (3859)	1XB7700-P02	465	**6SL3320-1TG34-7AA3**
1PH8284-1.H2...	0.86	41	0.931	4.21 (37.3)	1280 (2822)	1XB7322-P05	100	**6SL3320-1TG31-0AA3**
1PH8286-1.H2...	0.88	45	0.931	5.16 (45.7)	1490 (3285)	1XB7322-P05	120	**6SL3320-1TG31-2AA3**
1PH8288-1.H2...	0.88	58	0.936	6.29 (55.7)	1750 (3859)	1XB7322-P05	150	**6SL3320-1TG31-5AA3**
1PH8284-1.K2...	0.88	54	0.947	4.21 (37.3)	1280 (2822)	1XB7322-P05	150	**6SL3320-1TG31-5AA3**
1PH8286-1.K2...	0.85	84	0.954	5.16 (45.7)	1490 (3285)	1XB7322-P05	215	**6SL3320-1TG32-2AA3**
1PH8288-1.K2...	0.90	77	0.951	6.29 (55.7)	1750 (3859)	1XB7322-P05	260	**6SL3320-1TG32-6AA3**
1PH8284-1.U2...	0.85	90	0.959	4.21 (37.3)	1280 (2822)	1XB7322-P05	215	**6SL3320-1TG32-2AA3**
1PH8286-1.U2...	0.85	123	0.962	5.16 (45.7)	1490 (3285)	1XB7700-P02	330	**6SL3320-1TG33-3AA3**
1PH8288-1.U2...	0.86	144	0.963	6.29 (55.7)	1750 (3859)	1XB7700-P02	410	**6SL3320-1TG34-1AA3**
1PH8284-1.W2...	0.89	92	0.965	4.21 (37.3)	1280 (2822)	1XB7422-P06	330	**6SL3320-1TG33-3AA3**
1PH8286-1.W2...	0.90	104	0.967	5.16 (45.7)	1490 (3285)	1XB7700-P02	410	**6SL3320-1TG34-1AA3**
1PH8288-1.W2...	0.90	133	0.968	6.29 (55.7)	1750 (3859)	1XB7700-P02	465	**6SL3320-1TG34-7AA3**

[1] n_2: Max. permissible thermal speed at constant power or speed which is at the voltage limit when $P = P_{rated}$.
[2] n_{max}: Maximum speed that must not be exceeded (applicable to Standard: 14th data position A and B, E and F).
[3] The rated pulse frequencies must be taken into account. The rated motor data is valid for 2 kHz.

1PH8 synchronous motors
Forced ventilation, IP55 degree of protection

Selection and ordering data

Rated speed	Shaft height	Rated power	Rated torque	Rated current	Rated voltage	Rated frequency	Operating speed, max.[1]	Speed, max.[2]	1PH8 synchronous motor Forced ventilation
n_{rated}	SH	P_{rated}	M_{rated}	I_{rated}	U_{rated}	f_{rated}	$n_{max, Inv}$	n_{max}	
rpm		kW (HP)	Nm (lb_f-ft)	A	V	Hz	rpm	rpm	Order No.
Line voltage 400 V 3 AC, Smart/Basic Line Module									
1500	132	15.7 (21.1)	100 (73.8)	29	388	50.0	2550	4500	**1PH8131-2■F.■-...1**
		19.9 (26.7)	127 (93.7)	44	316	50.0	3050	4500	**1PH8133-2■F.■-...1**
		23.7 (31.8)	151 (111)	43	383	50.0	2450	4500	**1PH8135-2■F.■-...1**
		30.6 (41.0)	195 (144)	60	356	50.0	2700	4500	**1PH8137-2■F.■-...1**
	160	61 (81.8)	390 (288)	119	340	100.0	2600	4000	**1PH8165-2■F.■-...1**
		69 (92.5)	435 (321)	133	345	100.0	2600	4000	**1PH8167-2■F.■-...1**
2000	132	31.4 (42.1)	150 (111)	59	356	66.7	3500	4500	**1PH8135-2■G.■-...1**
2500	132	25 (33.5)	96 (71)	44	371	83.3	4050	4500	**1PH8131-2■L.■-...1**
		31.7 (42.5)	121 (89)	55	371	83.3	3950	4500	**1PH8133-2■L.■-...1**
		48.4 (64.9)	185 (136)	83	371	83.3	3900	4500	**1PH8137-2■L.■-...1**
	160	84 (113)	320 (236)	148	370	167.0	3900	4000	**1PH8165-2■L.■-...1**
		95 (127)	360 (266)	177	350	167.0	4000	4000	**1PH8167-2■L.■-...1**
3000	132	57.5 (77.1)	183 (135)	104	370	100.0	4500	4500	**1PH8137-2■M.■-...1**
Line voltage 400 V 3 AC, Active Line Module									
1750	132	18 (24.1)	98 (72.3)	29	415	58.3	2550	4500	**1PH8131-2■F.■-...1**
		23.1 (31.0)	126 (92.9)	43	366	58.3	3050	4500	**1PH8133-2■F.■-...1**
		27.2 (36.5)	149 (110)	42	415	58.3	2450	4500	**1PH8135-2■F.■-...1**
		35.6 (47.7)	194 (143)	59	412	58.3	2700	4500	**1PH8137-2■F.■-...1**
	160	69 (92.5)	375 (277)	115	395	117.0	2600	4000	**1PH8165-2■F.■-...1**
		77 (103)	420 (310)	128	400	117.0	2600	4000	**1PH8167-2■F.■-...1**
2300	132	35.6 (47.7)	148 (109)	59	407	76.7	3500	4500	**1PH8135-2■G.■-...1**
2800	132	27.7 (37.1)	95 (70.1)	44	415	93.3	4050	4500	**1PH8131-2■L.■-...1**
		35.2 (47.2)	120 (88.5)	54	415	93.3	3950	4500	**1PH8133-2■L.■-...1**
		53.4 (71.6)	182 (134)	82	415	93.3	3900	4500	**1PH8137-2■L.■-...1**
	160	87 (117)	300 (221)	138	410	187.0	3900	4000	**1PH8165-2■L.■-...1**
		98 (131)	335 (247)	164	385	187.0	4000	4000	**1PH8167-2■L.■-...1**
3300	132	62.2 (83.4)	180 (133)	102	405	110.0	4500	4500	**1PH8137-2■M.■-...1**
Line voltage 480 V 3 AC, Smart/Basic/Active Line Module									
2000	132	19.9 (26.7)	95 (70.1)	29	449	66.7	2550	4500	**1PH8131-2■F.■-...1**
		26.2 (35.1)	125 (92.2)	43	415	66.7	3050	4500	**1PH8133-2■F.■-...1**
		30.2 (40.5)	144 (106)	42	449	66.7	2450	4500	**1PH8135-2■F.■-...1**
		40.0 (53.6)	191 (141)	59	449	66.7	2700	4500	**1PH8137-2■F.■-...1**
	160	74 (99.2)	355 (262)	110	445	133.0	2600	4000	**1PH8165-2■F.■-...1**
		82 (110)	395 (291)	123	450	133.0	2600	4000	**1PH8167-2■F.■-...1**
2650	132	40.2 (53.9)	145 (107)	58	449	88.3	3500	4500	**1PH8135-2■G.■-...1**
3000	132	29.5 (39.6)	94 (69.3)	43	449	100.0	4050	4500	**1PH8131-2■L.■-...1**
		37.4 (50.2)	119 (87.8)	54	449	100.0	3950	4500	**1PH8133-2■L.■-...1**
		56.9 (76.3)	181 (134)	81	449	100.0	3900	4500	**1PH8137-2■L.■-...1**
	160	89 (119)	285 (210)	131	440	200.0	3900	4000	**1PH8165-2■L.■-...1**
		99 (133)	315 (232)	155	410	200.0	4000	4000	**1PH8167-2■L.■-...1**
3600	132	66.7 (89.4)	177 (131)	100	440	120.0	4500	4500	**1PH8137-2■M.■-...1**

For versions, see Order No. supplement and options on page 5/54.

Motor type (repeated)	Static torque	Static current	Effi-ciency	Moment of inertia	Weight, approx.	Terminal box	SINAMICS S120 Motor Module	
							Rated output current[3]	For additional versions and components see chapter SINAMICS S120 drive system
	M_0	I_0	η	J			I_{rated}	
	Nm (lb_f-ft)	A		kgm^2 (lb_f-in-s^2)	kg (lb)	Type	A	Order No.
1PH8131-2.F...	105 (77.4)	30	0.944	0.0446 (0.39)	85 (187)	gk833	30	6SL312■-1TE23-0AA3
1PH8133-2.F...	131 (96.6)	45	0.948	0.0600 (0.53)	103 (227)	gk833	45	6SL312■-1TE24-5AA3
1PH8135-2.F...	158 (117)	44	0.952	0.0750 (0.66)	120 (265)	gk833	45	6SL312■-1TE24-5AA3
1PH8137-2.F...	203 (150)	62	0.952	0.0885 (0.78)	136 (300)	gk833	60	6SL312■-1TE26-0AA3
1PH8165-2.F...	440 (325)	126	0.940	0.2160 (1.91)	218 (481)	gk874	132	6SL312■-1TE31-3AA3
1PH8167-2.F...	500 (369)	143	0.940	0.2440 (2.16)	240 (529)	gk874	132[5]	6SL312■-1TE31-3AA3
1PH8135-2.G...	158 (117)	63	0.953	0.0750 (0.66)	120 (265)	gk833	60	6SL312■-1TE26-0AA3
1PH8131-2.L...	105 (77.4)	48	0.948	0.0446 (0.39)	85 (187)	gk833	45	6SL312■-1TE24-5AA3
1PH8133-2.L...	131 (96.6)	59	0.951	0.0600 (0.53)	103 (227)	gk833	60	6SL312■-1TE26-0AA3
1PH8137-2.L...	203 (150)	89[4]	0.954	0.0885 (0.78)	136 (300)	gk833	85	6SL312■-1TE28-5AA3
1PH8165-2.L...	440 (325)	188	0.955	0.2160 (1.91)	218 (481)	gk874	200	6SL312■-1TE32-0AA3
1PH8167-2.L...	500 (369)	230	0.955	0.2440 (2.16)	240 (529)	gk874	200	6SL312■-1TE32-0AA3
1PH8137-2.M...	203 (150)	115[4]	0.953	0.0885 (0.78)	136 (300)	gk833	132	6SL312■-1TE31-3AA3
1PH8131-2.F...	105 (77.4)	30	0.947	0.0446 (0.39)	85 (187)	gk833	30	6SL312■-1TE23-0AA3
1PH8133-2.F...	131 (96.6)	45	0.950	0.0600 (0.53)	103 (227)	gk833	45	6SL312■-1TE24-5AA3
1PH8135-2.F...	158 (117)	44	0.952	0.0750 (0.66)	120 (265)	gk833	45	6SL312■-1TE24-5AA3
1PH8137-2.F...	203 (150)	62	0.953	0.0885 (0.78)	136 (300)	gk833	60	6SL312■-1TE26-0AA3
1PH8165-2.F...	440 (325)	126	0.943	0.2160 (1.91)	218 (481)	gk874	132	6SL312■-1TE31-3AA3
1PH8167-2.F...	500 (369)	143	0.943	0.2440 (2.16)	240 (529)	gk874	132	6SL312■-1TE31-3AA3
1PH8135-2.G...	158 (117)	63	0.953	0.0750 (0.66)	120 (265)	gk833	60	6SL312■-1TE26-0AA3
1PH8131-2.L...	105 (77.4)	48	0.949	0.0446 (0.39)	85 (187)	gk833	45	6SL312■-1TE24-5AA3
1PH8133-2.L...	131 (96.6)	59	0.952	0.0600 (0.53)	103 (227)	gk833	60	6SL312■-1TE26-0AA3
1PH8137-2.L...	203 (150)	89[4]	0.953	0.0885 (0.78)	136 (300)	gk833	85	6SL312■-1TE28-5AA3
1PH8165-2.L...	440 (325)	188	0.959	0.2160 (1.91)	218 (481)	gk874	200	6SL312■-1TE32-0AA3
1PH8167-2.L...	500 (369)	230	0.959	0.2440 (2.16)	240 (529)	gk874	200	6SL312■-1TE32-0AA3
1PH8137-2.M...	203 (150)	115[4]	0.952	0.0885 (0.78)	136 (300)	gk833	132	6SL312■-1TE31-3AA3
1PH8131-2.F...	105 (77.4)	30	0.948	0.0446 (0.39)	85 (187)	gk833	30	6SL312■-1TE23-0AA3
1PH8133-2.F...	131 (96.6)	45	0.951	0.0600 (0.53)	103 (227)	gk833	45	6SL312■-1TE24-5AA3
1PH8135-2.F...	158 (117)	44	0.953	0.0750 (0.66)	120 (265)	gk833	45	6SL312■-1TE24-5AA3
1PH8137-2.F...	203 (150)	62	0.954	0.0885 (0.78)	136 (300)	gk833	60	6SL312■-1TE26-0AA3
1PH8165-2.F...	440 (325)	126	0.946	0.2160 (1.91)	218 (481)	gk874	132	6SL312■-1TE31-3AA3
1PH8167-2.F...	500 (369)	143	0.946	0.2440 (2.16)	240 (529)	gk874	132	6SL312■-1TE31-3AA3
1PH8135-2.G...	158 (117)	63	0.952	0.0750 (0.66)	120 (265)	gk833	60	6SL312■-1TE26-0AA3
1PH8131-2.L...	105 (77.4)	48	0.951	0.0446 (0.39)	85 (187)	gk833	45	6SL312■-1TE24-5AA3
1PH8133-2.L...	131 (96.6)	59	0.952	0.0600 (0.53)	103 (227)	gk833	60	6SL312■-1TE26-0AA3
1PH8137-2.L...	203 (150)	89[4]	0.953	0.0885 (0.78)	136 (300)	gk833	85	6SL312■-1TE28-5AA3
1PH8165-2.L...	440 (325)	188	0.960	0.2160 (1.91)	218 (481)	gk874	200	6SL312■-1TE32-0AA3
1PH8167-2.L...	500 (369)	230	0.960	0.2440 (2.16)	240 (529)	gk874	200	6SL312■-1TE32-0AA3
1PH8137-2.M...	203 (150)	115[4]	0.950	0.0885 (0.78)	136 (300)	gk833	132	6SL312■-1TE31-3AA3

Cooling:	
Internal air cooling	**0**
External air cooling	**1**

[1] $n_{max,Inv}$: Maximum permissible operating speed based on the induced voltage in the motor and the voltage strength of the Motor Module (without protective circuit).

[2] n_{max}: Maximum speed that must not be exceeded.

[3] The rated pulse frequencies must be taken into account. The rated motor data is valid for 4 kHz.

[4] Above approx. 85 A, connection type "Power connector top" is not possible (15th data position E to H). Power connector is generally not possible with 1PH816.

[5] The rated output current of the Motor Module is lower than the rated motor current at 4 kHz.

1PH8 synchronous motors
Water cooling, IP65 degree of protection

Selection and ordering data

Rated speed	Shaft height	Rated power	Rated torque	Rated current	Rated voltage	Rated frequency	Operating speed, max.[1]	Speed, max.[2]	1PH8 synchronous motor Water cooling
n_{rated}	SH	P_{rated}	M_{rated}	I_{rated}	U_{rated}	f_{rated}	$n_{max, Inv}$	n_{max}	
rpm		kW (HP)	Nm (lb_f-ft)	A	V	Hz	rpm	rpm	Order No.
Line voltage 400 V 3 AC, Smart/Basic Line Module									
1500	132	17.6 (23.6)	112 (82.6)	40	326	50.0	3150	4500	**1PH8131-2■F2■-...1**
		23.1 (31.0)	147 (108)	42	371	50.0	2450	4500	**1PH8133-2■F2■-...1**
		29.7 (39.8)	189 (139)	57	384	50.0	2650	4500	**1PH8135-2■F2■-...1**
		32.7 (43.9)	208 (153)	58	371	50.0	2350	4500	**1PH8137-2■F2■-...1**
		44.9 (60.2)	286 (211)	118	316	50.0	3500	4500	**1PH8138-2■F2■-...1**
	160	59.0 (79.1)	375 (277)	111	380	100.0	2400	4000	**1PH8164-2■F2■-...1**
		74.0 (99.2)	475 (350)	148	355	100.0	2600	4000	**1PH8166-2■F2■-...1**
		84.0 (113)	530 (391)	169	355	100.0	2600	4000	**1PH8168-2■F2■-...1**
2000	132	30.6 (41.0)	146 (108)	57	383	66.7	3450	4500	**1PH8133-2■G2■-...1**
		39.0 (52.3)	186 (137)	81	346	66.7	3800	4500	**1PH8135-2■G2■-...1**
		44.4 (59.5)	212 (156)	85	371	66.7	3500	4500	**1PH8137-2■G2■-...1**
		59.3 (79.5)	283 (209)	131	374	66.7	3900	4500	**1PH8138-2■G2■-...1**
2500	132	28.5 (38.2)	109 (80.4)	57	359	83.3	4500	4500	**1PH8131-2■L2■-...1**
	160	88.0 (118)	335 (247)	165	355	167.0	4000	4000	**1PH8164-2■L2■-...1**
		102 (137)	390 (288)	188	380	167.0	3900	4000	**1PH8166-2■L2■-...1**
		119 (160)	455 (336)	225	355	167.0	4000	4000	**1PH8168-2■L2■-...1**
Line voltage 400 V 3 AC, Active Line Module									
1750	132	20.4 (27.4)	112 (82.6)	40	377	58.3	3150	4500	**1PH8131-2■F2■-...1**
		26.4 (35.4)	144 (106)	42	415	58.3	2450	4500	**1PH8133-2■F2■-...1**
		34.1 (45.7)	186 (137)	56	415	58.3	2650	4500	**1PH8135-2■F2■-...1**
		37.0 (49.6)	202 (149)	58	415	58.3	2350	4500	**1PH8137-2■F2■-...1**
		52.4 (70.3)	286 (211)	118	366	58.3	3500	4500	**1PH8138-2■F2■-...1**
	160	67.0 (89.9)	365 (269)	108	440	117.0	2400	4000	**1PH8164-2■F2■-...1**
		85.0 (114)	460 (339)	143	410	117.0	2600	4000	**1PH8166-2■F2■-...1**
		94.0 (126)	510 (376)	164	410	117.0	2600	4000	**1PH8168-2■F2■-...1**
2300	132	34.9 (46.8)	145 (107)	57	415	76.7	3450	4500	**1PH8133-2■G2■-...1**
		44.3 (59.4)	184 (136)	80	395	76.7	3800	4500	**1PH8135-2■G2■-...1**
		50.5 (67.7)	210 (155)	84	424	76.7	3500	4500	**1PH8137-2■G2■-...1**
		67.7 (90.8)	281 (207)	130	415	76.7	3900	4500	**1PH8138-2■G2■-...1**
2800	132	31.7 (42.5)	108 (79.7)	56	400	93.3	4500	4500	**1PH8131-2■L2■-...1**
	160	93.0 (125)	315 (232)	156	395	187.0	4000	4000	**1PH8164-2■L2■-...1**
		109 (146)	375 (277)	177	420	187.0	3900	4000	**1PH8166-2■L2■-...1**
		123 (165)	420 (310)	210	395	187.0	4000	4000	**1PH8168-2■L2■-...1**

For versions, see Order No. supplement and options on page 5/54.

Motor type (repeated)	Static torque	Static current	Efficiency	Moment of inertia	Weight, approx.	Terminal box	SINAMICS S120 Motor Module	
							Rated output current[3]	For additional versions and components see chapter SINAMICS S120 drive system
	M_0	I_0	η	J			I_{rated}	
	Nm (lb_f-ft)	A		kgm^2 (lb_f-in-s^2)	kg (lb)	Type	A	Order No.
1PH8131-2.F 2...	115 (84.8)	41	0.946	0.0446 (0.39)	102 (225)	gk843	45	6SL312■-1TE24-5AA3
1PH8133-2.F 2...	155 (114)	43	0.947	0.0600 (0.53)	120 (265)	gk843	45	6SL312■-1TE24-5AA3
1PH8135-2.F 2...	196 (145)	59	0.950	0.0750 (0.66)	138 (304)	gk843	60	6SL312■-1TE26-0AA3
1PH8137-2.F 2...	226 (167)	60	0.951	0.0885 (0.78)	153 (337)	gk843	60	6SL312■-1TE26-0AA3
1PH8138-2.F 2...	290 (214)	120[4]	0.958	0.0885 (0.78)	156 (344)	gk843	132	6SL312■-1TE31-3AA3
1PH8164-2.F 2...	440 (325)	118	0.940	0.1750 (1.55)	224 (494)	gk874	132	6SL312■-1TE31-3AA3
1PH8166-2.F 2...	550 (406)	159	0.940	0.2160 (1.91)	257 (567)	gk874	200	6SL312■-1TE32-0AA3
1PH8168-2.F 2...	620 (457)	179	0.940	0.2440 (2.16)	279 (615)	gk874	200	6SL312■-1TE32-0AA3
1PH8133-2.G 2...	155 (114)	61	0.950	0.0600 (0.53)	120 (265)	gk843	60	6SL312■-1TE26-0AA3
1PH8135-2.G 2...	196 (145)	85[4]	0.952	0.0750 (0.66)	138 (304)	gk843	85	6SL312■-1TE28-5AA3
1PH8137-2.G 2...	226 (167)	90[4]	0.954	0.0885 (0.78)	153 (337)	gk843	85	6SL312■-1TE28-5AA3
1PH8138-2.G 2...	290 (214)	133[4]	0.960	0.0885 (0.78)	156 (344)	gk843	132	6SL312■-1TE31-3AA3
1PH8131-2.L 2...	115 (84.8)	60	0.948	0.0446 (0.39)	102 (225)	gk843	60	6SL312■-1TE26-0AA3
1PH8164-2.L 2...	440 (325)	205	0.955	0.1750 (1.55)	224 (494)	gk874	200	6SL312■-1TE32-0AA3
1PH8166-2.L 2...	550 (406)	240	0.955	0.2160 (1.91)	257 (567)	gk874	200	6SL312■-1TE32-0AA3
1PH8168-2.L 2...	520 (384)	240	0.955	0.2440 (2.16)	279 (615)	gk874	260	6SL3320-1TE32-1AA3
1PH8131-2.F 2...	115 (84.8)	41	0.947	0.0446 (0.39)	102 (225)	gk843	45	6SL312■-1TE24-5AA3
1PH8133-2.F 2...	155 (114)	43	0.948	0.0600 (0.53)	120 (265)	gk843	45	6SL312■-1TE24-5AA3
1PH8135-2.F 2...	196 (145)	59	0.951	0.0750 (0.66)	138 (304)	gk843	60	6SL312■-1TE26-0AA3
1PH8137-2.F 2...	226 (167)	60	0.952	0.0885 (0.78)	153 (337)	gk843	60	6SL312■-1TE26-0AA3
1PH8138-2.F 2...	290 (214)	120[4]	0.959	0.0885 (0.78)	156 (344)	gk843	132	6SL312■-1TE31-3AA3
1PH8164-2.F 2...	440 (325)	118	0.943	0.1750 (1.55)	224 (494)	gk874	132	6SL312■-1TE31-3AA3
1PH8166-2.F 2...	550 (406)	159	0.943	0.2160 (1.91)	257 (567)	gk874	200	6SL312■-1TE32-0AA3
1PH8168-2.F 2...	620 (457)	179	0.943	0.2440 (2.16)	279 (615)	gk874	200	6SL312■-1TE32-0AA3
1PH8133-2.G 2...	155 (114)	61	0.951	0.0600 (0.53)	120 (265)	gk843	60	6SL312■-1TE26-0AA3
1PH8135-2.G 2...	196 (145)	85[4]	0.953	0.0750 (0.66)	138 (304)	gk843	85	6SL312■-1TE28-5AA3
1PH8137-2.G 2...	226 (167)	90[4]	0.956	0.0885 (0.78)	153 (337)	gk843	85	6SL312■-1TE28-5AA3
1PH8138-2.G 2...	290 (214)	133[4]	0.961	0.0885 (0.78)	156 (344)	gk843	132	6SL312■-1TE31-3AA3
1PH8131-2.L 2...	115 (84.8)	60	0.949	0.0446 (0.39)	102 (225)	gk843	60	6SL312■-1TE26-0AA3
1PH8164-2.L 2...	440 (325)	205	0.959	0.1750 (1.55)	224 (494)	gk874	200	6SL312■-1TE32-0AA3
1PH8166-2.L 2...	550 (406)	240	0.959	0.2160 (1.91)	257 (567)	gk874	200	6SL312■-1TE32-0AA3
1PH8167-2.L 2...	520 (384)	240	0.959	0.2440 (2.16)	279 (615)	gk874	260	6SL3320-1TE32-1AA3

Cooling:	
Internal air cooling	**0**
External air cooling	**1**

1) $n_{max,Inv}$: Maximum permissible operating speed based on the induced voltage in the motor and the voltage strength of the Motor Module (without protective circuit).

2) n_{max}: Maximum speed that must not be exceeded.

3) The rated pulse frequencies must be taken into account. The rated motor data is valid for 4 kHz.

4) Above approx. 85 A, connection type "Power connector top" is not possible (15th data position E to H). Power connector is generally not possible with 1PH816.

1PH8 synchronous motors
Water cooling, IP65 degree of protection

Selection and ordering data

Rated speed	Shaft height	Rated power	Rated torque	Rated current	Rated voltage	Rated frequency	Operating speed, max.[1]	Speed, max.[2]	1PH8 synchronous motor Water cooling
n_{rated}	SH	P_{rated}	M_{rated}	I_{rated}	U_{rated}	f_{rated}	$n_{max, Inv}$	n_{max}	
rpm		kW (HP)	Nm (lb_f-ft)	A	V	Hz	rpm	rpm	Order No.
Line voltage 480 V 3 AC, Smart/Basic/Active Line Module									
2000	132	23.2 (31.1)	111 (81.9)	39	427	66.7	3150	4500	**1PH8131-2■F2■-...1**
		29 (38.9)	139 (103)	41	449	66.7	2450	4500	**1PH8133-2■F2■-...1**
		37.9 (50.8)	181 (134)	56	449	66.7	2650	4500	**1PH8135-2■F2■-...1**
		40.6 (54.4)	194 (143)	57	449	66.7	2350	4500	**1PH8137-2■F2■-...1**
		59.7 (80.1)	285 (210)	118	416	66.7	3500	4500	**1PH8138-2■F2■-...1**
	160	70 (93.9)	330 (243)	105	500	133.0	2400	4000	**1PH8164-2■F2■-...1**
		89 (119)	425 (314)	138	465	133.0	2600	4000	**1PH8166-2■F2■-...1**
		100 (134)	480 (354)	157	465	133.0	2600	4000	**1PH8168-2■F2■-...1**
2650	132	39.1 (52.4)	141 (104)	57	449	88.3	3450	4500	**1PH8133-2■G2■-...1**
		50.5 (67.7)	182 (134)	79	452	88.3	3800	4500	**1PH8135-2■G2■-...1**
		56.8 (76.2)	205 (151)	83	449	88.3	3500	4500	**1PH8137-2■G2■-...1**
		76.3 (102)	275 (203)	130	449	88.3	3900	4500	**1PH8138-2■G2■-...1**
3000	132	33.6 (45.1)	107 (78.9)	56	427	100.0	4500	4500	**1PH8131-2■L2■-...1**
	160	96 (129	305 (225)	150	420	200.0	4000	4000	**1PH8164-2■L2■-...1**
		110 (148)	350 (258)	169	450	200.0	3900	4000	**1PH8166-2■L2■-...1**
		125 (168)	395 (291)	197	420	200.0	4000	4000	**1PH8168-2■L2■-...1**

For versions, see Order No. supplement and options on page 5/54.

Motor type (repeated)	Static torque	Static current	Efficiency	Moment of inertia	Weight, approx.	Terminal box	SINAMICS S120 Motor Module	
							Rated output current[3]	For additional versions and components see chapter SINAMICS S120 drive system
	M_0	I_0	η	J			I_{rated}	
	Nm (lb_f-ft)	A		kgm^2 (lb_f-in-s^2)	kg (lb)	Type	A	Order No.
1PH8131-2.F 2...	115 (84.8)	41	0.948	0.0446 (0.39)	102 (225)	gk843	45	**6SL312■-1TE24-5AA3**
1PH8133-2.F 2...	155 (114)	43	0.949	0.0600 (0.53)	120 (265)	gk843	45	**6SL312■-1TE24-5AA3**
1PH8135-2.F 2...	196 (145)	59	0.952	0.0750 (0.66)	138 (304)	gk843	60	**6SL312■-1TE26-0AA3**
1PH8137-2.F 2...	226 (167)	60	0.953	0.0885 (0.78)	153 (337)	gk843	60	**6SL312■-1TE26-0AA3**
1PH8138-2.F 2...	290 (214)	120[4]	0.960	0.0885 (0.78)	156 (344)	gk843	132	**6SL312■-1TE31-3AA3**
1PH8164-2.F 2...	440 (325)	118	0.946	0.1750 (1.55)	224 (494)	gk874	132	**6SL312■-1TE31-3AA3**
1PH8166-2.F 2...	550 (406)	159	0.946	0.2160 (1.91)	257 (567)	gk874	200	**6SL312■-1TE32-0AA3**
1PH8168-2.F 2...	620 (457)	179	0.946	0.2440 (2.16)	279 (615)	gk874	200	**6SL312■-1TE32-0AA3**
1PH8133-2.G 2...	155 (114)	61	0.952	0.0600 (0.53)	120 (265)	gk843	60	**6SL312■-1TE26-0AA3**
1PH8135-2.G 2...	196 (145)	85[4]	0.954	0.0750 (0.66)	138 (304)	gk843	85	**6SL312■-1TE28-5AA3**
1PH8137-2.G 2...	226 (167)	90[4]	0.958	0.0885 (0.78)	153 (337)	gk843	85	**6SL312■-1TE28-5AA3**
1PH8138-2.G 2...	290 (214)	133[4]	0.962	0.0885 (0.78)	156 (344)	gk843	132	**6SL312■-1TE31-3AA3**
1PH8131-2.L 2...	115 (84.8)	60	0.950	0.0446 (0.39)	102 (225)	gk843	60	**6SL312■-1TE26-0AA3**
1PH8164-2.L 2...	440 (325)	205	0.960	0.1750 (1.55)	224 (494)	gk874	200	**6SL312■-1TE32-0AA3**
1PH8166-2.L 2...	550 (406)	240	0.960	0.2160 (1.91)	257 (567)	gk874	200	**6SL312■-1TE32-0AA3**
1PH8168-2.L 2...	520 (384)	240	0.960	0.2440 (2.16)	279 (615)	gk874	260	**6SL3320-1TE32-1AA3**

Cooling:	
Internal air cooling	**0**
External air cooling	**1**

1) $n_{max,Inv}$: Maximum permissible operating speed based on the induced voltage in the motor and the voltage strength of the Motor Module (without protective circuit).

2) n_{max}: Maximum speed that must not be exceeded.

3) The rated pulse frequencies must be taken into account. The rated motor data is valid for 4 kHz.

4) Above approx. 85 A, connection type "Power connector top" is not possible (15th data position E to H). Power connector is generally not possible with 1PH816.

1PH8 synchronous motors
Water cooling, IP55 degree of protection

Selection and ordering data

Rated speed	Shaft height	Rated power	Rated torque	Rated current	Rated voltage	Rated frequency	Operating speed, max.[1]	Speed, max.[2]	1PH8 synchronous motor Water cooling
n_{rated}	SH	P_{rated}	M_{rated}	I_{rated}	U_{rated}	f_{rated}	$n_{max, Inv}$	n_{max}	
rpm		kW (HP)	Nm (lb_f-ft)	A	V	Hz	rpm	rpm	Order No.
Line voltage 400 V 3 AC, Smart/Basic Line Module									
700	180	42 (56.3)	573 (423)	100	303	47	1450	3800	**1PH8184-2■C2■-...1**
		58 (77.8)	791 (583)	142	295	47	1450	3800	**1PH8186-2■C2■-...1**
	225	72 (96.6)	982 (724)	180	275	47	1450	3500	**1PH8224-2■C2■-...1**
		95 (127)	1296 (956)	255	255	47	1550	3500	**1PH8226-2■C2■-...1**
		121 (162)	1651 (1218)	305	270	47	1450	3500	**1PH8228-2■C2■-...1**
1000	180	61 (82)	583 (430)	140	313	67	1950	3800	**1PH8184-2■D2■-...1**
		80 (107)	764 (564)	190	300	67	2050	3800	**1PH8186-2■D2■-...1**
	225	101 (135)	964 (711)	255	275	67	2050	3500	**1PH8224-2■D2■-...1**
		135 (181)	1289 (951)	325	285	67	1950	3500	**1PH8226-2■D2■-...1**
		169 (227)	1614 (1190)	395	290	67	1950	3500	**1PH8228-2■D2■-...1**
1500	180	90 (121)	573 (423)	190	334	100	2700	3800	**1PH8184-2■F2■-...1**
		119 (160)	758 (559)	275	305	100	2950	3800	**1PH8186-2■F2■-...1**
	225	151 (202)	961 (709)	355	290	100	2900	3500	**1PH8224-2■F2■-...1**
		201 (270)	1280 (944)	445	305	100	2700	3500	**1PH8226-2■F2■-...1**
		251 (337)	1598 (1179)	590	285	100	2900	3500	**1PH8228-2■F2■-...1**
2500	180	127 (170)	485 (358)	260	328	167	3800	3800	**1PH8184-2■L2■-...1**
		168 (225)	642 (474)	370	305	167	3800	3800	**1PH8186-2■L2■-...1**
	225	182 (244)	695 (513)	365	320	167	3500	3500	**1PH8224-2■L2■-...1**
		228 (306)	871 (642)	400	360	167	3500	3500	**1PH8226-2■L2■-...1**
		270 (362)	1031 (760)	570	300	167	3500	3500	**1PH8228-2■L2■-...1**
Line voltage 400 V 3 AC, Active Line Module									
800	180	48 (64.4)	573 (423)	102	342	53	1450	3800	**1PH8184-2■C2■-...1**
		66 (88.5)	788 (581)	142	335	53	1450	3800	**1PH8186-2■C2■-...1**
	225	81 (109)	967 (713)	178	310	53	1450	3500	**1PH8224-2■C2■-...1**
		108 (145)	1289 (951)	255	287	53	1550	3500	**1PH8226-2■C2■-...1**
		138 (185)	1647 (1215)	305	315	53	1450	3500	**1PH8228-2■C2■-...1**
1150	180	70 (93.9)	581 (429)	140	386	77	1950	3800	**1PH8184-2■D2■-...1**
		92 (123)	764 (564)	190	345	77	2050	3800	**1PH8186-2■D2■-...1**
	225	115 (154)	955 (704)	250	310	77	2050	3500	**1PH8224-2■D2■-...1**
		155 (208)	1287 (949)	325	325	77	1950	3500	**1PH8226-2■D2■-...1**
		194 (260)	1611 (1188)	395	330	77	1950	3500	**1PH8228-2■D2■-...1**
1750	180	103 (138)	562 (415)	186	386	117	2700	3800	**1PH8184-2■F2■-...1**
		138 (185)	753 (555)	275	355	117	2950	3800	**1PH8186-2■F2■-...1**
	225	175 (235)	955 (704)	355	335	117	2900	3500	**1PH8224-2■F2■-...1**
		233 (312)	1271 (937)	440	355	117	2700	3500	**1PH8226-2■F2■-...1**
		289 (388)	1577 (1163)	580	335	117	2900	3500	**1PH8228-2■F2■-...1**
2900	180	140 (188)	461 (340)	250	375	193	3800	3800	**1PH8184-2■L2■-...1**
		178 (239)	586 (432)	340	345	193	3800	3800	**1PH8186-2■L2■-...1**
	225	191 (256)	629 (464)	335	370	193	3500	3500	**1PH8224-2■L2■-...1**
		238 (319)	784 (578)	365	413	193	3500	3500	**1PH8226-2■L2■-...1**
		283 (380)	932 (687)	520	345	193	3500	3500	**1PH8228-2■L2■-...1**

For versions, see Order No. supplement and options on page 5/56.

Motor type (repeated)	Static torque	Static current	Efficiency	Moment of inertia	Weight, approx.	Terminal box	SINAMICS S120 Motor Module	
							Rated output current[3]	For additional versions and components see chapter SINAMICS S120 drive system
	M_0	I_0	η	J			I_{rated}	
	Nm (lb_f-ft)	A		kgm^2 (lb_f-in-s^2)	kg (lb)	Type	A	Order No.
1PH8184-2.C 2...	590 (435)	103	0.919	0.457 (4.04)	330 (728)	1XB7322-P05	132	**6SL3120-1TE31-3AA3**
1PH8186-2.C 2...	800 (590)	143	0.924	0.599 (5.30)	400 (882)	1XB7322-P05	200	**6SL3120-1TE32-0AA3**
1PH8224-2.C 2...	1007 (743)	183	0.947	1.28 (11.3)	580 (1279)	1XB7322-P05	200	**6SL3120-1TE32-0AA3**
1PH8226-2.C 2...	1330 (981)	260	0.952	1.66 (14.7)	700 (1544)	1XB7700-P02	260	**6SL3320-1TE32-6AA3**
1PH8228-2.C 2...	1680 (1239)	306	0.955	2.02 (17.9)	810 (1786)	1XB7700-P02	310	**6SL3320-1TE33-1AA3**
1PH8184-2.D 2...	600 (443)	143	0.937	0.457 (4.04)	330 (728)	1XB7322-P05	200	**6SL3120-1TE32-0AA3**
1PH8186-2.D 2...	800 (590)	196	0.943	0.599 (5.30)	400 (882)	1XB7322-P05	200	**6SL3120-1TE32-0AA3**
1PH8224-2.D 2...	1007 (743)	262	0.956	1.28 (11.3)	580 (1279)	1XB7700-P02	260	**6SL3320-1TE32-6AA3**
1PH8226-2.D 2...	1330 (981)	330	0.960	1.66 (14.7)	700 (1544)	1XB7700-P02	380	**6SL3320-1TE33-8AA3**
1PH8228-2.D 2...	1680 (1239)	408	0.962	2.02 (17.9)	810 (1786)	1XB7700-P02	490	**6SL3320-1TE35-0AA3**
1PH8184-2.F 2...	600 (443)	196	0.951	0.457 (4.04)	330 (728)	1XB7322-P05	200	**6SL3120-1TE32-0AA3**
1PH8186-2.F 2...	800 (590)	285	0.952	0.599 (5.30)	400 (882)	1XB7700-P02	310	**6SL3320-1TE33-1AA3**
1PH8224-2.F 2...	1007 (743)	367	0.962	1.28 (11.3)	580 (1279)	1XB7700-P02	380	**6SL3320-1TE33-8AA3**
1PH8226-2.F 2...	1330 (981)	454	0.965	1.66 (14.7)	700 (1544)	1XB7700-P02	490	**6SL3320-1TE35-0AA3**
1PH8228-2.F 2...	1680 (1239)	612	0.964	2.02 (17.9)	810 (1786)	1XB7712-P03	745	**6SL3320-1TE37-5AA3**
1PH8184-2.L 2...	530 (391)	278	0.957	0.457 (4.04)	330 (728)	1XB7700-P02	260	**6SL3320-1TE32-6AA3**
1PH8186-2.L 2...	720 (531)	405	0.957	0.599 (5.30)	400 (882)	1XB7700-P02	380	**6SL3320-1TE33-8AA3**
1PH8224-2.L 2...	885 (653)	460	0.961	1.28 (11.3)	580 (1279)	1XB7700-P02	380	**6SL3320-1TE33-8AA3**
1PH8226-2.L 2...	1170 (863)	532	0.962	1.66 (14.7)	700 (1544)	1XB7700-P02	380[4]	**6SL3320-1TE33-8AA3**
1PH8228-2.L 2...	1400 (1033)	762	0.963	2.02 (17.9)	810 (1786)	1XB7712-P03	745	**6SL3320-1TE37-5AA3**
1PH8184-2.C 2...	590 (435)	103	0.926	0.457 (4.04)	330 (728)	1XB7322-P05	132	**6SL3120-1TE31-3AA3**
1PH8186-2.C 2...	800 (590)	143	0.931	0.599 (5.30)	400 (882)	1XB7322-P05	200	**6SL3120-1TE32-0AA3**
1PH8224-2.C 2...	1007 (743)	183	0.952	1.28 (11.3)	580 (1279)	1XB7322-P05	200	**6SL3120-1TE32-0AA3**
1PH8226-2.C 2...	1330 (981)	260	0.956	1.66 (14.7)	700 (1544)	1XB7700-P02	260	**6SL3320-1TE32-6AA3**
1PH8228-2.C 2...	1680 (1239)	306	0.958	2.02 (17.9)	810 (1786)	1XB7700-P02	310	**6SL3320-1TE33-1AA3**
1PH8184-2.D 2...	600 (443)	143	0.942	0.457 (4.04)	330 (728)	1XB7322-P05	200	**6SL3120-1TE32-0AA3**
1PH8186-2.D 2...	800 (590)	196	0.948	0.599 (5.30)	400 (882)	1XB7322-P05	200	**6SL3120-1TE32-0AA3**
1PH8224-2.D 2...	1007 (743)	262	0.959	1.28 (11.3)	580 (1279)	1XB7700-P02	260	**6SL3320-1TE32-6AA3**
1PH8226-2.D 2...	1330 (981)	330	0.962	1.66 (14.7)	700 (1544)	1XB7700-P02	380	**6SL3320-1TE33-8AA3**
1PH8228-2.D 2...	1680 (1239)	408	0.964	2.02 (17.9)	810 (1786)	1XB7700-P02	490	**6SL3320-1TE35-0AA3**
1PH8184-2.F 2...	600 (443)	196	0.954	0.457 (4.04)	330 (728)	1XB7322-P05	200	**6SL3120-1TE32-0AA3**
1PH8186-2.F 2...	800 (590)	285	0.955	0.599 (5.30)	400 (882)	1XB7700-P02	310	**6SL3320-1TE33-1AA3**
1PH8224-2.F 2...	1007 (743)	367	0.963	1.28 (11.3)	580 (1279)	1XB7700-P02	380	**6SL3320-1TE33-8AA3**
1PH8226-2.F 2...	1330 (981)	454	0.965	1.66 (14.7)	700 (1544)	1XB7700-P02	490	**6SL3320-1TE35-0AA3**
1PH8228-2.F 2...	1680 (1239)	612	0.965	2.02 (17.9)	810 (1786)	1XB7712-P03	745	**6SL3320-1TE37-5AA3**
1PH8184-2.L 2...	530 (391)	278	0.956	0.457 (4.04)	330 (728)	1XB7700-P02	260	**6SL3320-1TE32-6AA3**
1PH8186-2.L 2...	720 (531)	405	0.955	0.599 (5.30)	400 (882)	1XB7700-P02	380	**6SL3320-1TE33-8AA3**
1PH8224-2.L 2...	885 (653)	460	0.958	1.28 (11.3)	580 (1279)	1XB7700-P02	380	**6SL3320-1TE33-8AA3**
1PH8226-2.L 2...	1170 (863)	532	0.958	1.66 (14.7)	700 (1544)	1XB7700-P02	380	**6SL3320-1TE33-8AA3**
1PH8228-2.L 2...	1400 (1033)	762	0.958	2.02 (17.9)	810 (1786)	1XB7712-P03	745	**6SL3320-1TE37-5AA3**

[1] $n_{max,Inv}$: Maximum permissible operating speed based on the induced voltage in the motor and the voltage strength of the Motor Module (without protective circuit).

[2] n_{max}: Maximum speed that must not be exceeded.

[3] The rated pulse frequencies must be taken into account. The rated motor data is valid for 4 kHz or 2 kHz.

[4] The rated output current of the Motor Module is lower than the motor rated current at 2.0 kHz.

1PH8 synchronous motors
Water cooling, IP55 degree of protection

Selection and ordering data

Rated speed	Shaft height	Rated power	Rated torque	Rated current	Rated voltage	Rated frequency	Operating speed, max.[1]	Speed, max.[2]	1PH8 synchronous motor Water cooling
n_{rated}	SH	P_{rated}	M_{rated}	I_{rated}	U_{rated}	f_{rated}	$n_{max, Inv}$	n_{max}	
rpm		kW (HP)	Nm (lb_f-ft)	A	V	Hz	rpm	rpm	Order No.
Line voltage 480 V 3 AC, Smart/Basic/Active Line Module									
1000	180	60 (80.5)	573 (423)	102	423	67	1450	3800	**1PH8184-2■C2■-...1**
		82 (110)	783 (578)	140	415	67	1450	3800	**1PH8186-2■C2■-...1**
	225	101 (135)	964 (711)	178	385	67	1450	3500	**1PH8224-2■C2■-...1**
		134 (180)	1280 (944)	255	357	67	1550	3500	**1PH8226-2■C2■-...1**
		172 (231)	1642 (1211)	300	390	67	1450	3500	**1PH8228-2■C2■-...1**
1350	180	82 (110)	580 (428)	140	417	90	1950	3800	**1PH8184-2■D2■-...1**
		107 (143)	757 (558)	190	400	90	2050	3800	**1PH8186-2■D2■-...1**
	225	135 (181)	955 (704)	250	365	90	2050	3500	**1PH8224-2■D2■-...1**
		180 (241)	1273 (939)	320	380	90	1950	3500	**1PH8226-2■D2■-...1**
		226 (303)	1599 (1179)	395	395	90	1950	3500	**1PH8228-2■D2■-...1**
2000	180	110 (148)	525 (387)	176	434	133	2700	3800	**1PH8184-2■F2■-...1**
		154 (207)	735 (542)	265	400	133	2950	3800	**1PH8186-2■F2■-...1**
	225	186 (249)	888 (655)	330	380	133	2900	3500	**1PH8224-2■F2■-...1**
		248 (333)	1184 (873)	410	390	133	2700	3500	**1PH8226-2■F2■-...1**
		310 (416)	1480 (1092)	550	380	133	2900	3500	**1PH8228-2■F2■-...1**
3200	180	142 (190)	424 (313)	230	405	213	3800	3800	**1PH8184-2■L2■-...1**
		183 (245)	546 (403)	315	375	213	3800	3800	**1PH8186-2■L2■-...1**
	225	196 (263)	585 (431)	310	400	213	3500	3500	**1PH8224-2■L2■-...1**
		245 (329)	731 (539)	340	460	213	3500	3500	**1PH8226-2■L2■-...1**
		291 (390)	868 (640)	485	380	213	3500	3500	**1PH8228-2■L2■-...1**

For versions, see Order No. supplement and options on page 5/56.

Motor type (repeated)	Static torque	Static current	Effi-ciency	Moment of inertia	Weight, approx.	Terminal box	SINAMICS S120 Motor Module	
							Rated output current[3]	For additional versions and components see chapter SINAMICS S120 drive system
	M_0	I_0	η	J			I_{rated}	
	Nm (lb_f-ft)	A		kgm^2 (lb_f-in-s^2)	kg (lb)	Type	A	Order No.
1PH8184-2.C 2...	590 (435)	103	0.937	0.457 (4.04)	330 (728)	1XB7322-P05	132	**6SL3120-1TE31-3AA3**
1PH8186-2.C 2...	800 (590)	143	0.941	0.599 (5.30)	400 (882)	1XB7322-P05	200	**6SL3120-1TE32-0AA3**
1PH8224-2.C 2...	1007 (743)	183	0.957	1.28 (11.3)	580 (1279)	1XB7322-P05	200	**6SL3120-1TE32-0AA3**
1PH8226-2.C 2...	1330 (981)	260	0.960	1.66 (14.7)	700 (1544)	1XB7700-P02	260	**6SL3320-1TE32-6AA3**
1PH8228-2.C 2...	1680 (1239)	306	0.961	2.02 (17.9)	810 (1786)	1XB7700-P02	310	**6SL3320-1TE33-1AA3**
1PH8184-2.D 2...	600 (443)	143	0.946	0.457 (4.04)	330 (728)	1XB7322-P05	200	**6SL3120-1TE32-0AA3**
1PH8186-2.D 2...	800 (590)	196	0.952	0.599 (5.30)	400 (882)	1XB7322-P05	200	**6SL3120-1TE32-0AA3**
1PH8224-2.D 2...	1007 (743)	262	0.961	1.28 (11.3)	580 (1279)	1XB7700-P02	260	**6SL3320-1TE32-6AA3**
1PH8226-2.D 2...	1330 (981)	330	0.964	1.66 (14.7)	700 (1544)	1XB7700-P02	380	**6SL3320-1TE33-8AA3**
1PH8228-2.D 2...	1680 (1239)	408	0.965	2.02 (17.9)	810 (1786)	1XB7700-P02	490	**6SL3320-1TE35-0AA3**
1PH8184-2.F 2...	600 (443)	196	0.957	0.457 (4.04)	330 (728)	1XB7322-P05	200	**6SL3120-1TE32-0AA3**
1PH8186-2.F 2...	800 (590)	285	0.956	0.599 (5.30)	400 (882)	1XB7700-P02	310	**6SL3320-1TE33-1AA3**
1PH8224-2.F 2...	1007 (743)	367	0.964	1.28 (11.3)	580 (1279)	1XB7700-P02	380	**6SL3320-1TE33-8AA3**
1PH8226-2.F 2...	1330 (981)	454	0.965	1.66 (14.7)	700 (1544)	1XB7700-P02	490	**6SL3320-1TE35-0AA3**
1PH8228-2.F 2...	1680 (1239)	612	0.964	2.02 (17.9)	810 (1786)	1XB7712-P03	745	**6SL3320-1TE37-5AA3**
1PH8184-2.L 2...	530 (391)	278	0.954	0.457 (4.04)	330 (728)	1XB7700-P02	260	**6SL3320-1TE32-6AA3**
1PH8186-2.L 2...	720 (531)	405	0.953	0.599 (5.30)	400 (882)	1XB7700-P02	380	**6SL3320-1TE33-8AA3**
1PH8224-2.L 2...	885 (653)	460	0.954	1.28 (11.3)	580 (1279)	1XB7700-P02	380	**6SL3320-1TE33-8AA3**
1PH8226-2.L 2...	1170 (863)	532	0.954	1.66 (14.7)	700 (1544)	1XB7700-P02	380	**6SL3320-1TE33-8AA3**
1PH8228-2.L 2...	1400 (1033)	762	0.954	2.02 (17.9)	810 (1786)	1XB7712-P03	745	**6SL3320-1TE37-5AA3**

[1] $n_{max,Inv}$: Maximum permissible operating speed based on the induced voltage in the motor and the voltage strength of the Motor Module (without protective circuit).

[2] n_{max}: Maximum speed that must not be exceeded.

[3] The rated pulse frequencies must be taken into account. The rated motor data is valid for 4 kHz or 2 kHz.

Order No. supplements for 1PH808/1PH810/1PH813/1PH816 motors

Data position of the Order No.	1	2	3	4	5	6	7		8	9	10	11	12		13	14	15	16		
Shaft height 80	**1**	**P**	**H**	**8**	**0**	**8**	**.**	**–**	**.**	■	**.**	■	■	**–**	■	■	■	**1**	**–**	**Z**
Shaft height 100	**1**	**P**	**H**	**8**	**1**	**0**	**.**													
Shaft height 132	**1**	**P**	**H**	**8**	**1**	**3**	**.**													
Shaft height 160	**1**	**P**	**H**	**8**	**1**	**6**	**.**													
Overall length[1]							**.**													
Asynchronous variant									**1**											
Synchronous variant (1PH813/1PH816)									**2**											
Encoder systems for motors without DRIVE-CLiQ interface																				
Without encoder[2]										**A**										
Absolute encoder 2048 S/R, 4096 revolutions, multi-turn (encoder AM2048S/R)[3]										**E**										
Incremental encoder HTL 1024 S/R (encoder HTL1024S/R) [2][4]										**H**										
Incremental encoder HTL 2048 S/R (encoder HTL2048S/R) [2][5]										**J**										
Incremental encoder sin/cos 1 V_{pp} 2048 S/R with C and D tracks (encoder IC2048S/R)[3]										**M**										
Encoder systems for motors with DRIVE-CLiQ interface																				
Absolute encoder 22 bit (resolution 4194304, internal 2048 S/R) + 12 bit multi-turn (traversing range 4096 revolutions) (encoder AM22DQ)[3]										**F**										
Incremental encoder 22 bit (resolution 4194304, internal 2048 S/R) + commutation position 11 bit (encoder IC22DQ)[3]										**D**										
Rated speeds at 380 V to 480 V 3 AC (winding design)																				
400 rpm/500 rpm/600 rpm											**B**									
1000 rpm/1150 rpm/1350 rpm											**D**									
1500 rpm/1750 rpm/2000 rpm											**F**									
2000 rpm/2300 rpm/2650 rpm											**G**									
2500 rpm/2800 rpm/3000 rpm											**L**									
3000 rpm/3300 rpm/3600 rpm											**M**									
Cooling **Degree of protection**																				
Forced ventilation DE → NDE IP55												**0**								
Forced ventilation NDE → DE IP55												**1**								
Water cooling IP65												**2**								
Type of construction																				
IM B3 (IM V5, IM V6)													**0**							
IM B5 (IM V1, IM V3)													**2**							
IM B35 (IM V15, IM V35)[6]													**3**							

For 13th to 15th data position of the Order No., see page 5/55.

[1] Not selectable. Determined by the choice of rated power.
[2] Only possible with 8th data position "1" (asynchronous variant).
[3] Limited to n_{max} = 12000 rpm.
[4] Limited to n_{max} = 9000 rpm.
[5] Limited to n_{max} = 4600 rpm.
[6] Only possible with 1PH810 to 1PH816.

Order No. supplements for 1PH808/1PH810/1PH813/1PH816 motors (continued)

Data position of the Order No.			1	2	3	4	5	6	7		8	9	10	11	12		13	14	15	16		
			1	P	H	8	.	.	.	–	.	■	.	■	■	–	■	■	■	1	–	Z
Shaft extension DE			**Balancing**																			
Plain shaft			–														**0**					
Fitted key			Full-key														**1**					
Fitted key			Half-key														**2**					
Bearing			**Vibration magnitude acc. to Siemens/EN 60034-14**[2]								**Shaft and flange accuracy**[2]											
Standard			R/A								R							**B**				
Standard			S/A								R							**C**				
Standard[1]			SR/A								SPECIAL							**D**				
Performance[3]			SPECIAL/B								SPECIAL							**L**				
Advanced lifetime[4]			S/A								R							**Q**				
Cable connection (view of DE)																						
Terminal box	Cable entry	Signal connection																				
Top	Right	DE																	**A**			
Top	Left	DE																	**B**			
Top	NDE	Left																	**C**			
Power connector[5]																						
Top	Right	DE																	**E**			
Top	Left	DE																	**F**			
Top	NDE	Left																	**G**			
Top	DE	Left																	**H**			
Version status																				**1**		
Special version (order codes are required for options, see page 5/60)																					**–**	**Z**

Ordering example

Selection criteria	Design	Structure of the order number
1PH8 motor	Synchronous variant, water cooling Shaft height 132 version status 1	**1PH8131-2..2.-...1**
Encoder system	Incremental encoder sin/cos 1 V_{pp} 2048 S/R with C and D tracks (encoder IC2048S/R)	**1PH8131-2M.2.-...1**
Rated operating point	1500 rpm, 17.6 kW (23.6 HP), 112 Nm (82.6 lb_f-ft)	**1PH8131-2MF2.-...1**
Type of construction	IM B3 (IM V5, IM V6)	**1PH8131-2MF20-...1**
Shaft extension DE	Plain shaft	**1PH8131-2MF20-0..1**
Bearing version	Standard Vibration magnitude R/A Shaft and flange accuracy R	**1PH8131-2MF20-0B.1**
Connection	Cable connection terminal box top Cable entry on the right Signal connection DE	**1PH8131-2MF20-0BA1**
Options		**1PH8131-2MF20-0BA1-Z**
	Additional PTC thermistor chain for alarm and tripping	**1PH8131-2MF20-0BA1-Z A12**
	Special paint finish worldwide: sky blue, RAL 5015	**1PH8131-2MF20-0BA1-Z A12+K23+X05**

1) Only possible with 8th data position "1" (asynchronous variant).

2) For definition, see 1PH8 Configuration Manual

3) Only possible with 8th data position "1" (asynchronous variant),
1PH808: Limited to n_{max} = 15000 rpm
1PH810: Limited to n_{max} = 12000 rpm
1PH813: Limited to n_{max} = 10000 rpm
1PH816: Limited to n_{max} = 9000 rpm. Not possible with 12th data position "2" (IM B5)

4) Limited to n_{max} = 5000 rpm.
1PH813: Limited to n_{max} = 4500 rpm
1PH816: Limited to n_{max} = 4000 rpm.

5) With 1PH810, power connector is only possible up to a maximum static current of I_0 = 36 A.
With 1PH813, power connector is only possible up to a maximum static current of I_0= 85 A.
Not possible for 1PH816.

1PH8 asynchronous and synchronous motors

Order No. supplements for 1PH818/1PH822/1PH828 motors

Data position of the Order No.	1	2	3	4	5	6	7		8	9	10	11	12		13	14	15	16		
Shaft height 180	**1**	**P**	**H**	**8**	**1**	**8**	**.**	**–**	**.**	■	**.**	■	■	**–**	■	■	■	**1**	**–**	**Z**
Shaft height 225	**1**	**P**	**H**	**8**	**2**	**2**	**.**													
Shaft height 280	**1**	**P**	**H**	**8**	**2**	**8**	**.**													
Overall length[1]							**.**													
Asynchronous variant									**1**											
Synchronous variant (1PH818/1PH822)									**2**											
Encoder systems for motors without DRIVE-CLiQ interface																				
Without encoder[2]										**A**										
Absolute encoder 2048 S/R, 4096 revolutions, multi-turn (encoder AM2048S/R)										**E**										
Incremental encoder HTL 1024 S/R (encoder HTL1024S/R)[2]										**H**										
Incremental encoder HTL 2048 S/R (encoder HTL2048S/R)[2][3]										**J**										
Incremental encoder sin/cos 1 V_{pp} 2048 S/R with C and D tracks (encoder IC2048S/R)										**M**										
Encoder systems for motors with DRIVE-CLiQ interface																				
Absolute encoder 22 bit (resolution 4194304, internal 2048 S/R) + 12 bit multi-turn (traversing range 4096 revolutions) (encoder AM22DQ)										**F**										
Incremental encoder 22 bit (resolution 4194304, internal 2048 S/R) + commutation position 11 bit (encoder IC22DQ)										**D**										
Rated speeds at 380 V to 480 V 3 AC (winding design)																				
400 rpm/500 rpm/600 rpm											**B**									
700 rpm/800 rpm/1000 rpm											**C**									
1000 rpm/1150 rpm/1350 rpm											**D**									
1500 rpm/1750 rpm/2000 rpm											**F**									
2500 rpm/2900 rpm/3200 (3400) rpm											**L**									
Rated speeds at 690 V 3 AC (1PH828) (winding design)																				
400 rpm/500 rpm											**H**									
700 rpm/800 rpm											**K**									
1000 rpm/1150 rpm											**U**									
1500 rpm/1750 rpm											**W**									

Cooling	**Degree of protection**			
Water cooling	IP55		**2**	
Type of construction				
1PH818	1PH822	1PH828		
• IM B3 (IM B6, IM B7, IM B8, IM V6)		• IM B3 (IM V6)		**0**
• IM V5	• IM V5	• IM V5[7]		**1**
• IM B5 with A450 flange (IM V3)[4]	• IM B5 with A550 flange (IM V3)[5]	• IM B5 with A660 flange (IM V3)[6][7]		**2**
• IM B35 with A450 flange (IM V35)	• IM B35 with A550 flange (IM V35)	• IM B35 with A660 flange (IM V35)		**3**
• IM V15 with A450 flange	• IM V15 with A550 flange	• IM V15 with A660 flange[7]		**5**

For 13th to 15th data position of the Order No., see page 5/57.

[1] Not selectable. Determined by the choice of rated power.
[2] Only possible with 8th data position "1" (asynchronous variant).
[3] Limited to n_{max} = 4600 rpm.
[4] Limited to n_{max} = 3000 rpm. Not possible with 14th data position "L" (bearing performance).
[5] Limited to n_{max} = 2500 rpm. Not possible with 14th data position "L" (bearing performance).
[6] Limited to n_{max} = 2000 rpm.
[7] Only possible with 14th data position A or B (standard bearing).

Order No. supplements for 1PH818/1PH822/1PH828 motors (continued)

Data position of the Order No.	1	2	3	4	5	6	7		8	9	10	11	12		13	14	15	16		
	1	**P**	**H**	**8**	**.**	**.**	**.**	**–**	**.**	■	**.**	■	■	**–**	■	■	■	**1**	**–**	**Z**

Shaft extension DE	**Balancing**		
Plain shaft	–		**0**
Fitted key	Full-key		**1**
Fitted key	Half-key		**2**

Bearing	**Vibration magnitude acc. to Siemens/EN 60034-14**[1]	**Shaft and flange accuracy**[1]	
Standard	A	N	**A**
Standard	R/A	R	**B**
Increased radial forces	A	N	**E**
Increased radial forces	R/A	R	**F**
Also possible with 1PH818 and 1PH822:			
Standard	S/A	R	**C**
Standard[2]	SR/A	R	**D**
Performance[2)3)]	SR/A	R	**L**

Cable connection (view of DE)			
Terminal box	Cable entry	Signal connection	
Top	Right	DE	**A**
Top	Left	DE	**B**
Top	NDE	Right	**C**
Top	DE	Right	**D**

Version status	**1**
Special version (order codes are required for options, see page 5/60)	**– Z**

Ordering example

Selection criteria	Design	Structure of the order number
1PH8 motor	Asynchronous variant, water cooling Shaft height 180 Version status 1	**1PH8184-1..2.-...1**
Encoder system	Incremental encoder sin/cos 1 V_{pp} 2048 S/R with C and D tracks (encoder IC2048S/R)	**1PH8184-1M.2.-...1**
Rated operating point	1750 rpm, 82 kW (110 HP), 447 Nm (330 lb_f-ft)	**1PH8184-1MF2.-...1**
Type of construction	IM B3 (IM B6, IM B7, IM B8, IM V6)	**1PH8184-1MF20-...1**
Shaft extension DE	Plain shaft	**1PH8184-1MF20-0..1**
Bearing version	Standard Vibration magnitude R/A Shaft and flange accuracy R	**1PH8184-1MF20-0B.1**
Connection	Cable connection terminal box top Cable entry on the right Signal connection DE	**1PH8184-1MF20-0BA1**
Options		**1PH8184-1MF20-0BA1-Z**
	Additional PTC thermistor chain for alarm and tripping	**1PH8184-1MF20-0BA1-Z A12**
	Special paint finish worldwide: sky blue, RAL 5015	**1PH8184-1MF20-0BA1-Z A12+K23+X05**

[1] For definition, see 1PH8 Configuration Manual

[2] Only possible with 8th data position "1" (asynchronous variant).

[3] Only possible with 1PH818: Limited to n_{max} = 7500 rpm. Not possible with 12th data position "2" (IM B5 type of construction).
Only possible with 1PH822: Limited to n_{max} = 6000 rpm. Not possible with 12th data position "2" (IM B5 type of construction).

1PH8 asynchronous and synchronous motors

Order No. supplements for 1PH835 motors

Data position of the Order No.	1	2	3	4	5	6	7		8	9	10	11	12		13	14	15	16		
Shaft height 355	**1**	**P**	**H**	**8**	**3**	**5**	**.**	**–**	**1**	■	**.**	■	■	**–**	■	■	■	**0**	**–**	**Z**
Overall length[1]							**.**													
Asynchronous variant																				
Forced ventilation with noise value 77 dB[2]									**1**											
Encoder systems for motors without DRIVE-CLiQ interface																				
Without encoder										**A**										
Absolute encoder 2048 S/R, 4096 revolutions, multi-turn (encoder AM2048S/R)										**E**										
Incremental encoder HTL 1024 S/R (encoder HTL1024S/R)										**H**										
Incremental encoder HTL 2048 S/R (encoder HTL2048S/R)										**J**										
Incremental encoder sin/cos 1 V_{pp} 2048 S/R with C and D tracks (encoder IC2048S/R)										**M**										
Encoder systems for motors with DRIVE-CLiQ interface																				
Absolute encoder 22 bit (resolution 4194304, internal 2048 S/R) + 12 bit multi-turn (traversing range 4096 revolutions) (encoder AM22DQ)										**F**										
Incremental encoder 22 bit (resolution 4194304, internal 2048 S/R) + commutation position 11 bit (encoder IC22DQ)										**D**										
Prepared for mounting external encoder systems[3]																				
Incremental encoder HTL1024 S/R with solid shaft Mounting of incremental encoder POG 10 D 1024 — Order code **H56** required										**K**									**–**	**Z**
Incremental encoder HTL1024 S/R with solid shaft Incremental encoder POG 10 supplied by customer — Order code **G80** required										**K**									**–**	**Z**
Incremental encoder HTL1024 S/R with hollow shaft Incremental encoder HOG 28 supplied by customer — Order code **H75** required										**G**									**–**	**Z**
Rated speeds at 400 V to 500 V 3 AC (winding design)																				
480 rpm/550 rpm/600 rpm											**B**									
640 rpm/750 rpm/800 rpm											**Q**									
800 (830) rpm/900 rpm/1000 rpm											**C**									
1080 rpm/1250 rpm/1350 rpm											**D**									
Rated speeds at 690 V 3 AC (winding design)																				
550 rpm/600 rpm											**H**									
750 rpm/800 rpm											**K**									
900 rpm/1000 rpm											**U**									
1250 rpm/1350 rpm											**V**									
Cooling — **Degree of protection**																				
Forced ventilation — IP55												**1**								
Forced ventilation — IP23 (open-circuit cooling)												**4**								
Type of construction																				
IM B3													**0**							
IM B35 with A800 flange													**3**							

For 13th to 15th data position of the Order No., see page 5/59.

[1] Not selectable. Determined by the choice of rated power.
[2] 1PH835.-7 asynchronous motors with forced ventilation and noise value of 85 dB, see Catalog CR 1.
[3] For more information on incremental encoders, see: www.baumerhuebner.com

Order No. supplements for 1PH835 motors (continued)

Data position of the Order No.			1	2	3	4	5	6	7		8	9	10	11	12		13	14	15	16		
			1	**P**	**H**	**8**	**3**	**5**	**.**	**–**	**1**	■	**.**	■	■	**–**	■	■	■	**0**	**–**	**Z**
Shaft extension DE			**Balancing**																			
Plain shaft			–														**0**					
Fitted key			Full-key														**1**					
Fitted key			Half-key														**2**					
Bearing			**Vibration magnitude acc. to Siemens/EN 60034-14**[1]								**Shaft and flange accuracy**[1]											
Standard			A								N							**A**				
Standard			R/A								R							**B**				
Increased radial forces			A								N							**E**				
Increased radial forces			R/A								R							**F**				
Cable connection (view of DE)																						
Terminal box	Cable entry	Signal connection	External fan NDE with air inlet from NDE air-flow direction NDE → DE																			
NDE right	Bottom	NDE	Top																**U**			
			Left (order code **G00** required)																**U**		**–**	**Z**
NDE left	Bottom	NDE	Top																**V**			
			Right (order code **G02** required)																**V**		**–**	**Z**
NDE top	Right	NDE	Left (order code **G00** required)																**W**		**–**	**Z**
			Right (order code **G02** required)																**W**		**–**	**Z**
DE top[2]	Right	NDE	Top[2)3)]																**X**			
			Left (order code **G00** required)[2]																**X**		**–**	**Z**
			Right (order code **G02** required)[2]																**X**		**–**	**Z**
Version status																				**0**		
Special version (additional order codes are required for options, see page 5/60)																					**–**	**Z**

Ordering example

Selection criteria	Design	Structure of the order number
1PH8 motor	Asynchronous variant, forced ventilation with noise value of 77 dB Shaft height 355 IP55 degree of protection Version status 0	**1PH8350-1 . .1 .- . . . 0**
Encoder system	Incremental encoder 22 bit (resolution 4194304, internal 2048 S/R) + commutation position 11 bit (encoder IC22DQ)	**1PH8350-1D . 1 .- . . . 0**
Rated operating point	1080 rpm, 270 kW (362 HP), 2388 Nm (1761 lb_f-ft)	**1PH8350-1DF1 .- . . . 0**
Type of construction	IM B3	**1PH8350-1DF10- . . . 0**
Shaft extension DE	Plain shaft	**1PH8350-1DF10-0 . . 0**
Bearing version	Standard Vibration magnitude R/A Shaft and flange accuracy R	**1PH8350-1DF10-0B . 0**
Connection	Cable connection, terminal box NDE top Cable entry on the right Signal connection NDE External fan NDE left with air inlet from NDE, air-flow direction NDE → DE	**1PH8350-1DF10-0BW0-Z** **G00**
Options	With air filter	**1PH8350-1DF10-0BW0-Z** **G00+G14**
	Special paint finish worldwide: sky blue, RAL 5015	**1PH8350-1DF10-0BW0-Z** **G00+G14+K23+X05**

[1] For definition, see 1PH8 Configuration Manual
[2] Only possible with 12th data position "0" (IM B3).
[3] Only possible for assignments with terminal box 1XB7712-P.

Options

Order code	Description	For use with motors		
		1PH808 1PH810 1PH813 1PH816	1PH818 1PH822 1PH828	1PH835
A12	Additional PTC thermistor chain for alarm and tripping (only possible for version with terminal box)	✔	✔	✔
A25	Additional KTY84 temperature sensor as reserve connected to signal terminal strip (only possible for version with terminal box)	✔	Standard	Standard
G00	External fan NDE left (possible if 15th data position is U, W or X)	–	–	✔
G02	External fan NDE right (possible if 15th data position is V, W or X)	–	–	✔
G14	With air filter	–	–	✔
G80	Mounting of a POG 10 incremental encoder supplied by customer (possible if 9th data position is K)	–	–	✔
H56	Mounting of the POG 10 D 1024 incremental encoder (possible if 9th data position is K)	–	–	✔
H75	Mounting of an HOG 28 incremental encoder supplied by customer (possible if 9th data position is G)	–	–	✔
K08	Encoder connector mounted opposite	–	✔	–
K09	Terminal box or power connector NDE right	✔ For 1PH810 only[1]/ 1PH813/1PH816	–	–
	Terminal box NDE right, cable entry DE, signal connection top (possible if 15th data position is A)	–	✔	–
K10	Terminal box or power connector NDE left	✔ For 1PH810 only[1]/ 1PH813/1PH816	–	–
	Terminal box NDE left, cable entry DE, signal connection top (possible if 15th data position is A)	–	✔	–
K16	Second shaft extension ($d \times l$: 120 mm × 210 mm (4.72 in × 8.27 in)) (possible if 9th data position is A or G)	–	–	✔
K18	Radial shaft sealing ring DE[2]	✔	✔	–
K40	Regreasing system, DE and NDE	–	✔ Only for 1PH818/1PH822 Standard with 1PH828	Standard
K80	Axial pipe connection NDE (only possible with forced ventilation)	✔	–	✔
K83	Rotation of terminal box by +90 degrees (possible in combination with options K09 or K10)	–	✔[4]	–
K84	Rotation of terminal box by -90 degrees (possible in combination with options K09 or K10)	–	✔[4]	–
K85	Rotation of terminal box by +180 degrees (possible in combination with options K09 or K10)	–	✔	–
K90	Version with flange size A400 (possible if 12th data position 2, 3 and 5)	–	✔ Only for 1PH818	–
L00	Replace terminal box (standard) with the next largest terminal box Note dimension implications, see CAD CREATOR.	–	✔	✔
L27	NDE bearing in insulated version	–	✔ Only for 1PH818 Standard with 1PH822/1PH828	Standard
L74	Fan version in IP65 degree of protection[3]	✔	–	–

✔ Option available
– Option not available

1) Not possible with 12th data position "2" (IM B5 type of construction).
2) Only appropriate if oil spray or oil vapor is occasionally deposited on the sealing ring. Radial shaft sealing ring is not possible with: 14th data position E, F and L.
3) Regardless of the degree of protection, at high levels of atmospheric pollution, the fan must be cleaned.
4) Not possible for 1PH822 and 1XB7712-P03 terminal box.

Options (continued)

Order code	Description	For use with motors		
		1PH808 1PH810 1PH813 1PH816	1PH818 1PH822 1PH828	1PH835
P00	Undrilled cable entry plate	–	✔	✔ Not for 1XB7820-P00
P01	Cable entry plate 3 × M63 × 1.5	–	✔ Only for 1XB7700-P02 1XB7712-P03	✔ Only for 1XB7712-P03
P02	Cable entry plate 3 × M75 × 1.5	–	✔ Only for 1XB7712-P03	✔ Only for 1XB7712-P01 1XB7712-P03
P03	Cable entry plate 4 × M75 × 1.5	–	–	✔ Only for 1XB7712-P01
P04	Cable entry plate 4 × M63 × 1.5	–	✔ Only for 1XB7712-P03	✔ Only for 1XB7712-P01 1XB7712-P03
V90	1PH7-compatible shaft extension (*d* × *l*: 42 mm × 110 mm (1.65 in × 4.33 in)) (note reduced radial forces)	✔ Only for 1PH813	–	–
–	**Paint finish: anthracite RAL 7016**	Standard	Standard	Standard
X01	Paint finish: jet black, matt RAL 9005	✔	✔	✔
X02	Paint finish: cream white RAL9001	✔	✔	✔
X03	Paint finish: reseda green RAL 6011	✔	✔	✔
X04	Paint finish: pebble gray RAL 7032	✔	✔	✔
X05	Paint finish: sky blue RAL 5015	✔	✔	✔
X06	Paint finish: light ivory RAL 1015	✔	✔	✔
X08	Paint finish: white aluminum RAL 9006	✔	✔	✔
K24	Primer	✔ Pale green	✔ Red brown	✔ Red brown
K23	Special paint finish worldwide, primer and paint finish: anthracite RAL 7016	✔	✔	✔
K23+X..	Special paint finish worldwide, primer and other paint finish can be selected from X01 to X08	✔	✔	✔

✔ Option available
– Option not available

When ordering a motor with options, **-Z** should be added to the order number.

1PH7 asynchronous motors
Forced ventilation, IP55 degree of protection

Overview

1PH7 motors, shaft heights 180 and 225

1PH7 motors, shaft height 280

The 1PH7 AC motors are compact, force-ventilated squirrel-cage asynchronous motors with degree of protection IP55. The motors are ventilated using a mounted external fan unit.

The motor can be ordered either with the air flow from the motor drive end (DE) to the motor non-drive end (NDE) - or vice versa.

These motors have been designed specifically for use in conjunction with converters. Depending on the control requirements, the appropriate encoder systems are available for the motors. These encoders are used to sense the motor speed and indirect position.

Benefits

- High power density with small motor dimensions
- High degree of protection
- Wide speed control ranges
- Speed down to zero without reducing the torque
- Ruggedness
- Essentially maintenance-free
- Bearings for high cantilever load
- High rotational accuracy, even at the lowest speeds
- Integrated encoder system to sense the motor speed, connected using a connector or DRIVE-CLiQ interface
- Terminal box to connect the power cable
- Motor temperature monitoring with KTY84
- Various types of cooling systems
- Basic external cooling using a pipe connection
- Optional bearing versions with re-lubrication device and insulated bearings (NDE)

Application

Crane systems:

- Hoisting and closing gears for cranes
- Hoisting and traversing gears for high-bay racking vehicles

Printing industry:

- Single and main drives for printing machines

Rubber, plastic, wire, and glass manufacturing:

- Drives for extruders, calenders, rubber injection machines, foil machines, fleece plants
- Wire-drawing machines, cable-stranding machines, etc.

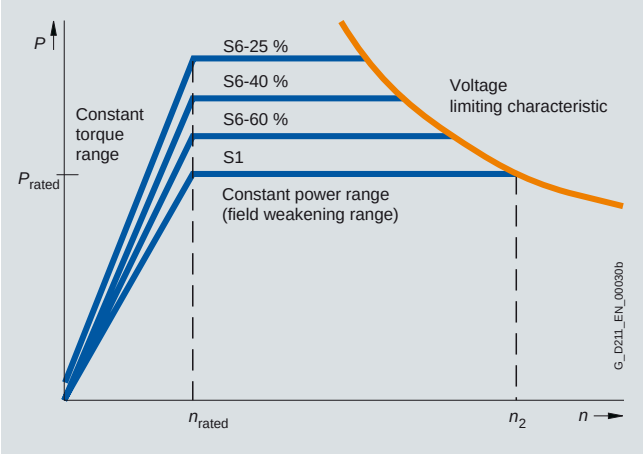
General applications such as coiler and winder drives.

The 1PH7 motors are suitable for installation in dry indoor areas without corrosive atmospheres.

Technical specifications

1PH7 motor	
Insulation of the stator winding in accordance with EN 60034-1 (IEC 60034-1)	Temperature class155 (F) for a coolant temperature of up to 40 °C (104°F)
Cooling in accordance with EN 60034-6 (IEC 60034-6)	Forced ventilation
• 1PH718/1PH722 • 1PH728	Fan mounted axially at NDE Fan mounted radially at NDE
Temperature monitoring	Temperature sensor KTY84 in the stator winding
• 1PH728	1 additional KTY84 as reserve
Motor fan ratings	400 V 3 AC 50/60 Hz 480 V 3 AC 60 Hz
Type of construction in accordance with EN 60034-7 (IEC 60034-7)	IM B3, IM B35
Degree of protection in accordance with EN 60034-5 (IEC 60034-5)	IP55 (fan IP54)
Shaft extension on the drive end in accordance with DIN 748-3 (IEC 60072-1)	With fitted key, half-key/full-key balancing
Shaft and flange accuracy in accordance with DIN 42955 (IEC 60072-1)[1)]	Tolerance N/Tolerance R
Vibration magnitude in accordance with Siemens/EN 60034-14 (IEC 60034-14)	
• 1PH718/1PH722 • 1PH728	Grade R/A, grade S/A, grade SR/A Grade A, grade R/A
Sound pressure level L_{pA} (1 m) in accordance with EN ISO 1680, max. Tolerance + 3 dB External fan 50 Hz	Sound pressure level as a function of air-flow direction
Connection	Connector for signals (mating connector not supplied) Terminal box for power
• 1PH718/1PH722 • 1PH728	Terminal box at top Terminal box NDE right
Paint finish	Primed Paint finish anthracite RAL 7016

Characteristic curves



Typical speed/power characteristic for 1PH7 motors

[1)] Shaft extension run-out, concentricity of centering ring and shaft and perpendicularity of flange to shaft.

1PH7 asynchronous motors
Forced ventilation, IP55 degree of protection

Selection and ordering data

Rated speed	Shaft height	Rated power	Rated torque	Rated current	Rated voltage	Speed during field weakening[1]	Continuous speed, max.[2]	Speed, max.[3]	1PH7 asynchronous motor Forced ventilation
n_{rated}	SH	P_{rated}	M_{rated}	I_{rated}	U_{rated}	n_2	n_{S1}	n_{max}	
rpm		kW (HP)	Nm (lb_f-ft)	A	V	rpm	rpm	rpm	Order No.
Line voltage 400 V 3 AC, Smart/Basic Line Module									
400	180	16.3 (21.9)	390 (288)	51	271	2100[4]	3500[5][4]	5000[4]	**1PH7184-■■B■■-■...**
		21.2 (28.4)	505 (373)	67	268	2400[4]	3500[5][4]	5000[4]	**1PH7186-■■B■■-■...**
	225	30.4 (40.8)	725 (535)	88	268	1900	3100[5][4]	4500[4]	**1PH7224-■■B■■-■...**
		39.2 (52.6)	935 (690)	114	264	2200[4]	3100[5][4]	4500[4]	**1PH7226-■■B■■-■...**
		48 (64.4)	1145 (845)	136	272	2200[4]	3100[5][4]	4500[5][4]	**1PH7228-■■B■■-■...**
1000	180	39 (52.3)	372 (274)	90	335	3300	3500[5]	5000	**1PH7184-■■D■■-■...**
		51 (68.4)	485 (358)	116	340	3700	3500[5]	5000	**1PH7186-■■D■■-■...**
	225	71 (95.2)	678 (500)	161	335	2900	3100[5]	4500	**1PH7224-■■D■■-■...**
		92 (123)	880 (649)	198	340	2900	3100[5]	4500	**1PH7226-■■D■■-■...**
		113 (152)	1080 (797)	240	340	2900	3100[5]	4500[5]	**1PH7228-■■D■■-■...**
1500	180	51 (68.4)	325 (240)	120	335	5000	3500[5]	5000	**1PH7184-■■F■■-■...**
		74 (99.2)	471 (347)	170	330	5000	3500[5]	5000	**1PH7186-■■F■■-■...**
	225	95 (127)	605 (446)	204	340	2900	3100[5]	4500	**1PH7224-■■U■■-■...**
		130 (174)	828 (611)	278	340	2900	3100[5]	4500	**1PH7226-■■F■■-■...**
		160 (215)	1019 (752)	350	340	2900	3100[5]	4500[5]	**1PH7228-■■F■■-■...**
2500	180	78 (10.5)	298 (220)	171	340	5000	3500[5]	5000	**1PH7184-■■L■■-■...**
		106 (142)	405 (299)	235	335	5000	3500[5]	5000	**1PH7186-■■L■■-■...**
	225	142 (190)	542 (400)	298	340	3500	3100[5]	4500	**1PH7224-■■L■■-■...**
		168 (225)	642 (438)	362	335	3500	3100[5]	4500	**1PH7226-■■L■■-■...**
		205 (275)	783 (578)	433	340	3500	3100[5]	4500[5]	**1PH7228-■■L■■-■...**

For versions, see Order No. supplement and options on page 5/72.

Motor type (repeated)	Power factor	Magnetizing current	Efficiency	Rated frequency	Moment of inertia	Weight, approx.	Terminal box	SINAMICS S120 Motor Module	
								Rated output current[6]	For additional versions and components see chapter SINAMICS S120 drive system
	$\cos \varphi$	I_μ	η_{rated}	f_{rated}	J			I_{rated}	
		A		Hz	kgm^2 (lb$_f$-in-s^2)	kg (lb)	Type	A	Order No.
1PH7184-..B...	0.84	26	0.830	14.2	0.503 (4.45)	370 (816)	1XB7322	60	**6SL3120- 1TE26-0AA3**
1PH7186-..B...	0.81	38.5	0.845	14.0	0.666 (5.89)	440 (970)	1XB7322	85	**6SL3120- 1TE28-5AA3**
1PH7224-..B...	0.87	36.5	0.864	14.0	1.479 (13.1)	630 (1389)	1XB7322	85[7]	**6SL3120- 1TE28-5AA3**
1PH7226-..B...	0.86	49	0.880	14.0	1.930 (17.1)	750 (1654)	1XB7322	132	**6SL3120- 1TE31-3AA3**
1PH7228-..B...	0.85	60.5	0.888	13.9	2.326 (20.6)	860 (1896)	1XB7322	132[7]	**6SL3120- 1TE31-3AA3**
1PH7184-..D...	0.83	44	0.913	34.2	0.503 (4.45)	370 (816)	1XB7322	85[7]	**6SL3120- 1TE28-5AA3**
1PH7186-..D...	0.81	58	0.918	34.1	0.666 (5.89)	440 (970)	1XB7322	132	**6SL3120- 1TE31-3AA3**
1PH7224-..D...	0.81	78.5	0.934	33.9	1.479 (13.1)	630 (1389)	1XB7322	200	**6SL3120- 1TE32-0AA3**
1PH7226-..D...	0.84	87.5	0.935	33.9	1.930 (17.1)	750 (1654)	1XB7422	200	**6SL3120- 1TE32-0AA3**
1PH7228-..D...	0.85	98	0.938	33.9	2.326 (20.6)	860 (1896)	1XB7700	260	**6SL3320- 1TE32-6AA3**
1PH7184-..F...	0.78	64	0.930	50.7	0.503 (4.45)	370 (816)	1XB7322	132	**6SL3120- 1TE31-3AA3**
1PH7186-..F...	0.81	84	0.937	50.7	0.666 (5.89)	440 (970)	1XB7422	200	**6SL3120- 1TE32-0AA3**
1PH7224-..U...	0.84	88.5	0.944	50.6	1.479 (13.1)	630 (1398)	1XB7422	200[7]	**6SL3120- 1TE32-0AA3**
1PH7226-..F...	0.84	120	0.945	50.6	1.930 (17.1)	750 (1654)	1XB7700	310	**6SL3320- 1TE33-1AA3**
1PH7228-..F...	0.82	169	0.949	50.5	2.326 (20.6)	860 (1896)	1XB7700	380	**6SL3320- 1TE33-8AA3**
1PH7184-..L...	0.82	77	0.937	84.1	0.503 (4.45)	370 (816)	1XB7322	200	**6SL3120- 1TE32-0AA3**
1PH7186-..L...	0.82	108	0.942	84.1	0.666 (5.89)	440 (970)	1XB7422	260	**6SL3320- 1TE32-6AA3**
1PH7224-..L...	0.84	115	0.948	84.0	1.479 (13.1)	630 (1389)	1XB7700	310	**6SL3320- 1TE33-1AA3**
1PH7226-..L...	0.84	154	0.950	84.0	1.930 (17.1)	750 (1654)	1XB7700	380	**6SL3320- 1TE33-8AA3**
1PH7228-..L...	0.84	185	0.950	83.9	2.326 (20.6)	860 (1896)	1XB7700	490	**6SL3320- 1TE35-0AA3**

1) n_2: Max. permissible thermal speed at constant power or speed which is at the voltage limit when $P = P_{rated}$.
2) n_{S1}: Maximum permissible speed that is continuously permitted without speed duty cycles.
3) n_{max}: Maximum speed that must not be exceeded.
4) The speed is limited to lower values in some cases. The following restriction applies: Maximum output frequency < 5 × motor rated frequency.
5) Speed is reduced with increased radial forces, see selection guides.
6) The rated pulse frequencies must be taken into account. The rated motor data is valid for 4 kHz or 2 kHz.
7) The rated output current of the Motor Module is lower than the motor rated current.

1PH7 asynchronous motors
Forced ventilation, IP55 degree of protection

Selection and ordering data

Rated speed	Shaft height	Rated power	Rated torque	Rated current	Rated voltage	Speed during field weakening[1]	Continuous speed, max.[2]	Speed, max.[3]	1PH7 asynchronous motor Forced ventilation
n_{rated}	SH	P_{rated}	M_{rated}	I_{rated}	U_{rated}	n_2	n_{S1}	n_{max}	
rpm		kW (HP)	Nm (lb_f-ft)	A	V	rpm	rpm	rpm	Order No.
Line voltage 400 V 3 AC, Active Line Module									
400	180	16.3 (21.9)	390 (288)	51	271	2900[4]	3500[4][5]	5000[4]	**1PH7184-■■B■■-■...**
		21.2 (28.4)	505 (373)	67	268	3300[4]	3500[4][5]	5000[4]	**1PH7186-■■B■■-■...**
	225	30.4 (40.8)	725 (535)	88	268	2700[4]	3100[4][5]	4500[4]	**1PH7224-■■B■■-■...**
		39.2 (52.6)	935 (690)	114	264	2900[4]	3100[4][5]	4500[4]	**1PH7226-■■B■■-■...**
		48 (64.4)	1145 (845)	136	272	2900[4]	3100[4][5]	4500[4][5]	**1PH7228-■■B■■-■...**
500	280	80 (107)	1529 (1128)	144	400	1700	2200	3300[4]	**1PH7284-■■B■■-0...**
		100 (134)	1909 (1408)	180	400	1800	2200	3300[4]	**1PH7286-■■B■■-0...**
		130 (174)	2481 (1830)	233	400	1800	2200	3300[4]	**1PH7288-■■B■■-0...**
800	280	125 (168)	1492 (1101)	220	400	2200	2200	3300	**1PH7284-■■C■■-0...**
		155 (208)	1850 (1365)	285	385	2200	2200	3300	**1PH7286-■■C■■-0...**
		190 (255)	2268 (1673)	365	370	2200	2200	3300	**1PH7288-■■C■■-0...**
1150	180	44 (59)	366 (270)	89	383	4200	3500[5]	5000	**1PH7184-■■D■■-■...**
		58 (77.8)	482 (356)	116	390	4400	3500[5]	5000	**1PH7186-■■D■■-■...**
	225	81 (109)	670 (494)	160	385	2900	3100[5]	4500	**1PH7224-■■D■■-■...**
		105 (141)	870 (642)	197	390	2900	3100[5]	4500	**1PH7226-■■D■■-■...**
		129 (173)	1070 (789)	238	390	2900	3100[5]	4500[5]	**1PH7228-■■D■■-■...**
	280	170 (228)	1414 (1043)	314	400	2200	2200	3300	**1PH7284-■■D■■-0...**
		210 (282)	1745 (1287)	414	380	2200	2200	3300	**1PH7286-■■D■■-0...**
		260 (349)	2160 (1593)	497	385	2200	2200	3300	**1PH7288-■■D■■-0...**
1750	180	60 (80.5)	327 (241)	120	388	5000	3500[5]	5000	**1PH7184-■■F■■-■...**
		85 (114)	465 (343)	169	385	5000	3500[5]	5000	**1PH7186-■■F■■-■...**
	225	110 (148)	600 (443)	203	395	2900	3100[5]	4500	**1PH7224-■■U■■-■...**
		135 (181)	737 (544)	254	395	2900	3100[5]	4500	**1PH7226-■■F■■-■...**
		179 (240)	975 (719)	342	395	2900	3100[5]	4500[5]	**1PH7228-■■F■■-■...**
	280	225 (302)	1228 (906)	393	400	2200	2200	3300	**1PH7284-■■F■■-0...**
		270 (362)	1474 (1087)	466	400	2200	2200	3300	**1PH7286-■■F■■-0...**
		340 (456)	1856 (1369)	586	400	2200	2200	3300	**1PH7288-■■F■■-0...**
2900	180	81 (109)	265 (196)	158	395	5000	3500[5]	5000	**1PH7184-■■L■■-■...**
		101 (135)	333 (246)	206	385	5000	3500[5]	5000	**1PH7186-■■L■■-■...**
	225	149 (200)	490 (361)	274	395	3500	3100[5]	4500	**1PH7224-■■L■■-■...**
		185 (248)	610 (450)	348	390	3500	3100[5]	4500	**1PH7226-■■L■■-■...**
		215 (288)	708 (522)	402	395	3500	3100[5]	4500[5]	**1PH7228-■■L■■-■...**

For versions, see Order No. supplement and options on page 5/72.

Motor type (repeated)	Power factor	Magnetizing current	Efficiency	Rated frequency	Moment of inertia	Weight, approx.	Terminal box	SINAMICS S120 Motor Module	
								Rated output current[6]	For additional versions and components see chapter SINAMICS S120 drive system
	$\cos \varphi$	I_μ	η_{rated}	f_{rated}	J			I_{rated}	
		A		Hz	kgm^2 (lb$_f$-in-s^2)	kg (lb)	Type	A	Order No.
1PH7184-..B...	0.84	26	0.830	14.2	0.503 (4.45)	370 (816)	1XB7322	60	**6SL3120-1TE26-0AA3**
1PH7186-..B...	0.81	38.5	0.845	14.0	0.666 (5.89)	440 (970)	1XB7322	85	**6SL3120-1TE28-5AA3**
1PH7224-..B...	0.87	36.5	0.864	14.0	1.479 (13.1)	630 (1389)	1XB7322	85[7]	**6SL3120-1TE28-5AA3**
1PH7226-..B...	0.86	49	0.880	14.0	1.930 (17.1)	750 (1654)	1XB7322	132	**6SL3120-1TE31-3AA3**
1PH7228-..B...	0.85	60.5	0.888	13.9	2.326 (20.6)	860 (1896)	1XB7322	132[7]	**6SL3120-1TE31-3AA3**
1PH7284-..B...	0.87	60	0.922	17	4.2 (37.2)	1300 (2867)	1XB7712	200	**6SL3120-1TE32-0AA3**
1PH7286-..B...	0.86	78	0.930	17	5.2 (46)	1500 (3308)	1XB7712	200	**6SL3120-1TE32-0AA3**
1PH7288-..B...	0.87	100	0.933	17	6.3 (55.8)	1700 (3749)	1XB7712	260	**6SL3320-1TE32-6AA3**
1PH7284-..C...	0.86	95	0.944	27	4.2 (37.2)	1300 (2867)	1XB7712	260	**6SL3320-1TE32-6AA3**
1PH7286-..C...	0.85	135	0.948	27	5.2 (46)	1500 (3308)	1XB7712	310	**6SL3320-1TE33-1AA3**
1PH7288-..C...	0.84	170	0.951	27	6.3 (55.8)	1700 (3749)	1XB7712	380	**6SL3320-1TE33-8AA3**
1PH7184-..D...	0.82	42	0.920	39.2	0.503 (4.45)	370 (816)	1XB7322	85[7]	**6SL3120-1TE28-5AA3**
1PH7186-..D...	0.81	58	0.925	39.1	0.666 (5.89)	440 (970)	1XB7322	132	**6SL3120-1TE31-3AA3**
1PH7224-..D...	0.81	79	0.938	38.9	1.479 (13.1)	630 (1389)	1XB7322	200	**6SL3120-1TE32-0AA3**
1PH7226-..D...	0.84	87.5	0.941	38.9	1.930 (17.1)	750 (1654)	1XB7422	200	**6SL3120-1TE32-0AA3**
1PH7228-..D...	0.85	98	0.943	38.9	2.326 (20.6)	860 (1896)	1XB7700	260	**6SL3320-1TE32-6AA3**
1PH7284-..D...	0.82	158	0.956	38.6	4.2 (37.2)	1300 (2867)	1XB7712	310[7]	**6SL3320-1TE33-1AA3**
1PH7286-..D...	0.81	218	0.958	38.6	5.2 (46)	1500 (3308)	1XB7712	490	**6SL3320-1TE35-0AA3**
1PH7288-..D...	0.82	252	0.960	38.6	6.3 (55.8)	1700 (3749)	1XB7712	490[7]	**6SL3320-1TE35-0AA3**
1PH7184-..F...	0.78	64	0.934	59.0	0.503 (4.45)	370 (816)	1XB7322	132	**6SL3120-1TE31-3AA3**
1PH7186-..F...	0.80	84	0.940	59.0	0.666 (5.89)	440 (970)	1XB7422	200	**6SL3120-1TE32-0AA3**
1PH7224-..U...	0.84	88	0.944	58.9	1.479 (13.1)	630 (1389)	1XB7422	200[7]	**6SL3120-1TE32-0AA3**
1PH7226-..F...	0.82	120	0.947	58.9	1.930 (17.1)	750 (1654)	1XB7700	260	**6SL3320-1TE32-6AA3**
1PH7228-..F...	0.81	169	0.948	58.8	2.326 (20.6)	860 (1896)	1XB7700	380	**6SL3320-1TE33-8AA3**
1PH7284-..F...	0.86	163	0.962	58.7	4.2 (37.2)	1300 (2867)	1XB7712	490	**6SL3320-1TE35-0AA3**
1PH7286-..F...	0.87	184	0.963	58.7	5.2 (46)	1500 (3308)	1XB7712	490	**6SL3320-1TE35-0AA3**
1PH7288-..F...	0.87	234	0.965	58.7	6.3 (55.8)	1700 (3749)	1XB7712	745	**6SL3320-1TE37-5AA3**
1PH7184-..L...	0.80	77	0.934	97.4	0.503 (4.45)	370 (816)	1XB7322	200	**6SL3120-1TE32-0AA3**
1PH7186-..L...	0.78	107	0.936	97.3	0.666 (5.89)	440 (970)	1XB7422	200[7]	**6SL3120-1TE32-0AA3**
1PH7224-..L...	0.84	115	0.946	97.3	1.479 (13.1)	630 (1389)	1XB7700	310	**6SL3320-1TE33-1AA3**
1PH7226-..L...	0.83	154	0.946	97.2	1.930 (17.1)	750 (1654)	1XB7700	380	**6SL3320-1TE33-8AA3**
1PH7228-..L...	0.82	186	0.946	97.2	2.326 (20.6)	860 (1896)	1XB7700	490	**6SL3320-1TE35-0AA3**

1) n_2: Max. permissible thermal speed at constant power or speed which is at the voltage limit when $P = P_{rated}$.
2) n_{S1}: Maximum permissible speed that is continuously permitted without speed duty cycles.
3) n_{max}: Maximum speed that must not be exceeded.
4) The speed is limited to lower values in some cases. The following restriction applies: Maximum output frequency < 5 × motor rated frequency.
5) Speed is reduced with increased radial forces, see selection guides.
6) The rated pulse frequencies must be taken into account: The rated motor data is valid for 4 kHz or 2 kHz.
7) The rated output current of the Motor Module is lower than the motor rated current.

1PH7 asynchronous motors
Forced ventilation, IP55 degree of protection

Selection and ordering data

Rated speed	Shaft height	Rated power	Rated torque	Rated current	Rated voltage	Speed during field weakening[1]	Continuous speed, max.[2]	Speed, max.[3]	1PH7 asynchronous motor Forced ventilation
n_{rated}	SH	P_{rated}	M_{rated}	I_{rated}	U_{rated}	n_2	n_{S1}	n_{max}	
rpm		kW (HP)	Nm (lb_f-ft)	A	V	rpm	rpm	rpm	Order No.
Line voltage 480 V 3 AC, Smart/Basic/Active Line Module									
500	180	20.5 (27.5)	392 (289)	51	335	3200[4]	3500[4][5]	5000[4]	**1PH7184-■■B■■-■...**
		26.5 (35.5)	506 (373)	67	335	3600[4]	3500[4][5]	5000[4]	**1PH7186-■■B■■-■...**
	225	38 (51.0)	725 (535)	86	335	2900[4]	3100[4][5]	4500[4]	**1PH7224-■■B■■-■...**
		49 (65.7)	935 (690)	112	330	3200[4]	3100[4][5]	4500[4]	**1PH7226-■■B■■-■...**
		60 (80.5)	1145 (845)	135	340	3200[4]	3100[4][5]	4500[4][5]	**1PH7228-■■B■■-■...**
600	280	95 (127)	1519 (1120)	144	480	2200	2200	3300[4]	**1PH7284-■■B■■-0...**
		120 (161)	1916 (1413)	180	480	2200	2200	3300[4]	**1PH7286-■■B■■-0...**
		155 (208)	2467 (1820)	233	480	2200	2200	3300[4]	**1PH7288-■■B■■-0...**
1000	280	150 (201)	1433 (1057)	220	480	2200	2200	3300	**1PH7284-■■C■■-0...**
		185 (248)	1767 (1303)	285	480	2200	2200	3300	**1PH7286-■■C■■-0...**
		230 (308)	2197 (1621)	365	460	2200	2200	3300	**1PH7288-■■C■■-0...**
1350	180	50 (67.1)	355 (262)	86	450	5000	3500[5]	5000	**1PH7184-■■D■■-■...**
		67 (89.9)	475 (350)	114	460	5000	3500[5]	5000	**1PH7186-■■D■■-■...**
	225	92 (123)	650 (479)	156	450	2900	3100[5]	4500	**1PH7224-■■D■■-■...**
		120 (161)	847 (625)	193	460	2900	3100[5]	4500	**1PH7226-■■D■■-■...**
		147 (197)	1043 (769)	232	460	2900	3100[5]	4500[5]	**1PH7228-■■D■■-■...**
	280	200 (268)	1416 (1044)	314	470	2200	2200	3300	**1PH7284-■■D■■-0...**
		245 (329)	1733 (1278)	414	445	2200	2200	3300	**1PH7286-■■D■■-0...**
		305 (409)	2158 (1592)	497	450	2200	2200	3300	**1PH7288-■■D■■-0...**
2000	180	68 (91.2)	325 (240)	120	450	5000	3500[5]	5000	**1PH7184-■■F■■-■...**
		94 (126)	450 (332)	165	445	5000	3500[5]	5000	**1PH7186-■■F■■-■...**
	225	124 (166)	590 (435)	200	460	2900	3100[5]	4500	**1PH7224-■■U■■-■...**
		153 (205)	730 (538)	254	450	2900	3100[5]	4500	**1PH7226-■■F■■-■...**
		196 (263)	936 (690)	332	450	3000	3100[5]	4500[5]	**1PH7228-■■F■■-■...**
	280	255 (342)	1218 (898)	393	455	2200	2200	3300	**1PH7284-■■F■■-0...**
		310 (416)	1481 (1092)	466	455	2200	2200	3300	**1PH7286-■■F■■-0...**
		385 (516)	1838 (1356)	586	455	2200	2200	3300	**1PH7288-■■F■■-0...**
2900	180	81 (109)	267 (197)	158	395	5000	3500[5]	5000	**1PH7184-■■L■■-■...**
		101 (135)	333 (246)	206	385	5000	3500[5]	5000	**1PH7186-■■L■■-■...**
	225	149 (200)	490 (361)	274	395	3500	3100[5]	4500	**1PH7224-■■L■■-■...**
		185 (248)	610 (450)	348	390	3500	3100[5]	4500	**1PH7226-■■L■■-■...**
		215 (288)	708 (522)	402	395	3500	3100[5]	4500[5]	**1PH7228-■■L■■-■...**

For versions, see Order No. supplement and options on page 5/72.

Motor type (repeated)	Power factor	Magnetizing current	Efficiency	Rated frequency	Moment of inertia	Weight, approx.	Terminal box	SINAMICS S120 Motor Module	
								Rated output current[6]	For additional versions and components see chapter SINAMICS S120 drive system
	$\cos \varphi$	I_μ	η_{rated}	f_{rated}	J			I_{rated}	
		A		Hz	kgm^2 (lb$_f$-in-s^2)	kg (lb)	Type	A	Order No.
1PH7184-..B...	0.83	26	0.858	17.5	0.503 (4.45)	370 (816)	1XB7322	60	**6SL3120-1TE26-0AA3**
1PH7186-..B...	0.79	39.5	0.870	17.3	0.666 (5.89)	440 (970)	1XB7322	85	**6SL3120-1TE28-5AA3**
1PH7224-..B...	0.85	37.5	0.888	17.3	1.479 (13.1)	630 (1389)	1XB7322	85[7]	**6SL3120-1TE28-5AA3**
1PH7226-..B...	0.85	50	0.900	17.3	1.930 (17.1)	750 (1654)	1XB7322	132	**6SL3120-1TE31-3AA3**
1PH7228-..B...	0.84	61.5	0.907	17.2	2.326 (20.6)	860 (1896)	1XB7322	132[7]	**6SL3120-1TE31-3AA3**
1PH7284-..B...	0.86	61	0.932	20.3	4.2 (37.2)	1300 (2867)	1XB7712	200	**6SL3120-1TE32-0AA3**
1PH7286-..B...	0.86	80	0.939	20.3	5.2 (46.0)	1500 (3308)	1XB7712	200	**6SL3120-1TE32-0AA3**
1PH7288-..B...	0.86	102	0.941	20.3	6.3 (55.8)	1700 (3749)	1XB7712	260	**6SL3320-1TE32-6AA3**
1PH7284-..C...	0.86	90	0.950	34	4.2 (37.2)	1300 (2867)	1XB7712	260	**6SL3320-1TE32-6AA3**
1PH7286-..C...	0.84	135	0.954	34	5.2 (46.0)	1500 (3308)	1XB7712	310	**6SL3320-1TE33-1AA3**
1PH7288-..C...	0.84	170	0.956	34	6.3 (55.8)	1700 (3749)	1XB7712	380	**6SL3320-1TE33-8AA3**
1PH7184-..D...	0.81	42	0.928	45.8	0.503 (4.45)	370 (816)	1XB7322	85[7]	**6SL3120-1TE28-5AA3**
1PH7186-..D...	0.79	59.5	0.930	45.7	0.666 (5.89)	440 (970)	1XB7322	132	**6SL3120-1TE31-3AA3**
1PH7224-..D...	0.80	78.5	0.942	45.6	1.479 (13.1)	630 (1389)	1XB7322	200	**6SL3120-1TE32-0AA3**
1PH7226-..D...	0.82	88.5	0.945	45.6	1.930 (17.1)	750 (1654)	1XB7422	200	**6SL3120-1TE32-0AA3**
1PH7228-..D...	0.84	99.5	0.947	45.6	2.326 (20.6)	860 (1896)	1XB7700	260	**6SL3320-1TE32-6AA3**
1PH7284-..D...	0.82	159	0.958	45.3	4.2 (37.2)	1300 (2867)	1XB7712	310[7]	**6SL3320-1TE33-1AA3**
1PH7286-..D...	0.80	217	0.960	45.3	5.2 (46.0)	1500 (3308)	1XB7712	490	**6SL3320-1TE35-0AA3**
1PH7288-..D...	0.82	250	0.962	45.3	6.3 (55.8)	1700 (3749)	1XB7712	490[7]	**6SL3320-1TE35-0AA3**
1PH7184-..F...	0.78	66	0.935	67.3	0.503 (4.45)	370 (816)	1XB7322	132	**6SL3120-1TE31-3AA3**
1PH7186-..F...	0.78	87	0.941	67.3	0.666 (5.89)	440 (970)	1XB7422	200	**6SL3120-1TE32-0AA3**
1PH7224-..U...	0.82	91	0.944	67.2	1.479 (13.1)	630 (1389)	1XB7422	200	**6SL3120-1TE32-0AA3**
1PH7226-..F...	0.82	119	0.948	67.2	1.930 (17.1)	750 (1654)	1XB7700	260	**6SL3320-1TE32-6AA3**
1PH7228-..F...	0.79	168	0.950	67.1	2.326 (20.6)	860 (1896)	1XB7700	380	**6SL3320-1TE33-8AA3**
1PH7284-..F...	0.86	162	0.962	67	4.2 (37.2)	1300 (2867)	1XB7712	490	**6SL3320-1TE35-0AA3**
1PH7286-..F...	0.87	182	0.964	67	5.2 (46.0)	1500 (3308)	1XB7712	490	**6SL3320-1TE35-0AA3**
1PH7288-..F...	0.87	232	0.965	67	6.3 (55.8)	1700 (3749)	1XB7712	745	**6SL3320-1TE37-5AA3**
1PH7184-..L...	0.80	77	0.934	97.4	0.503 (4.45)	370 (816)	1XB7322	200	**6SL3120-1TE32-0AA3**
1PH7186-..L...	0.78	107	0.936	97.3	0.666 (5.89)	440 (970)	1XB7422	210	**6SL3320-1TE32-1AA3**
1PH7224-..L...	0.84	115	0.946	97.3	1.479 (13.1)	630 (1389)	1XB7700	310	**6SL3320-1TE33-1AA3**
1PH7226-..L...	0.83	154	0.946	97.2	1.930 (17.1)	750 (1654)	1XB7700	380	**6SL3320-1TE33-8AA3**
1PH7228-..L...	0.82	188	0.954	97.2	2.326 (20.6)	860 (1896)	1XB7700	490	**6SL3320-1TE35-0AA3**

1) n_2: Max. permissible thermal speed at constant power or speed which is at the voltage limit when $P = P_{rated}$.
2) n_{S1}: Maximum permissible speed that is continuously permitted without speed duty cycles.
3) n_{max}: Maximum speed that must not be exceeded.
4) The speed is limited to lower values in some cases. The following restriction applies: Maximum output frequency < 5 × motor rated frequency.
5) Speed is reduced with increased radial forces, see selection guides.
6) The rated pulse frequencies must be taken into account. The rated motor data is valid for 4 kHz or 2 kHz.
7) The rated output current of the Motor Module is lower than the motor rated current.

1PH7 asynchronous motors
Forced ventilation, IP55 degree of protection

Selection and ordering data

Rated speed	Shaft height	Rated power	Rated torque	Rated current	Rated voltage	Speed during field weakening[1]	Continuous speed, max.[2]	Speed, max.[3]	**1PH7 asynchronous motor Forced ventilation**	
n_{rated}	SH	P_{rated}	M_{rated}	I_{rated}	U_{rated}	n_2	n_{S1}	n_{max}		Order code
rpm		kW (HP)	Nm (lb_f-ft)	A	V	rpm	rpm	rpm	Order No.	
Line voltage 690 V 3 AC, Active Line Module										
500	280	77 (103)	1471 (1085)	80	690	1700	2200	3300[4]	**1PH7284-■■B■■-0...-Z**	**C30**
		96 (128)	1834 (1353)	101	690	1800	2200	3300[4]	**1PH7286-■■B■■-0...-Z**	**C30**
		125 (168)	2388 (1761)	130	690	1900	2200	3300[4]	**1PH7288-■■B■■-0...-Z**	**C30**
800	280	115 (154)	1373 (1013)	120	690	2200	2200	3300	**1PH7284-■■C■■-0...-Z**	**C30**
		145 (194)	1731 (1277)	160	665	2200	2200	3300	**1PH7286-■■C■■-0...-Z**	**C30**
		185 (248)	2208 (1629)	210	640	2200	2200	3300	**1PH7288-■■C■■-0...-Z**	**C30**
1150	280	164 (220)	1362 (1005)	176	690	2200	2200	3300	**1PH7284-■■D■■-0...-Z**	**C30**
		203 (272)	1686 (1244)	233	655	2200	2200	3300	**1PH7286-■■D■■-0...-Z**	**C30**
		251 (337)	2084 (1537)	280	665	2200	2200	3300	**1PH7288-■■D■■-0...-Z**	**C30**
1750	280	217 (291)	1184 (873)	221	690	2200	2200	3300	**1PH7284-■■F■■-0....Z**	**C30**
		261 (350)	1424 (1050)	262	690	2200	2200	3300	**1PH7286-■■F■■-0...-Z**	**C30**
		329 (441)	1795 (1324)	330	690	2200	2200	3300	**1PH7288-■■F■■-0...-Z**	**C30**

For versions, see Order No. supplement and options on page 5/74.

Motor type (repeated)	Power factor	Magnetizing current	Efficiency	Rated frequency	Moment of inertia	Weight, approx.	Terminal box	SINAMICS S120 Motor Module	
								Rated output current[6]	For additional versions and components see chapter SINAMICS S120 drive system
	$\cos \varphi$	I_μ	η_{rated}	f_{rated}	J			I_{rated}	
		A		Hz	kgm^2 (lb$_f$-in-s^2)	kg (lb)	Type	A	Order No.
1PH7284-..B...	0.87	34	0.923	17	4.2 (37.2)	1300 (2867)	1XB7712	85[7]	**6SL3320-1TG28-5AA3**
1PH7286-..B...	0.86	45	0.927	17	5.2 (46.0)	1500 (3308)	1XB7712	120	**6SL3320-1TG31-2AA3**
1PH7288-..B...	0.86	57	0.930	17	6.3 (55.8)	1700 (3749)	1XB7712	150	**6SL3320-1TG31-5AA3**
1PH7284-..C...	0.85	55	0.943	27	4.2 (37.2)	1300 (2867)	1XB7712	150	**6SL3320-1TG31-5AA3**
1PH7286-..C...	0.84	80	0.947	27	5.2 (46.0)	1500 (3308)	1XB7712	175	**6SL3320-1TG31-8AA3**
1PH7288-..C...	0.84	100	0.950	27	6.3 (55.8)	1700 (3749)	1XB7712	260	**6SL3320-1TG32-6AA3**
1PH7284-..D...	0.81	91	0.955	38.6	4.2 (37.2)	1300 (2867)	1XB7712	215	**6SL3320-1TG32-2AA3**
1PH7286-..D...	0.80	125	0.957	38.6	5.2 (46.0)	1500 (3308)	1XB7712	260	**6SL3320-1TG32-6AA3**
1PH7288-..D...	0.81	145	0.959	38.6	6.3 (55.8)	1700 (3749)	1XB7712	330	**6SL3320-1TG33-3AA3**
1PH7284-..F...	0.86	94	0.961	58.7	4.2 (37.2)	1300 (2867)	1XB7712	260	**6SL3320-1TG32-6AA3**
1PH7286-..F...	0.87	105	0.963	58.7	5.2 (46.0)	1500 (3308)	1XB7712	330	**6SL3320-1TG33-3AA3**
1PH7288-..F...	0.86	134	0.964	58.7	6.3 (55.8)	1700 (3749)	1XB7712	410	**6SL3320-1TG34-1AA3**

1) n_2: Max. permissible thermal speed at constant power or speed which is at the voltage limit when $P = P_{rated}$.
2) n_{S1}: Maximum permissible speed that is continuously permitted without speed duty cycles.
3) n_{max}: Maximum speed that must not be exceeded.
4) The speed is limited to lower values in some cases. The following restriction applies: Maximum output frequency < 5 × motor rated frequency.
5) Speed is reduced with increased radial forces, see selection guides.
6) The rated pulse frequencies must be taken into account: The rated motor data is valid for 4 kHz or 2 kHz.
7) The rated output current of the Motor Module is lower than the rated motor current at 2 kHz.

1PH7 asynchronous motors
Forced ventilation, IP55 degree of protection

Order No. supplements for 1PH718/1PH722 motors

Data position of the Order No.	1	2	3	4	5	6	7		8	9	10	11	12		13	14	15	16	
Shaft height 180	**1**	**P**	**H**	**7**	**1**	**8**	**.**	**–**	**.**	■	**.**	■	■	**–**	■	■	■	■	**–** **Z**
Shaft height 225	**1**	**P**	**H**	**7**	**2**	**2**	**.**												
Overall length[1]							**.**												
Fan																			
External fan, PG cable gland in terminal box									**2**										
Without external fan, for pipe connection, PG cable gland in terminal box									**6**										
External fan, metric cable gland in terminal box									**7**										
Without external fan, for pipe connection, metric cable gland in terminal box									**8**										
Encoder systems for motors without DRIVE-CLiQ interface																			
Without encoder										**A**									
Absolute encoder 2048 S/R, 4096 revolutions, multi-turn (encoder AM2048S/R)										**E**									
Incremental encoder HTL 1024 S/R (encoder HTL1024S/R)										**H**									
Incremental encoder HTL 2048 S/R (encoder HTL2048S/R)										**J**									
Incremental encoder sin/cos 1 V_{pp} 2048 S/R with C and D tracks (encoder IC2048S/R)										**M**									
Incremental encoder sin/cos 1 V_{pp} 2048 S/R without C and D tracks (encoder IN2048S/R)										**N**									
Encoder systems for motors with DRIVE-CLiQ interface																			
Absolute encoder 22 bit (resolution 4194304, internal 2048 S/R) + 12 bit multi-turn (traversing range 4096 revolutions) (encoder AM22DQ)										**F**									
Incremental encoder 22 bit (resolution 4194304, internal 2048 S/R) + commutation position 11 bit (encoder IC22DQ)										**D**									
Incremental encoder 22 bit without commutation position (encoder IN22DQ)										**Q**									
Rated speeds at 380 V to 480 V 3 AC (winding design)																			
400 rpm/500 rpm											**B**								
1000 rpm/1150 rpm/1350 rpm											**D**								
1500 rpm/1750 rpm/2000 rpm											**F**								
1500 rpm/1750 rpm/2000 rpm (for 1PH7224 only)											**U**								
2500 rpm/2900 rpm											**L**								
Cable connection (view of DE)																			
Terminal box / Cable entry																			
Top – Right												**0**							
Top – DE												**1**							
Top – NDE												**2**							
Top – Left												**3**							
Type of construction																			
IM B3													**0**						
IM B3 – Hoisting system for different types of construction (IM B6, IM B7, IM B8, IM V5, IM V6)													**1**						
IM B35 – 1PH7184 with A400 flange, 1PH7186 with A450 flange, 1PH722 with A550 flange													**3**						
IM B35 – 1PH7184 with A450 flange													**4**						
IM B35 – 1PH7184 with A400 flange, 1PH7186 with A450 flange, 1PH722 with A550 flange, Hoisting concept for different types of construction (IM V15, IM V36)													**5**						
IM B35 – 1PH7184 with A450 flange, Hoisting system for different types of construction (IM V15, IM V36)													**6**						

For 13th to 16th data position of the Order No., see page 5/73.

[1] Not selectable. Determined by the choice of rated power.

Order No. supplements for 1PH718/1PH722 motors (continued)

Data position of the Order No.		1	2	3	4	5	6	7		8	9	10	11	12		13	14	15	16		
Shaft height 180		**1**	**P**	**H**	**7**	**1**	**8**	**.**	**–**	**.**	■	**.**	■	■	**–**	■	■	■	■	**–**	**Z**
Shaft height 225		**1**	**P**	**H**	**7**	**2**	**2**	**.**													
Holding brake with emergency stop function (suitable for coupling output in type of construction IM B3)[1]																					
Without brake																**0**					
With brake	With emergency release screws and microswitch															**2**					
With brake	With manual release and microswitch															**4**					
Bearing version	**Vibration magnitude acc. to Siemens/EN 60034-14**[2]	**Shaft and flange accuracy**[2]																			
Coupling	R/A	N															**A**				
Coupling	R/A	R															**B**				
Coupling	S/A	R															**C**				
Coupling	SR/A	R															**D**				
Belt	R/A	N															**E**				
Belt	R/A	R															**F**				
Increased cantilever forces	R/A	N															**G**				
Increased cantilever forces	R/A	R															**H**				
Increased maximum speed[5]	S/A	R															**J**				
Shaft extension DE	**Balancing**	**Direction of air flow (fan)**																			
Fitted key	Half-key	DE → NDE																**A**			
Fitted key	Half-key	NDE → DE[3]																**B**			
Fitted key	Full-key	DE → NDE																**C**			
Fitted key	Full-key	NDE → DE[3]																**D**			
Plain shaft	–	DE → NDE																**J**			
Plain shaft	–	NDE → DE[3]																**K**			
Seal	**Paint finish**																				
–	Primed																		**0**		
Flange and shaft sealing ring[4]	Primed																		**2**		
–	Anthracite RAL 7016																		**3**		
Flange and shaft sealing ring[4]	Anthracite RAL 7016																		**5**		
–	Special paint finish in anthracite RAL 7016																		**6**		
Flange and shaft sealing ring[4]	Special paint finish in anthracite RAL 7016																		**8**		
Special version (order codes are required for options)																				**–**	**Z**

[1] Version with holding brake possible with:
12th data position 0
14th data position A
15th data position A or B
16th data position 0, 3 or 6

[2] For definition see 1PH7 Configuration Manual.

[3] Preferred direction of air flow in a polluted environment.

[4] Only appropriate if oil spray or oil vapor is occasionally deposited on the sealing ring. A sealing ring is not possible for type of construction IM B3 (IM V5, IM V6) or version with increased maximum speed, version with belt or increased cantilever forces.

[5] 1PH718: n_{max} = 7000 rpm
1PH7224: n_{max} = 5500 rpm
Version possible for coupling output: 16th data position 0, 3 or 6.

1PH7 asynchronous motors
Forced ventilation, IP55 degree of protection

Order No. supplements for 1PH728 motors

Data position of the Order No.			1	2	3	4	5	6	7		8	9	10	11	12		13	14	15	16		
Shaft height 280			**1**	**P**	**H**	**7**	**2**	**8**	**.**	**–**	**.**	■	**.**	■	■	**–**	**0**	■	■	■	**–**	**Z**
Overall length[1]									**.**													
Fans[2]	Mounting	Direction of air flow																				
External fan	NDE top	NDE → DE									**0**											
External fan	NDE right	NDE → DE									**1**											
External fan	NDE left	NDE → DE									**2**											
External fan	DE top	DE → NDE									**3**											
External fan	DE right	DE → NDE									**4**											
External fan	DE left	DE → NDE									**5**											
Without external fan	NDE right for single pipe connection										**6**											
Encoder systems for motors without DRIVE-CLiQ interface																						
Without encoder												**A**										
Absolute encoder 2048 S/R, 4096 revolutions, multi-turn (encoder AM2048S/R)												**E**										
Incremental encoder HTL 1024 S/R (encoder HTL1024S/R)												**H**										
Incremental encoder HTL 2048 S/R (encoder HTL2048S/R)												**J**										
Incremental encoder sin/cos 1 V_{pp} 2048 S/R with C and D tracks (encoder IC2048S/R)												**M**										
Incremental encoder sin/cos 1 V_{pp} 2048 S/R without C and D tracks (encoder IN2048S/R)												**N**										
Encoder systems for motors with DRIVE-CLiQ interface																						
Absolute encoder 22 bit (resolution 4194304, internal 2048 S/R) + 12 bit multi-turn (traversing range 4096 revolutions) (encoder AM22DQ)												**F**										
Incremental encoder 22 bit (resolution 4194304, internal 2048 S/R) + commutation position 11 bit (encoder IC22DQ)												**D**										
Incremental encoder 22 bit without commutation position (encoder IN22DQ)												**Q**										
Rated speeds at 380 V to 480 V 3 AC (winding design)																						
500 rpm/600 rpm													**B**									
800 rpm/1000 rpm													**C**									
1150 rpm/1350 rpm													**D**									
1750 rpm/2000 rpm													**F**									
Rated speeds at 690 V 3 AC (winding design)																						
500 rpm	Order code **C30** required												**B**								**–**	**Z**
800 rpm	Order code **C30** required												**C**								**–**	**Z**
1150 rpm	Order code **C30** required												**D**								**–**	**Z**
1750 rpm	Order code **C30** required												**F**								**–**	**Z**
Cable connection (view of DE)																						
Terminal box	Cable entry	Signal connection																				
NDE right	Bottom	DE												**0**								
NDE left	Bottom	DE												**1**								
NDE top	Right	DE												**2**								
DE top	Right	NDE												**5**								

For 12th to 16th data position of the Order No., see page 5/75.

[1] Not selectable. Determined by the choice of rated power.
[2] See selection guides.

Order No. supplements for 1PH728 motors (continued)

Data position of the Order No.		1	2	3	4	5	6	7		8	9	10	11	12		13	14	15	16		
Shaft height 280		**1**	**P**	**H**	**7**	**2**	**8**	**.**	**–**	**.**	■	**.**	■	■	**–**	**0**	■	■	■	**–**	**Z**
Type of construction[1]																					
IM B3														**0**							
IM V5	Can be subsequently modified to IM V6.													**1**							
IM B35	With A660 flange													**3**							
IM V15	With A660 flange Can be subsequently modified to IM V35.													**5**							
Bearing version										**Vibration magnitude acc. to Siemens/EN 60034-14**[2]					**Shaft and flange accuracy**[2]						
Coupling										A						N		**A**			
Coupling										R/A						R		**B**			
Increased cantilever forces										A						N		**E**			
Increased cantilever forces										R/A						R		**F**			
Shaft extension DE										**Balancing**											
Fitted key										Half-key									**A**		
Fitted key										Full-key									**C**		
Plain shaft										–									**J**		
Paint finish																					
Primed																				**0**	
Anthracite RAL 7016																				**3**	
Special paint finish in anthracite RAL 7016																				**6**	
Special version (order codes are required for options)																					**Z**

[1] See technical definitions for AC motors in chapter Servomotors.
[2] For definition, see 1PH7 Configuration Manual

1PH7 asynchronous motors
Forced ventilation, IP55 degree of protection

Order No. supplements for 1PH728/1PL628 motors

Permissible combinations of mechanical variants – External fan, terminal box, type of construction and drive type

1PH728/1PL628 motors **Shaft height 280** Data position of Order No. 8. 9. 10. 11. 12. 13. 14. 15. 16. **1PH728 . - ■ . . ■ ■ - . ■ . .** **1PL628 . - ■ . . ■ ■ - . ■ . .**	**Permissible combinations of mechanical designs** **External fan** 8th data position of the Order No. **1PH728 . - ■ . . . . - . . . .** **1PL628 . - ■ . . . . - . . . .** Order No. supplement							
	0	**1**	**2**	**3**	**4**	**5**	**6**	
	NDE **top** NDE → DE	NDE **right** NDE → DE	NDE **left** NDE → DE	DE **top** DE → NDE	DE **right** DE → NDE	DE **left** DE → NDE	**Single pipe connection NDE right** (can be modified subsequently to NDE left)	
1P . . 28 . - . . . . 0 - . . . . Type of construction IM B3 **1PL628 . - . . . . 0 - . . . .**	■							
		■						
			■					
				■				
					■			
						■		
							■	
1PH728 . - . . . . 1 - . . . . Type of construction IM V5 (can be modified subsequently to IM V6) **1PL628 . - . . . . 1 - . . . .**	■							
		■						
			■					
				■				
					■			
						■		
							■	
1PH728 . - . . . . 3 - . . . . Type of construction IM B35 **1PL628 . - . . . . 3 - . . . .**	■							
		■						
			■					
				■				
					■			
						■		
							■	
1PH728 . - . . . . 5 - . . . . Type IM V15 (can be modified subsequently to IM V35) **1PL628 . - . . . . 5 - . . . .**	■							
		■						
			■					
				■				
					■			
						■		
							■	
Order codes for options								
G14 With air filter	■	■	■	■	■	■		
K08 Encoder connector mounted opposite								
K55 Cable entry plate, terminal box, customer-specific[1)]								
K83 Terminal box rotated through +90 degrees								
K84 Terminal box rotated through -90 degrees								
K85 Terminal box rotated through 180 degrees								
K16 Second standard shaft extension (only possible without encoder)								
Y55 Non-standard shaft extension DE								
M83 Additional thread for a setting screw on motor feet								

■ Standard design

■ Released supplementary versions

1) Plain text is required.

Terminal box 11th data position of the Order No. **1PH728 . - . . . ■ . - . . . .** **1PL628 . - . . . ■ . - . . . .** Order No. supplement			
0	**1**	**2**	**5**
NDE **right** Cable entry at bottom, encoder connector DE	NDE **left** Cable entry at bottom, encoder connector DE	NDE **top** Cable entry on right, encoder connector DE	DE **top** Cable entry on right, encoder connector NDE

Type of construction 12th data position of the Order No. **1PH728 . - . . . . ■ - . . . .** **1PL628 . - . . . . ■ - . . . .** Order No. supplement			
0	**1**	**3**	**5**
Type of construction **IM B3**	Type of construction **IM V5** (IM V6)	Type of construction **IM B35**	Type of construction **IM V15** (IM V35)

Drive type 14th data position in Order No. **1PH728 . - . . . . . - . ■ . .** **1PL628 . - . . . . . - . ■ . .** Order No. supplement			
A	**B**	**E**	**F**
Coupling N/N	**Coupling R/R**	**Belt/ Increased radial force N/N**	**Belt/ Increased radial force R/R**

Options

Order code	Description	For use with motors	
		1PH718 1PH722	1PH728
C30	Winding version 690 V 3 AC	–	✔
G14	Fan unit with air filter	✔	✔
G80	Prepared for mounting an incremental encoder POG 10	–	✔
K08	Signal connector mounted opposite	–	✔
K16	Second standard shaft extension (only possible without encoder)	–	✔
K31	2nd rating plate supplied separately in terminal box	✔	✔
K40	Re-lubrication device DE and NDE (not possible with bearings for increased maximum speed)	✔	Standard
K45	230 V AC standstill heating	–	✔
K55	Cable entry plate, terminal box, customer-specific[1)]	✔	✔
K83	Terminal box rotated through +90 degrees	–	✔
K84	Terminal box rotated through -90 degrees	–	✔
K85	Terminal box rotated through 180 degrees	–	✔
L27	NDE bearing in insulated version	✔ Only for 1PH718 Standard with 1PH722	Standard
M39	Version for zone 22 hazardous areas in accordance with EN 50281[2)]	✔	✔
M83	Additional thread for a setting screw on motor feet	–	✔
Y55	Non-standard shaft extension DE	On request	On request
Y80	Different rating plate data[1)]	On request	On request
Y82	Additional rating plate with customer data[1)]	On request	On request
	Primer or paint finish in anthracite RAL 7016	Standard	Standard
R1Y	Paint finish in other RAL color[3)]	✔	✔
R2Y	Special finish in other RAL color[3)]	✔	✔

✔ Option available
– Option not available

When ordering a motor with options, **-Z** should be added to the order number.

1) Plain text is required in addition to order code.
2) The general conditions and information in the declaration of conformity must be taken into account.. Declarations of conformity are available on request from your local Siemens sales office.
3) RAL color number must be specified in addition to order code.

Options (continued)

Ordering example

Selection criteria	Design	Structure of the order number
1PH7 motor	Shaft height 180	**1PH7184-. . . . . - . . . .**
Fan	External fan, PG cable gland in terminal box	**1PH7184-2. . . . - . . . .**
Encoder system	Incremental encoder sin/cos 1 V_{pp} 2048 S/R with C and D tracks (encoder IC2048S/R)	**1PH7184-2M. . .- . . . .**
Rated operating point	2900 rpm, 81 kW (109 HP), 265 Nm (196 lb_f-ft)	**1PH7184-2ML. . - . . . .**
Cable connection	Terminal box at top, cable entry NDE	**1PH7184-2ML2. - . . . .**
Type of construction	IM B3	**1PH7184-2ML20- . . . .**
Brake	Without holding brake	**1PH7184-2ML20-0. . .**
Bearing version	Coupling Vibration magnitude R/A Shaft and flange accuracy R	**1PH7184-2ML20-0B. .**
Shaft extension DE Balancing Air direction	Fitted key Half-key DE → NDE	**1PH7184-2ML20-0BA.**
Paint finish	Primed	**1PH7184-2ML20-0BA0**
Options		**1PH7184-2ML20-0BA0-Z**
	Fan unit with air filter	**1PH7184-2ML20-0BA0-Z G14**
	Paint finish in other RAL color pearl white	**1PH7184-2ML20-0BA0-Z G14+R1Y RAL1013**

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1PL6 asynchronous motors
Forced ventilation, IP23 degree of protection

Overview

1PL6 motors, shaft heights 180 to 225

1PL6 motors, shaft height 280

The 1PL6 AC motors are compact, force-ventilated or enclosed-ventilated squirrel-cage asynchronous motors with degree of protection IP23. The motors are ventilated using a mounted external fan unit.

The motor can be ordered either with the air flow from the motor drive end (DE) to the motor non-drive end (NDE) - or vice versa.

Depending on the control requirements, the appropriate encoder systems are available for the motors. These encoders are used to sense the motor speed and indirect position.

The motors comply with DIN standards and have degree of protection IP23 in accordance with EN 60034-5 (IEC 60034-5).

Benefits

- Extremely high power density with small motor dimensions (50 to 60 % higher output as compared to 1PH7 in degree of protection IP55)
- Speed down to zero without reducing the torque
- Ruggedness
- Essentially maintenance-free
- Bearings for high cantilever load
- High rotational accuracy, even at the lowest speeds
- Integrated encoder system to sense the motor speed, connected using a connector or DRIVE-CLiQ interface
- Terminal box to connect the power cables
- Motor temperature monitoring with KTY84
- Various types of cooling systems
- Basic external cooling using a pipe connection
- Optional bearing versions with re-lubrication device and insulated bearings (NDE)

Application

Crane systems:
- Hoisting and closing gears for cranes

Printing industry:
- Main drives for printing machines

Manufacture of rubber, plastic and wire:
- Drives for extruders, calenders, rubber injection machines, foil machines, fleece plants
- Wire-drawing machines, cable-stranding machines, etc.

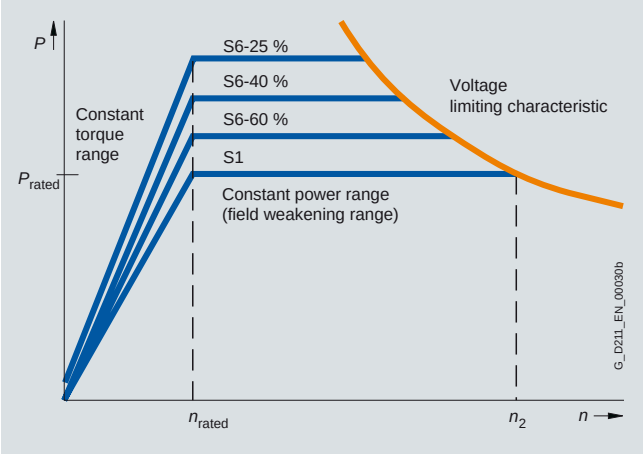
General applications such as coiler and winder drives.

The 1PL6 motors are suitable for installation in dry indoor areas without corrosive atmospheres.

Technical specifications

1PL6 motor	
Insulation of the stator winding in accordance with EN 60034-1 (IEC 60034-1)	Temperature class 155 (F) for a coolant temperature of up to 40 °C (104°F)
Cooling in accordance with EN 60034-6 (IEC 60034-6)	
• 1PL618/1PL622	Forced ventilation and enclosed ventilation Fan mounted axially at NDE
• 1PL628	Forced ventilation, the fan is mounted radially at the NDE
Temperature monitoring	Temperature sensor KTY84 in the stator winding
• 1PL628	1 additional KTY84 as reserve
Motor fan ratings	400 V 3 AC 50/60 Hz 480 V 3 AC 60 Hz
Type of construction in accordance with EN 60034-7 (IEC 60034-7)	IM B3, IM B35
Degree of protection in accordance with EN 60034-5 (IEC 60034-5)	IP23
Shaft extension on the drive end in accordance with DIN 748-3 (IEC 60072-1)	With fitted key, half-key/full-key balancing
Shaft and flange accuracy in accordance with DIN 42955 (IEC 60072-1)[1)]	Tolerance N/Tolerance R
Vibration magnitude in accordance with Siemens/EN 60034-14 (IEC 60034-14)	
• 1PL618/1PL622 • 1PL628	Grade R/A, grade S/A, grade SR/A Grade A, grade R/A
Sound pressure level L_{pA} (1 m) in accordance with EN ISO 1680, max. Tolerance + 3 dB	Sound pressure level as a function of the air-flow direction
Connection	Connector for signals (mating connector not supplied) Terminal box for power
• 1PL618/1PL622 • 1PL628	Terminal box at top terminal box NDE right
Paint finish	Primed anthracite RAL 7016

Characteristic curves



Typical speed/power characteristic for 1PL6 motors

5

[1)] Shaft extension run-out, concentricity of centering ring and shaft and perpendicularity of flange to shaft.

1PL6 asynchronous motors
Forced ventilation, IP23 degree of protection

Selection and ordering data

Rated speed	Shaft height	Rated power	Rated torque	Rated current	Rated voltage	Speed during field weakening[1]	Continuous speed, max.[2]	Speed, max.[3]	1PL6 asynchronous motor Forced ventilation
n_{rated}	SH	P_{rated}	M_{rated}	I_{rated}	U_{rated}	n_2	n_{S1}	n_{max}	
rpm		kW (HP)	Nm (lb_f-ft)	A	V	rpm	rpm	rpm	Order No.
Line voltage 400 V 3 AC, Smart/Basic Line Module									
400	180	20.5 (27.5)	489 (361)	58	290	1500	3500[4)5)]	5000[5)]	**1PL6184-■■B■■-0…**
		30.5 (40.9)	728 (537)	87	290	1600	3500[4)5)]	5000[5)]	**1PL6186-■■B■■-0…**
	225	40 (53.6)	955 (704)	105	296	1400	3100[4)5)]	4500[5)]	**1PL6224-■■B■■-0…**
		57 (76.4)	1361 (1004)	145	305	1400	3100[4)5)]	4500[5)]	**1PL6226-■■B■■-0…**
		72 (96.6)	1719 (1268)	181	305	1300	3100[4)5)]	4500[4)5)]	**1PL6228-■■B■■-0…**
1000	180	57 (76.4)	544 (401)	122	345	2100	3500[4)]	5000	**1PL6184-■■D■■-0…**
		74 (99.2)	707 (522)	157	345	2400	3500[4)]	5000	**1PL6186-■■D■■-0…**
	225	105 (141)	1003 (740)	220	345	2500	3100[4)]	4500	**1PL6224-■■D■■-0…**
		135 (181)	1289 (951)	278	345	2200	3100[4)]	4500	**1PL6226-■■D■■-0…**
		165 (221)	1576 (1163)	331	348	2200	3100[4)]	4500[4)]	**1PL6228-■■D■■-0…**
1500	180	76 (102)	484 (357)	165	345	4000	3500[4)]	5000	**1PL6184-■■F■■-0…**
		108 (145)	688 (508)	233	340	4000	3500[4)]	5000	**1PL6186-■■F■■-0…**
	225	142 (190)	904 (667)	292	345	2900	3100[4)]	4500	**1PL6224-■■F■■-0…**
		175 (235)	1114 (822)	356	345	2900	3100[4)]	4500	**1PL6226-■■F■■-0…**
		230 (308)	1465 (1081)	468	345	2900	3100[4)]	4500[4)]	**1PL6228-■■F■■-0…**
2500	180	100 (134)	382 (282)	208	345	5000	3500[4)]	5000	**1PL6184-■■L■■-0…**
		130 (174)	497 (367)	275	340	5000	3500[4)]	5000	**1PL6186-■■L■■-0…**
	225	178 (239)	680 (502)	358	345	3500	3100[4)]	4500	**1PL6224-■■L■■-0…**
		235 (315)	698 (515)	476	340	3500	3100[4)]	4500	**1PL6226-■■L■■-0…**
		265 (355)	1013 (747)	535	345	3500	3100[4)]	4500[4)]	**1PL6228-■■L■■-0…**

For versions, see Order No. supplement and options on page 5/90.

Motor type (repeated)	Power factor	Magnetizing current	Efficiency	Rated frequency	Moment of inertia	Weight, approx.	Terminal box	SINAMICS S120 Motor Module	
								Rated output current[6]	For additional versions and components see chapter SINAMICS S120 drive system
	$\cos \varphi$	I_μ	η_{rated}	f_{rated}	J			I_{rated}	
		A		Hz	kgm^2 (lb$_f$-in-s^2)	kg (lb)	Type	A	Order No.
1PL6184-..B...	0.84	33.4	0.820	14.2	0.503 (4.45)	370 (816)	1XB7322	60	**6SL3120-1TE26-0AA3**
1PL6186-..B...	0.84	48.6	0.828	14.1	0.666 (5.89)	440 (970)	1XB7322	85[7]	**6SL3120-1TE28-5AA3**
1PL6224-..B...	0.86	45.8	0.864	14	1.479 (13.1)	630 (1389)	1XB7322	132	**6SL3120-1TE31-3AA3**
1PL6226-..B...	0.85	67	0.868	14	1.930 (17.1)	750 (1654)	1XB7322	200	**6SL3120-1TE32-0AA3**
1PL6228-..B...	0.86	77	0.871	14.1	2.326 (20.6)	860 (1896)	1XB7322	200	**6SL3120-1TE32-0AA3**
1PL6184-..D...	0.87	45	0.897	34.4	0.503 (4.45)	370 (816)	1XB7322	132	**6SL3120-1TE31-3AA3**
1PL6186-..D...	0.86	61	0.907	34.3	0.666 (5.89)	440 (970)	1XB7322	200	**6SL3120-1TE32-0AA3**
1PL6224-..D...	0.86	86	0.927	34.5	1.479 (13.1)	630 (1389)	1XB7422	210[7]	**6SL3320-1TE32-1AA3**
1PL6226-..D...	0.88	90	0.927	31.1	1.930 (17.1)	750 (1654)	1XB7700	310	**6SL3320-1TE33-1AA3**
1PL6228-..D...	0.89	103	0.928	34.2	2.326 (20.6)	860 (1896)	1XB7700	380	**6SL3320-1TE33-8AA3**
1PL6184-..F...	0.84	70	0.924	50.9	0.503 (4.45)	370 (816)	1XB7322	200	**6SL3120-1TE32-0AA3**
1PL6186-..F...	0.85	91	0.930	50.9	0.666 (5.89)	440 (970)	1XB7422	260	**6SL3320-1TE32-1AA3**
1PL6224-..F...	0.87	91	0.940	50.9	1.479 (13.1)	630 (1389)	1XB7700	310	**6SL3320-1TE33-1AA3**
1PL6226-..F...	0.87	125	0.944	50.7	1.930 (17.1)	750 (1654)	1XB7700	380	**6SL3320-1TE33-8AA3**
1PL6228-..F...	0.86	177	0.947	50.7	2.326 (20.6)	860 (1896)	1XB7700	490	**6SL3320-1TE35-0AA3**
1PL6184-..L...	0.86	80	0.936	84.2	0.503 (4.45)	370 (816)	1XB7422	210	**6SL3320-1TE32-1AA3**
1PL6186-..L...	0.85	113	0.943	84.1	0.666 (5.89)	440 (970)	1XB7700	310	**6SL3320-1TE33-1AA3**
1PL6224-..L...	0.87	119	0.950	84.1	1.479 (13.1)	630 (1389)	1XB7700	380	**6SL3320-1TE33-8AA3**
1PL6226-..L...	0.88	157	0.953	84	1.930 (17.1)	750 (1654)	1XB7700	490	**6SL3320-1TE35-0AA3**
1PL6228-..L...	0.87	189	0.952	84	2.326 (20.6)	860 (1896)	1XB7700	745	**6SL3320-1TE37-5AA3**

1) n_2: Max. permissible thermal speed at constant power or speed which is at the voltage limit when $P = P_{rated}$.
2) n_{S1}: Maximum permissible speed that is continuously permitted without speed duty cycles.
3) n_{max}: Maximum speed that must not be exceeded.
4) Speed is reduced with increased radial forces, see selection guides.
5) The speed is limited to lower values in some cases. The following restriction applies: Maximum output frequency < 5 × motor rated frequency.
6) The rated pulse frequencies must be taken into account. The rated motor data is valid for 4 kHz or 2 kHz.
7) The rated output current of the Motor Module is lower than the motor rated current.

1PL6 asynchronous motors
Forced ventilation, IP23 degree of protection

Selection and ordering data

Rated speed	Shaft height	Rated power	Rated torque	Rated current	Rated voltage	Speed during field weakening[1]	Continuous speed, max.[2]	Speed, max.[3]	1PL6 asynchronous motor Forced ventilation
n_{rated}	SH	P_{rated}	M_{rated}	I_{rated}	U_{rated}	n_2	n_{S1}	n_{max}	
rpm		kW (HP)	Nm (lb_f-ft)	A	V	rpm	rpm	rpm	Order No.
Line voltage 400 V 3 AC, Active Line Module									
400	180	24.5 (32.9)	585 (432)	69	300	1700	3500[4][5]	5000[5]	**1PL6184-■■B■■-0…**
		31.5 (42.2)	752 (555)	90	290	1900	3500[4][5]	5000[5]	**1PL6186-■■B■■-0…**
	225	45 (60.4)	1074 (792)	117	300	1600	3100[4][5]	4500[5]	**1PL6224-■■B■■-0…**
		57 (76.4)	1361 (1004)	145	305	1800	3100[4][5]	4500[5]	**1PL6226-■■B■■-0…**
		72 (96.6)	1719 (1268)	181	305	1800	3100[4][5]	4500[4][5]	**1PL6228-■■B■■-0…**
800	280	195 (262)	2328 (1717)	335	400	1700	2200	3300	**1PL6284-■■C■■-0…**
		250 (335)	2984 (2201)	440	385	1900	2200	3300	**1PL6286-■■C■■-0…**
		310 (416)	3701 (2730)	570	370	2200	2200	3300	**1PL6288-■■C■■-0…**
1150	180	65 (87.2)	540 (398)	121	400	2500	3500[4]	5000	**1PL6184-■■D■■-0…**
		85 (114)	706 (521)	158	400	2700	3500[4]	5000	**1PL6186-■■D■■-0…**
	225	120 (161)	997 (735)	218	400	2800	3100[4]	4500	**1PL6224-■■D■■-0…**
		155 (208)	1287 (949)	275	400	2600	3100[4]	4500	**1PL6226-■■D■■-0…**
		190 (255)	1578 (1164)	334	400	2500	3100[4]	4500[4]	**1PL6228-■■D■■-0…**
	280	280 (375)	2325 (1715)	478	400	2200	2200	3300	**1PL6284-■■D■■-0…**
		355 (476)	2944 (2172)	637	380	2200	2200	3300	**1PL6286-■■D■■-0…**
		435 (583)	3607 (2688)	765	385	2200	2200	3300	**1PL6288-■■D■■-0…**
1750	180	89 (119)	486 (359)	166	400	4500	3500[4]	5000	**1PL6184-■■F■■-0…**
		125 (168)	682 (503)	231	400	4500	3500[4]	5000	**1PL6186-■■F■■-0…**
	225	165 (221)	900 (664)	292	400	2900	3100[4]	4500	**1PL6224-■■F■■-0…**
		200 (268)	1091 (805)	350	400	2900	3100[4]	4500	**1PL6226-■■F■■-0…**
		265 (355)	1446 (1067)	470	400	2900	3100[4]	4500[4]	**1PL6228-■■F■■-0…**
	280	370 (496)	2019 (1489)	616	400	2200	2200	3300	**1PL6284-■■F■■-0…**
		445 (597)	2429 (1792)	736	400	2200	2200	3300	**1PL6286-■■F■■-0…**
		560 (751)	3055 (2253)	924	400	2200	2200	3300	**1PL6288-■■F■■-0…**
2900	180	113 (152)	372 (274)	209	400	5000	3500[4]	5000	**1PL6184-■■L■■-0…**
		150 (201)	494 (364)	280	390	5000	3500[4]	5000	**1PL6186-■■L■■-0…**
	225	205 (275)	675 (498)	365	400	3500	3100[4]	4500	**1PL6224-■■L■■-0…**
		270 (362)	889 (656)	470	400	3500	3100[4]	4500	**1PL6226-■■L■■-0…**
		300 (402)	988 (729)	530	400	3500	3100[4]	4500[4]	**1PL6228-■■L■■-0…**

For versions, see Order No. supplement and options on page 5/90.

Motor type (repeated)	Power factor	Magnetizing current	Efficiency	Rated frequency	Moment of inertia	Weight, approx.	Terminal box	SINAMICS S120 Motor Module	
								Rated output current[6]	For additional versions and components see chapter SINAMICS S120 drive system
	$\cos \varphi$	I_μ	η_{rated}	f_{rated}	J			I_{rated}	
		A		Hz	kgm^2 (lb$_f$-in-s^2)	kg (lb)	Type	A	Order No.
1PL6184-..B...	0.86	33	0.800	14.4	0.503 (4.45)	370 (816)	1XB7322	85	**6SL3120-1TE28-5AA3**
1PL6186-..B...	0.85	47	0.814	14.3	0.666 (5.89)	440 (970)	1XB7322	85[7]	**6SL3120-1TE28-5AA3**
1PL6224-..B...	0.87	45	0.844	14.2	1.479 (13.1)	630 (1389)	1XB7322	132	**6SL3120-1TE31-3AA3**
1PL6226-..B...	0.85	67	0.868	14.0	1.930 (17.1)	750 (1654)	1XB7322	200	**6SL3120-1TE32-0AA3**
1PL6228-..B...	0.86	77	0.871	14.0	2.326 (20.6)	860 (1896)	1XB7322	200	**6SL3120-1TE32-0AA3**
1PL6284-..C...	0.90	95	0.929	27.3	4.2 (37.2)	1300 (2867)	1XB7712	380	**6SL3320-1TE33-8AA3**
1PL6286-..C...	0.90	135	0.934	27.3	5.2 (46.0)	1500 (3308)	1XB7712	490	**6SL3320-1TE35-0AA3**
1PL6288-..C...	0.90	170	0.939	27.3	6.3 (55.8)	1700 (3749)	1XB7712	745	**6SL3320-1TE37-5AA3**
1PL6184-..D...	0.86	46	0.906	39.4	0.503 (4.45)	370 (816)	1XB7322	132	**6SL3120-1TE31-3AA3**
1PL6186-..D...	0.86	62	0.910	39.4	0.666 (5.89)	440 (970)	1XB7322	200	**6SL3120-1TE32-0AA3**
1PL6224-..D...	0.85	86	0.930	39.1	1.479 (13.1)	630 (1389)	1XB7422	260	**6SL3320-1TE32-6AA3**
1PL6226-..D...	0.87	92	0.930	39.2	1.930 (17.1)	750 (1654)	1XB7700	310	**6SL3320-1TE33-1AA3**
1PL6228-..D...	0.88	102	0.931	39.2	2.326 (20.6)	860 (1896)	1XB7700	380	**6SL3320-1TE33-8AA3**
1PL6284-..D...	0.89	156	0.950	38.9	4.2 (37.2)	1300 (2867)	1XB7712	490	**6SL3320-1TE35-0AA3**
1PL6286-..D...	0.89	214	0.953	38.9	5.2 (46.0)	1500 (3308)	1XB7712	840	**6SL3320-1TE38-4AA3**
1PL6288-..D...	0.89	248	0.955	38.9	6.3 (55.8)	1700 (3749)	1XB7712	985	**6SL3320-1TE41-0AA3**
1PL6184-..F...	0.84	68	0.921	59.3	0.503 (4.45)	370 (816)	1XB7322	200	**6SL3120-1TE32-0AA3**
1PL6186-..F...	0.84	92	0.935	59.3	0.666 (5.89)	440 (970)	1XB7422	260	**6SL3320-1TE32-6AA3**
1PL6224-..F...	0.87	90	0.942	59.2	1.479 (13.1)	630 (1389)	1XB7700	310	**6SL3320-1TE33-1AA3**
1PL6226-..F...	0.87	122	0.942	59.1	1.930 (17.1)	750 (1654)	1XB7700	380	**6SL3320-1TE33-8AA3**
1PL6228-..F...	0.86	174	0.948	59.0	2.326 (20.6)	860 (1896)	1XB7700	490	**6SL3320-1TE35-0AA3**
1PL6284-..F...	0.90	162	0.959	59.0	4.2 (37.2)	1300 (2867)	1XB7712	745	**6SL3320-1TE37-5AA3**
1PL6286-..F...	0.91	182	0.960	59.0	5.2 (46.0)	1500 (3308)	1XB7712	840[7]	**6SL3320-1TE38-4AA3**
1PL6288-..F...	0.91	232	0.962	59.0	6.3 (55.8)	1700 (3749)	1XB7712	1260	**6SL3320-1TE41-2AA3**
1PL6184-..L...	0.85	79	0.938	97.6	0.503 (4.45)	370 (816)	1XB7422	210	**6SL3320-1TE32-1AA3**
1PL6186-..L...	0.84	110	0.943	97.5	0.666 (5.89)	440 (970)	1XB7700	310	**6SL3320-1TE33-1AA3**
1PL6224-..L...	0.86	118	0.950	97.5	1.479 (13.1)	630 (1389)	1XB7700	380	**6SL3320-1TE33-8AA3**
1PL6226-..L...	0.87	160	0.952	97.4	1.930 (17.1)	750 (1654)	1XB7700	490	**6SL3320-1TE35-0AA3**
1PL6228-..L...	0.86	188	0.952	97.3	2.326 (20.6)	860 (1896)	1XB7700	745	**6SL3320-1TE37-5AA3**

1) n_2: Max. permissible thermal speed at constant power or speed which is at the voltage limit when $P = P_{rated}$.
2) n_{S1}: Maximum permissible speed that is continuously permitted without speed duty cycles.
3) n_{max}: Maximum speed that must not be exceeded.
4) Speed is reduced with increased radial forces, see selection guides.
5) The speed is limited to lower values in some cases. The following restriction applies: Maximum output frequency < 5 × motor rated frequency.
6) The rated pulse frequencies must be taken into account. The rated motor data is valid for 4 kHz or 2 kHz.
7) The rated output current of the Motor Module is lower than the rated motor current at 2 kHz.

1PL6 asynchronous motors
Forced ventilation, IP23 degree of protection

Selection and ordering data

Rated speed	Shaft height	Rated power	Rated torque	Rated current	Rated voltage	Speed during field weakening[1]	Continuous speed, max.[2]	Speed, max.[3]	1PL6 asynchronous motor Forced ventilation
n_{rated}	SH	P_{rated}	M_{rated}	I_{rated}	U_{rated}	n_2	n_{S1}	n_{max}	
rpm		kW (HP)	Nm (lb_f-ft)	A	V	rpm	rpm	rpm	Order No.
Line voltage 480 V 3 AC, Smart/Basic/Active Line Module									
500	180	30 (40.2)	573 (423)	66	370	1900	3500[4)5)]	5000[5)]	**1PL6184-■■B■■-0…**
		40 (53.6)	764 (564)	91	355	2000	3500[4)5)]	5000[5)]	**1PL6186-■■B■■-0…**
	225	55 (73.8)	1050 (774)	114	370	1800	3100[4)5)]	4500[5)]	**1PL6224-■■B■■-0…**
		72 (96.6)	1375 (1014)	147	375	2000	3100[4)5)]	4500[5)]	**1PL6226-■■B■■-0…**
		90 (121)	1719 (1268)	180	380	1900	3100[4)5)]	4500[4)5)]	**1PL6228-■■B■■-0…**
1000	280	235 (315)	2244 (1655)	335	480	2200	2200	3300	**1PL6284-■■C■■-0…**
		310 (416)	2961 (2184)	440	480	2200	2200	3300	**1PL6286-■■C■■-0…**
		385 (516)	3677 (2712)	570	460	2200	2200	3300	**1PL6288-■■C■■-0…**
1350	180	74 (99.2)	523 (386)	119	460	3000	3500[4)]	5000	**1PL6184-■■D■■-0…**
		98 (131)	693 (511)	156	460	3100	3500[4)]	5000	**1PL6186-■■D■■-0…**
	225	137 (184)	969 (715)	215	460	2900	3100[4)]	4500	**1PL6224-■■D■■-0…**
		172 (231)	1217 (898)	265	460	2900	3100[4)]	4500	**1PL6226-■■D■■-0…**
		218 (292)	1542 (1137)	332	460	2900	3100[4)]	4500[4)]	**1PL6228-■■D■■-0…**
	280	325 (436)	2299 (1696)	478	470	2200	2200	3300	**1PL6284-■■D■■-0…**
		410 (550)	2901 (2140)	637	445	2200	2200	3300	**1PL6286-■■D■■-0…**
		505 (677)	3573 (2635)	765	450	2200	2200	3300	**1PL6288-■■D■■-0…**
2000	180	98 (131)	468 (345)	161	460	5000	3500[4)]	5000	**1PL6184-■■F■■-0…**
		135 (181)	645 (476)	220	460	5000	3500[4)]	5000	**1PL6186-■■F■■-0…**
	225	178 (239)	850 (627)	275	460	2900	3100[4)]	4500	**1PL6224-■■F■■-0…**
		220 (295)	1050 (774)	342	460	2900	3100[4)]	4500	**1PL6226-■■F■■-0…**
		288 (386)	1375 (1014)	450	460	2900	3100[4)]	4500[4)]	**1PL6228-■■F■■-0…**
	280	415 (557)	1981 (1461)	616	455	2200	2200	3300	**1PL6284-■■F■■-0…**
		500 (671)	2387 (1761)	736	455	2200	2200	3300	**1PL6286-■■F■■-0…**
		630 (845)	3009 (2219)	924	455	2200	2200	3300	**1PL6288-■■F■■-0…**
2900	180	113 (152)	372 (274)	209	400	5000	3500[4)]	5000	**1PL6184-■■L■■-0…**
		150 (201)	494 (364)	280	390	5000	3500[4)]	5000	**1PL6186-■■L■■-0…**
	225	205 (275)	675 (498)	365	400	3500	3100[4)]	4500	**1PL6224-■■L■■-0…**
		270 (362)	889 (656)	470	395	3500	3100[4)]	4500	**1PL6226-■■L■■-0…**
		300 (402)	988 (729)	530	400	3500	3100[4)]	4500[4)]	**1PL6228-■■L■■-0…**

For versions, see Order No. supplement and options on page 5/90.

Motor type (repeated)	Power factor	Magnetizing current	Efficiency	Rated frequency	Moment of inertia	Weight, approx.	Terminal box	SINAMICS S120 Motor Module	
								Rated output current[6]	For additional versions and components see chapter SINAMICS S120 drive system
	$\cos \varphi$	I_μ	η_{rated}	f_{rated}	J			I_{rated}	
		A		Hz	kgm^2 (lb$_f$-in-s^2)	kg (lb)	Type	A	Order No.
1PL6184-..B...	0.84	34	0.844	17.6	0.503 (4.45)	370 (816)	1XB7322	85	**6SL3120-1TE28-5AA3**
1PL6186-..B...	0.84	46	0.845	17.6	0.666 (5.89)	440 (970)	1XB7322	132	**6SL3120-1TE31-3AA3**
1PL6224-..B...	0.86	46	0.875	17.5	1.479 (13.1)	630 (1389)	1XB7322	132	**6SL3120-1TE31-3AA3**
1PL6226-..B...	0.85	66	0.887	17.4	1.930 (17.1)	750 (1654)	1XB7322	200	**6SL3120-1TE32-0AA3**
1PL6228-..B...	0.85	79	0.894	17.4	2.326 (20.6)	860 (1896)	1XB7322	200	**6SL3120-1TE32-0AA3**
1PL6284-..C...	0.90	90	0.939	34.0	4.2 (37.2)	1300 (2867)	1XB7712	380	**6SL3320-1TE33-8AA3**
1PL6286-..C...	0.90	135	0.945	34.0	5.2 (46.0)	1500 (3308)	1XB7712	490	**6SL3320-1TE35-0AA3**
1PL6288-..C...	0.90	170	0.948	34.0	6.3 (55.8)	1700 (3749)	1XB7712	745	**6SL3320-1TE37-5AA3**
1PL6184-..D...	0.86	44	0.918	46.1	0.503 (4.45)	370 (816)	1XB7322	132	**6SL3120-1TE31-3AA3**
1PL6186-..D...	0.85	60	0.920	46.0	0.666 (5.89)	440 (970)	1XB7322	200	**6SL3120-1TE32-0AA3**
1PL6224-..D...	0.85	82	0.940	45.8	1.479 (13.1)	630 (1389)	1XB7422	210[7]	**6SL3320-1TE32-1AA3**
1PL6226-..D...	0.87	88	0.940	45.8	1.930 (17.1)	750 (1654)	1XB7700	260[7]	**6SL3320-1TE32-6AA3**
1PL6228-..D...	0.88	100	0.938	45.8	2.326 (20.6)	860 (1896)	1XB7700	380	**6SL3320-1TE33-8AA3**
1PL6284-..D...	0.89	157	0.955	45.5	4.2 (37.2)	1300 (2867)	1XB7712	490	**6SL3320-1TE35-0AA3**
1PL6286-..D...	0.89	215	0.957	45.5	5.2 (46.0)	1500 (3308)	1XB7712	840	**6SL3320-1TE38-4AA3**
1PL6288-..D...	0.89	248	0.959	45.5	6.3 (55.8)	1700 (3749)	1XB7712	985	**6SL3320-1TE41-0AA3**
1PL6184-..F...	0.83	70	0.934	67.5	0.503 (4.45)	370 (816)	1XB7322	200	**6SL3120-1TE32-0AA3**
1PL6186-..F...	0.83	94	0.940	67.5	0.666 (5.89)	440 (970)	1XB7422	260	**6SL3320-1TE32-6AA3**
1PL6224-..F...	0.86	91	0.944	67.5	1.479 (13.1)	630 (1389)	1XB7700	310	**6SL3320-1TE33-1AA3**
1PL6226-..F...	0.86	124	0.948	67.5	1.930 (17.1)	750 (1654)	1XB7700	380	**6SL3320-1TE33-8AA3**
1PL6228-..F...	0.85	176	0.948	67.3	2.326 (20.6)	860 (1896)	1XB7700	490	**6SL3320-1TE35-0AA3**
1PL6284-..F...	0.90	161	0.961	67.3	4.2 (37.2)	1300 (2867)	1XB7712	745	**6SL3320-1TE37-5AA3**
1PL6286-..F...	0.91	181	0.963	67.3	5.2 (46.0)	1500 (3308)	1XB7712	840[7]	**6SL3320-1TE38-4AA3**
1PL6288-..F...	0.91	231	0.965	67.3	6.3 (55.8)	1700 (3749)	1XB7712	1260	**6SL3320-1TE41-2AA3**
1PL6184-..L...	0.85	79	0.938	97.6	0.503 (4.45)	370 (816)	1XB7422	210	**6SL3320-1TE32-1AA3**
1PL6186-..L...	0.84	110	0.943	97.5	0.666 (5.89)	440 (970)	1XB7700	310	**6SL3320-1TE33-1AA3**
1PL6224-..L...	0.86	118	0.950	97.5	1.479 (13.1)	630 (1389)	1XB7700	380	**6SL3320-1TE33-8AA3**
1PL6226-..L...	0.87	160	0.952	97.4	1.930 (17.1)	750 (1654)	1XB7700	490	**6SL3320-1TE35-0AA3**
1PL6228-..L...	0.86	188	0.952	97.3	2.326 (20.6)	860 (1896)	1XB7700	745	**6SL3320-1TE37-5AA3**

1) n_2: Max. permissible thermal speed at constant power or speed which is at the voltage limit when $P = P_{rated}$.
2) n_{S1}: Maximum permissible speed that is continuously permitted without speed duty cycles.
3) n_{max}: Maximum speed that must not be exceeded.
4) Speed is reduced with increased radial forces, see selection guides.
5) The speed is limited to lower values in some cases. The following restriction applies: Maximum output frequency < 5 × motor rated frequency.
6) The rated pulse frequencies must be taken into account. The rated motor data is valid for 4 kHz or 2 kHz.
7) The rated output current of the Motor Module is lower than the rated motor current at 2 kHz.

1PL6 asynchronous motors
Forced ventilation, IP23 degree of protection

Selection and ordering data

Rated speed	Shaft height	Rated power	Rated torque	Rated current	Rated voltage	Speed during field weakening[1]	Continuous speed, max.[2]	Speed, max.[3]	1PL6 asynchronous motor Forced ventilation	
n_{rated}	SH	P_{rated}	M_{rated}	I_{rated}	U_{rated}	n_2	n_{S1}	n_{max}		Order code
rpm		kW (HP)	Nm (lb_f-ft)	A	V	rpm	rpm	rpm	Order No.	
Line voltage 690 V 3 AC, Active Line Module										
800	280	185 (248)	2208 (1629)	185	690	2000	2200	3300	**1PL6284- ■■ C ■■ - 0 … -Z**	**C30**
		240 (322)	2865 (2113)	250	665	2100	2200	3300	**1PL6286- ■■ C ■■ - 0 … -Z**	**C30**
		300 (402)	3581 (2641)	320	640	2200	2200	3300	**1PL6288- ■■ C ■■ - 0 … -Z**	**C30**
1150	280	272 (365)	2259 (1666)	270	690	2200	2200	3300	**1PL6284- ■■ D ■■ - 0 … -Z**	**C30**
		344 (461)	2857 (2107)	359	655	2200	2200	3300	**1PL6286- ■■ D ■■ - 0 … -Z**	**C30**
		422 (566)	3504 (2585)	431	665	2200	2200	3300	**1PL6288- ■■ D ■■ - 0 … -Z**	**C30**
1750	280	359 (481)	1959 (1445)	347	690	2200	2200	3300	**1PL6284- ■■ F ■■ - 0 … -Z**	**C30**
		432 (579)	2357 (1739)	415	690	2200	2200	3300	**1PL6286- ■■ F ■■ - 0 … -Z**	**C30**
		543 (728)	2963 (2186)	520	690	2200	2200	3300	**1PL6288- ■■ F ■■ - 0 … -Z**	**C30**

For versions, see Order No. supplement and options on page 5/92.

Motor type (repeated)	Power factor	Magnetizing current	Efficiency	Rated frequency	Moment of inertia	Weight, approx.	Terminal box	SINAMICS S120 Motor Module	
								Rated output current[4]	For additional versions and components see chapter SINAMICS S120 drive system
	$\cos \varphi$	I_μ	η_{rated}	f_{rated}	J			I_{rated}	
		A		Hz	kgm^2 (lb$_f$-in-s^2)	kg (lb)	Type	A	Order No.
1PL6284-..C...	0.90	55	0.928	27	4.2 (37.2)	1300 (2867)	1XB7712	215	**6SL3320-1TG32-2AA3**
1PL6286-..C...	0.90	80	0.934	27	5.2 (46.0)	1500 (3308)	1XB7712	330	**6SL3320-1TG33-3AA3**
1PL6288-..C...	0.90	100	0.938	27	6.3 (55.8)	1700 (3749)	1XB7712	410	**6SL3320-1TG34-1AA3**
1PL6284-..D...	0.89	89	0.949	38.9	4.2 (37.2)	1300 (2867)	1XB7712	330	**6SL3320-1TG33-3AA3**
1PL6286-..D...	0.89	123	0.953	38.9	5.2 (46.0)	1500 (3308)	1XB7712	410	**6SL3320-1TG34-1AA3**
1PL6288-..D...	0.89	143	0.955	38.9	6.3 (55.8)	1700 (3749)	1XB7712	465[5]	**6SL3320-1TG34-7AA3**
1PL6284-..F...	0.90	93	0.958	59	4.2 (37.2)	1300 (2867)	1XB7712	410	**6SL3320-1TG34-1AA3**
1PL6286-..F...	0.91	105	0.960	59	5.2 (46.0)	1500 (3308)	1XB7712	465	**6SL3320-1TG34-7AA3**
1PL6288-..F...	0.91	133	0.962	59	6.3 (55.8)	1700 (3749)	1XB7712	575	**6SL3320-1TG35-8AA3**

1) n_2: Max. permissible thermal speed at constant power or speed which is at the voltage limit when $P = P_{rated}$.
2) n_{S1}: Maximum permissible speed that is continuously permitted without speed duty cycles.
3) n_{max}: Maximum speed that must not be exceeded.
4) The rated pulse frequencies must be taken into account. The rated motor data is valid for 4 kHz or 2 kHz.
5) The rated output current of the Motor Module is lower than the rated motor current at 2 kHz.

1PL6 asynchronous motors
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Order No. supplements for 1PL618/1PL622 motors

Data position of the Order No.	1	2	3	4	5	6	7		8	9	10	11	12		13	14	15	16		
Shaft height 180	**1**	**P**	**L**	**6**	**1**	**8**	**.**	**–**	**.**	■	**.**	■	■	**–**	**0**	■	■	■	**–**	**Z**
Shaft height 225	**1**	**P**	**L**	**6**	**2**	**2**	**.**													
Overall length[1]							**.**													
Fan																				
External fan, PG cable gland in terminal box									**2**											
Without external fan, for pipe connection, PG cable gland in terminal box									**6**											
External fan, metric cable gland in terminal box									**7**											
Without external fan, for pipe connection, metric cable gland in terminal box									**8**											
Encoder systems for motors without DRIVE-CLiQ interface																				
Without encoder										**A**										
Absolute encoder 2048 S/R, 4096 revolutions, multi-turn (encoder AM2048S/R)										**E**										
Incremental encoder HTL 1024 S/R (encoder HTL1024S/R)										**H**										
Incremental encoder HTL 2048 S/R (encoder HTL2048S/R)										**J**										
Incremental encoder sin/cos 1 V_{pp} 2048 S/R with C and D tracks (encoder IC2048S/R)										**M**										
Incremental encoder sin/cos 1 V_{pp} 2048 S/R without C and D tracks (encoder IN2048S/R)										**N**										
Encoder systems for motors with DRIVE-CLiQ interface																				
Absolute encoder 22 bit (resolution 4194304, internal 2048 S/R) + 12 bit multi-turn (traversing range 4096 revolutions) (encoder AM22DQ)										**F**										
Incremental encoder 22 bit (resolution 4194304, internal 2048 S/R) + commutation position 11 bit (encoder IC22DQ)										**D**										
Incremental encoder 22 bit without commutation position (encoder IN22DQ)										**Q**										
Rated speeds at 380 V to 480 V 3 AC (winding design)																				
400 rpm/500 rpm											**B**									
1000 rpm/1150 rpm/1350 rpm											**D**									
1500 rpm/1750 rpm/2000 rpm											**F**									
2500 rpm/2900 rpm											**L**									
Cable connection (view of DE)																				
Terminal box / Cable entry																				
Top – Right												**0**								
Top – DE												**1**								
Top – NDE												**2**								
Top – Left												**3**								

For 12th to 16th data position of the Order No., see page 5/91.

[1] Not selectable. Determined by the choice of rated power.

Order No. supplements for 1PL618/1PL622 motors (continued)

Data position of the Order No.		1	2	3	4	5	6	7		8	9	10	11	12		13	14	15	16		
Shaft height 180		**1**	**P**	**L**	**6**	**1**	**8**	**.**	**–**	**.**	■	**.**	■	■	**–**	**0**	■	■	■	**–**	**Z**
Shaft height 225		**1**	**P**	**L**	**6**	**2**	**2**	**.**													
Type of construction																					
IM B3														**0**							
IM B3	Hoisting system for different types of construction (IM B6, IM B7, IM B8, IM V5, IM V6)													**1**							
IM B35	1PL618 with A450 flange 1PL622 with A550 flange													**3**							
IM B35	1PL618 with A450 flange 1PL622 with A550 flange Hoisting system for different types of construction (IM V15, IM V36)													**5**							
Bearing version	**Vibration magnitude acc. to Siemens/EN 60034-14**[1]	**Shaft and flange accuracy**[1]																			
Coupling	R/A	N															**A**				
Coupling	R/A	R															**B**				
Coupling	S/A	R															**C**				
Coupling	SR/A	R															**D**				
Belt	R/A	N															**E**				
Belt	R/A	R															**F**				
Increased cantilever forces	R/A	N															**G**				
Increased cantilever forces	R/A	R															**H**				
Shaft extension DE	**Balancing**	**Direction of air flow (fan)**																			
Fitted key	Half-key	DE → NDE																**A**			
Fitted key	Half-key	NDE → DE[2]																**B**			
Fitted key	Full-key	DE → NDE																**C**			
Fitted key	Full-key	NDE → DE[2]																**D**			
Plain shaft	–	DE → NDE																**J**			
Plain shaft	–	NDE → DE[2]																**K**			
Paint finish																					
Primed																			**0**		
Anthracite RAL 7016																			**3**		
Special paint finish in anthracite RAL 7016																			**6**		
Special version (order codes are required for options)																				**–**	**Z**

[1] For definition, see 1PL6 Configuration Manual.
[2] Preferred direction of air flow in a polluted environment.

1PL6 asynchronous motors
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Order No. supplements for 1PL628 motors

Data position of the Order No.			1	2	3	4	5	6	7		8	9	10	11	12		13	14	15	16		
Shaft height 280			**1**	**P**	**L**	**6**	**2**	**8**	.	–	.	■	.	■	■	–	**0**	■	■	■	–	**Z**
Overall length[1]									.													
Fans[2]	Mounting	Direction of air flow																				
External fan	NDE top	NDE → DE									**0**											
External fan	NDE right	NDE → DE									**1**											
External fan	NDE left	NDE → DE									**2**											
External fan	DE top	DE → NDE									**3**											
External fan	DE right	DE → NDE									**4**											
External fan	DE left	DE → NDE									**5**											
Without external fan	NDE right for single pipe connection										**6**											
Encoder systems for motors without DRIVE-CLiQ interface																						
Without encoder												**A**										
Absolute encoder 2048 S/R, 4096 revolutions, multi-turn (encoder AM2048S/R)												**E**										
Incremental encoder HTL 1024 S/R (encoder HTL1024S/R)												**H**										
Incremental encoder HTL 2048 S/R (encoder HTL2048S/R)												**J**										
Incremental encoder sin/cos 1 V_{pp} 2048 S/R with C and D tracks (encoder IC2048S/R)												**M**										
Incremental encoder sin/cos 1 V_{pp} 2048 S/R without C and D tracks (encoder IN2048S/R)												**N**										
Encoder systems for motors with DRIVE-CLiQ interface																						
Absolute encoder 22 bit (resolution 4194304, internal 2048 S/R) + 12 bit multi-turn (traversing range 4096 revolutions) (encoder AM22DQ)												**F**										
Incremental encoder 22 bit (resolution 4194304, internal 2048 S/R) + commutation position 11 bit (encoder IC22DQ)												**D**										
Incremental encoder 22 bit without commutation position (encoder IN22DQ)												**Q**										
Rated speeds at 380 V to 480 V 3 AC (winding design)																						
800 rpm/1000 rpm													**C**									
1150 rpm/1350 rpm													**D**									
1750 rpm/2000 rpm													**F**									
Rated speeds at 690 V 3 AC (winding design)																						
800 rpm	Order code **C30** required												**C**								–	**Z**
1150 rpm	Order code **C30** required												**D**								–	**Z**
1750 rpm	Order code **C30** required												**F**								–	**Z**
Cable connection (view of DE)[2]																						
Terminal box	Cable entry	Signal connection																				
NDE right	Bottom	DE												**0**								
NDE left	Bottom	DE												**1**								
NDE top	Right	DE												**2**								
DE top	Right	NDE												**5**								

For 12th to 16th data position of the Order No., see page 5/93.

[1] Not selectable. Determined by the choice of rated power.
[2] See selection guides.

Order No. supplements for 1PL628 motors (continued)

Data position of the Order No.		1	2	3	4	5	6	7		8	9	10	11	12		13	14	15	16		
Shaft height 280		**1**	**P**	**L**	**6**	**2**	**8**	**.**	**–**	**.**	■	**.**	■	■	**–**	**0**	■	■	■	**–**	**Z**
Type of construction[1]																					
IM B3														**0**							
IM V5									Can be subsequently modified to IM V6.					**1**							
IM B35	With A660 flange													**3**							
IM V15	With A660 flange								Can be subsequently modified to IM V35.					**5**							
Bearing version									**Vibration magnitude acc. to Siemens/EN 60034-14**[2]	**Shaft and flange accuracy**[2]											
Coupling									A	N							**A**				
Coupling									R/A	R							**B**				
Increased cantilever forces									A	N							**E**				
Increased cantilever forces									R/A	R							**F**				
Shaft extension DE									**Balancing**												
Fitted key									Half-key									**A**			
Fitted key									Full-key									**C**			
Plain shaft									–									**J**			
Paint finish																					
Primed																			**0**		
Anthracite RAL 7016																			**3**		
Special paint finish in anthracite RAL 7016																			**6**		
Special version (order codes are required for options)																				**–**	**Z**

Permissible combinations of mechanical variants for 1PL6 motors, see 1PH7 motors, page 5/76.

[1] See technical definitions for AC motors in chapter Servomotors.
[2] For definition, see 1PL6 Configuration Manual.

1PL6 asynchronous motors
Forced ventilation, IP23 degree of protection

Options

Order code	Description	For use with motors	
		1PL618 1PL622	1PL628
C30	Winding version 690 V 3 AC	–	✔
G14	Fan unit with air filter	✔	✔
G80	Prepared for mounting an incremental encoder POG 10	–	✔
K08	Signal connector mounted opposite	–	✔
K16	Second standard shaft extension (only possible without encoder)	–	✔
K31	2nd rating plate supplied separately in terminal box	✔	✔
K40	Re-lubrication device DE and NDE (not possible with bearings for increased maximum speed)	✔	Standard
K45	230 V AC standstill heating	–	✔
K55	Cable entry plate, terminal box, customer-specific[1)]	✔	✔
K83	Terminal box rotated through +90 degrees	–	✔
K84	Terminal box rotated through -90 degrees	–	✔
K85	Terminal box rotated through 180 degrees	–	✔
L27	NDE bearing in insulated version	✔ Only for 1PL618 Standard with 1PL622	Standard
M83	Additional thread for a setting screw on motor feet	–	✔
Y55	Non-standard shaft extension DE	On request	On request
Y80	Different rating plate data[1)]	On request	On request
Y82	Additional rating plate with customer data[1)]	On request	On request
	Primer or paint finish in anthracite RAL 7016	Standard	Standard
R1Y	Paint finish in other RAL color[2)]	✔	✔
R2Y	Special finish in other RAL color[2)]	✔	✔

✔ Option available
– Option not available

When ordering a motor with options, **-Z** should be added to the order number.

1) Plain text is required in addition to order code.
2) RAL color number must be specified in addition to order code.

Technical specifications

Terminal box type (see selection and ordering data for assignment)	Cable entry Power	External signals	Max. outer cable diameter[3] mm (in)	Number of main terminals		Max. cross-section per terminal mm²	Max. rated current[4] A
gk803	1 × M25 × 1.5	1 × M16 × 1.5[1]	20 (0.79)	Phases: Grounding:	3 × M5 2 × M5	1 × 10	52
gk813	1 × M32 × 1.5	1 × M16 × 1.5[1]	24.2 (0.95)	Phases: Grounding:	3 × M5 2 × M5	1 × 16	70
gk823	1 × M32 × 1.5	1 × M16 × 1.5[1]	24.2 (0.95)	Phases: Grounding:	3 × M5 2 × M5	1 × 16	70
gk826	1 × M32 × 1.5	1 × M16 × 1.5[1]	24.2 (0.95)	Phases: Grounding:	6 × M5 2 × M5	1 × 10	52
gk833	1 × M40 × 1.5	1 × M16 × 1.5[1]	32 (1.26)	Phases: Grounding:	3 × M6 2 × M6	1 × 35	110
gk843	1 × M50 × 1.5	1 × M16 × 1.5[1]	38 (1.50)	Phases: Grounding:	3 × M6 2 × M6	1 × 50	133
gk863	1 × M50 × 1.5	1 × M16 × 1.5[1]	38 (1.50)	Phases: Grounding:	3 × M6 2 × M6	1 × 50	133
gk873	1 × M63 × 1.5	1 × M16 × 1.5[1]	42.6 (1.68)	Phases: Grounding:	3 × M6 2 × M6	1 × 50	133
gk874	1 × M63 × 1.5	1 × M16 × 1.5[1]	42.6 (1.68)	Phases: Grounding:	3 × M10 2 × M6	2 × 70	240
1XB7322-P05	2 × M50 × 1.5	1 × PG 13.5[2]	38 (1.50)	Phases: Grounding:	3 × M12 2 × fixing eyelet	2 × 50	210
1XB7422-P06	2 × M63 × 1.5	1 × PG 13.5[2]	53 (2.09)	Phases: Grounding:	3 × M12 2 × fixing eyelet	2 × 70	270
1XB7700-P02	3 × M75 × 1.5	1 × PG 13.5[2]	68 (2.68)	Phases: Grounding:	3 × 2 × M12 2 × fixing eyelet	3 × 150	700
1XB7712-P03	4 × M75 × 1.5	1 × PG 13.5[2]	68 (2.68)	Phases: Grounding:	3 × 4 × M16 4 × M16	4 × 185	1150
With 1PH835 only							
1XB7712-P01	3 × M63 × 1.5	1 × M20 × 1.5[5] 1 × M25 × 1.5[6]	53 (2.09)	Phases: Grounding:	3 × 4 × M16 4 × M16	3 × 95	450
1XB7712-P03	4 × M75 × 1.5	1 × M20 × 1.5[5] 1 × M25 × 1.5[6]	68 (2.68)	Phases: Grounding:	3 × 4 × M16 4 × M16	4 × 185	1150
1XB7820-P00	Undrilled	1 × M20 × 1.5[5] 1 × M25 × 1.5[6]	–	Phases: Grounding:	2 × 3 × 4 × M16 8 × M16	8 × 240	2100

For terminal box type **1XB7712-P01** or **1XB7712-P03**, other cable entries (power) can be ordered via P options depending on the standard:

P00	Undrilled cable entry plate
P01	Cable entry plate 3 x M63 x 1.5 (not for 1XB7712-P01)
P02	Cable entry plate 3 x M75 x 1.5
P03	Cable entry plate 4 x M75 x 1.5 (not for 1XB7712-P03)
P04	Cable entry plate 4 x M63 x 1.5

For terminal box type **1XB7700-P02** other cable entries (power) can be ordered via P options depending on the standard:

P00	Undrilled cable entry plate
P01	Cable entry plate 3 x M63 x 1.5

For terminal box type **1XB7322-P05** and**1XB7422-P06**, other cable entries (power) can be ordered via the P option depending on the standard:

P00	Undrilled cable entry plate

For options **K09** or **K10**, instead of terminal box **gk863**, terminal box **gk873** is used mounted on the side.

For options **K09** or **K10**, instead of terminal box **gk833**, terminal box **gk843** is used mounted on the side.

For options **K09** or **K10**, instead of terminal box **gk813**, terminal box **gk823** is used mounted on the side.

[1] Thread M16 × 1.5 arranged with 90° to signal connection; thread only for options A12, A25 and 9th data position "A" (without encoder).
[2] Arranged opposite of signal connection (sideways from cable entry plate).
[3] Dependent on the design of the metric cable gland.
[4] Current-carrying capacity based on EN 60204-1/IEC 60364-5-52 with installation type E.
[5] Mounted on left side of terminal box (viewed toward cable entries).
[6] Mounted on right side of terminal box (viewed toward cable entries).

Selection guides for 1PH8 motors
Ventilation data/Sound pressure levels

Technical specifications (continued)

Motor type	Direction of air flow	Fan motor max. current consumption at			Volume of air, min.	Sound pressure level L_{pA} (1 m) Motor + external fan operation at 50 Hz tolerance + 3 dB
		A	A	A	m^3/s (ft^3/s)	dB
Forced ventilation		**230 V 50 Hz (± 10 %)**	**230 V 60 Hz (± 10 %)**	**265 V 60 Hz (± 10 %)**		
1PH808	NDE → DE DE → NDE	0.33 0.20	0.25 0.16	0.32 0.19	0.02 (0.71) 0.02 (0.71)	70 [1] 70 [1]
Forced ventilation		**400 V 50 Hz (± 10 %)**	**400 V 60 Hz (± 10 %)**	**480 V 60 Hz (± 10 %)**		
1PH810	NDE → DE DE → NDE	0.12 0.13	0.09 0.09	0.12 0.13	0.04 (1.41) 0.04 (1.41)	70 [1] 70 [1]
1PH813	NDE → DE DE → NDE	0.13 0.21	0.16 0.19	0.17 0.23	0.09 (3.18) 0.09 (3.18)	70 [1] 70 [1]
1PH816	NDE → DE DE → NDE	0.17 0.23	0.22 0.30	0.22 0.30	0.16 (5.65) 0.16 (5.65)	73 [1] 73 [1]
Forced ventilation		**400 V 50 Hz (± 10 %)**	**400 V 60 Hz (+ 5%/- 10 %)**	**480 V 60 Hz (+ 5%/- 10 %)**		
1PH835.-1..1 (IP55 degree of protection)	NDE → DE DE → NDE	4.7	4.6	4.6	0.75 (26.5)	77 [2]
1PH835.-1..4 (IP23 degree of protection)	NDE → DE DE → NDE	4.7	4.6	4.6	1 (35.3)	77 [2]

[1] For rated pulse frequency of 4 kHz and speed range up to 5000 rpm.
[2] For rated pulse frequency of 2.5 kHz and speed range up to 2800 rpm.

Technical specifications (continued)

Cooling data and sound pressure levels

Motor type	Flow volume, min.	Pressure drop	Water connection at NDE thread	Sound pressure level L_{pA} (1 m) motor tolerance + 3 dB
	l/min (US gal./min)	bar	Inch	dB
Water cooling				
1PH808	6 (1.58)	0.6	G 1/8	68[1)]
1PH810	8 (2.11)	0.4	G 1/4	68[1)]
1PH813	12 (3.17)	0.9	G 3/8	68[1)]
1PH816	15 (3.96)	0.2	G 1/2	69[1)]
1PH8184	15 (3.96)	0.6	G 3/8	70[2)]
1PH8186	15 (3.96)	0.7	G 3/8	70[2)]
1PH822.-1 (asynchronous variant)	20 (5.28)	0.6	G 3/8	70[2)]
1PH822.-2 (synchronous variant)	25 (6.61)	0.9	G 3/8	70[3)]
1PH828	35 (9.25)	0.6	G 1/2	72[3)]

Water specification

Cooling water quality	The values specified for the cooling water correspond to the requirements for a closed cooling circuit. Not all of the specified concentrations will occur in the cooling water at the same time. For trouble-free operation, a filter can be installed. The filter fineness should be no less than 100 µm.
Cooling water specifications	
pH value	6.0 ... 9.0
Total hardness	< 170 ppm
Conductivity	< 500 µS/cm
Operating pressure, max.	< 6 bar
Pressure drop at V(N)	< 1 bar
Cooling water inlet temperature, max.	< 30 °C (86 °F)
Cooling water temperature, min.	$T_{cooling\ water} > T_{ambient} - 5$ K
Anti-freeze protection / corrosion protection	20 ... 30 %
NALCO 00GE056 inhibitor	0.2 ... 0.25 %
Components	
Dissolved substances	< 340 ppm
Max. grain size	< 100 µm
Chloride ions	< 40 ppm
Sulfate ions	< 50 ppm
Nitrate ions	< 50 ppm

1) For rated pulse frequency of 4 kHz and speed range up to 5000 rpm.

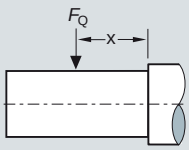
2) For rated pulse frequencies of 2 kHz or 4 kHz and speed ranges:
1PH818 up to 5000 rpm
1PH822 up to 4500 rpm.

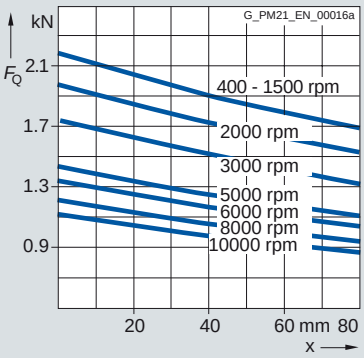
3) At rated pulse frequency of 2 kHz and speed ranges:
1PH822 up to 4500 rpm
1PH828 up to 3300 rpm.

Selection guides for 1PH8 motors
Radial force diagrams

Characteristic curves

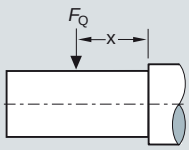
Permissible radial forces
1PH8 motors
Shaft height 80
Standard

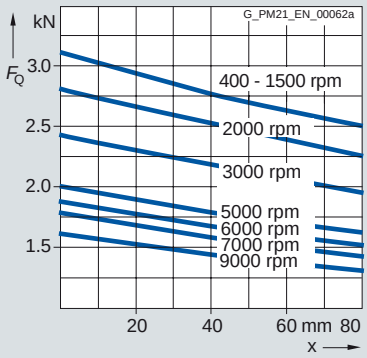




L_{10h} = 20000 h

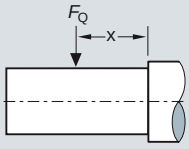
Permissible radial forces
1PH8 motors
Shaft height 100
Standard

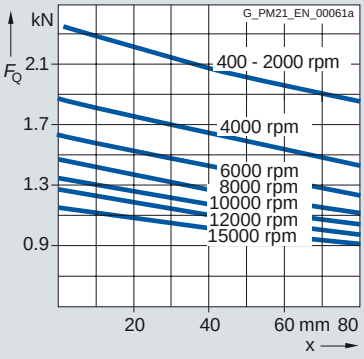




L_{10h} = 20000 h

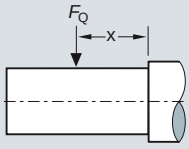
Permissible radial forces
1PH8 motors
Shaft height 80
Performance

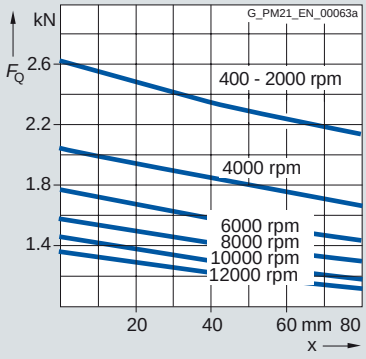




L_{10h} = 12000 h

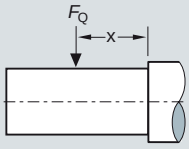
Permissible radial forces
1PH8 motors
Shaft height 100
Performance

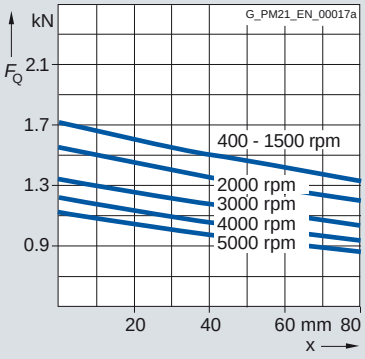




L_{10h} = 12000 h

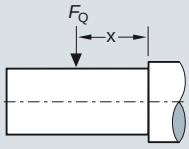
Permissible radial forces
1PH8 motors
Shaft height 80
Advanced lifetime

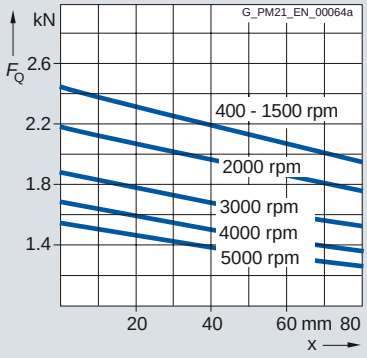




L_{10h} = 40000 h

Permissible radial forces
1PH8 motors
Shaft height 100
Advanced lifetime





L_{10h} = 40000 h

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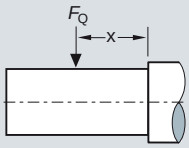
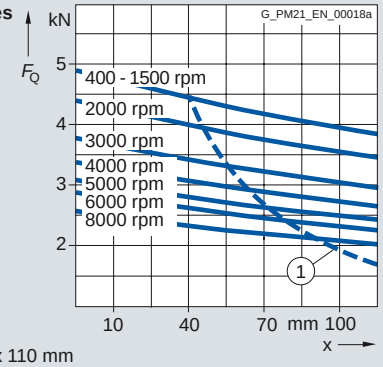
Characteristic curves (continued)

Permissible radial forces
1PH8 motors
Shaft height 132
Standard

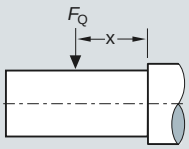


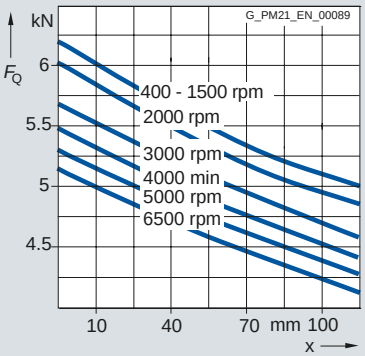


(1) Maximum load for 1PH7-compatible shaft extension (42 x 110 mm (1.65 x 4.33 in)) (option V90)

L_{10h} = 20000 h

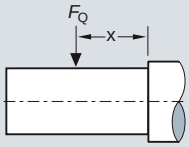
Permissible radial forces
1PH8 motors
Shaft height 160
Standard

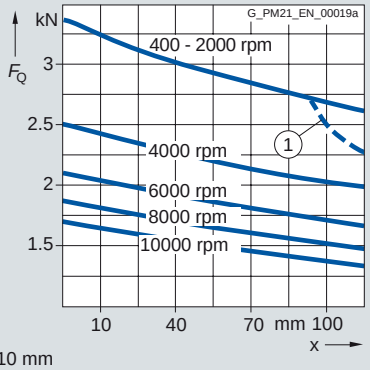




L_{10h} = 20000 h

Permissible radial forces
1PH8 motors
Shaft height 132
Performance

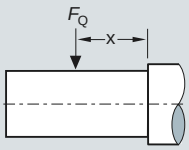


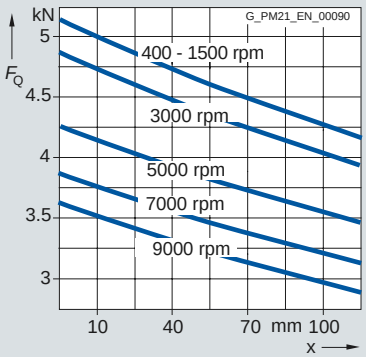


(1) Maximum load for 1PH7-compatible shaft extension (42 x 110 mm (1.65 x 4.33 in)) (option V90)

L_{10h} = 12000 h

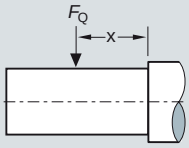
Permissible radial forces
1PH8 motors
Shaft height 160
Performance

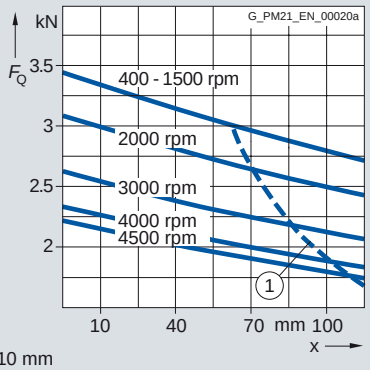




L_{10h} = 12000 h

Permissible radial forces
1PH8 motors
Shaft height 132
Advanced lifetime

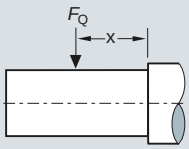


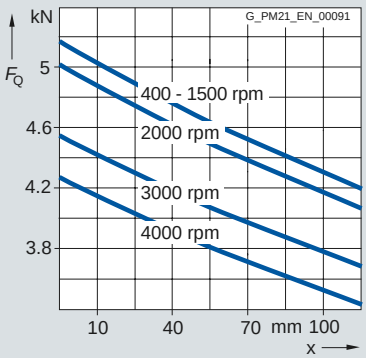


(1) Maximum load for 1PH7-compatible shaft extension (42 x 110 mm (1.65 x 4.33 in)) (option V90)

L_{10h} = 40000 h

Permissible radial forces
1PH8 motors
Shaft height 160
Advanced Lifetime





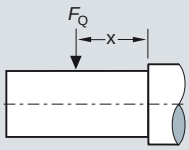
L_{10h} = 40000 h

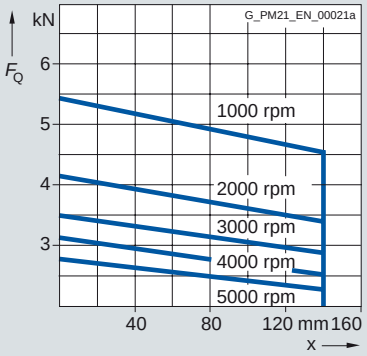
5

Selection guides for 1PH8 motors
Radial force diagrams

Characteristic curves (continued)

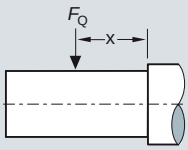
Permissible radial forces
1PH8 motors
Shaft height 180
Standard

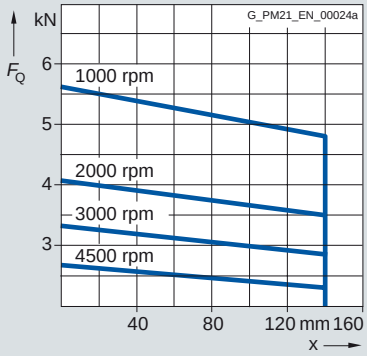




L_{10h} = 20000 h

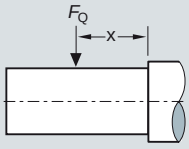
Permissible radial forces
1PH8 motors
Shaft height 225
Standard

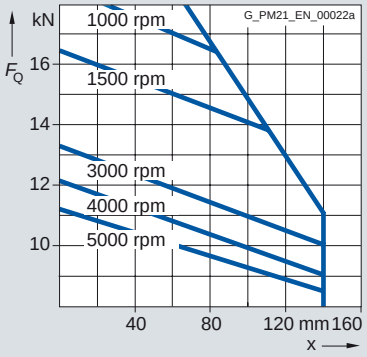




L_{10h} = 20000 h

Permissible radial forces
1PH8 motors
Shaft height 180
With increased radial force

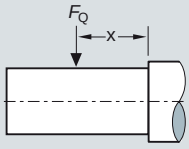


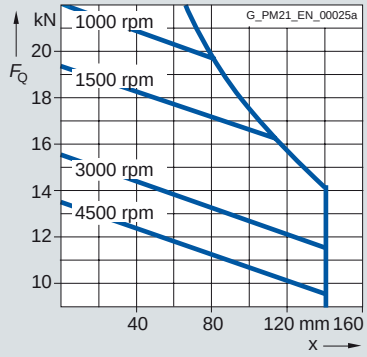


Minimum radial force 4 kN (899 lbf)

L_{10h} = 12000 h

Permissible radial forces
1PH8 motors
Shaft height 225
With increased radial force

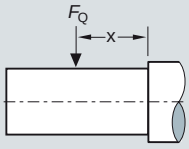


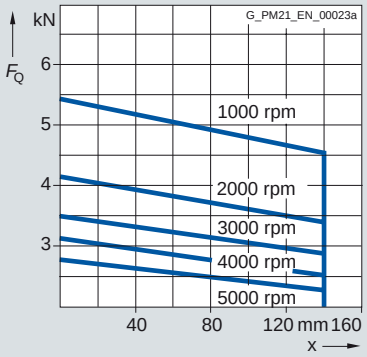


Minimum radial force 5 kN (1124 lbf)

L_{10h} = 12000 h

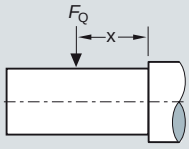
Permissible radial forces
1PH8 motors
Shaft height 180
Performance

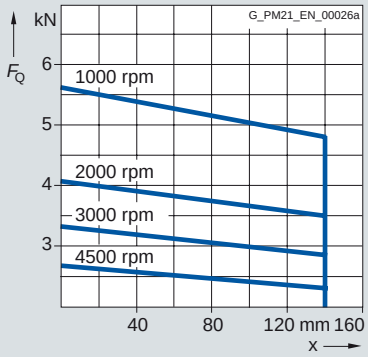




L_{10h} = 12000 h

Permissible radial forces
1PH8 motors
Shaft height 225
Performance



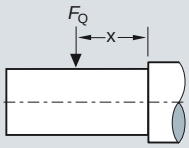


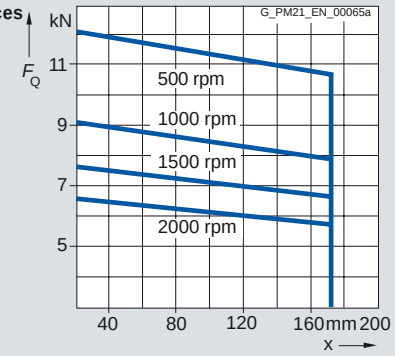
L_{10h} = 12000 h

Note:
The roller bearings used here (bearings with increased radial force) could sustain damage if they are operated under no load. Observe the specified minimum radial forces!

Characteristic curves (continued)

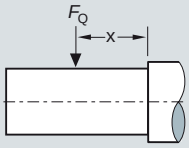
Permissible radial forces
1PH8 motors
Shaft height 280
Standard

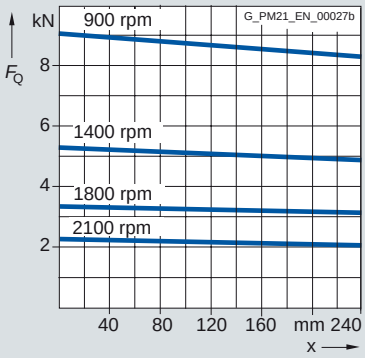




L_{10h} = 20000 h

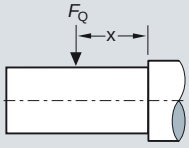
Permissible radial forces
1PH8 motors
Shaft height 355
Standard

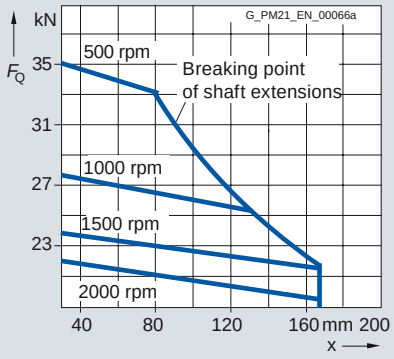




L_{10h} = 20000 h

Permissible radial forces
1PH8 motors
Shaft height 280
With increased radial force

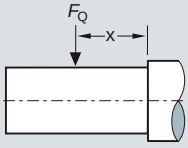


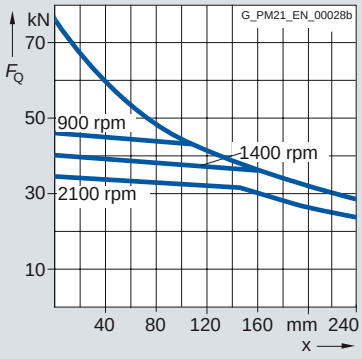


Minimum radial force 9 kN
(2023 lbf)

L_{10h} = 12000 h

Permissible radial forces
1PH8 motors
Shaft height 355
With increased radial force





Minimum radial force 13 kN
(2923 lbf)

L_{10h} = 20000 h

Note:
The roller bearings used here (bearings with increased radial force) could sustain damage if they are operated under no load. Observe the specified minimum radial forces!

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Selection guides for 1PH7/1PL6 motors
Terminal box/Cable cross-sections

Technical specifications

Terminal box	Cable entry	Outer cable diameter, max.	Cable entry	Outer cable diameter, max.[1]	Number of main terminals	Cross-section per terminal, max.	Current per terminal, max.[2]
Type	Valid for Order No. with 8th data position 2, 4 or 6[3]		Valid for Order No. with 8th data position 7 or 8				
		mm (in)		mm (in)		mm^2	A
1XB7322	2 x PG42	40 (1.57)	2 x M50 x 1.5	38 (1.50)	3 x M12	2 x 50	191
1XB7422	2 x M72 x 2	56 (2.20)	2 x M63 x 1.5	53 (2.09)	3 x M12	2 x 70	242
1XB7700	3 x M72 x 2	56 (2.20)	3 x M75 x 1.5	68 (2.68)	3 x 2 x M12	3 x 150	583
1XB7712	**For 1PH728.-..B / 1PH7284-..C / 1PH7284-..D motors**						
	3 x M63 x 1.5	53 (2.09)	–	–	(3+1)[4] x 3 x M16	3 x 95	450
	For 1PH728.-..F / 1PH7286-..C / 1PH7286-..D / 1PH7288-..C / 1PH7288-..D motors						
	3 x M75 x 1.5	68 (2.68)	–	–	(3+1)[4] x 3 x M16	3 x 185	710
	For 1PL628 motors						
	4 x M75 x 1.5	68 (2.68)	–	–	(3+1)[4] x 4 x M16	4 x 185	925

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[1] Dependent on the design of the metric cable gland.
[2] Current carrying capacity similar to EN 60204-1 for installation type C.
[3] Not for 1PH728/1PL628.
[4] Including ground terminal.

Technical specifications (continued)

Motor	Direction of air flow	Fan motor current consumption at			Volume of air, approx.	Sound pressure level L_{pA} (1 m)
Type		400 V 50 Hz (± 10 %)	400 V 60 Hz (± 10 %)	480 V 60 Hz (+ 5 %, - 10 %)	at 50 Hz	Motor + external fan operation 50 Hz Tolerance +3 dB Rated pulse frequency 4 kHz/2.5 kHz
		A	A	A	m^3/s (ft^3/s)	dB
Forced ventilation, 1PH7 motors						
1PH718	NDE → DE DE → NDE	0.8	1.1	1.1	0.19 (6.71)	73
1PH722	NDE → DE DE → NDE	1.9 2.8	2.2 2.8	2.2 2.8	0.36 (12.7) 0.36 (12.7)	74 76[1)]
1PH728	NDE → DE DE → NDE	2.55	2.6	2.6	0.42 (14.8)	74
Forced ventilation, 1PL6 motors						
1PL618	NDE → DE DE → NDE	0.8	1.1	1.1	0.27 (9.53)	73[2)]
1PL622	NDE → DE DE → NDE	1.9 2.8	2.2 2.8	2.2 2.8	0.38 (13.4) 0.38 (13.4)	74[2)] 76[1)2)]
1PL628	NDE → DE DE → NDE	2.55	2.6	2.6	0.52 (18.3)	74[2)]

[1)] The sound pressure level can be reduced if the air flow is from the drive end to the non-drive end with option G15 (sound attenuator).
[2)] Speed range 0 to 2000 rpm.

Technical specifications (continued)

Motor type	Bearing type	Drive type	Bearing		Continuous speed for S1 duty, max.		Speed limit, max.[1]	
			Motor end	Bearing designation	n_{S1}	n_{S1}[2]	$n_{max.}$	$n_{max.}$[2]
					rpm	rpm	rpm	rpm
1PH718/1PL618	Deep-groove ball bearing	Coupling output	DE NDE	6214 C3 6214 C3	3500	4500	5000	7000
	Cylindrical roller bearing	Belt output	DE NDE	NU22 14E 6214 C3	3500	–	5000	–
	Cylindrical roller bearing	Increased radial forces	DE NDE	NU22 14E 6214 C3	3000	–	5000	–
1PH722/1PL622	Deep-groove ball bearing	Coupling output	DE NDE	6216 C3 6216 C3	3100	3600 (for 1PH7224)	4500	5500 (for 1PH7224)
	Cylindrical roller bearing	Belt output	DE NDE	NU22 16E 6216 C3	3100	–	4500	–
1PH7224/1PH7226/ 1PL6224/1PL6226	Cylindrical roller bearing	Increased radial forces	DE NDE	NU22 16E 6216 C3	2700	–	4500	–
1PH7228/1PL6228	Cylindrical roller bearing	Increased radial forces	DE NDE	NU22 16E 6216 C3	2500	–	4000	–
1PH728/1PL628	Deep-groove ball bearing	Coupling output	DE NDE	6220 C3 6220 C3	2200	–	3300	–
	Cylindrical roller bearing	Belt output	DE NDE	NU22 0E 6220 C3	2200	–	3300	–

Bearing service life

The bearing service life is limited by material fatigue, the fatigue service life, or lubrication failure, the grease service life.

The fatigue service life, the static bearing service life L_{10h}, is primarily dependent on the mechanical load. This correlation can be seen in the radial force/axial force diagrams. The values were determined in accordance with DIN/ISO 281.

The grease lifetime is mainly dependent on the bearing size, speed, temperature as well as the vibration load. The grease lifetime can be extended by especially favorable operating conditions, e.g. low average speed, low bearing temperature, radial force or vibration load.

A reduced bearing service life can be expected for difficult operating conditions and when motors are mounted vertically.

Lifetime lubrication

On motors equipped with lifetime lubrication, the grease lifetime is harmonized with bearing service life.

Apart from the 1PH728/1PL628 motors, the 1PH7/1PL6 motors in the basic version have lifetime lubrication.

Regreasing system

For motors with regreasing systems, the bearing service life can be extended through defined regreasing intervals and influencing factors such as mounting conditions, speed, bearing size and mechanical load can be compensated.

Lubricating nipples for regreasing are provided as standard on 1PH728/1PL628 motors. With the exception of 1PH728/1PL628 motors, regreasing with lubricating nipples can be supplied as an option, order code K40.

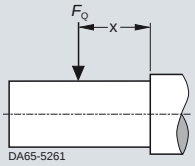
For more information, see 1PH7 and 1PL6 Configuration Manuals.

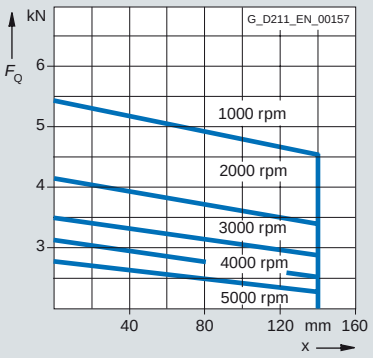
[1] For continuous duty (with 30 % n_{max}, 60 % $^2/_3$ n_{max}, 10 % standstill) for a duty cycle duration of 10 min.

[2] Version for increased maximum speed, see selection and ordering data for 1PH7.

Characteristic curves

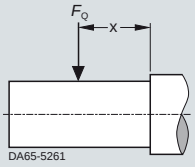
Permissible radial forces for coupling output 1PH718/1PL618 motors

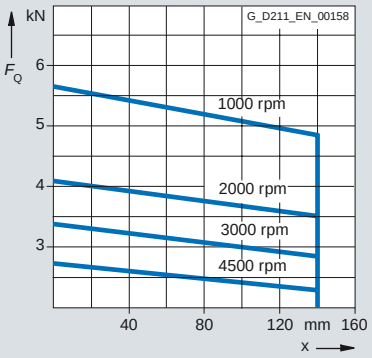




L_{10h} = 20000 h

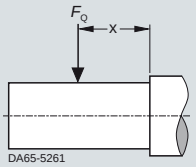
Permissible radial forces for coupling output 1PH722/1PL622 motors

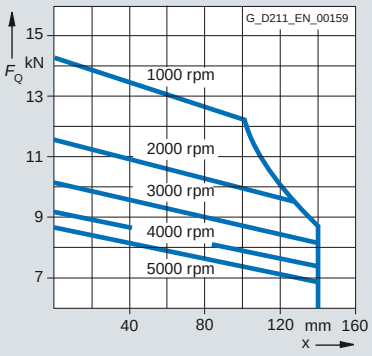




L_{10h} = 20000 h

Permissible radial forces for belt output 1PH718/1PL618 motors

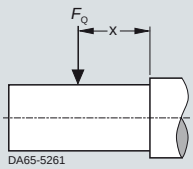


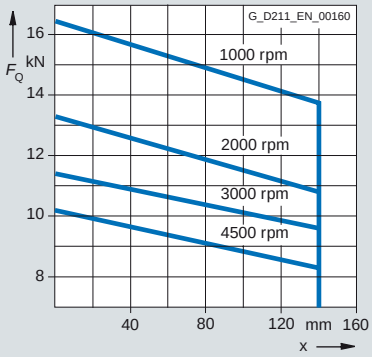


Minimum radial force 3 kN

L_{10h} = 12000 h

Permissible radial forces for belt output 1PH722/1PL622 motors

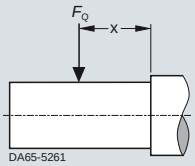


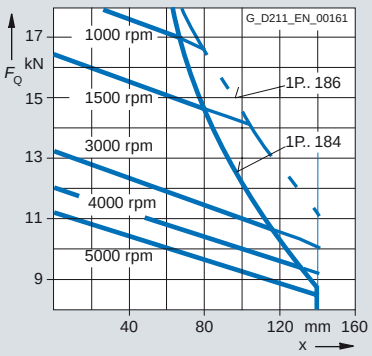


Minimum radial force 4 kN

L_{10h} = 12000 h

Permissible radial forces for belt output with increased radial force 1PH718/1PL618 motors

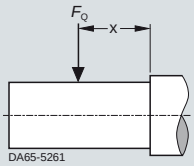


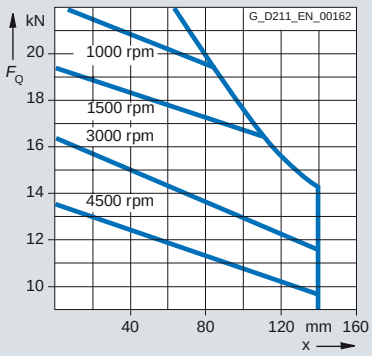


Minimum radial force 4 kN

L_{10h} = 12000 h

Permissible radial forces for belt output with increased radial force 1PH722/1PL622 motors





Minimum radial force 5 kN

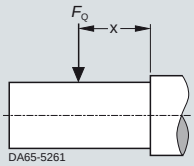
L_{10h} = 12000 h

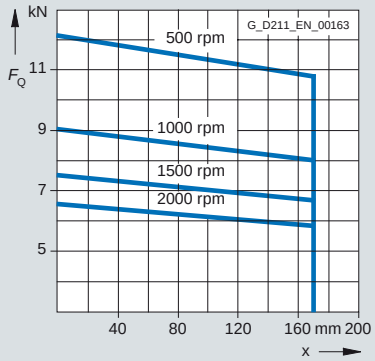
Note:
The roller bearings used here (bearings with increased radial force) could sustain damage if they are operated under no load. Observe the specified minimum radial forces!

Selection guides for 1PH7/1PL6 motors
Radial force diagrams

Characteristic curves (continued)

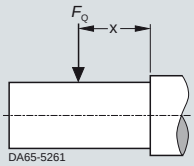
Permissible radial forces for coupling output 1PH728/1PL628 motors

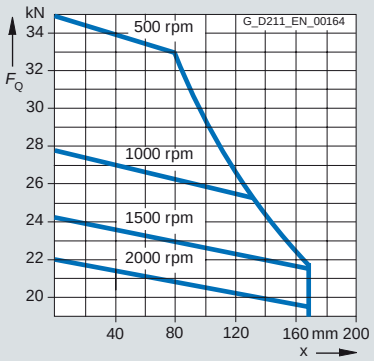




L_{10h} > 20000 h
when regreased

Permissible radial forces for belt output with increased radial force 1PH728/1PL628 motors





Minimum radial force 9 kN

L_{10h} > 12000 h
when regreased

Note:
The roller bearings used here (bearings with increased radial force) could sustain damage if they are operated under no load. Observe the specified minimum radial forces!

Options

Mounted holding brake for 1PH718/1PH722 motors

A holding brake (Stromag) can be mounted on the DE end of 1PH718/1PH722 motors. The motor shaft is extended using a shrunk-on stub shaft. The torque is transmitted through a fitted key in accordance with DIN 6885-1. In addition, the stub shaft can be axially secured using a thrust washer and a central screw (M20).

The holding brake does not have its own bearings; the output forces are therefore absorbed by the motor bearings. Due to limitations of space and their high radial forces, belt pulleys cannot be attached. When selecting the coupling to couple to the motor-brake combination, it should be carefully noted that the shaft extension diameter is larger than the diameter of the motor shaft extension.

The electromagnetic holding brake operates in accordance with the quiescent current principle, i.e. when current is flowing, the brake is released electromagnetically and when no current is flowing, the braking effect is achieved through the spring force.

When the power fails or an emergency stop is issued, the drive is braked from its current speed down to standstill and the brake holds the drive steady.

The holding brake is designed for dry operation and maintains IP55 degree of protection. The connection must be provided by the customer.

In the basic version, the brake has three emergency release screws; these are axially accessible from the front. The integrated or built-on microswitch can be incorporated in a higher-level control system as either an NC or an NO contact. The fast switching rectifier in the terminal box for the holding brake is used to over-excite the coil to release the brake and to achieve short release times. Release current = 2 × holding current

Motor	Holding brake	Holding torque (tolerance ± 20 %)	Speed, max.	Single switching energy, perm.	Service life switching energy	Coil current	Shaft extension dimension DIN 748		Cantilever force, perm. (3000 rpm, $x_{max.}$)	Moment of inertia of brake	Opening time	Closing time	Weight, brake
							Ø	Length					
Type	Type		$n_{max.}$	W_E	$W_{max.}$	I				J			
		Nm (lb_f-ft)	rpm	kJ	MJ	A	mm (in)	mm (in)	N (lb_f)	kgm^2 (lb_f-in-s^2)	ms	ms	kg (lb)
Brake supply voltage 230 V AC, 50 to 60 Hz													
1PH7184	NFE 60	600 (443)	3500	69	154	0.9	90 (3.54)	90 (3.54)	2800 (629.47)	0.027 (0.24)	400	160	55 (121)
1PH7186	NFE 60/80	800 (590)		91	56					0.026 (0.23)			
1PH7224	NFE 100	1000 (738)	3100	158	153	1.3	100 (3.94)	100 (3.94)	2800 (629.47)	0.041 (0.36)	460	200	75 (165)
1PH7226	NFE 100	1000 (738)		206	109					0.041 (0.36)			
1PH7228	NFE 100/140	1400 (1033)		248	32					0.041 (0.36)			

Speed $n_{max.}$:
Max. permissible speed at which an emergency stop is possible.

Single switching energy, perm. W_E:
Perm. switching energy for emergency stop
$W_E = J_{tot.} \times n^2/182.5 \times 10^{-3}$ (J in kgm^2, n in rpm)

Service life switching energy $W_{max.}$:
Max. possible switching energy of the brake (for emergency stop) until the brake linings must be replaced. $W_{max.} = W_E \times z$

Number of emergency stops z:
The number of emergency stops refers to the following conditions:
Braking from speed $n_{max.}$, $J_{tot.} = 2 \times J_{mot.}$
A conversion can be made for operation under different conditions:
Number of emergency stops $z = W_{max.}/W_E$

Coil current I:
Current in order to maintain the brake in a released condition.
Release current = 2 × holding current

Permissible radial force:
Only coupling output is permissible.

Opening time:
Separating time until the brake opens. The values refer to the maximum braking torque.

Closing time:
Interlocking time until the brake closes. The values refer to the maximum braking torque.

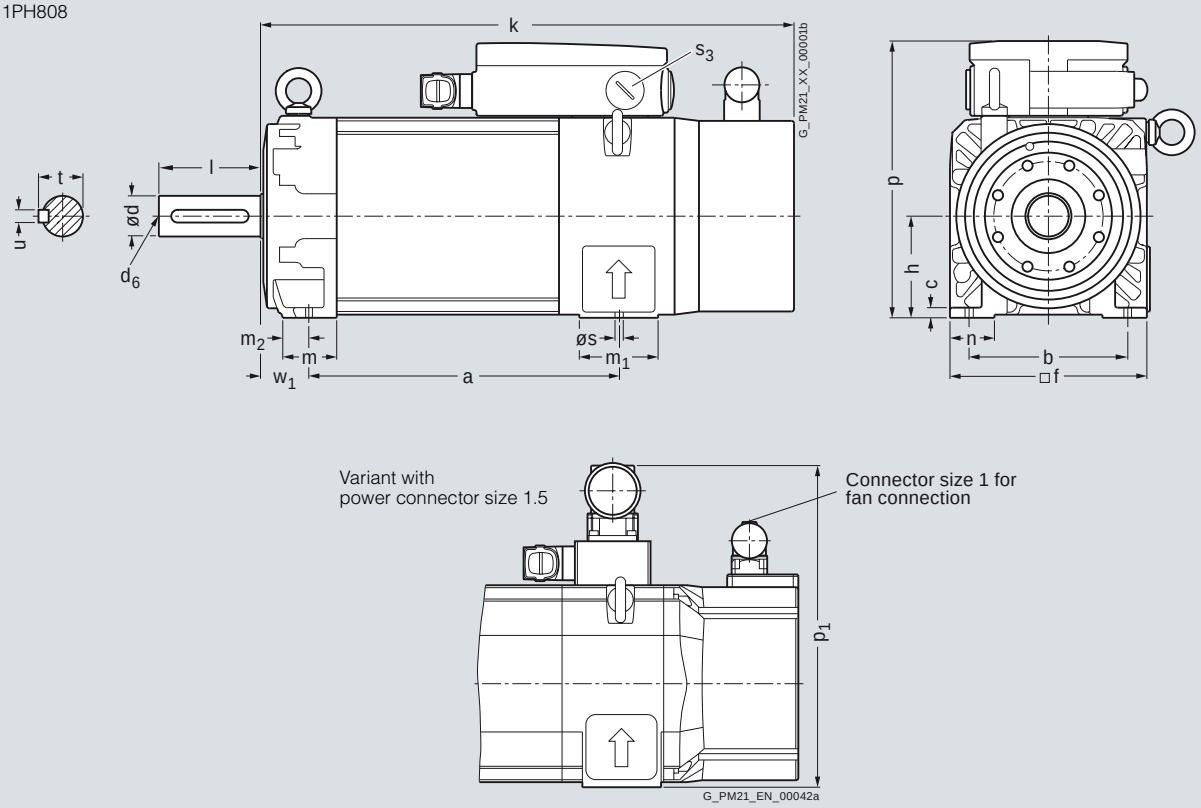
1PH8 asynchronous motors
Shaft height 80 – Forced ventilation

Dimensional drawings

For motor		Dimensions in mm (inches)											
Shaft height	Type	DIN a IEC B	b A	c HA	f AB	h H	k LB	m BA	m_1 –	m_2 –	n AA	p HD	p_1 –
1PH8, type of construction IM B3, forced ventilation													
80	1PH8083	194 (7.64)	125 (4.92)	8 (0.31)	155 (6.10)	80 (3.15)	375 (14.76)	42 (1.65)	62 (2.44)	20 (0.79)	35 (1.38)	216 (8.50)	253.5 (9.98)
	1PH8087	244 (9.61)					425 (16.73)						

					Shaft extension DE				
Shaft height	Type	DIN s IEC K	s_3 –	w_1 C	**d** **D**	d_6 –	l E	t GA	u F
80	1PH8083	10 (0.39)	M25 × 1.5	38 (1.50)	**32** **(1.26)**	M12	80 (3.15)	35 (1.38)	10 (0.39)
	1PH8087								

1PH808



Dimensional drawings

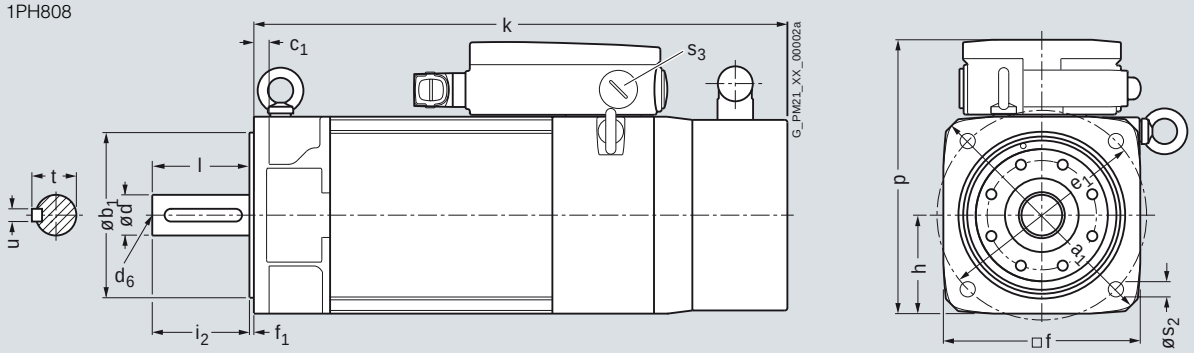
For motor — Dimensions in mm (inches)

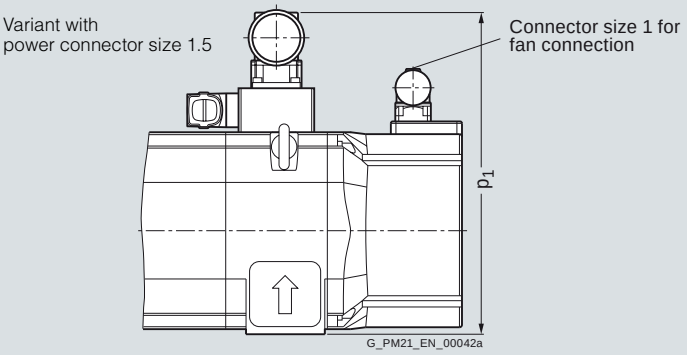
Shaft height	Type	DIN IEC	a_1 P	b_1 N	c_1 LA	e_1 M	f AB	f_1 T	h H	k LB	p HD	p_1 –	s_2 –	s_3 –
1PH8, type of construction IM B5, forced ventilation														
80	1PH8083		200 (7.87)	130 (5.12)	12 (0.47)	165 (6.50)	155 (6.10)	3.5 (0.14)	77.5 (3.05)	375 (14.76)	213.5 (8.41)	251 (9.88)	12 (0.47)	M25 × 1.5
	1PH8087									425 (16.73)				

Shaft extension DE

Shaft height	Type	DIN IEC	**d** **D**	d_6 –	i_2 E	t GA	u F
80	1PH8083		**32** **(1.26)**	M12	80 (3.15)	35 (1.38)	10 (0.39)
	1PH8087						

1PH808





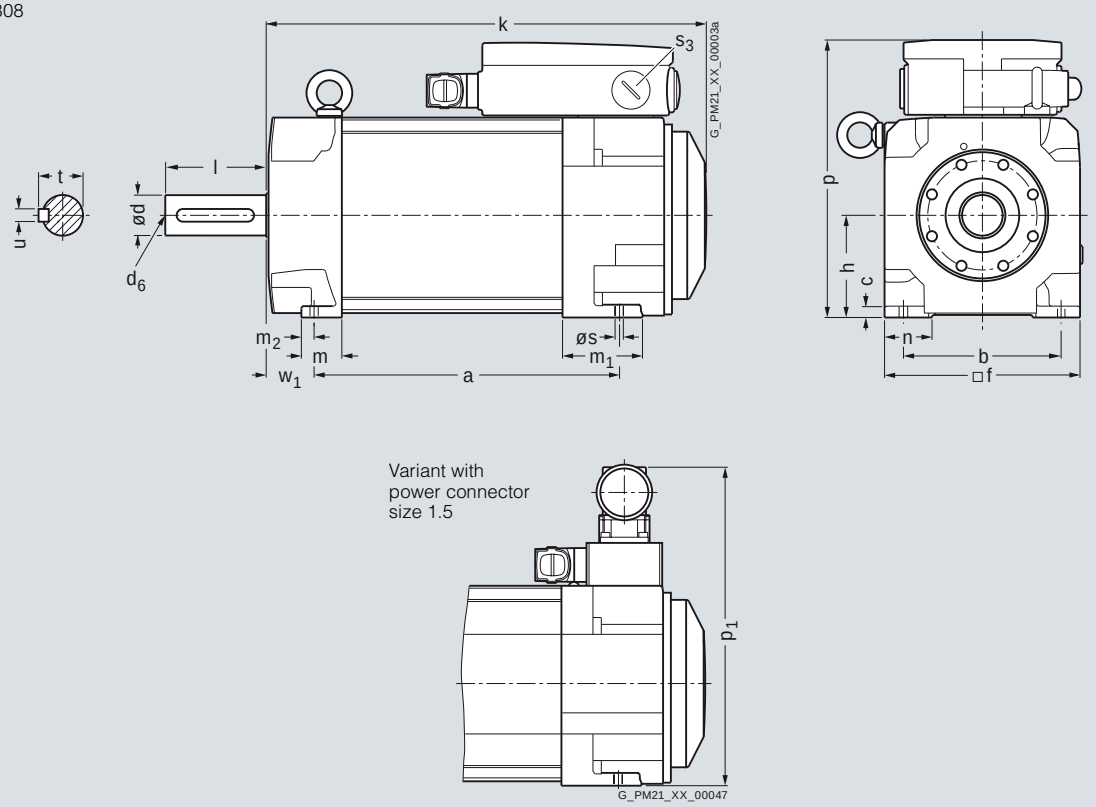
1PH8 asynchronous motors
Shaft height 80 – Water cooling

Dimensional drawings

For motor		Dimensions in mm (inches)											
Shaft height	Type	DIN a IEC B	b A	c HA	f AB	h H	k LB	m BA	m_1 –	m_2 –	n AA	p HD	p_1 –
1PH8, type of construction IM B3, water cooling													
80	1PH8083	194 (7.64)	125 (4.92)	8 (0.31)	155 (6.10)	80 (3.15)	301.5 (11.87)	37 (1.46)	63.5 (2.50)	15 (0.59)	35 (1.38)	216 (8.50)	253.5 (9.98)
	1PH8087	244 (9.61)					351.5 (13.84)						

					Shaft extension DE				
Shaft height	Type	DIN s IEC K	s_3 –	w_1 C	**d** **D**	d_6 –	l E	t GA	u F
80	1PH8083	10 (0.39)	M25 × 1.5	38 (1.50)	**32** **(1.26)**	M12	80 (3.15)	35 (1.38)	10 (0.39)
	1PH8087								

1PH808



Dimensional drawings

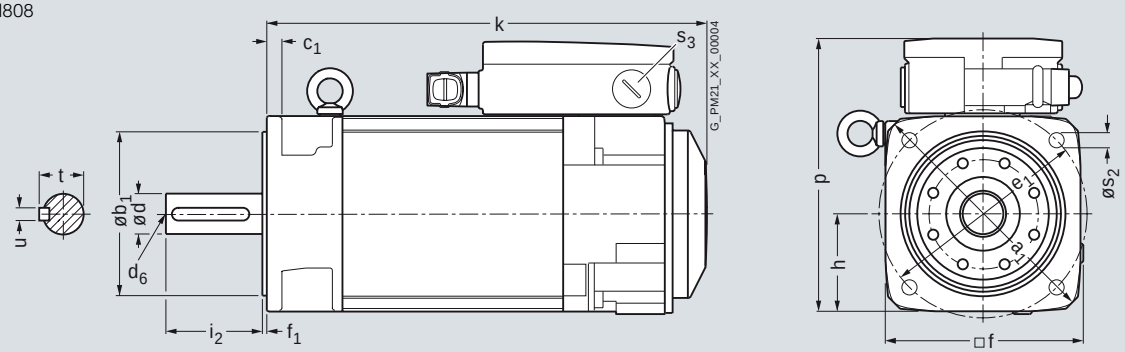
For motor — Dimensions in mm (inches)

Shaft height	Type	DIN IEC	a_1 P	b_1 N	c_1 LA	e_1 M	f AB	f_1 T	h H	k LB	p HD	p_1 –	s_2 –	s_3 –
1PH8, type of construction IM B5, water cooling														
80	1PH8083		200 (7.87)	130 (5.12)	12 (0.47)	165 (6.50)	155 (6.10)	3.5 (0.14)	77.5 (3.05)	301.5 (11.87)	213.5 (8.41)	251 (9.88)	12 (0.47)	M25 × 1.5
	1PH8087									351.5 (13.84)				

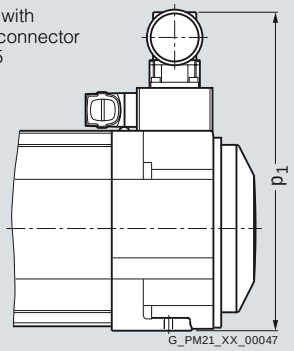
Shaft extension DE

Shaft height	Type	DIN IEC **d** **D**	d_6 –	i_2 E	t GA	u F
80	1PH8083	**32 (1.26)**	M12	80 (3.15)	35 (1.38)	10 (0.39)
	1PH8087					

1PH808



Variant with power connector size 1.5



1PH8 asynchronous motors
Shaft height 100 – Forced ventilation

Dimensional drawings

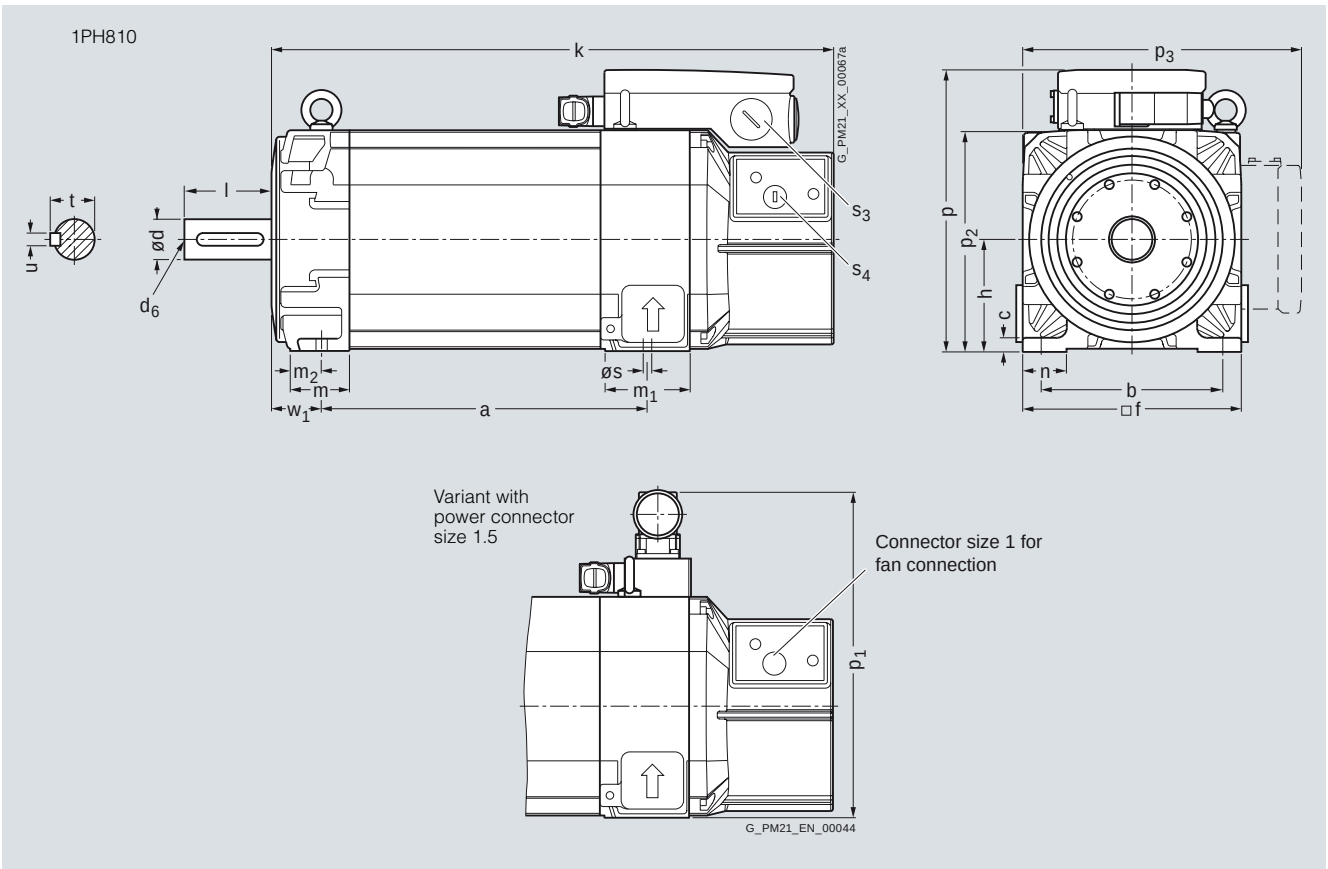
For motor — Dimensions in mm (inches)

Shaft height	Type	DIN IEC	a B	a_1 P	b A	b_1 N	c HA	c_1 LA	e_1 M	f AB	f_1 T	h H	k LB	m BA	m_1 –	m_2 –	n AA
1PH8, type of construction IM B3, forced ventilation																	
100	1PH8101		167 (6.57)	–	160 (6.30)	–	11 (0.43)	–	–	196 (7.72)	–	100 (3.94)	369.5 (14.55)	49 (1.93)	74 (2.91)	24 (0.94)	40 (1.57)
	1PH8103		202.5 (7.97)										405 (15.94)				
	1PH8105		262 (10.31)										464.5 (18.29)				
	1PH8107		297.5 (11.71)										500 (19.69)				

5

Shaft extension DE

Shaft height	Type	DIN IEC	p HD	p_1 –	p_2 –	p_3 –	s K	s_3 –	s_4 –	w_1 C	**d D**	d_6 –	l E	t GA	u F
100	1PH8101		252 (9.92)	294 (11.57)	198 (7.80)	276.5 (10.89)	12 (0.47)	M32 × 1.5	M20 × 1.5	43 (1.69)	**38 (1.50)**	M12	80 (3.15)	41 (1.61)	10 (0.39)
	1PH8103														
	1PH8105														
	1PH8107														

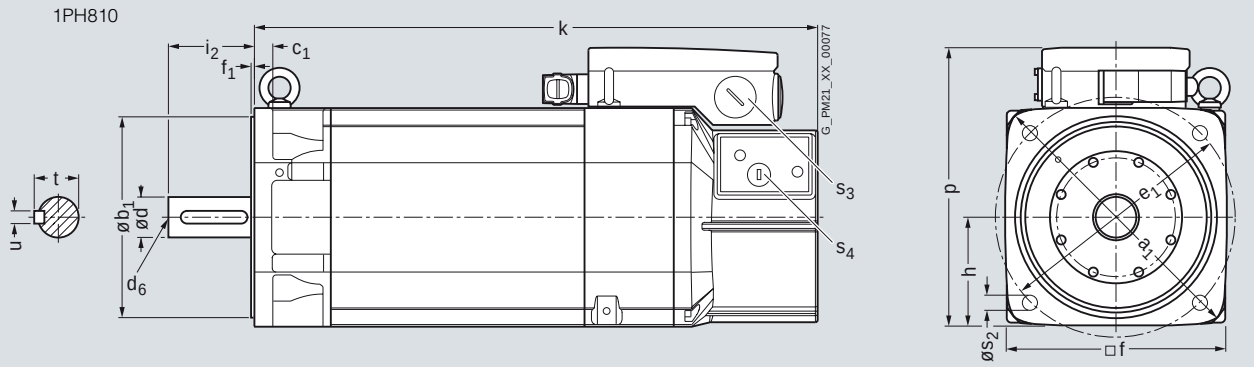


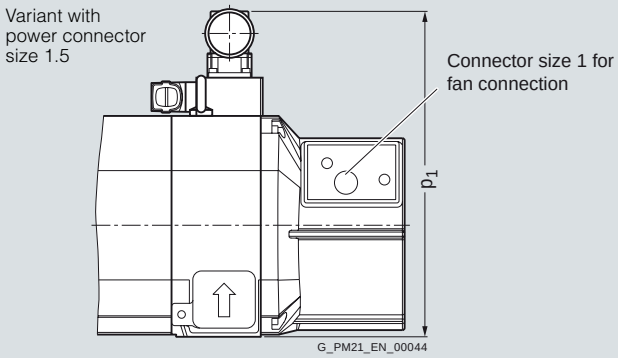
Dimensional drawings

For motor		Dimensions in mm (inches)											
Shaft height	Type	DIN IEC a_1 P	b_1 N	c_1 LA	e_1 M	f AB	f_1 T	h H	k LB	p HD	p_1 –	p_2 –	p_3 –
1PH8, type of construction IM B5, forced ventilation													
100	1PH8101	250 (9.84)	180 (7.09)	16 (0.63)	215 (8.46)	196 (7.72)	4 (0.16)	98 (3.86)	369.5 (14.55)	250 (9.84)	292 (11.50)	–	–
	1PH8103								405 (15.94)				
	1PH8105								464.5 (18.29)				
	1PH8107								500 (19.69)				

					Shaft extension DE				
Shaft height	Type	DIN IEC s_2 –	s_3 –	s_4 –	**d** **D**	d_6 –	i_2 E	t GA	u F
100	1PH8101	14 (0.55)	M32 × 1.5	M20 × 1.5	**38** **(1.50)**	M12	80 (3.15)	41 (1.61)	10 (0.39)
	1PH8103								
	1PH8105								
	1PH8107								

1PH810





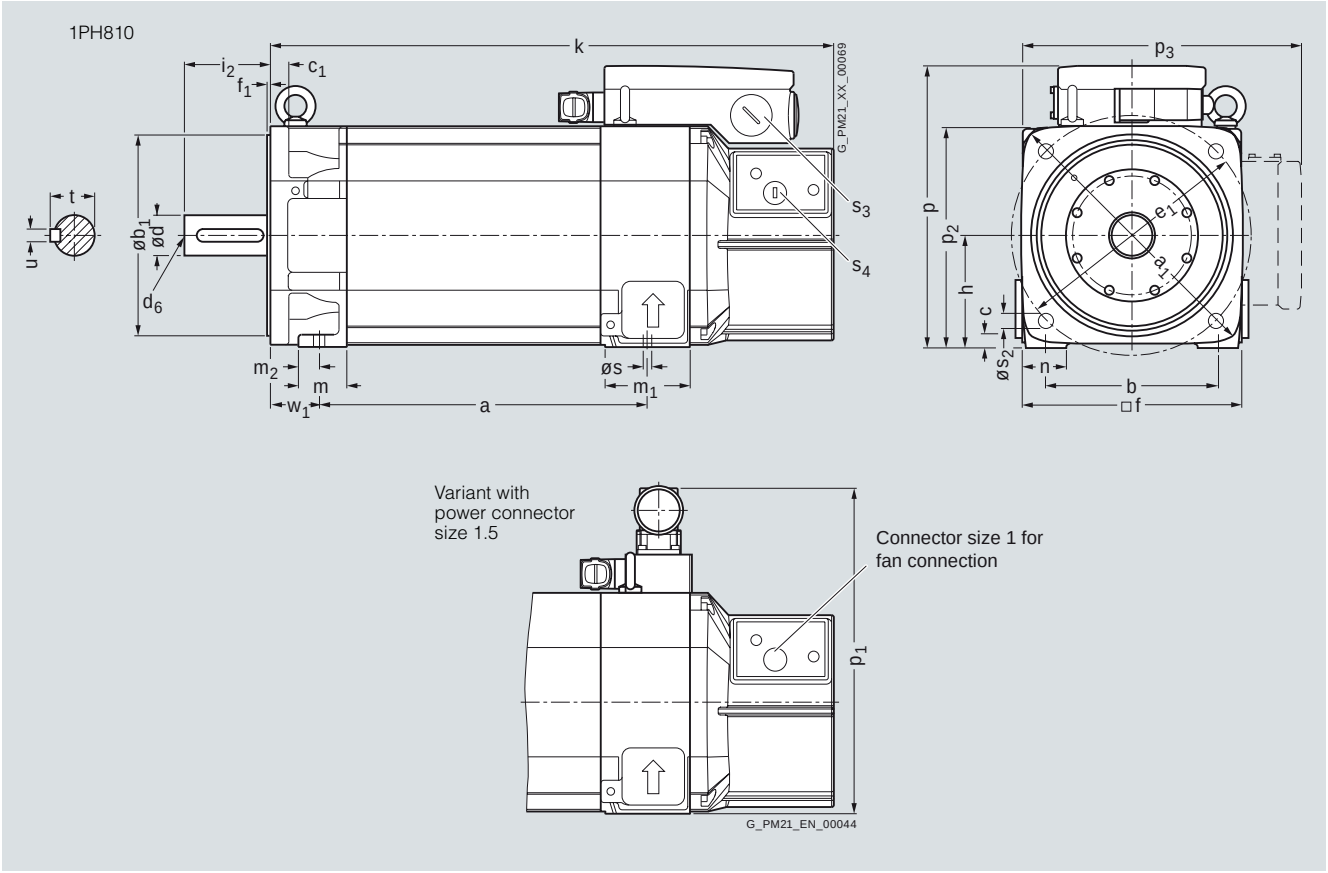
1PH8 asynchronous motors
Shaft height 100 – Forced ventilation

Dimensional drawings

For motor		Dimensions in mm (inches)															
Shaft height	Type	DIN IEC a B	a_1 P	b A	b_1 N	c HA	c_1 LA	e_1 M	f AB	f_1 T	h H	k LB	m BA	m_1 –	m_2 –	n AA	
1PH8, type of construction IM B35, forced ventilation																	
100	1PH8101	167 (6.57)	250 (9.84)	160 (6.30)	180 (7.09)	11 (0.43)	16 (0.63)	215 (8.46)	196 (7.72)	4 (0.16)	100 (3.94)	369.5 (14.55)	44 (1.73)	74 (2.91)	19 (0.75)	40 (1.57)	
	1PH8103	202.5 (7.97)										405 (15.94)					
	1PH8105	262 (10.31)										464.5 (18.29)					
	1PH8107	297.5 (11.71)										500 (19.69)					

5

											Shaft extension DE					
Shaft height	Type	DIN IEC p HD	p_1 –	p_2 –	p_3 –	s K	s_2 –	s_3 –	s_4 –	w_1 C	**d D**	d_6 –	i_2 E	t GA	u F	
100	1PH8101	252 (9.92)	294 (11.57)	198 (7.80)	276.5 (10.89)	12 (0.47)	14 (0.55)	M32 × 1.5	M20 × 1.5	43 (1.69)	**38 (1.50)**	M12	80 (3.15)	41 (1.61)	10 (0.39)	
	1PH8103															
	1PH8105															
	1PH8107															

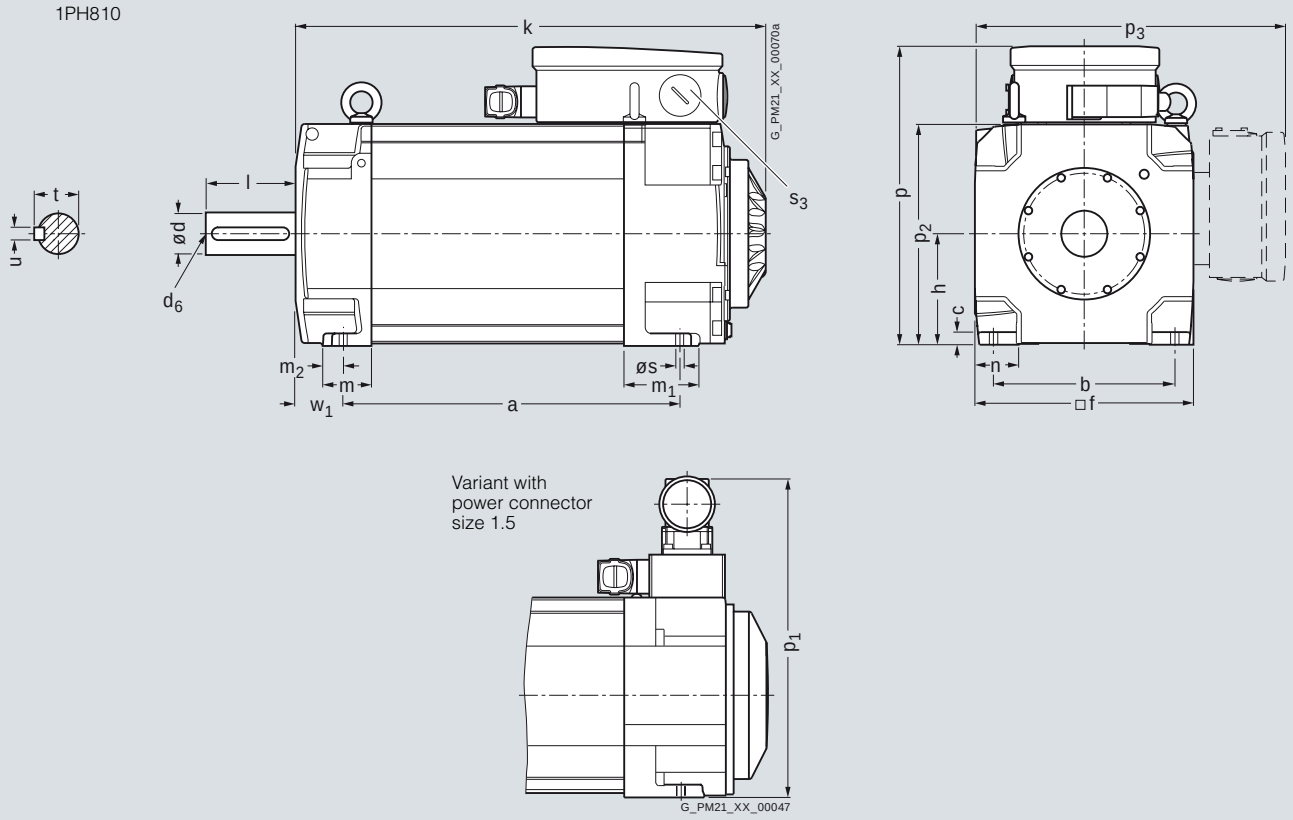


Dimensional drawings

For motor		Dimensions in mm (inches)																
Shaft height	Type	DIN IEC	a B	a_1 P	b A	b_1 N	c HA	c_1 LA	e_1 M	f AB	f_1 T	h H	k LB	m BA	m_1 –	m_2 –	n AA	
1PH8, type of construction IM B3, water cooling																		
100	1PH8101		167 (6.57)	–	160 (6.30)	–	11 (0.43)	–	–	196 (7.72)	–	100 (3.94)	289.5 (11.40)	44 (1.73)	68 (2.68)	19 (0.75)	43 (1.69)	
	1PH8103		202.5 (7.97)										325 (12.80)					
	1PH8105		262 (10.31)										384.5 (15.14)					
	1PH8107		297.5 (11.71)										420 (16.54)					

											Shaft extension DE				
Shaft height	Type	DIN IEC	p HD	p_1 –	p_2 –	p_3 –	s K	s_2 –	s_3 –	w_1 C	**d D**	d_6 –	l E	t GA	u F
100	1PH8101		266.5 (10.49)	294 (11.57)	198 (7.80)	276.5 (10.89)	12 (0.47)	–	M32 × 1.5	43 (1.69)	**38 (1.50)**	M12	80 (3.15)	41 (1.61)	10 (0.39)
	1PH8103														
	1PH8105														
	1PH8107														

1PH810



1PH8 asynchronous motors
Shaft height 100 – Water cooling

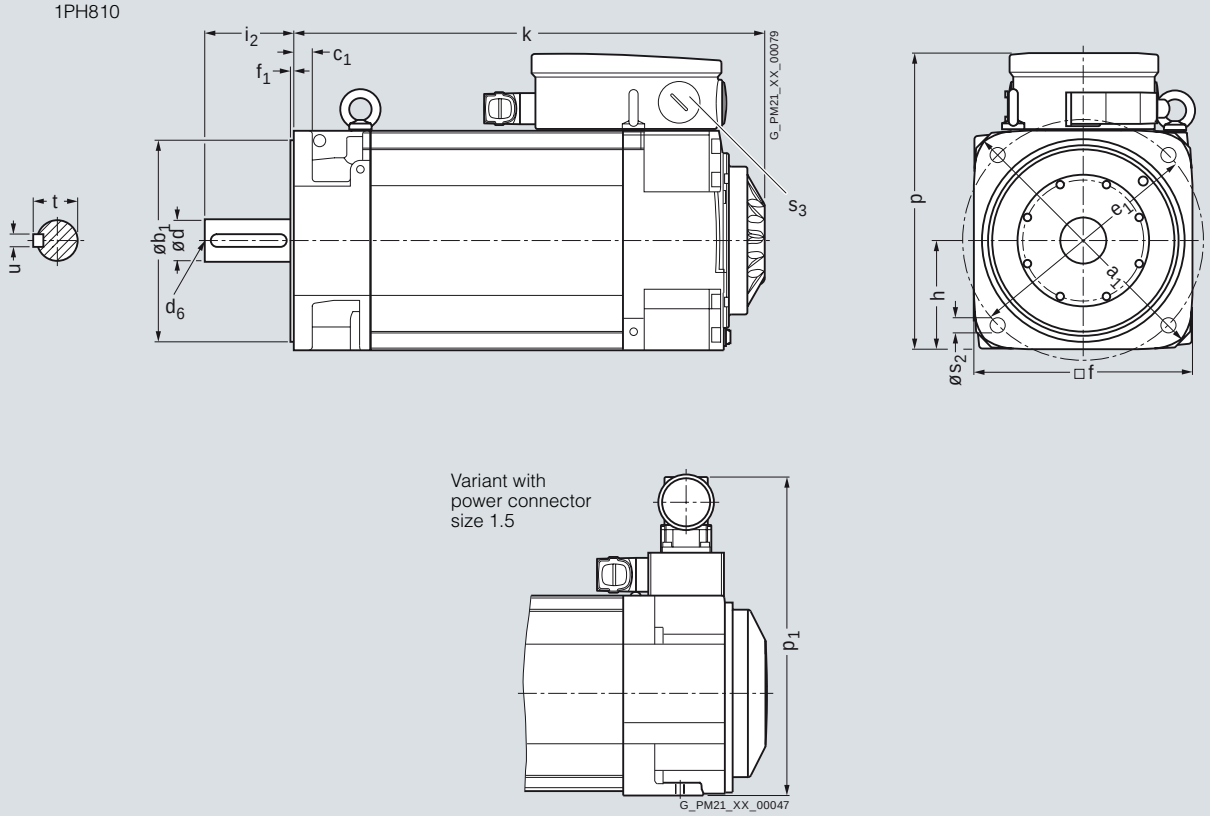
Dimensional drawings

For motor		Dimensions in mm (inches)															
Shaft height	Type	DIN IEC a B	a_1 P	b A	b_1 N	c HA	c_1 LA	e_1 M	f AB	f_1 T	h H	k LB	m BA	m_1 –	m_2 –	n AA	
1PH8, type of construction IM B5, water cooling																	
100	1PH8101	–	250 (9.84)	–	180 (7.09)	–	16 (0.63)	215 (8.46)	196 (7.72)	4 (0.16)	98 (3.86)	289.5 (11.40)	–	–	–	–	
	1PH8103											325 (12.80)					
	1PH8105											384.5 (15.14)					
	1PH8107											420 (16.54)					

5

										Shaft extension DE				
Shaft height	Type	DIN IEC p HD	p_1 –	p_2 –	p_3 –	s K	s_2 –	s_3 –	w_1 C	**d D**	d_6 –	i_2 E	t GA	u F
100	1PH8101	264.5 (10.41)	292 (11.50)	–	–	–	14 (0.55)	M32 × 1.5	–	**38 (1.50)**	M12	80 (3.15)	41 (1.61)	10 (0.39)
	1PH8103													
	1PH8105													
	1PH8107													

1PH810

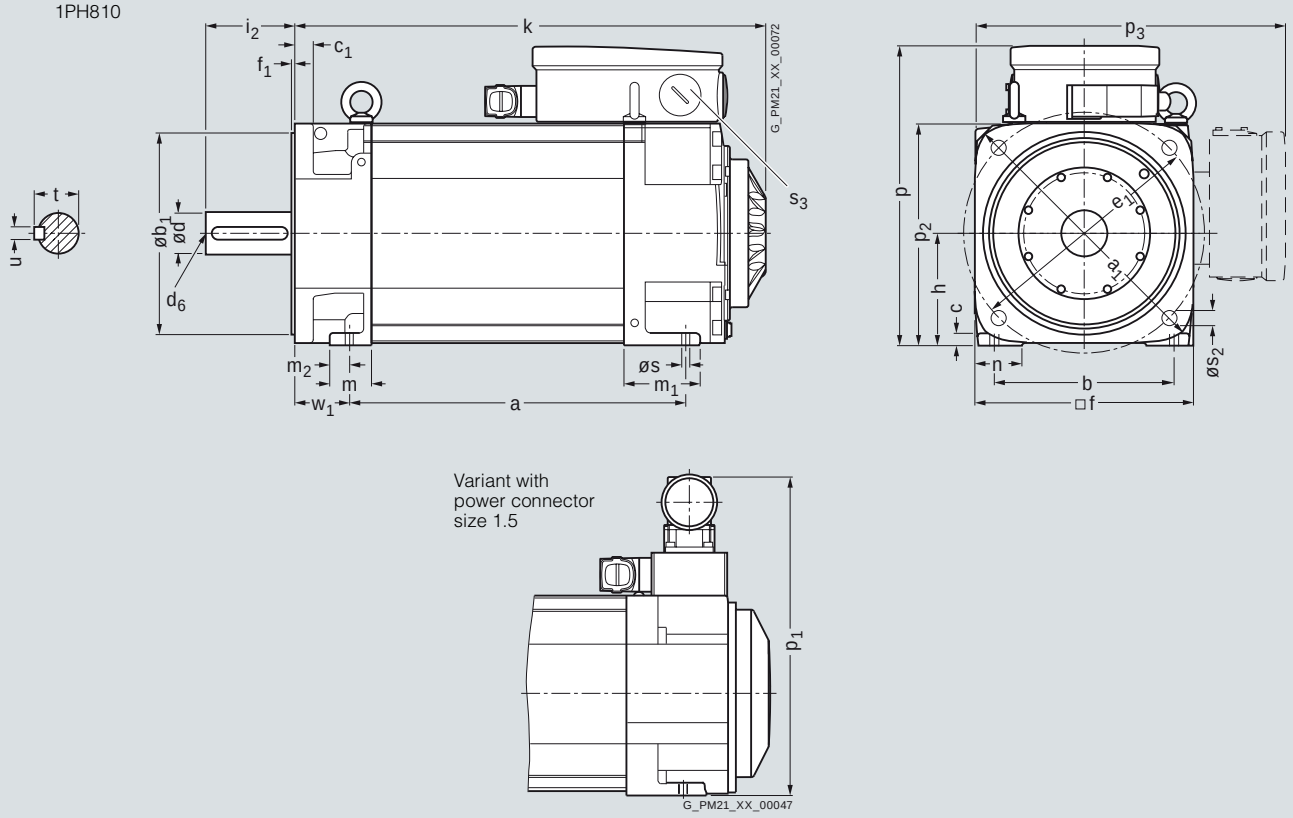


Dimensional drawings

For motor		Dimensions in mm (inches)															
Shaft height	Type	DIN IEC	a B	a_1 P	b A	b_1 N	c HA	c_1 LA	e_1 M	f AB	f_1 T	h H	k LB	m BA	m_1 –	m_2 –	n AA
1PH8, type of construction IM B35, water cooling																	
100	1PH8101		167 (6.57)	250 (9.84)	160 (6.30)	180 (7.09)	11 (0.43)	16 (0.63)	215 (8.46)	196 (7.72)	4 (0.16)	100 (3.94)	289.5 (11.40)	37 (1.46)	68 (2.68)	12 (0.47)	43 (1.69)
	1PH8103		202.5 (7.97)										325 (12.80)				
	1PH8105		262 (10.31)										384.5 (15.14)				
	1PH8107		297.5 (11.71)										420 (16.54)				

											Shaft extension DE					
Shaft height	Type	DIN IEC	p HD	p_1 –	p_2 –	p_3 –	s K	s_2 –	s_3 –	w_1 C	**d** **D**	d_6 –	i_2 E	t GA	u F
100	1PH8101		266.5 (10.49)	294 (11.57)	198 (7.80)	276.5 (10.89)	12 (0.47)	14 (0.55)	M32 × 1.5	43 (1.69)	**38** **(1.50)**	M12	80 (3.15)	41 (1.61)	10 (0.39)
	1PH8103														
	1PH8105														
	1PH8107														

1PH810



1PH8 asynchronous and synchronous motors
Shaft height 132 – Forced ventilation

Dimensional drawings

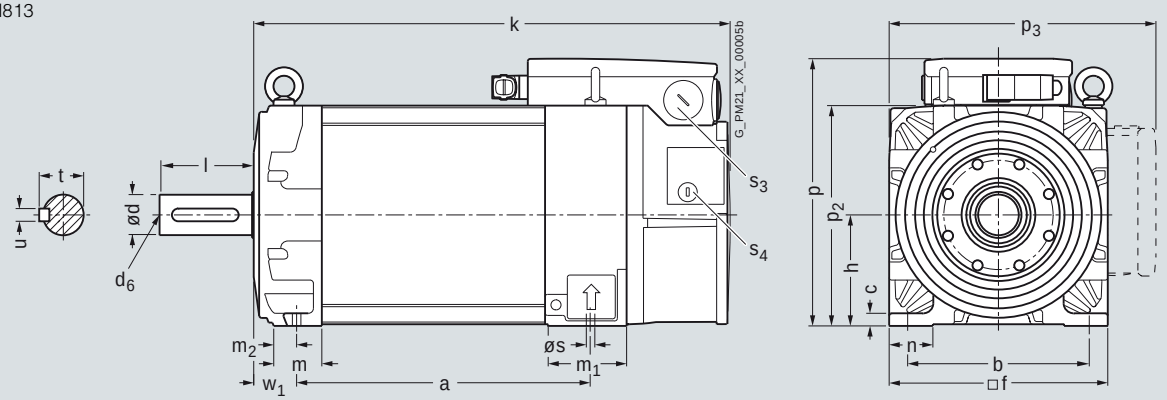
For motor — Dimensions in mm (inches)

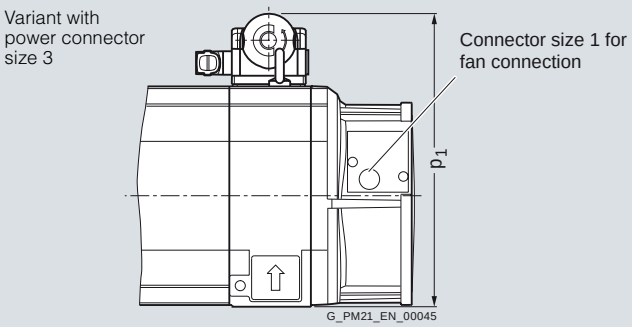
Shaft height	Type	DIN IEC	a B	a_1 P	b A	b_1 N	c HA	c_1 LA	e_1 M	f AB	f_1 T	h H	k LB	m BA	m_1 –	m_2 –	n AA
1PH8, type of construction IM B3, forced ventilation																	
132	1PH8131		220.5 (8.68)	–	216 (8.50)	–	15 (0.59)	–	–	260 (10.24)	–	132 (5.20)	439 (17.28)	57 (2.24)	93 (3.66)	27 (1.06)	52 (2.05)
	1PH8133		265.5 (10.45)										484 (19.06)				
	1PH8135		310.5 (12.22)										529 (20.83)				
	1PH8137		350.5 (13.80)										569 (22.40)				

Shaft extension DE

Shaft height	Type	DIN IEC	p HD	p_1 –	p_2 –	p_3 –	s K	s_2 –	s_3 –	s_4 –	w_1 C	**d D**	d_6 –	l E	t GA	u F
132	1PH8131		317.5 (12.50)	347 (13.66)	262 (10.31)	357.5 (14.07)	12 (0.47)	–	M40 × 1.5	M20 × 1.5	53 (2.09)	**48 (1.89)**	M16	110 (4.33)	51.5 (2.03)	14 (0.55)
	1PH8133															
	1PH8135															
	1PH8137															

1PH813





Dimensional drawings

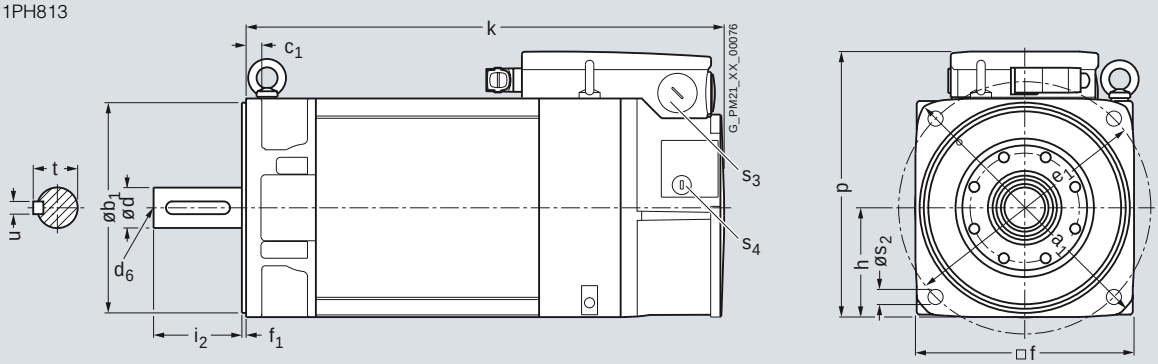
For motor — Dimensions in mm (inches)

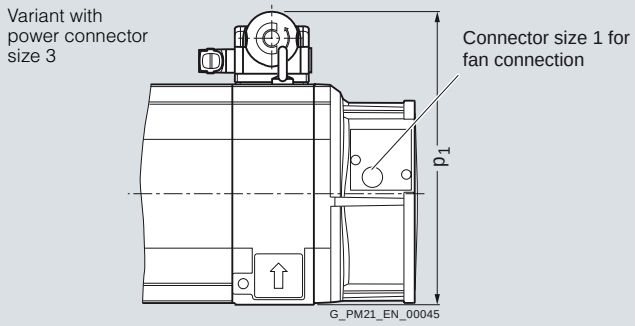
Shaft height	Type	DIN IEC	a B	a_1 P	b A	b_1 N	c HA	c_1 LA	e_1 M	f AB	f_1 T	h H	k LB	m BA	m_1 –	m_2 –	n AA
1PH8, type of construction IM B5, forced ventilation																	
132	1PH8131		–	340 (13.39)	–	250 (9.84)	–	18 (0.71)	300 (11.81)	260 (10.24)	5 (0.20)	130 (5.12)	439 (17.28)	–	–	–	–
	1PH8133												484 (19.06)				
	1PH8135												529 (20.83)				
	1PH8137												569 (22.40)				

Shaft extension DE

Shaft height	Type	DIN IEC	p HD	p_1 –	p_2 –	p_3 –	s K	s_2 –	s_3 –	s_4 –	w_1 C	**d D**	d_6 –	i_2 E	t GA	u F
132	1PH8131		315.5 (12.42)	345 (13.58)	–	–	–	18 (0.71)	M40 × 1.5	M20 × 1.5	–	**48 (1.89)**	M16	110 (4.33)	51.5 (2.03)	14 (0.55)
	1PH8133															
	1PH8135															
	1PH8137															

1PH813





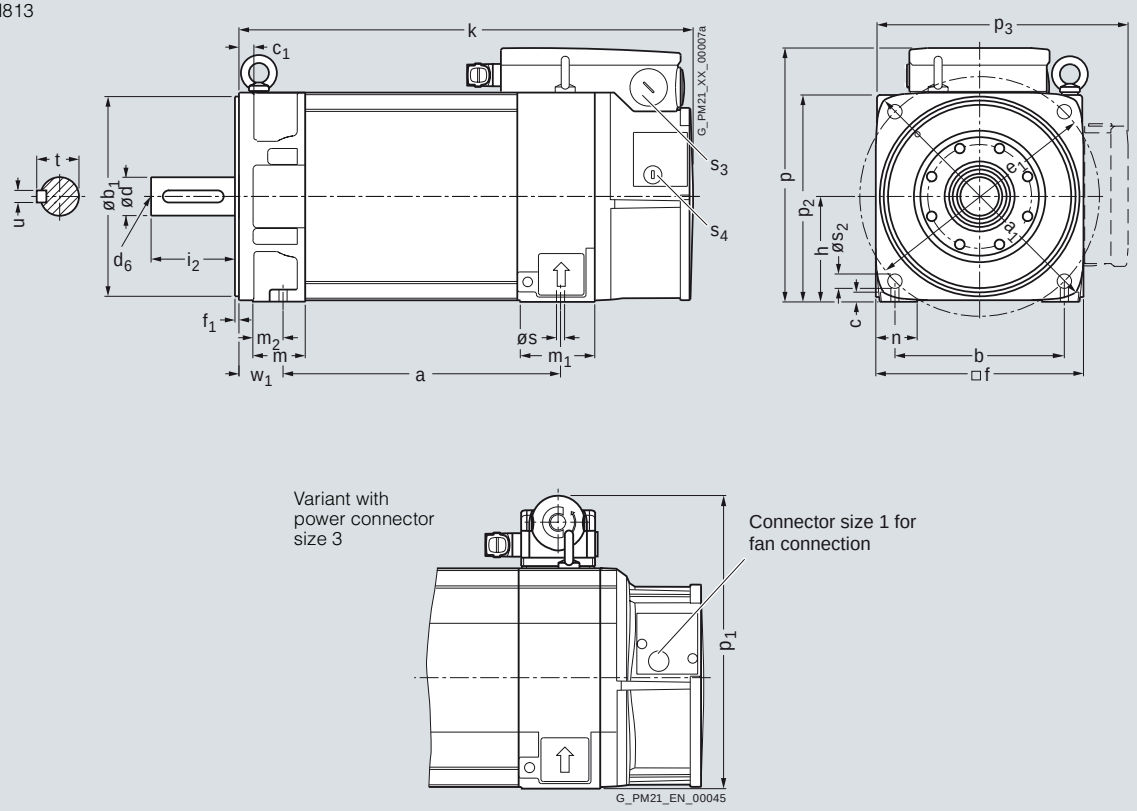
1PH8 asynchronous and synchronous motors
Shaft height 132 – Forced ventilation

Dimensional drawings

For motor		Dimensions in mm (inches)															
Shaft height	Type	DIN IEC a B	a_1 P	b A	b_1 N	c HA	c_1 LA	e_1 M	f AB	f_1 T	h H	k LB	m BA	m_1 –	m_2 –	n AA	
1PH8, type of construction IM B35, forced ventilation																	
132	1PH8131	220.5 (8.68)	340 (13.39)	216 (8.50)	250 (9.84)	15 (0.59)	18 (0.71)	300 (11.81)	260 (10.24)	5 (0.20)	132 (5.20)	439 (17.28)	65 (2.56)	93 (3.66)	35 (1.38)	52 (2.05)	
	1PH8133	265.5 (10.45)										484 (19.06)					
	1PH8135	310.5 (12.22)										529 (20.83)					
	1PH8137	350.5 (13.80)										569 (22.40)					

												Shaft extension DE				
Shaft height	Type	DIN IEC p HD	p_1 –	p_2 –	p_3 –	s K	s_2 –	s_3 –	s_4 –	w_1 C	**d D**	d_6 –	i_2 E	t GA	u F	
132	1PH8131	317.5 (12.50)	347 (13.66)	262 (10.31)	357.5 (14.07)	12 (0.47)	18 (0.71)	M40 × 1.5	M20 × 1.5	53 (2.09)	**48 (1.89)**	M16	110 (4.33)	51.5 (2.03)	14 (0.55)	
	1PH8133															
	1PH8135															
	1PH8137															

1PH813



Dimensional drawings

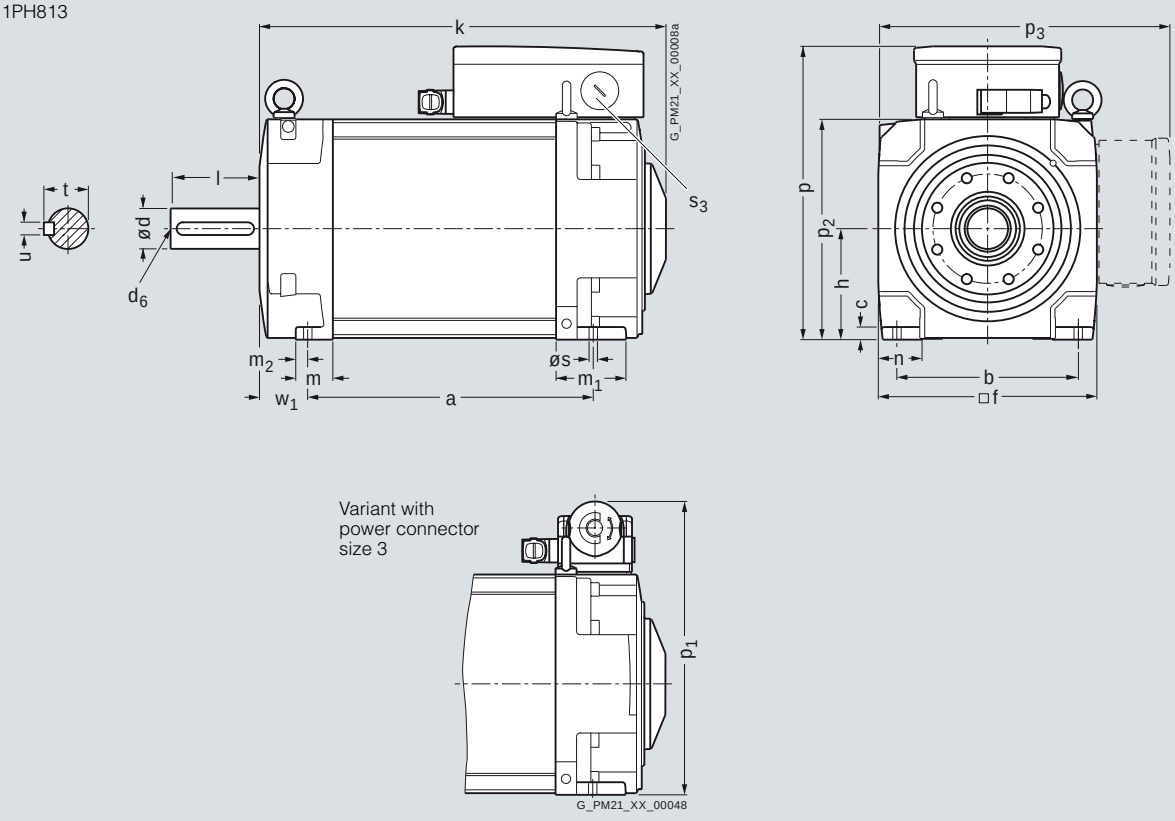
For motor — Dimensions in mm (inches)

Shaft height	Type	DIN IEC	a B	a_1 P	b A	b_1 N	c HA	c_1 LA	e_1 M	f AB	f_1 T	h H	k LB	m BA	m_1 –	m_2 –	n AA
1PH8, type of construction IM B3, water cooling																	
132	1PH8131		220.5 (8.68)	–	216 (8.50)	–	15 (0.59)	–	–	260 (10.24)	–	132 (5.20)	347.5 (13.68)	42 (1.65)	81 (3.19)	12 (0.47)	43 (1.69)
	1PH8133		265.5 (10.45)										392.5 (15.45)				
	1PH8135		310.5 (12.22)										437.5 (17.22)				
	1PH8137		350.5 (13.80)										477.5 (18.80)				

Shaft extension DE

Shaft height	Type	DIN IEC	p HD	p_1 –	p_2 –	p_3 –	s K	s_2 –	s_3 –	w_1 C	**d D**	d_6 –	l E	t GA	u F
132	1PH8131		347.5 (13.68)	347 (13.66)	262 (10.31)	357.5 (14.07)	12 (0.47)	–	M50 × 1.5	53 (2.09)	**48 (1.89)**	M16	110 (4.33)	51.5 (2.03)	14 (0.55)
	1PH8133														
	1PH8135														
	1PH8137														

1PH813



1PH8 asynchronous and synchronous motors
Shaft height 132 – Water cooling

Dimensional drawings

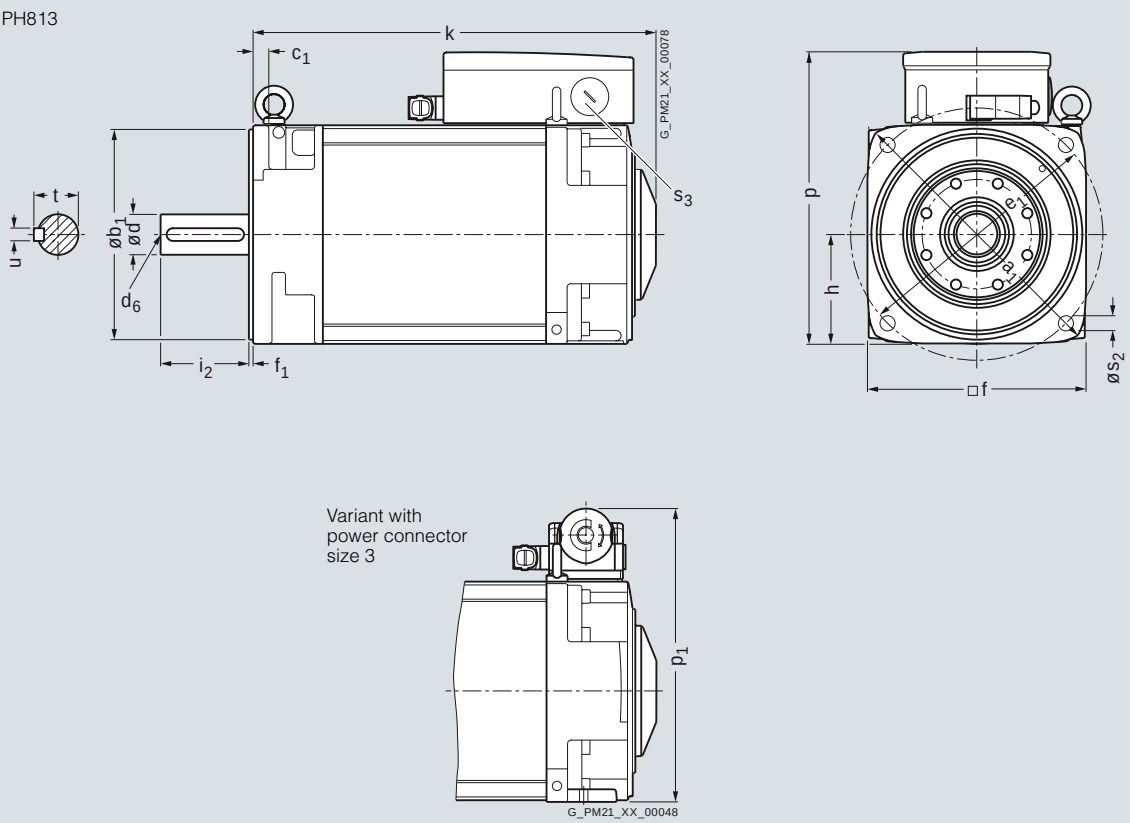
For motor — Dimensions in mm (inches)

Shaft height	Type	DIN IEC	a B	a_1 P	b A	b_1 N	c HA	c_1 LA	e_1 M	f AB	f_1 T	h H	k LB	m BA	m_1 –	m_2 –	n AA
1PH8, type of construction IM B5, water cooling																	
132	1PH8131		–	340 (13.39)	–	250 (9.84)	–	18 (0.71)	300 (11.81)	260 (10.24)	5 (0.20)	132 (5.20)	347.5 (13.68)	–	–	–	–
	1PH8133												392.5 (15.45)				
	1PH8135												437.5 (17.22)				
	1PH8137												477.5 (18.80)				

Shaft extension DE

Shaft height	Type	DIN IEC	p HD	p_1 –	p_2 –	p_3 –	s K	s_2 –	s_3 –	w_1 C	**d D**	d_6 –	i_2 E	t GA	u F
132	1PH8131		345.5 (13.60)	345 (13.58)	–	–	–	18 (0.71)	M50 × 1.5	–	**48 (1.89)**	M16	110 (4.33)	51.5 (2.03)	14 (0.55)
	1PH8133														
	1PH8135														
	1PH8137														

1PH813

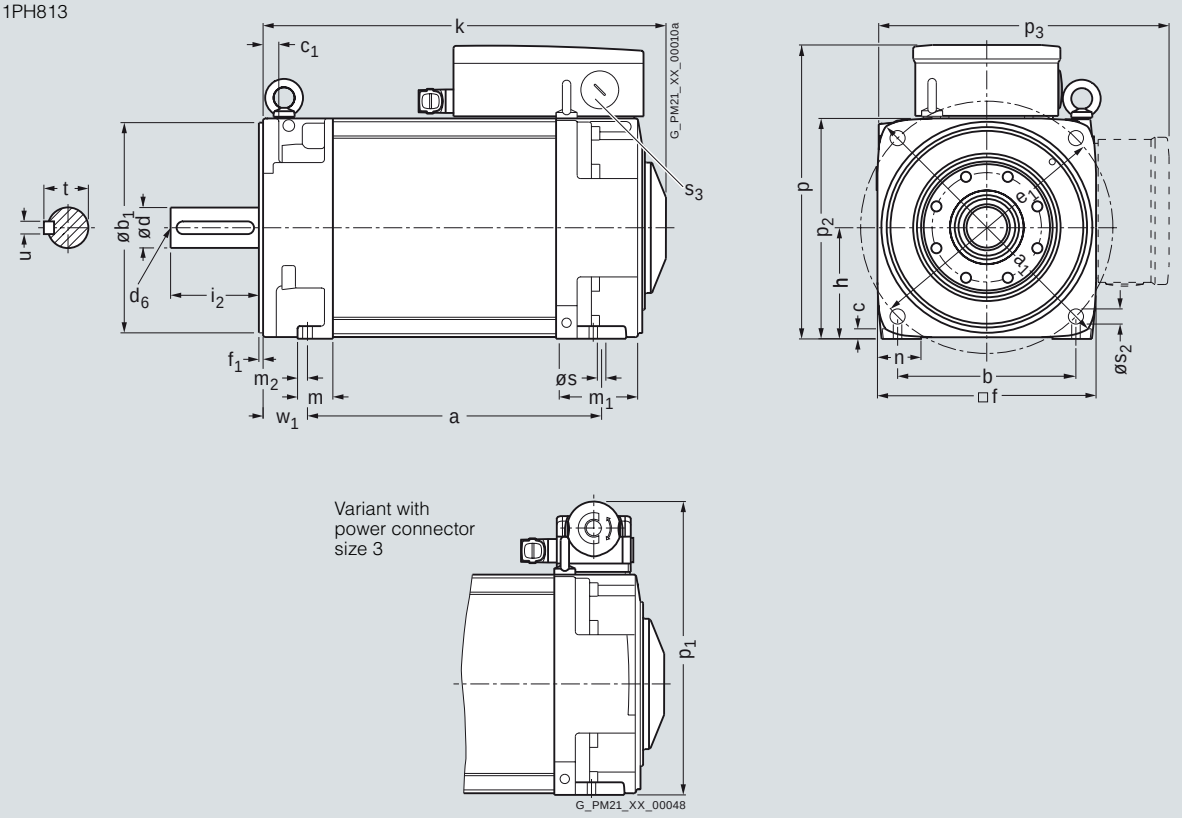


Dimensional drawings

For motor		Dimensions in mm (inches)															
Shaft height	Type	DIN IEC a B	a_1 P	b A	b_1 N	c HA	c_1 LA	e_1 M	f AB	f_1 T	h H	k LB	m BA	m_1 –	m_2 –	n AA	
1PH8, type of construction IM B35, water cooling																	
132	1PH8131	220.5 (8.68)	340 (13.39)	216 (8.50)	250 (9.84)	15 (0.59)	18 (0.71)	300 (11.81)	260 (10.24)	5 (0.20)	132 (5.20)	347.5 (13.68)	42 (1.65)	81 (3.19)	12 (0.47)	43 (1.69)	
	1PH8133	265.5 (10.45)										392.5 (15.45)					
	1PH8135	310.5 (12.22)										437.5 (17.22)					
	1PH8137	350.5 (13.80)										477.5 (18.80)					

										Shaft extension DE					
Shaft height	Type	DIN IEC p HD	p_1 –	p_2 –	p_3 –	s K	s_2 –	s_3 –	w_1 C	**d D**	d_6 –	i_2 E	t GA	u F	
132	1PH8131	347.5 (13.68)	347 (13.66)	262 (10.31)	357.5 (14.07)	12 (0.47)	18 (0.71)	M50 × 1.5	53 (2.09)	**48 (1.89)**	M16	110 (4.33)	51.5 (2.03)	14 (0.55)	
	1PH8133														
	1PH8135														
	1PH8137														

1PH813



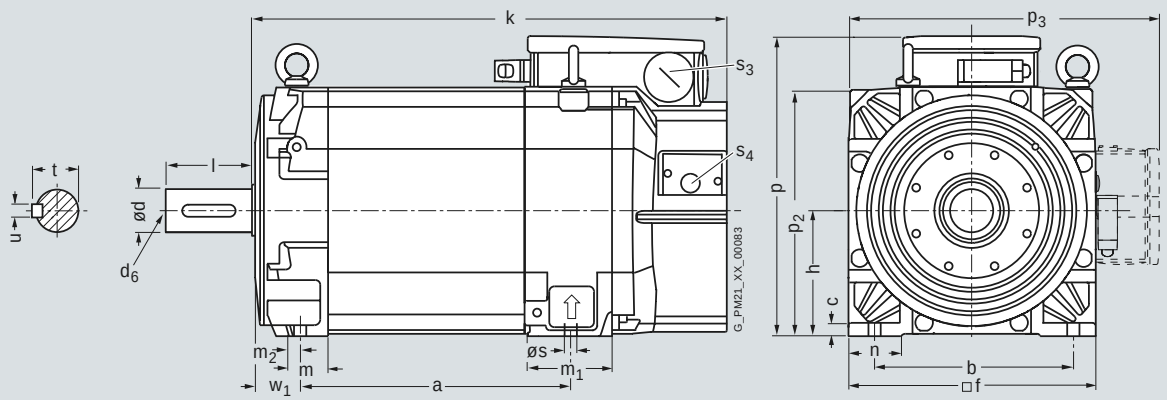
1PH8 asynchronous motors
Shaft height 160 – Forced ventilation

Dimensional drawings

For motor		Dimensions in mm (inches)															
Shaft height	Type	DIN IEC a B	a_1 P	b A	b_1 N	c HA	c_1 LA	e_1 M	f AB	f_1 T	h H	k LB	m BA	m_1 –	m_2 –	n AA	
1PH8, type of construction IM B3, forced ventilation																	
160	1PH8163	346.5 (13.64)	–	254 (10.00)	–	17 (0.67)	23 (0.91)	–	314 (12.36)	–	160 (6.30)	610.5 (24.04)	64 (2.52)	99.5 (3.92)	28 (1.10)	70 (2.76)	
	1PH8165	406.5 (16.00)										670.5 (26.40)					

											Shaft extension DE					
Shaft height	Type	DIN IEC p HD	p_1 –	p_2 –	p_3 –	s K	s_2 –	s_3 –	s_4 –	w_1 C	**d D**	d_6 –	l L	t GA	u F	
	1PH8163	382.5 (15.06)	–	317 (12.48)	412.5 (16.24)	14 (0.55)	–	M50 × 1.5	M20 × 1.5	61 (2.40)	**55 (2.17)**	M20	110 (4.33)	59 (2.32)	16 (0.63)	
	1PH8165															

1PH816



Dimensional drawings

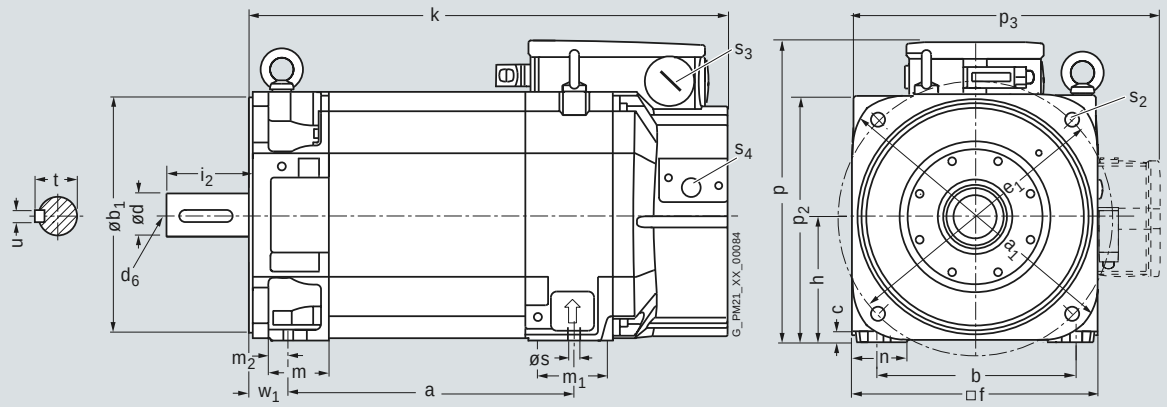
For motor — Dimensions in mm (inches)

Shaft height	Type	DIN IEC	a B	a_1 P	b A	b_1 N	c HA	c_1 LA	e_1 M	f AB	f_1 T	h H	k LB	m BA	m_1 –	m_2 –	n AA
1PH8, type of construction IM B5/IM B35, forced ventilation																	
160	1PH8163		346.5 (13.64)	393 (15.47)	254 (10.00)	300 (11.81)	17 (0.67)	–	350 (13.78)	314 (12.36)	5 (0.20)	160 (6.30)	610.5 (24.04)	55 (2.17)	99.5 (3.92)	19 (0.75)	70 (2.76)
	1PH8165		406.5 (16.00)										670.5 (26.40)				

Shaft extension DE

Shaft height	Type	DIN IEC	p HD	p_1 –	p_2 –	p_3 –	s K	s_2 –	s_3 –	s_4 –	w_1 C	**d D**	d_6 –	i_2 E	t GA	u F
	1PH8163		382.5 (15.06)	–	317 (12.48)	412.5 (16.24)	14 (0.55)	18 (0.71)	M50 × 1.5	M20 × 1.5	61 (2.40)	55 (2.17)	M20	110 (4.33)	59 (2.32)	16 (0.63)
	1PH8165															

1PH816



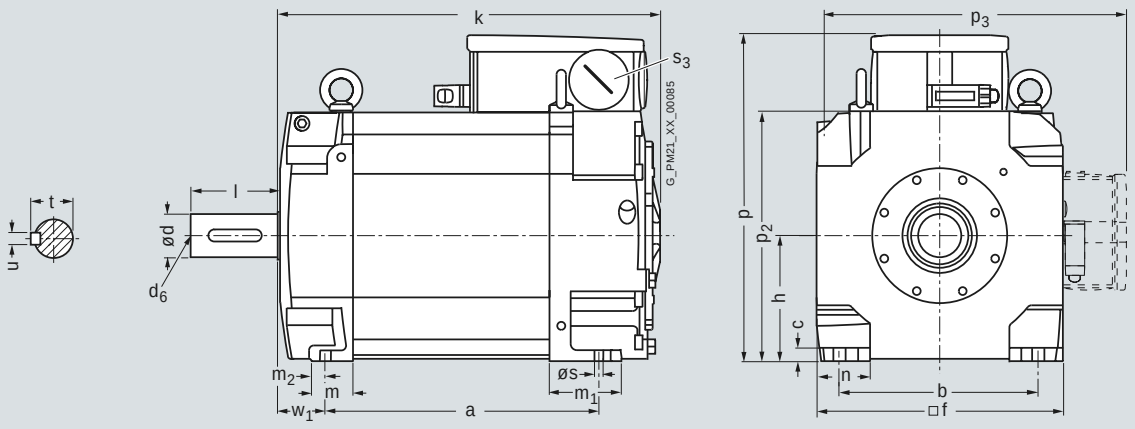
1PH8 asynchronous motors
Shaft height 160 – Water cooling

Dimensional drawings

For motor		Dimensions in mm (inches)															
Shaft height	Type	DIN IEC	a B	a_1 P	b A	b_1 N	c HA	c_1 LA	e_1 M	f AB	f_1 T	h H	k LB	m BA	m_1 –	m_2 –	n AA
1PH8, type of construction IM B3, water cooling																	
160	1PH8163		346.5 (13.64)	–	254 (10.00)	–	17 (0.67)	23 (0.91)	–	314 (12.36)	–	160 (6.30)	488.5 (19.23)	53 (2.09)	91 (3.58)	17 (0.67)	70 (2.76)
	1PH8165		406.5 (16.00)										548.5 (21.59)				
	1PH8166																

											Shaft extension DE					
Shaft height	Type	DIN IEC	p HD	p_1 –	p_2 –	p_3 –	s K	s_2 –	s_3 –	s_4 –	w_1 C	**d D**	d_6 –	l L	t GA	u F
	1PH8163		415.5 (16.36)	–	317 (12.48)	412.5 (16.24)	14 (0.55)	–	M63 × 1.5	–	61 (2.40)	**55 (2.17)**	M20	110 (4.33)	59 (2.32)	16 (0.63)
	1PH8165															
	1PH8166															

1PH816



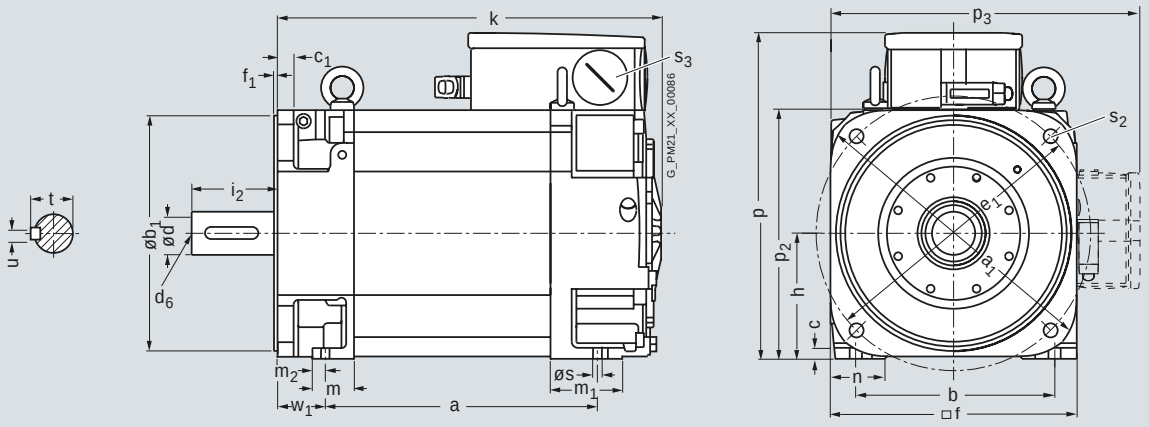
Dimensional drawings

For motor — Dimensions in mm (inches)

Shaft height	Type	DIN IEC	a B	a_1 P	b A	b_1 N	c HA	c_1 LA	e_1 M	f AB	f_1 T	h H	k LB	m BA	m_1 –	m_2 –	n AA
1PH8, type of construction IM B5/IM B35, water cooling																	
160	1PH8163		346.5 (13.64)	393 (15.47)	254 (10.00)	300 (11.81)	17 (0.67)	–	350 (13.78)	314 (12.36)	5 (0.20)	160 (6.30)	488.5 (19.23)	53 (2.09)	91 (3.58)	17 (0.67)	70 (2.76)
	1PH8165		406.5 (16.00)										548.5 (21.59)				
	1PH8166																

Shaft height	Type	DIN IEC	p HD	p_1 –	p_2 –	p_3 –	s K	s_2 –	s_3 –	s_4 –	w_1 C	Shaft extension DE **d** **D**	d_6 –	i_2 E	t GA	u F
	1PH8163		415.5 (16.36)	–	317 (12.48)	412.5 (16.24)	14 (0.55)	18 (0.71)	M63 × 1.5	–	61 (2.40)	**55** **(2.17)**	M20	110 (4.33)	59 (2.32)	16 (0.63)
	1PH8165															
	1PH8166															

1PH816



1PH8 synchronous motors
Shaft height 160 – Forced ventilation

Dimensional drawings

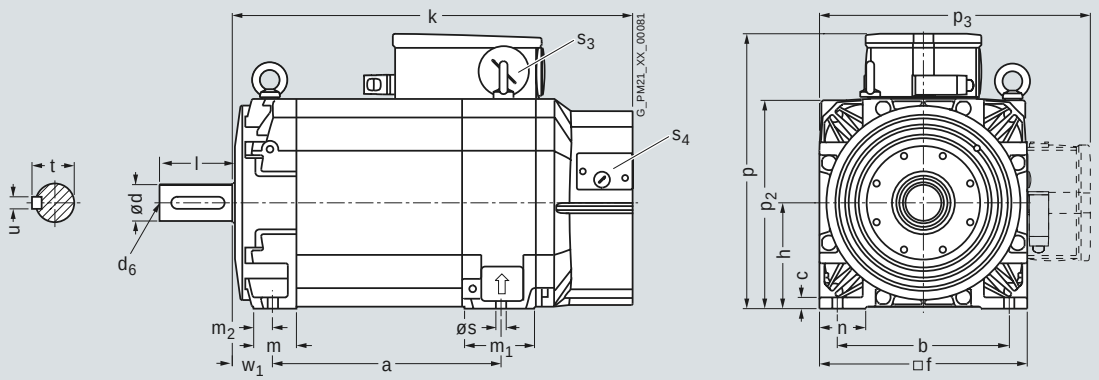
For motor — Dimensions in mm (inches)

Shaft height	Type	DIN IEC	a B	a_1 P	b A	b_1 N	c HA	c_1 LA	e_1 M	f AB	f_1 T	h H	k LB	m BA	m_1 –	m_2 –	n AA
1PH8, type of construction IM B3, forced ventilation																	
160	1PH8165		406.5 (16.00)	–	254 (10.00)	–	17 (0.67)	23 (0.91)	–	314 (12.36)	–	160 (6.30)	670.5 (26.40)	64 (2.52)	99.5 (3.92)	28 (1.10)	70 (2.76)
	1PH8167		446.5 (17.58)										710.5 (27.97)				

Shaft extension DE

Shaft height	Type	DIN IEC	p HD	p_1 –	p_2 –	p_3 –	s K	s_2 –	s_3 –	s_4 –	w_1 C	**d D**	d_6 –	l L	t GA	u F
	1PH8165		415.5 (16.36)	–	317 (12.48)	412.5 (16.24)	14 (0.55)	–	M63 × 1.5	M20 × 1.5	61 (2.40)	**55 (2.17)**	M20	110 (4.33)	59 (2.32)	16 (0.63)
	1PH8167															

1PH816



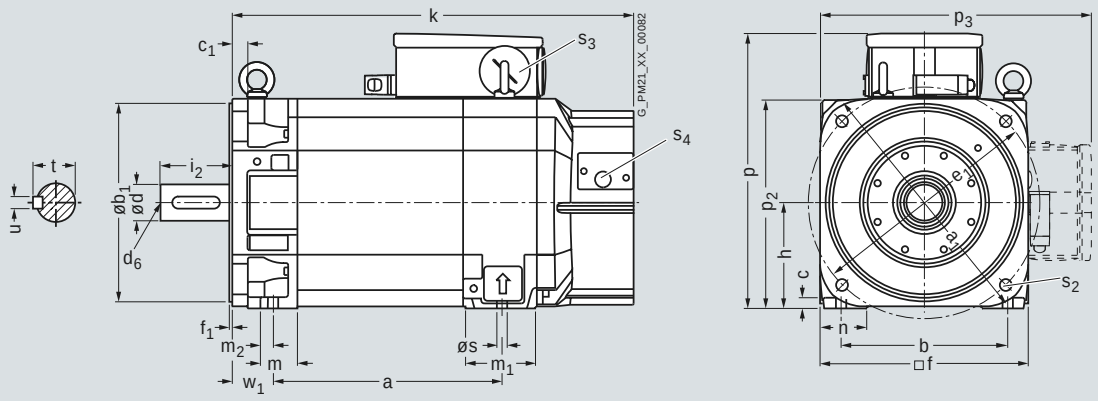
Dimensional drawings

For motor — Dimensions in mm (inches)

Shaft height	Type	DIN IEC	a B	a_1 P	b A	b_1 N	c HA	c_1 LA	e_1 M	f AB	f_1 T	h H	k LB	m BA	m_1 –	m_2 –	n AA
1PH8, type of construction IM B5/IM B35, forced ventilation																	
160	1PH8165		406.5 (16.00)	393 (15.47)	254 (10.00)	300 (11.81)	17 (0.67)	–	350 (13.78)	314 (12.36)	5 (0.20)	160 (6.30)	670.5 (26.40)	55 (2.17)	99.5 (3.92)	19 (0.75)	70 (2.76)
	1PH8167		446.5 (17.58)										710.5 (27.97)				

Shaft height	Type	DIN IEC	p HD	p_1 –	p_2 –	p_3 –	s K	s_2 –	s_3 –	s_4 –	w_1 C	Shaft extension DE **d** **D**	d_6 –	i_2 E	t GA	u F
	1PH8165		415.5 (16.36)	–	317 (12.48)	412.5 (16.24)	14 (0.55)	18 (0.71)	M63 × 1.5	M20 × 1.5	61 (2.40)	**55** **(2.17)**	M20	110 (4.33)	59 (2.32)	16 (0.63)
	1PH8167															

1PH816



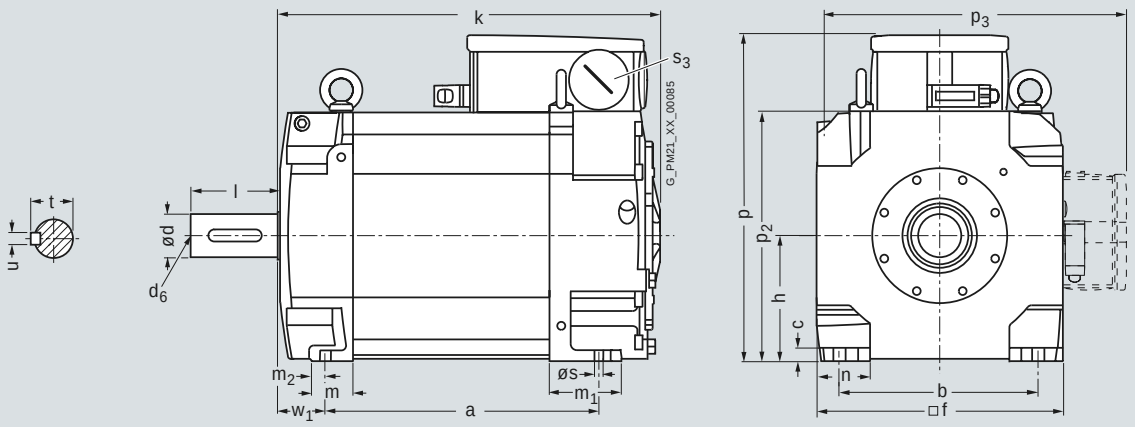
1PH8 synchronous motors
Shaft height 160 – Water cooling

Dimensional drawings

For motor		Dimensions in mm (inches)															
Shaft height	Type	DIN IEC	a B	a_1 P	b A	b_1 N	c HA	c_1 LA	e_1 M	f AB	f_1 T	h H	k LB	m BA	m_1 –	m_2 –	n AA
1PH8, type of construction IM B3, water cooling																	
160	1PH8164		346.5 (13.64)	–	254 (10.00)	–	17 (0.67)	23 (0.91)	–	314 (12.36)	–	160 (6.30)	488.5 (19.23)	53 (2.09)	91 (3.58)	17 (0.67)	70 (2.76)
	1PH8166		406.5 (16.00)										548.5 (21.59)				
	1PH8168		446.5 (17.58)										588.5 (23.17)				

												Shaft extension DE					
Shaft height	Type	DIN IEC	p HD	p_1 –	p_2 –	p_3 –	s K	s_2 –	s_3 –	s_4 –	w_1 C	**d** **D**	d_6 –	l L	t GA	u F
	1PH8164		415.5 (16.36)	–	317 (12.48)	412.5 (16.24)	14 (0.55)	–	M63 × 1.5	–	61 (2.40)	**55** **(2.17)**	M20	110 (4.33)	59 (2.32)	16 (0.63)
	1PH8166															
	1PH8168															

1PH816

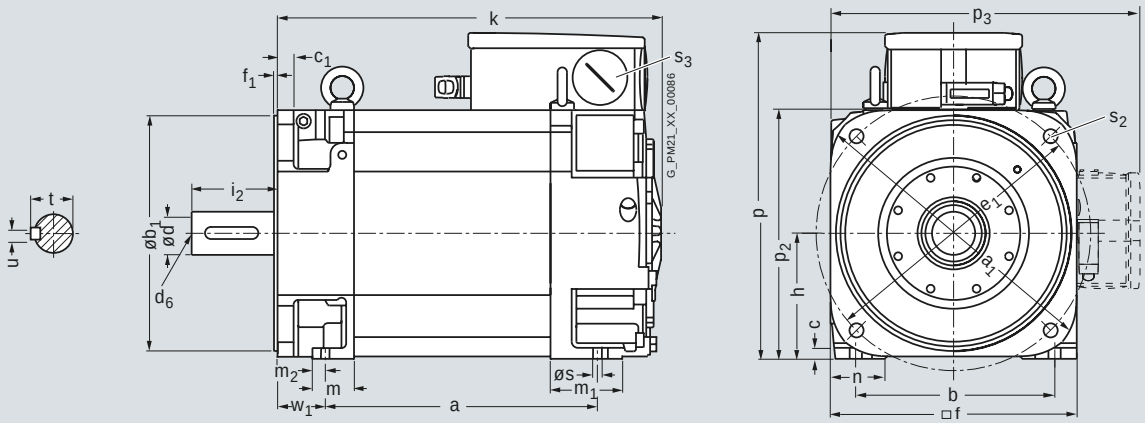


Dimensional drawings

For motor		Dimensions in mm (inches)															
Shaft height	Type	DIN IEC a B	a_1 P	b A	b_1 N	c HA	c_1 LA	e_1 M	f AB	f_1 T	h H	k LB	m BA	m_1 –	m_2 –	n AA	
1PH8, type of construction IM B5/IM B35, water cooling																	
160	1PH8164	346.5 (13.64)	393 (15.47)	254 (10.00)	300 (11.81)	17 (0.67)	–	350 (13.78)	314 (12.36)	5 (0.20)	160 (6.30)	488.5 (19.23)	53 (2.09)	91 (3.58)	17 (0.67)	70 (2.76)	
	1PH8166	406.5 (16.00)										548.5 (21.59)					
	1PH8168	446.5 (17.58)										588.5 (23.17)					

											Shaft extension DE					
Shaft height	Type	DIN IEC p HD	p_1 –	p_2 –	p_3 –	s K	s_2 –	s_3 –	s_4 –	w_1 C	**d D**	d_6 –	i_2 E	t GA	u F	
	1PH8164	415.5 (16.36)	–	317 (12.48)	412.5 (16.24)	14 (0.55)	18 (0.71)	M63 × 1.5	–	61 (2.40)	**55 (2.17)**	M20	110 (4.33)	59 (2.32)	16 (0.63)	
	1PH8166															
	1PH8168															

1PH816



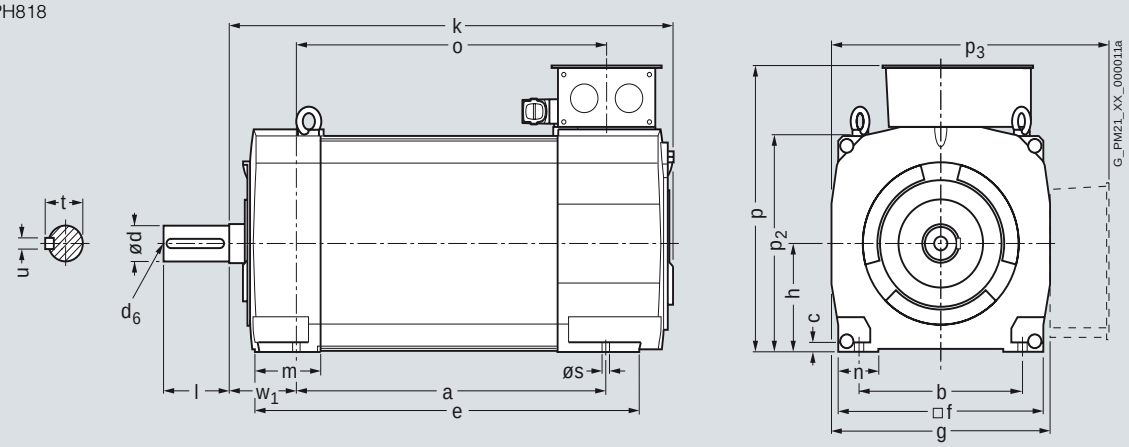
1PH8 asynchronous and synchronous motors
Shaft height 180 – Water cooling

Dimensional drawings

For motor			Dimensions in mm (inches)											
Shaft height	Type	DIN IEC	a B	b A	c HA	f AB	g AC	h H	k LB	m BA	n AA	p_2 –	s K	w_1 C
1PH8, types of construction IM B3/IM V5, water cooling														
180	1PH8184		430 (16.93)	279 (10.98)	15 (0.59)	356 (14.02)	384 (15.12)	180 (7.09)	670 (26.38)	138 (5.43)	73 (2.87)	372 (14.65)	14.5 (0.57)	121 (4.76)
	1PH8186		520 (20.47)						760 (29.92)					

			Shaft extension DE					Terminal box type												
								1XB7322				1XB7422				1XB7700				
Shaft height	Type	DIN IEC	**d** **D**	d_6 –	l E	t GA	u F	p HD	p_3 –	r LL	x_1 AG	p HD	p_3 –	r LL	x_1 AG	p HD	p_3 –	r LL	x_1 AG
180	1PH8184		**65m6**	M20	140 (5.51)	69 (2.72)	18 (0.71)	484 (19.06)	485 (19.09)	197 (7.76)	258 (10.16)	539 (21.22)	540 (21.26)	230 (9.06)	303 (11.93)	588 (23.15)	574 (22.60)	310 (12.20)	295 (11.61)
	1PH8186																		

1PH818

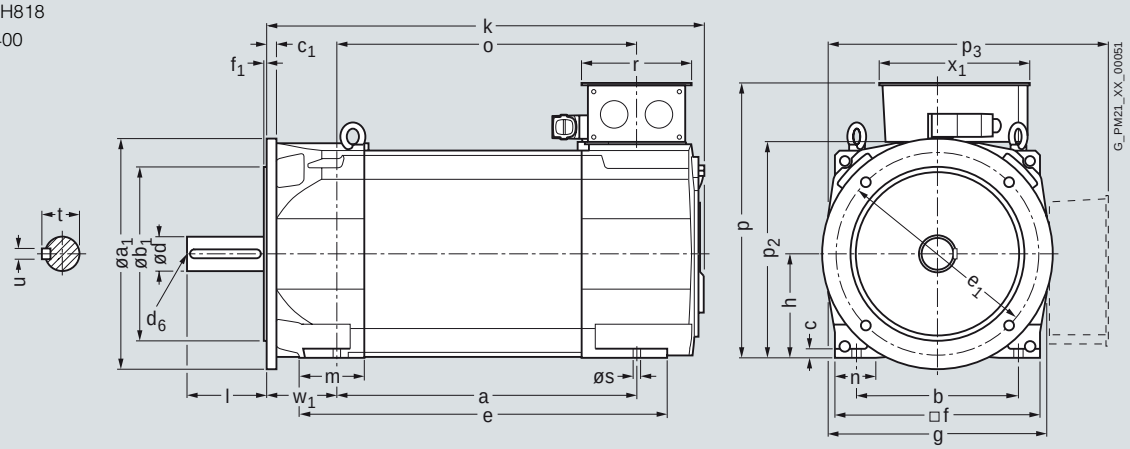


Dimensional drawings

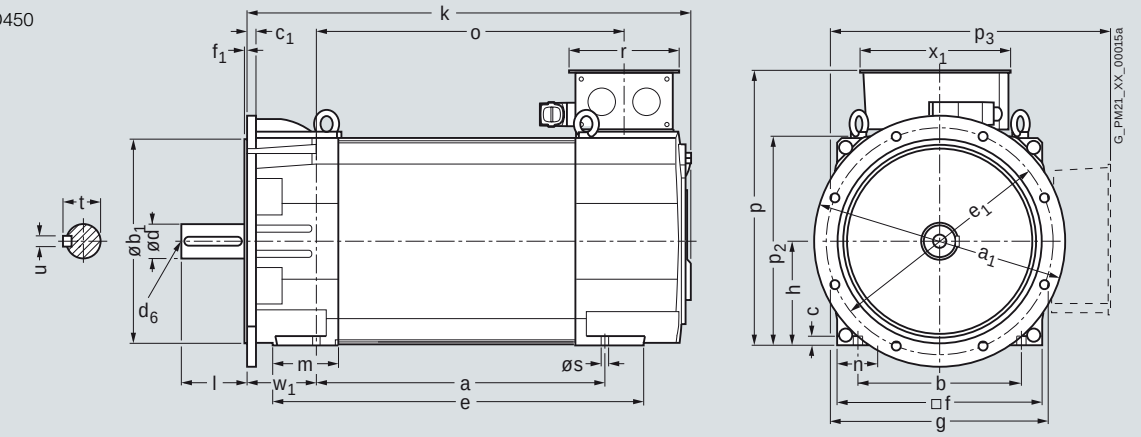
For motor			Dimensions in mm (inches)																	
				D400	D450		D400	D450				D400	D450							
Shaft height	Type	DIN IEC	a B	a_1 P		b A	b_1 N		c HA	c_1 LA	e_1 M			f AB	f_1 T	g AC	h H	k LB	m BA
1PH8, types of construction IM B5/IM B35/IM V15, water cooling																				
180	1PH8184		430 (16.93)	400 (15.75)	450 (17.72)	279 (10.98)	300 (11.81)	350 (13.78)	15 (0.59)	16 (0.63)	350 (13.78)	400 (15.75)		356 (14.02)	5 (0.20)	384 (15.12)	180 (7.09)	670 (26.38)	123 (4.84)
	1PH8186		520 (20.47)															760 (29.92)	

			Shaft extension DE									Terminal box type
												Dimensions as for types of construction IM B3/IM V5
Shaft height	Type	DIN IEC	n AA	p_2 –	s K	w_1 C	**d D**	d_6 –	l E	t GA	u F	
180	1PH8184		73 (2.87)	372 (14.65)	14.5 (0.57)	121 (4.76)	**65m6**	M20	140 (5.51)	69 (2.72)	18 (0.71)	
	1PH8186											

1PH818
D400



D450



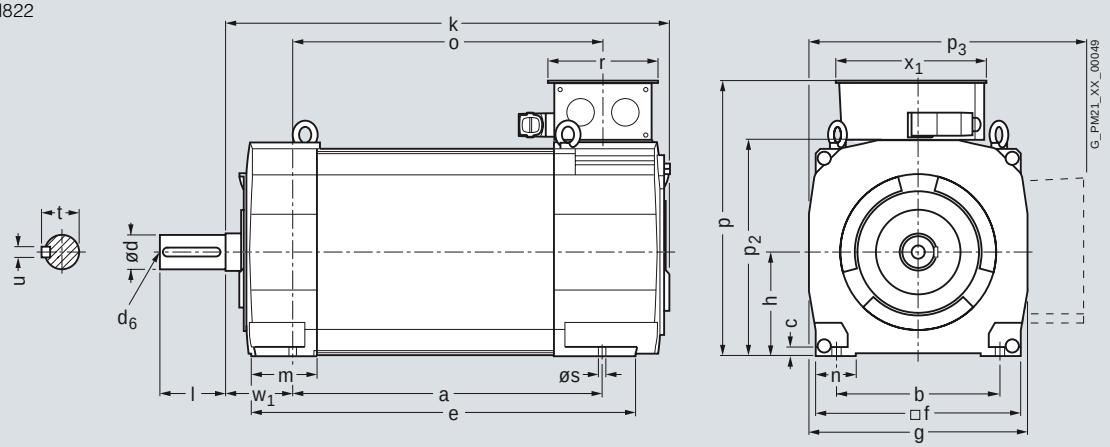
1PH8 asynchronous and synchronous motors
Shaft height 225 – Water cooling

Dimensional drawings

For motor			Dimensions in mm (inches)											
Shaft height	Type	DIN IEC	a B	b A	c HA	f AB	g AC	h H	k LB	m BA	n AA	p_2 _	s K	w_1 C
1PH8, types of construction IM B3/IM V5, water cooling														
225	1PH8224		445 (17.52)	356 (14.02)	18 (0.71)	446 (17.56)	474 (18.66)	225 (8.86)	775 (30.51)	154 (6.06)	88 (3.46)	462 (18.19)	18.5 (0.73)	149 (5.87)
	1PH8226		545 (21.46)						875 (34.45)					
	1PH8228		635 (25.0)						965 (37.99)					

			Shaft extension DE					Terminal box type											
								1XB7322				1XB7422				1XB7700			
Shaft height	Type	DIN IEC	**d** **D**	d_6 –	l E	t GA	u F	p HD	p_3 _	r LL	x_1 AG	p HD	p_3 _	r LL	x_1 AG	p HD	p_3 _	r LL	x_1 AG
225	1PH8224		**75m6**	M20	140 (5.51)	79.5 (3.13)	20 (0.79)	579 (22.80)	577 (22.72)	197 (7.76)	258 (10.16)	634 (24.96)	632 (24.88)	230 (9.06)	303 (11.93)	683 (26.89)	666 (26.22)	310 (12.20)	295 (11.61)
	1PH8226																		
	1PH8228																		

1PH822

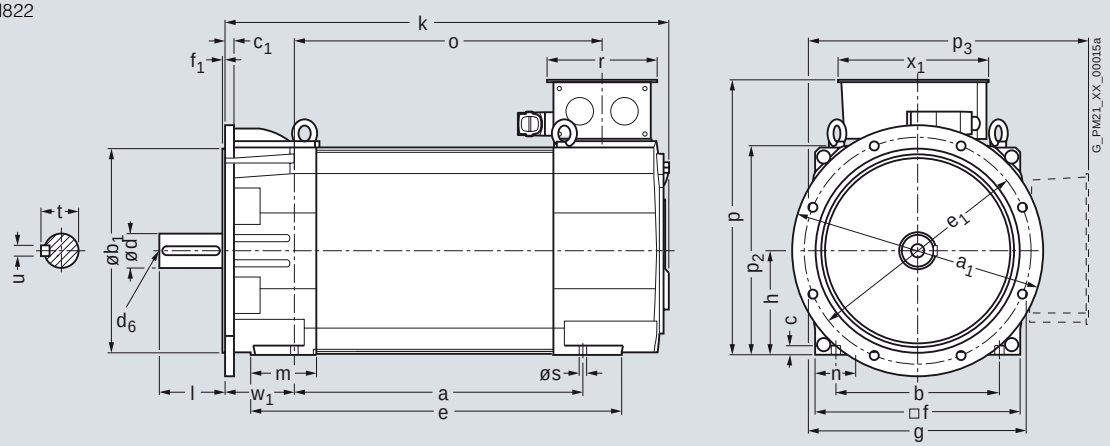


Dimensional drawings

For motor			Dimensions in mm (inches)																
Shaft height	Type	DIN IEC	a B	a_1 P	b A	b_1 N	c HA	c_1 LA	e_1 M	f AB	f_1 T	g AC	h H	k LB	m BA	n AA	p_2 –	w_1 C
1PH8, types of construction IM B5/IM B35/IM V15 D550, water cooling																		
225	1PH8224		445 (17.52)	550 (21.65)	356 (14.02)	450 (17.72)	18 (0.71)	20 (0.79)	500 (19.69)	446 (17.56)	5 (0.20)	474 (18.66)	225 (8.86)	770 (30.31)	144 (5.67)	88 (3.46)	462 (18.19)	149 (5.87)
	1PH8226		545 (21.46)											872 (34.33)				
	1PH8228		635 (25.00)											962 (37.87)				

			Shaft extension DE					Terminal box type
								Dimensions as for types of construction IM B3/IM V5
Shaft height	Type	DIN IEC	**d** **D**	d_6 –	l E	t GA	u F	
225	1PH8224		**75m6**	M20	140 (5.51)	79.5 (3.13)	20 (0.79)	
	1PH8226							
	1PH8228							

1PH822



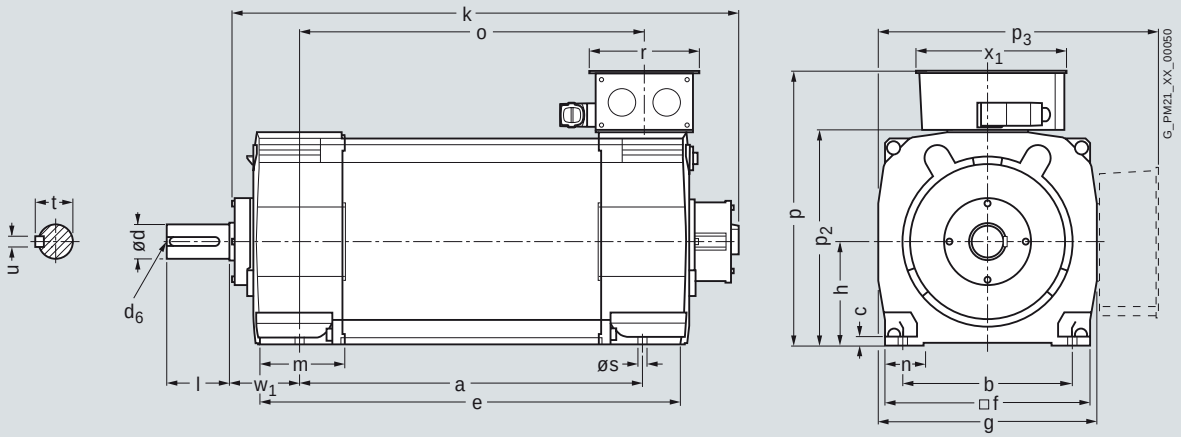
1PH8 asynchronous motors
Shaft height 280 – Water cooling

Dimensional drawings

For motor			Dimensions in mm (inches)																	
																Shaft extension DE				
Shaft height	Type	DIN IEC	a B	b A	c LA/HA	f AB	g AC	h H	k LB	m BA	n AA	p_2 –	s K	w_1 C	**d D**	d_6 –	l E	t GA	u F
1PH8, types of construction IM B3/IM V5, water cooling																				
280	1PH8284		684 (26.93)	457 (17.99)	21 (0.83)	556 (21.89)	588 (23.15)	280 (11.02)	1134 (44.65)	220 (8.66)	105 (4.13)	574 (22.60)	24 (0.94)	190 (7.48)	**95m6**	M24	170 (6.69)	100 (3.94)	25 (0.98)
	1PH8286		794 (31.26)						1244 (48.98)											
	1PH8288		924 (36.38)						1374 (54.09)											

			Terminal box type																	
			1XB7322				1XB7422				1XB7700				1XB7712					
Shaft height	Type	DIN IEC	p HD	p_3 –	r LL	x_1 AG	p HD	p_3 –	r LL	x_1 AG	p HD	p_3 –	r LL	x_1 AG	p HD	p_3 –	r LL	x_1 AG		
280	1PH8284		709 (27.91)	716 (28.19)	197 (7.76)	258 (10.16)	724 (28.5)	731 (28.78)	230 (9.06)	303 (11.93)	770 (30.31)	777 (30.59)	310 (12.2)	318 (12.52)	820 (32.28)	827 (32.56)	377 (14.84)	370 (14.57)		
	1PH8286																			
	1PH8288																			

1PH828

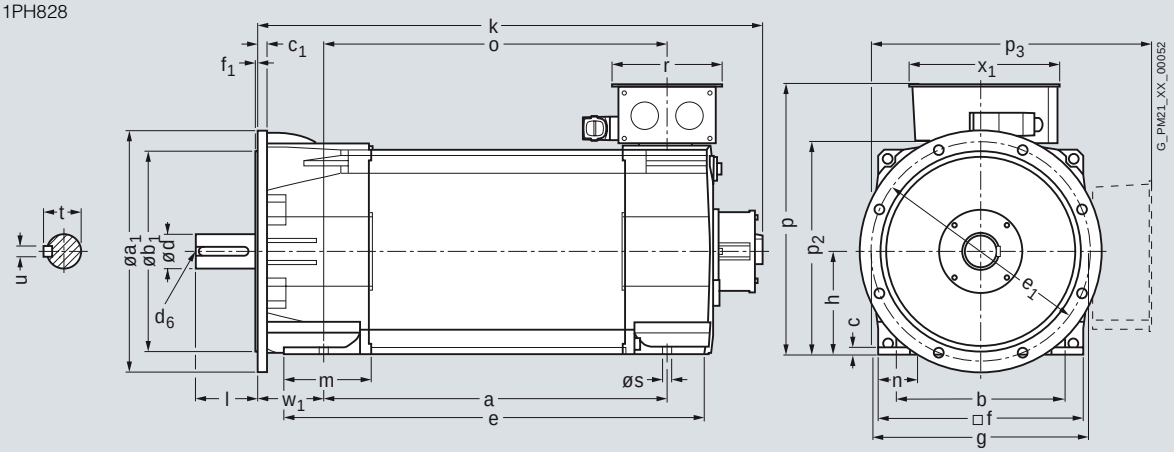


Dimensional drawings

For motor			Dimensions in mm (inches)																	
Shaft height	Type	DIN IEC	a B	a_1 P	b A	b_1 N	c HA	c_1 LA	e_1 M	f AB	f_1 T	g AC	h H	i_2 EB	k LB	m BA	n AA	p_2 –	s K
1PH8, types of construction IM B5/IM B35/IM V15 D660, water cooling																				
280	1PH8284		684 (26.93)	660 (25.98)	457 (17.99)	550 (21.65)	21 (0.83)	24 (0.94)	600 (23.62)	556 (21.89)	6 (0.24)	588 (23.15)	280 (11.02)	140 (5.51)	1134 (44.65)	220 (8.66)	105 (4.13)	574 (22.60)	24 (0.94)
	1PH8286		794 (31.26)												1244 (48.98)				
	1PH8288		924 (36.38)												1374 (54.09)				

			Shaft extension DE									Terminal box type
												Dimensions as for types of construction IM B3/IM V5
Shaft height	Type	DIN IEC	m BA	n AA	s K	w_1 C	**d D**	d_6 –	l E	t GA	u F	
280	1PH8284		220 (8.66)	105 (4.13)	24 (0.94)	190 (7.48)	**95m6**	M24	170 (6.69)	100 (3.94)	25 (0.98)	
	1PH8286											
	1PH8288											

1PH828

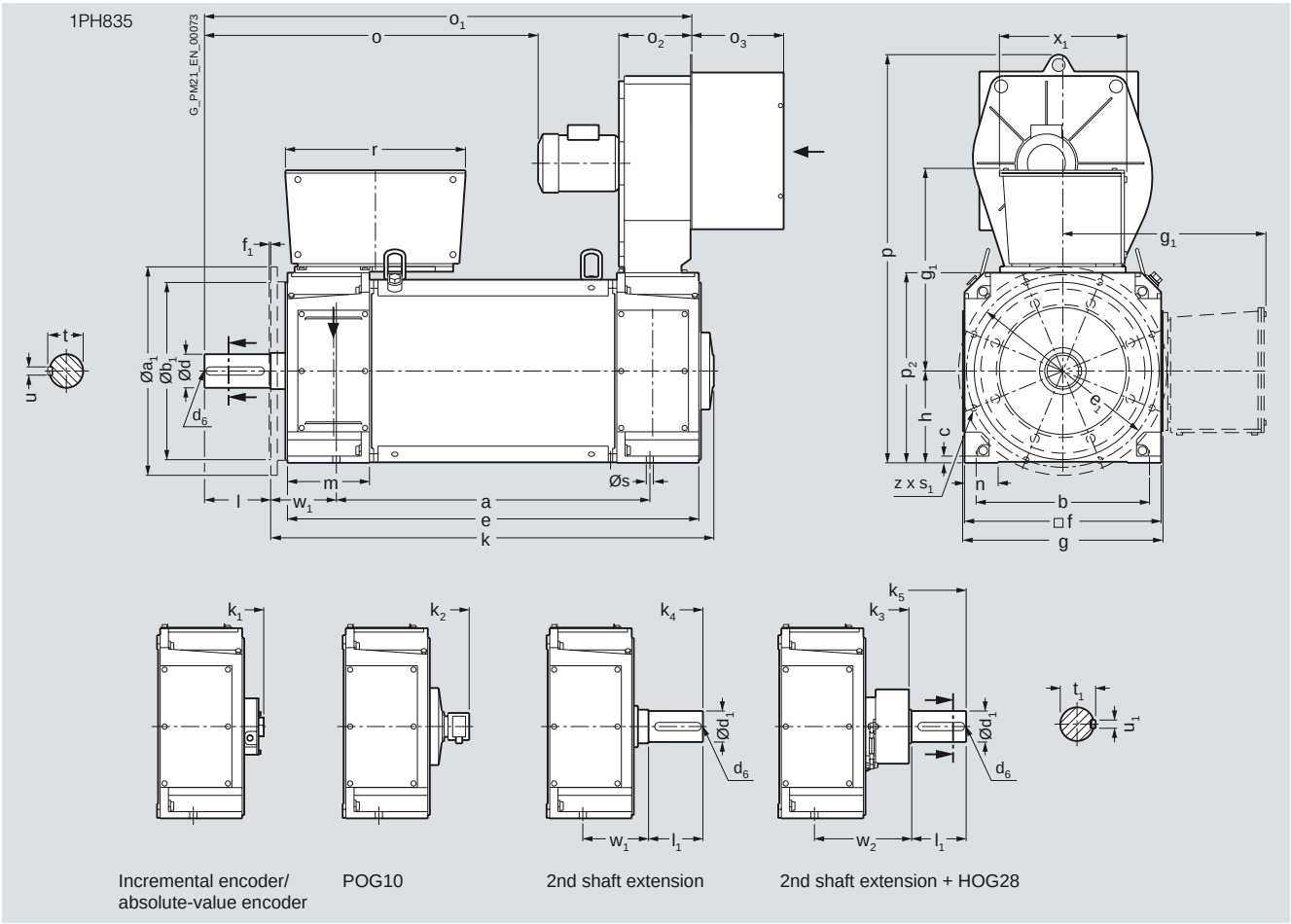


1PH8 asynchronous motors
Shaft height 355 – Forced ventilation

Dimensional drawings

For motor		Dimensions in mm (inches)															
Shaft height	Type	DIN IEC	a B	a_1 P	b A	b_1 N	c HA	e_1 M	f AB	f_1 T	h H	k L	k_1	k_2	k_3	k_4	k_5
1PH8, type of construction IM B35, forced ventilation																	
355	1PH8350 1PH8351		772 (30.39)	800 (31.50)	670 (26.38)	680 (26.77)	26 (1.02)	740 (29.13)	760 (29.92)	6 (0.24)	355 (13.98)	1273 (50.12)	1549 (60.98)	1625 (63.98)	1644 (64.72)	1740 (68.50)	1861 (73.27)
	1PH8352		862 (33.94)									1363 (53.66)	1639 (64.53)	1715 (67.52)	1734 (68.27)	1830 (72.05)	1951 (76.81)
	1PH8354		972 (38.27)									1473 (57.99)	1749 (68.86)	1825 (71.85)	1844 (72.60)	1940 (76.38)	2061 (81.14)
	1PH8356		1092 (42.99)									1593 (62.72)	1869 (73.58)	1945 (76.57)	1964 (77.32)	2060 (81.10)	2181 (85.87)
	1PH8358		1212 (47.72)									1713 (67.44)	1989 (78.31)	2065 (81.30)	2084 (82.05)	2180 (85.83)	2301 (90.59)

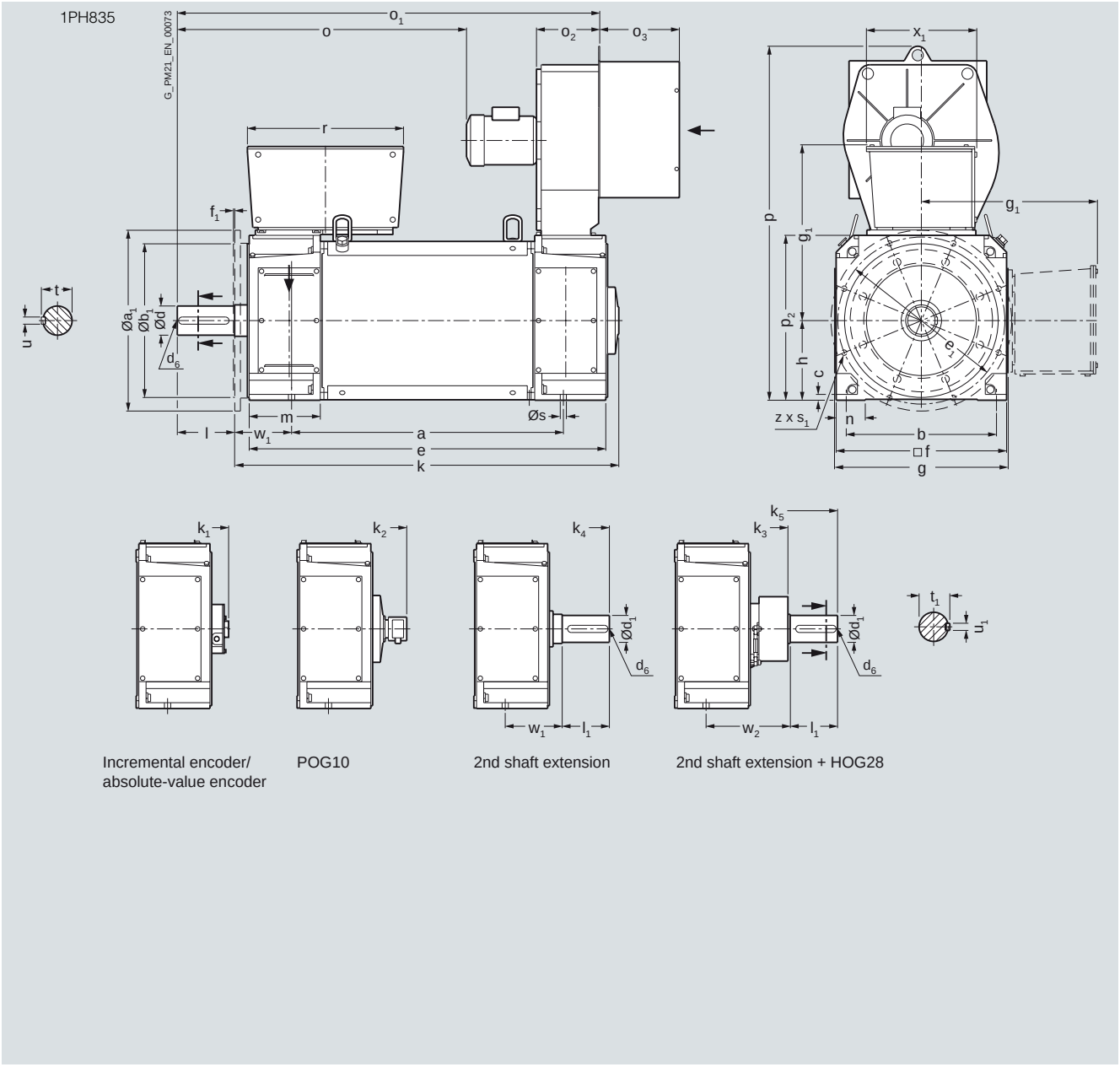
Shaft height	Type	DIN IEC	m BA	n AA	p HD	p_2 HC	o K1	o_1 K2	o_2 K3	o_3 K4	s K	s_1 S	w_1 C/CA	w_2 CA1	z Z
355	1PH8350 1PH8351		317 (12.48)	130 (5.12)	1269 (49.96)	735 (28.94)	900 (35.43)	1412 (55.59)	200 (7.87)	355 (13.98)	28 (1.10)	24 (0.94)	254 (10.00)	375 (14.76)	8
	1PH8352						990 (38.98)	1502 (59.13)							
	1PH8354						1110 (43.70)	1612 (63.46)							
	1PH8356						1220 (48.03)	1732 (68.19)							
	1PH8358						1340 (52.76)	1852 (72.91)							



For dimensions of shaft extension and terminal box, see page 5/139.

Dimensional drawings

Shaft height	Type	DIN IEC	Shaft extension DE									Terminal box type 1XB7712			1XB7820		
			d **D**	d_1 DA	d_6 DB/DC	l E	l_1 EC	t G	t_1 GB	u F	u_1 FA	g_2 AD	r LL	x_1 AG	g_2 AD	r LL	x_1 AG
355	1PH8350 1PH8351 1PH8352 1PH8354 1PH8356 1PH8358		**130** **(5.12)**	120 (4.72)	M24	250 (9.84)	180 (7.09)	119 (4.69)	114 (4.49)	32 (1.26)	32 (1.26)	640 (25.20)	370 (14.57)	377 (14.84)	784 (30.87)	696 (27.40)	492 (19.37)

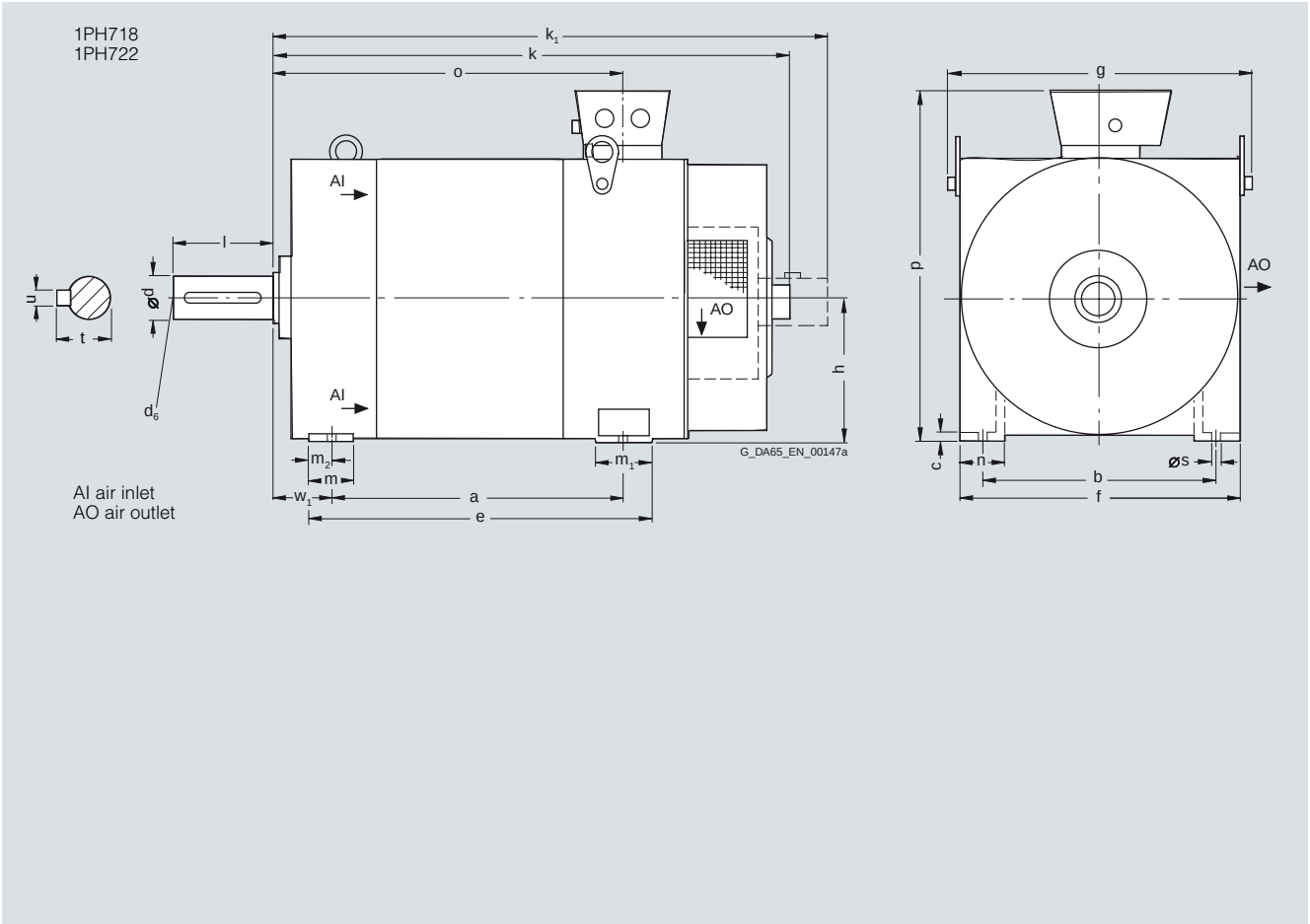


1PH7 asynchronous motors
Forced ventilation

Dimensional drawings

For motor			Dimensions in mm (inches)															Terminal box type 1XB7...		
																		322	422	700
Shaft height	Type	DIN IEC	a B	b A	c LA	e M	f AB	g AC	h H	k LB	k_1 –	m BA	m_1 –	m_2 –	n AA	o –		$p^{1)}$ HD	$p^{1)}$ HD	$p^{1)}$ HD
1PH7, type of construction IM B3, forced ventilation, direction of air flow DE → NDE																				
180	1PH7184		430 (16.93)	279 (10.98)	14 (0.55)	510 (20.08)	360 (14.17)	408 (16.06)	180 (7.09)	835 (32.87)	–	60 (2.36)	120 (4.72)	35 (1.38)	65 (2.56)	541 (21.30)		495 (19.49)	–	–
	1PH7186		520 (20.47)			600 (23.62)				925 (36.42)						631 (24.84)			545 (21.46)	–
225	1PH7224		445 (17.52)	356 (14.02)	18 (0.71)	530 (20.87)	450 (17.72)	498 (19.61)	225 (8.86)	–	1100 (43.31)	60 (2.36)	120 (4.72)	40 (1.57)	85 (3.35)	629 (24.76)		595 (23.43)	645 (25.39)	680 (26.77)
	1PH7226		545 (21.46)			630 (24.80)					1200 (47.24)					729 (28.70)				
	1PH7228		635 (25.00)			720 (28.35)					1290 (50.79)					819 (32.24)			–	

			Shaft extension DE						
Shaft height	Type	DIN IEC	s K	w_1 C	**d D**	d_6 –	l E	t GA	u F
180	1PH7184		14.5 (0.57)	121 (4.76)	**60 (2.36)**	M20	140 (5.51)	64 (2.52)	18 (0.71)
	1PH7186				**65 (2.56)**			69 (2.72)	
225	1PH7224 1PH7226 1PH7228		18.5 (0.73)	149 (5.87)	**75 (2.95)**	M20	140 (5.51)	79.5 (3.13)	20 (0.79)

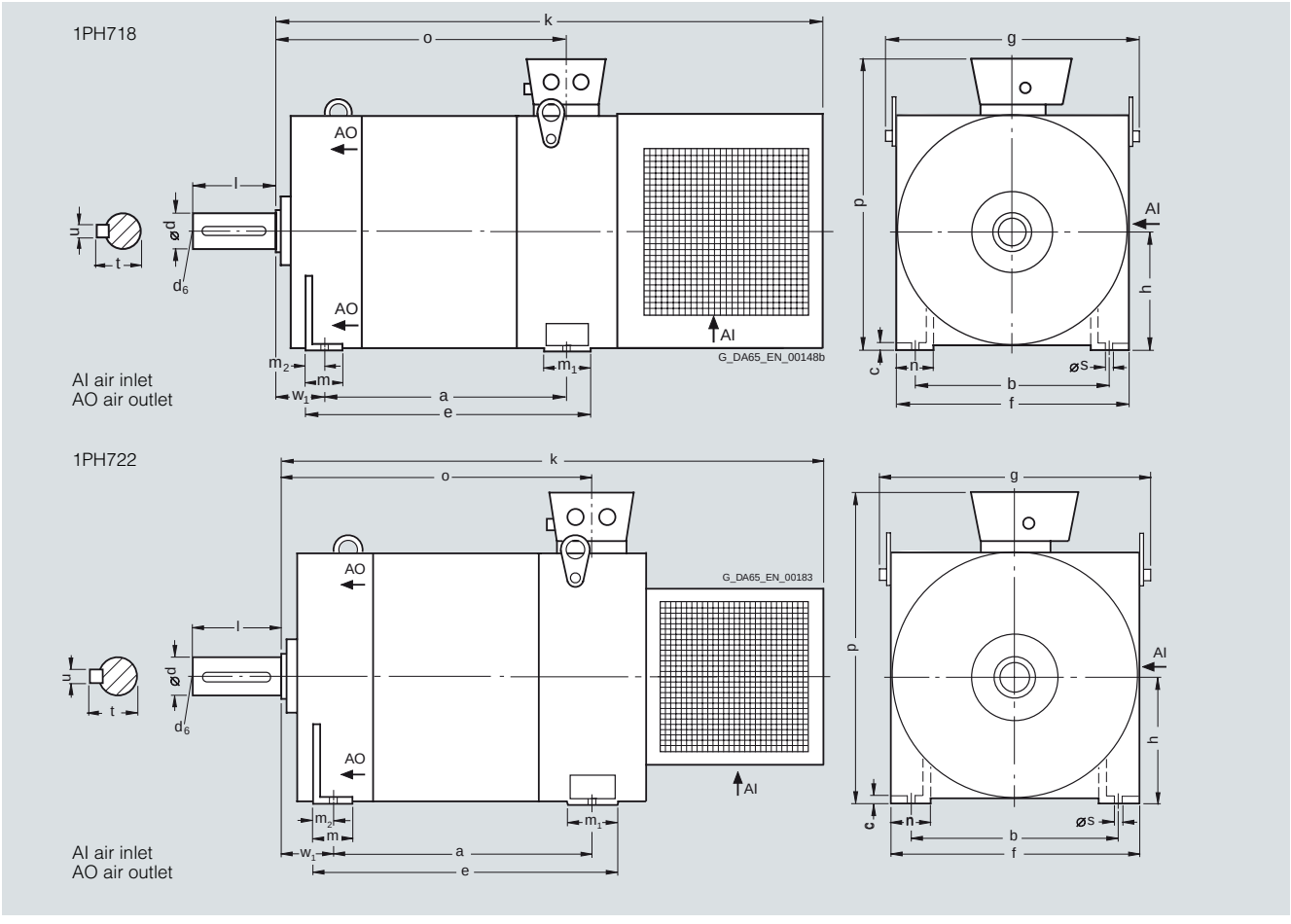


[1)] Maximum dimensions, depending on electrical version (terminal box).

Dimensional drawings

For motor			Dimensions in mm (inches)														Terminal box type 1XB7...		
																	322	422	700
Shaft height	Type	DIN IEC	a B	b A	c LA	e M	f AB	g AC	h H	k LB	m BA	m_1 –	m_2 –	n AA	o –		$p^{1)}$ HD	$p^{1)}$ HD	$p^{1)}$ HD
1PH7, type of construction IM B3, forced ventilation, direction of air flow NDE → DE																			
180	1PH7184		430 (16.93)	279 (10.98)	14 (0.55)	510 (20.08)	360 (14.17)	405 (15.94)	180 (7.09)	1010 (39.76)	60 (2.36)	120 (4.72)	35 (1.38)	65 (2.56)	541 (21.30)		495 (19.49)	–	–
	1PH7186		520 (20.47)			600 (23.62)				1100 (43.31)					631 (24.84)			560 (22.05)	–
225	1PH7224		445 (17.52)	356 (14.02)	18 (0.71)	530 (20.87)	450 (17.72)	498 (19.61)	225 (8.86)	1090 (42.91)	60 (2.36)	120 (4.72)	40 (1.57)	85 (3.35)	629 (24.76)		595 (23.43)	645 (25.93)	680 (26.77)
	1PH7226		545 (21.46)			630 (24.80)				1190 (46.85)					729 (28.70)				
	1PH7228		635 (25.00)			720 (28.35)				1280 (50.39)					819 (32.24)			–	

			Shaft extension DE						
Shaft height	Type	DIN IEC	s K	w_1 C	**d D**	d_6 –	l E	t GA	u F
180	1PH7184		14.5 (0.57)	121 (4.76)	**60 (2.36)**	M20	140 (5.51)	64 (2.52)	18 (0.71)
	1PH7186				**65 (2.56)**			69 (2.72)	
225	1PH7224 1PH7226 1PH7228		18.5 (0.73)	149 (5.87)	**75 (2.95)**	M20	140 (5.51)	79.5 (3.13)	20 (0.79)



1) Maximum dimensions, depending on electrical version (terminal box).

1PH7 asynchronous motors
Forced ventilation

Dimensional drawings

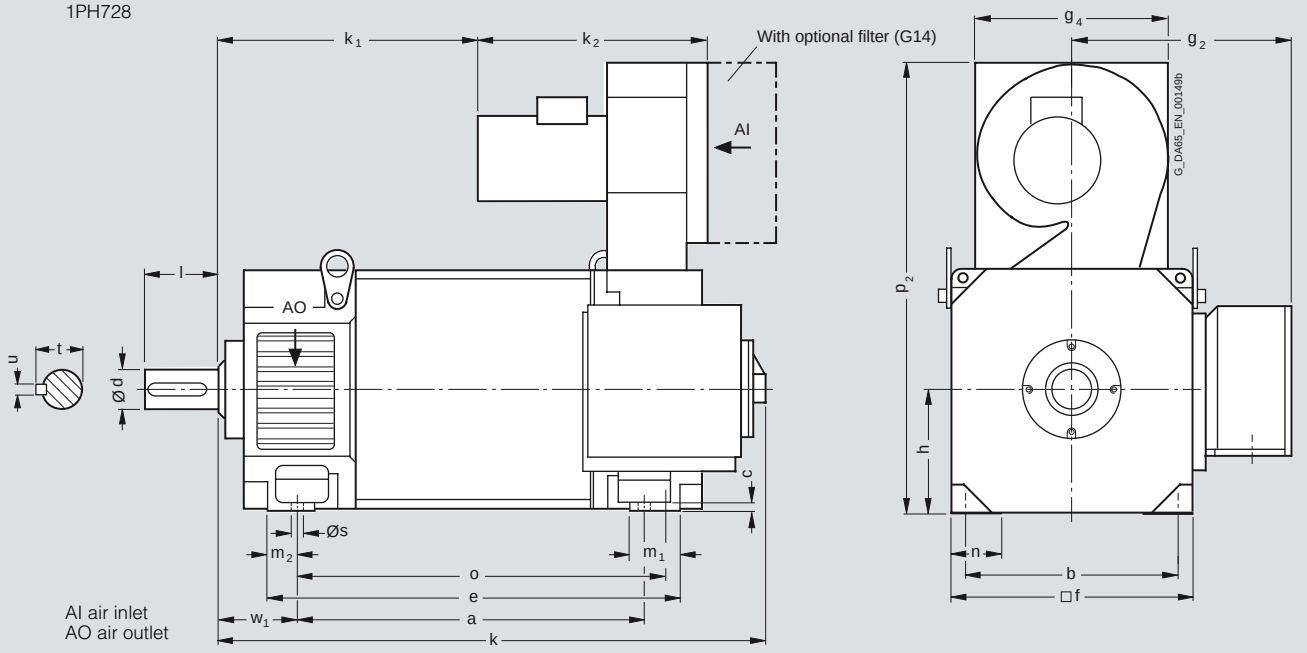
For motor — Dimensions in mm (inches)

Shaft height	Type	DIN IEC	a B	b A	c HA	e BB	f AB	g_2 AD	g_4 –	h H	k LB	k_1 –	k_2 –	m_1 –	m_2 –	n AA	o –	p_2 –
1PH7, type of construction IM B3, forced ventilation, direction of air flow NDE → DE																		
280	1PH7284		684 (26.93)	457 (17.99)	22 (0.87)	840 (33.07)	560 (22.05)	518 (20.39)	449 (17.68)	280 (11.02)	1146 (45.12)	489 (19.25)	546 (21.50)	108 (4.25)	78 (3.07)	100 (3.94)	731 (28.78)	1042 (41.02)
	1PH7286		794 (31.26)			950 (37.40)					1256 (49.45)	599 (23.58)					841 (33.11)	
	1PH7288		924 (36.38)			1080 (42.52)					1386 (54.57)	729 (28.70)					971 (38.23)	

Shaft extension DE

Shaft height	Type	DIN IEC	s K	w_1 C	**d D**	l E	t GA	u F
280	1PH7284		24 (0.94)	190 (7.48)	**95 (3.74)**	170 (6.69)	100 (3.94)	25 (0.98)
	1PH7286							
	1PH7288							

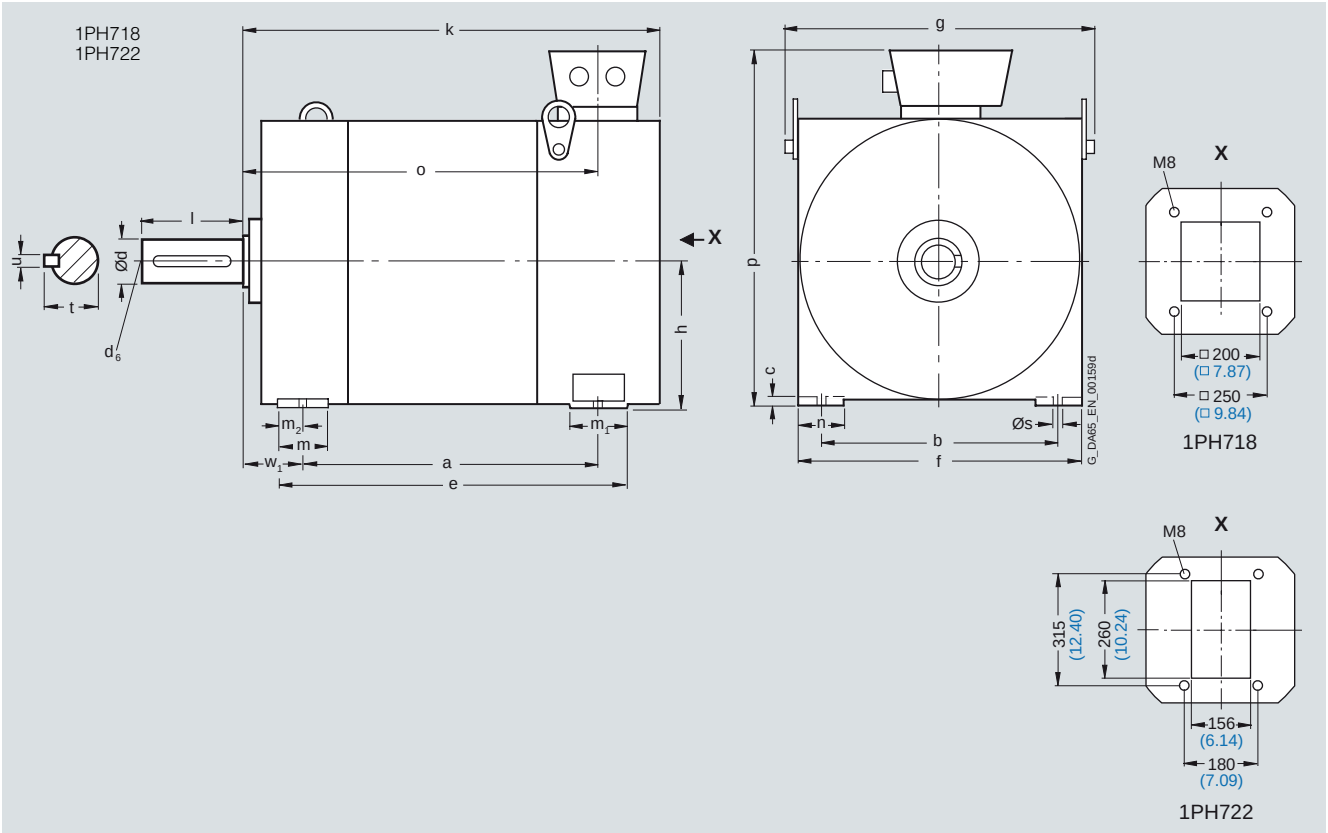
1PH728



Dimensional drawings

For motor		Dimensions in mm (inches)														Terminal box type 1XB7...		
																322	422	700
Shaft height	Type	DIN IEC	a B	b A	c LA	e M	f AB	g AC	h H	k LB	m BA	m_1 –	m_2 –	n AA	o –	p[1] HD	p[1] HD	p[1] HD
1PH7, type of construction IM B3, forced ventilation, with pipe connection at NDE																		
180	1PH7184		430 (16.93)	279 (10.98)	14 (0.55)	510 (20.08)	360 (14.17)	408 (16.06)	180 (7.09)	830 (32.68)	60 (2.36)	120 (4.72)	35 (1.38)	65 (2.56)	541 (21.30)	495 (19.49)	–	–
	1PH7186		520 (20.47)			600 (23.62)				920 (36.22)					631 (24.84)		560 (22.05)	–
225	1PH7224		445 (17.52)	356 (14.02)	18 (0.71)	530 (20.78)	450 (17.72)	498 (19.61)	225 (8.86)	950 (37.40)	60 (2.36)	120 (4.72)	40 (1.57)	80 (3.15)	629 (24.76)	595 (23.43)	645 (25.39)	680 (26.77)
	1PH7226		545 (21.46)			630 (24.80)				1050 (41.34)					729 (28.70)			
	1PH7228		635 (25.00)			720 (28.35)				1140 (44.88)					819 (32.24)		–	

			Shaft extension DE						
Shaft height	Type	DIN IEC	s K	w_1 C	**d D**	d_6 –	l E	t GA	u F
180	1PH7184		14.5 (0.57)	121 (4.76)	**60 (2.36)**	M20	140 (5.51)	64 (2.52)	18 (0.71)
	1PH7186				**65 (2.56)**			69 (2.72)	
225	1PH7224 1PH7226 1PH7228		18.5 (0.73)	149 (5.87)	**75 (2.95)**	M20	140 (5.51)	79.5 (3.13)	20 (0.79)



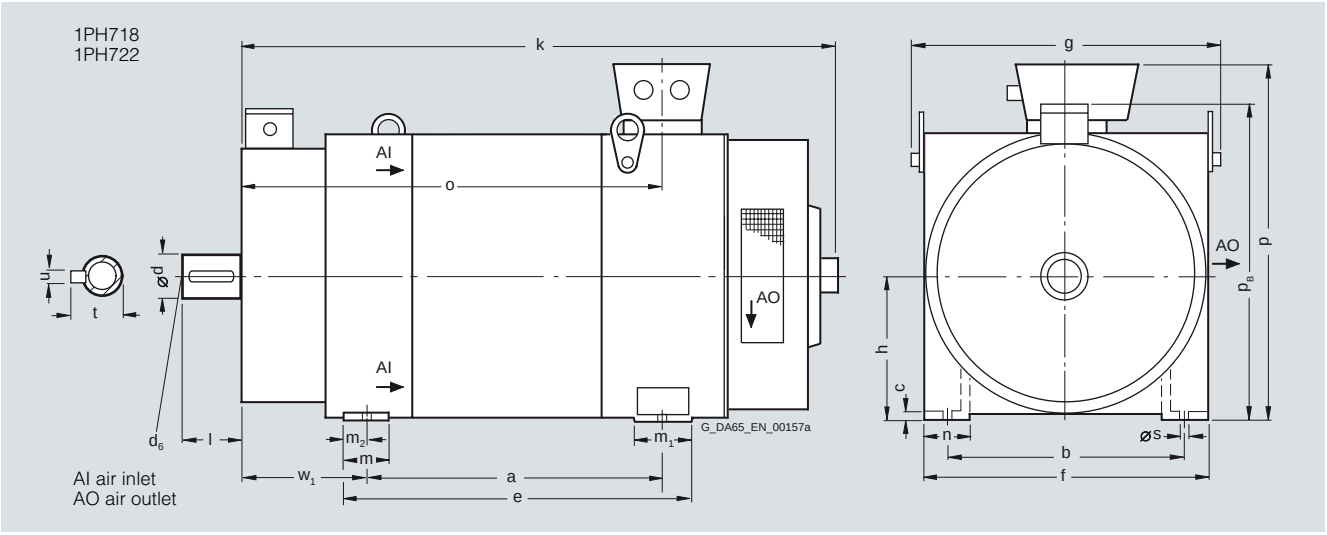
[1] Maximum dimensions, depending on electrical version (terminal box).

1PH7 asynchronous motors
Forced ventilation

Dimensional drawings

For motor		Dimensions in mm (inches)														Terminal box type 1XB7...		
																322	422	700
Shaft height	Type	DIN IEC	a B	b A	c LA	e M	f AB	g AC	h H	k LB	m BA	m_1 –	m_2 –	n AA	o –	$p^{1)}$ HD	$p^{1)}$ HD	$p^{1)}$ HD
1PH7, type of construction IM B3, forced ventilation, brake control module, direction of air flow DE → NDE																		
180	1PH7184		430 (16.93)	279 (10.98)	14 (0.55)	510 (20.08)	360 (14.17)	408 (16.06)	180 (7.09)	945 (37.20)	60 (2.36)	120 (4.72)	35 (1.38)	65 (2.56)	644 (25.35)	495 (19.49)	–	–
	1PH7186		520 (20.47)			600 (23.62)				1035 (40.75)					734 (28.90)		560 (22.05)	–
225	1PH7224		445 (17.52)	356 (14.02)	18 (0.71)	530 (20.87)	450 (17.72)	498 (19.61)	225 (8.86)	1230 (48.43)	60 (2.36)	120 (4.72)	40 (1.57)	80 (3.15)	758 (29.84)	595 (23.43)	645 (25.39)	680 (26.77)
	1PH7226		545 (21.46)			630 (24.80)				1330 (52.36)					858 (33.78)			
	1PH7228		635 (25.00)			720 (28.35)				1420 (55.91)					948 (37.32)		–	

			Shaft extension DE							
Shaft height	Type	DIN IEC	p_B –	s K	w_1 C	**d D**	d_6 –	l E	t GA	u F
180	1PH7184 1PH7186		390 (15.35)	14.5 (0.57)	224 (8.82)	**90 (3.54)**	M20	90 (3.54)	95 (3.74)	25 (0.98)
225	1PH7224 1PH7226 1PH7228		450 (17.72)	18.5 (0.73)	278 (10.94)	**100 (3.94)**	M20	100 (3.94)	106 (4.17)	28 (1.10)



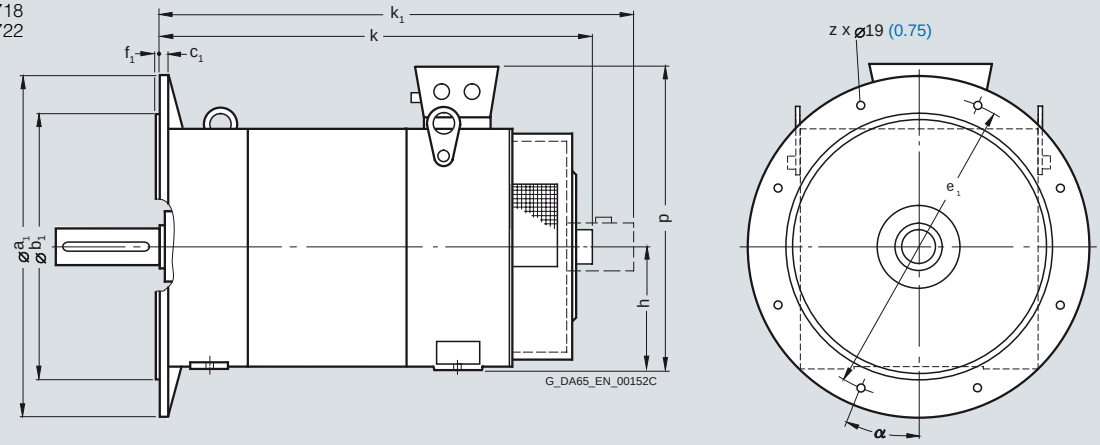
[1)] Maximum dimensions, depending on electrical version (terminal box).

Dimensional drawings

For motor | Dimensions in mm (inches) | For dimensions for foot mounting, shaft and terminal box, see dimensional drawing of 1PH718/1PH722 motors, type of construction IM B3.

Shaft height	Type	DIN IEC	a_1 P	b_1 N	c_1 LA	e_1 M	f_1 T	h H	k LB	k_1 –	Terminal box type 1XB7322 $p^{1)}$ HD	1XB7422 $p^{1)}$ HD	1XB7700 $p^{1)}$ HD	z –	α –
1PH7, type of construction IM B35, forced ventilation, direction of air flow DE → NDE															
180	1PH7184[2)]		400 (15.75)	300 (11.81)	15 (0.59)	350 (13.78)	5 (0.20)	180 (7.09)	835 (32.87)	–	495 (19.49)	–	–	4	45°
	1PH7184[2)]		450 (17.72)	350 (13.78)	16 (0.63)	400 (15.75)			835 (32.87)			–	–	8	22.5°
	1PH7186								925 (36.42)			560 (22.05)	–		
225	1PH7224		550 (21.65)	450 (17.72)	18 (0.71)	500 (19.69)	5 (0.20)	225 (8.86)	–	1100 (43.31)	595 (23.43)	645 (25.39)	680 (26.77)	8	22.5°
	1PH7226									1200 (47.24)					
	1PH7228									1290 (50.79)		–			

1PH718
1PH722



[1)] Maximum dimensions, depending on electrical version (terminal box).
[2)] For flange selection, see Order No. supplement for 1PH718/1PH722.

1PH7 asynchronous motors
Forced ventilation

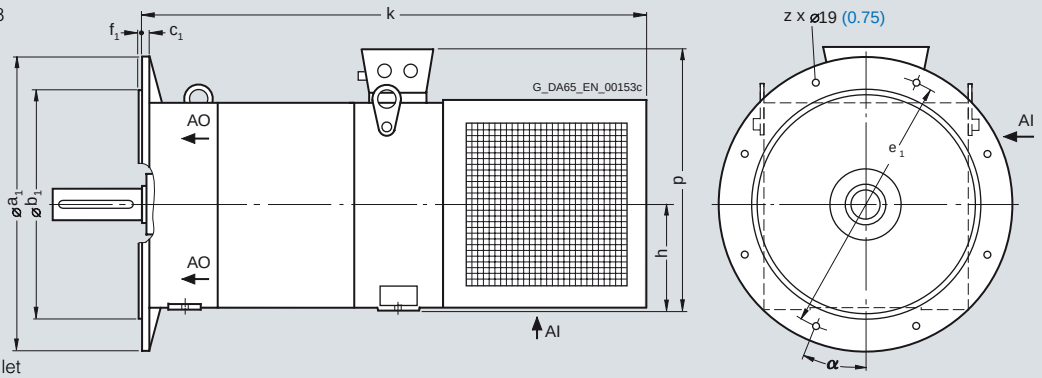
Dimensional drawings

For motor — Dimensions in mm (inches)

For dimensions for foot mounting, shaft and terminal box, see dimensional drawing of 1PH718/1PH722 motors, type of construction IM B3.

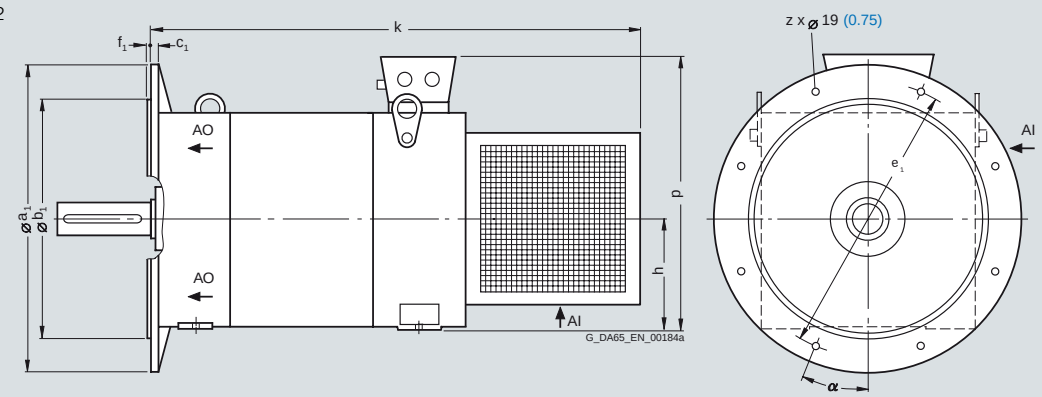
Shaft height	Type	DIN IEC	a_1 P	b_1 N	c_1 LA	e_1 M	f_1 T	h H	k LB	Terminal box type 1XB7322 p[1] HD	Terminal box type 1XB7422 p[1] HD	Terminal box type 1XB7700 p[1] HD	z –	α –
1PH7, type of construction IM B35, forced ventilation, direction of air flow NDE → DE														
180	1PH7184[2]		400 (15.75)	300 (11.81)	15 (0.59)	350 (13.78)	5 (0.20)	180 (7.09)	1010 (39.76)	495 (19.49)	–	–	4	45°
	1PH7184[2]		450 (17.72)	350 (13.78)	16 (0.63)	400 (15.75)			1010 (39.76)		–	–	8	22.5°
	1PH7186								1100 (43.31)		560 (22.05)	–		
225	1PH7224		550 (21.65)	450 (17.72)	18 (0.71)	500 (19.69)	5 (0.20)	225 (8.86)	1090 (42.91)	595 (23.43)	645 (25.39)	680 (26.77)	8	22.5°
	1PH7226								1190 (46.85)					
	1PH7228								1280 (50.39)		–			

1PH718



AI air inlet
AO air outlet

1PH722



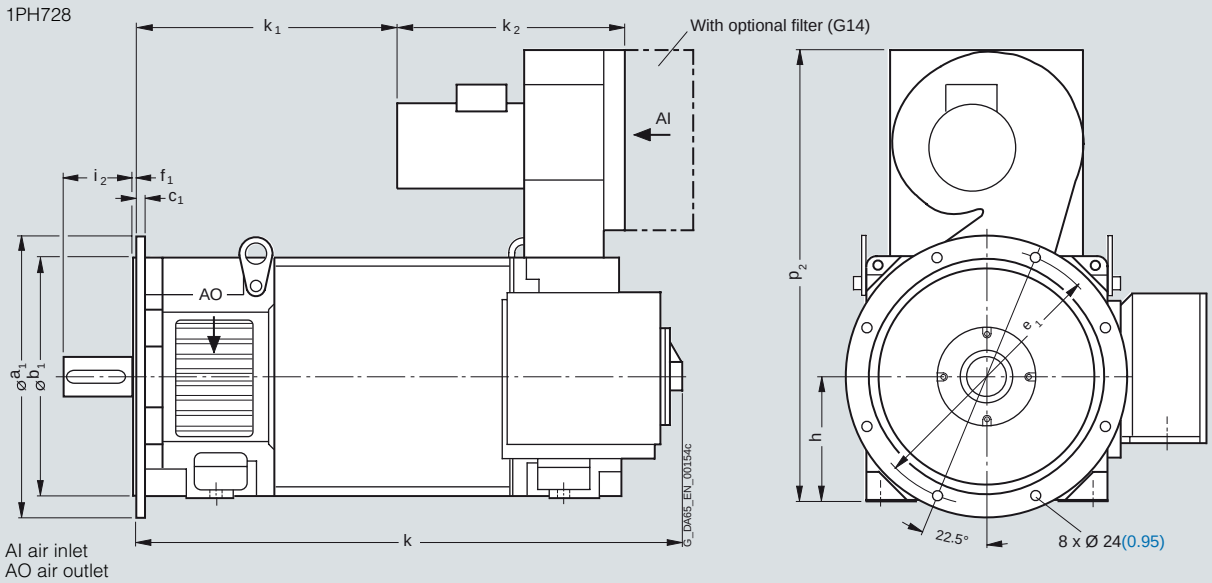
AI air inlet
AO air outlet

[1] Maximum dimensions, depending on electrical version (terminal box).
[2] For flange selection, see Order No. supplement for 1PH718/1PH722.

Dimensional drawings

For motor — Dimensions in mm (inches) — For dimensions for foot mounting, shaft and terminal box, see dimensional drawing of 1PH728 motors, type of construction IM B3.

Shaft height	Type	DIN IEC	a_1 P	b_1 N	c_1 LA	e_1 M	f_1 T	h H	i_2 –	k LB	k_1 –	k_2 –	p_2 –
1PH7, type of construction IM B35, forced ventilation, direction of air flow NDE → DE													
280	1PH7284		660 (25.98)	550 (21.65)	24 (0.94)	600 (23.62)	6 (0.24)	280 (11.02)	170 (6.69)	1146 (45.12)	489 (19.25)	546 (21.50)	1042 (41.02)
	1PH7286									1256 (49.45)	599 (23.58)		
	1PH7288									1386 (54.57)	729 (28.70)		

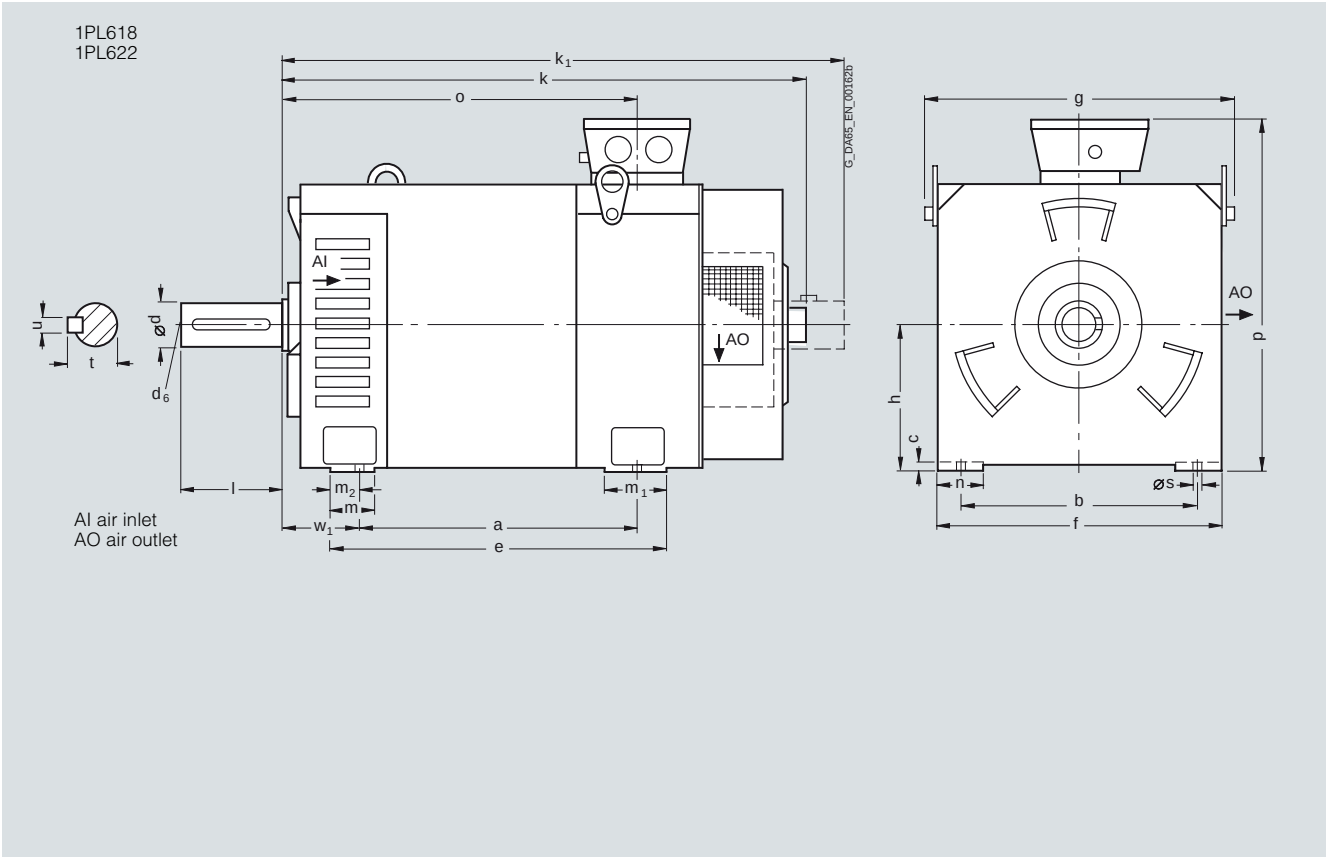


1PL6 asynchronous motors
Forced ventilation

Dimensional drawings

For motor			Dimensions in mm (inches)													
Shaft height	Type	DIN IEC	a B	b A	c LA	e M	f AB	g AC	h H	k LB	k_1 –	m BA	m_1 –	m_2 –	n AA	o –
1PL6, type of construction IM B3, forced ventilation, direction of air flow DE → NDE																
180	1PL6184		430 (16.93)	279 (10.98)	14 (0.55)	525 (20.67)	360 (14.17)	405 (15.94)	180 (7.09)	835 (32.87)	–	78 (3.07)	120 (4.72)	50 (1.97)	65 (2.56)	541 (21.30)
	1PL6186		520 (20.47)			615 (24.21)				925 (36.42)						631 (24.84)
225	1PL6224		445 (17.52)	356 (14.02)	18 (0.71)	545 (21.46)	450 (17.72)	498 (19.61)	225 (8.86)	–	1100 (43.31)	80 (3.15)	120 (4.72)	60 (2.36)	85 (3.35)	629 (24.76)
	1PL6226		545 (21.46)			645 (25.39)					1200 (47.24)					729 (28.70)
	1PL6228		635 (25.00)			735 (28.94)					1290 (50.79)					819 (32.24)

			Terminal box type					Shaft extension DE				
			1XB7322	1XB7422	1XB7700							
Shaft height	Type	DIN IEC	p[1] HD	p[1] HD	p[1] HD	s K	w_1 C	**d D**	d_6 –	l E	t GA	u F
180	1PL6184		495 (19.49)	560 (22.05)	–	14.5 (0.57)	121 (4.76)	**60 (2.36)**	M20	140 (5.51)	64 (2.52)	18 (0.71)
	1PL6186				580 (22.83)			**65 (2.56)**			69 (2.72)	
225	1PL6224		595 (23.43)	645 (25.39)	680 (26.77)	18.5 (0.73)	149 (5.87)	**75 (2.95)**	M20	140 (5.51)	79.5 (3.13)	20 (0.79)
	1PL6226			–								
	1PL6228			–								

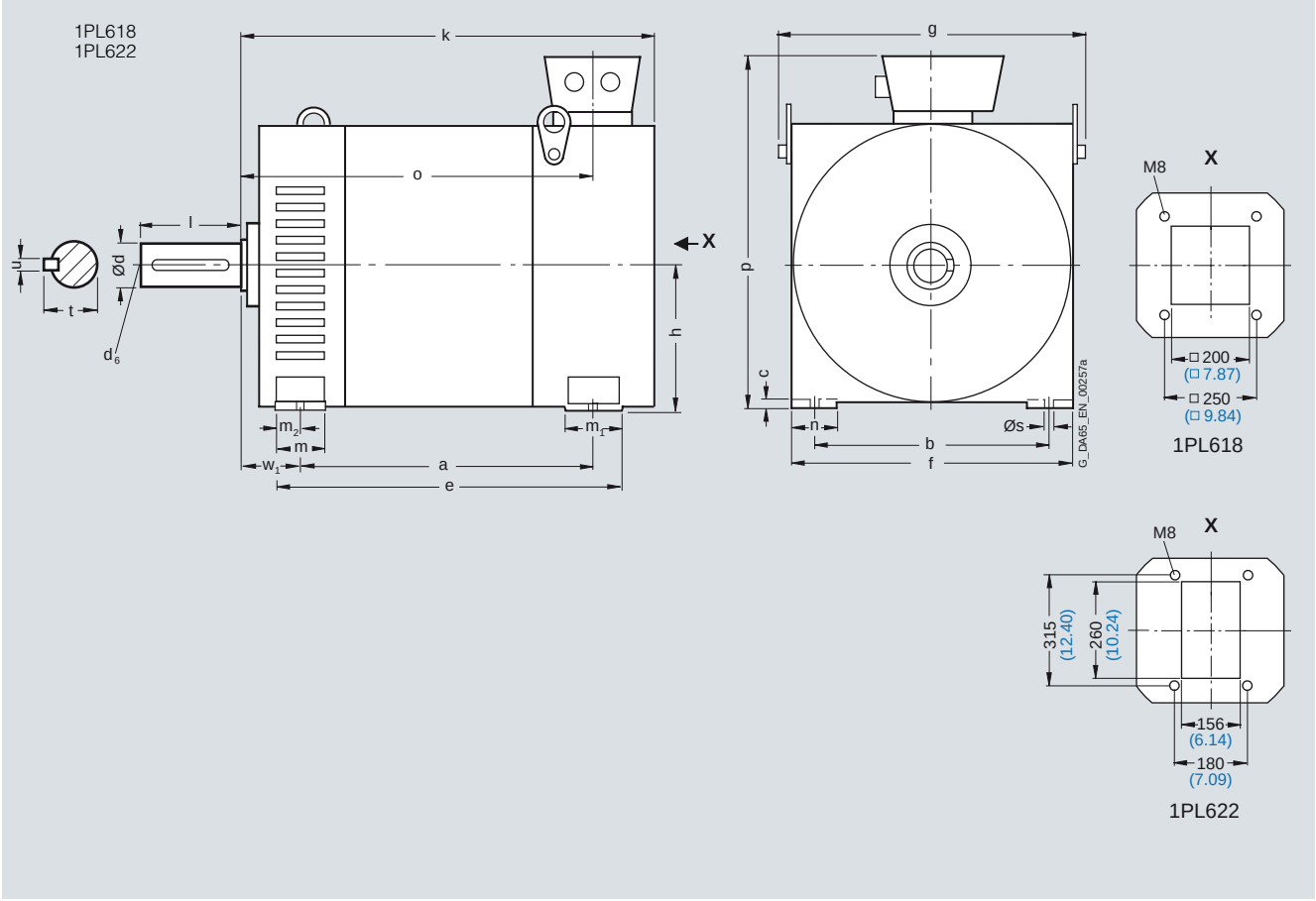


[1] Maximum dimensions, depending on electrical version (terminal box).

Dimensional drawings

For motor		Dimensions in mm (inches)														Terminal box type	
																1XB7422	1XB7700
Shaft height	Type	DIN IEC	a B	b A	c LA	e M	f AB	g AC	h H	k LB	m BA	m_1 –	m_2 –	n AA	o –	p[1] HD	p[1] HD
1PL6, type of construction IM B3, forced ventilation, with pipe connection at NDE																	
180	1PL6184		430 (16.93)	279 (10.98)	14 (0.55)	510 (20.08)	360 (14.17)	408 (16.06)	180 (7.09)	630 (24.80)	60 (2.36)	120 (4.72)	35 (1.38)	65 (2.56)	541 (21.30)	560 (22.05)	–
	1PL6186		520 (20.47)			600 (23.62)				720 (28.35)					631 (24.84)		680 (26.77)
225	1PL6224		445 (17.52)	356 (14.02)	18 (0.71)	530 (20.87)	450 (17.72)	498 (19.61)	225 (8.86)	750 (29.53)	60 (2.36)	120 (4.72)	40 (1.57)	80 (3.15)	629 (24.76)	–	680 (26.77)
	1PL6226		545 (21.46)			630 (24.80)				850 (33.46)					729 (28.70)		
	1PL6228		635 (25.00)			720 (28.35)				940 (37.01)					819 (32.24)		

			Shaft extension DE						
Shaft height	Type	DIN IEC	s K	w_1 C	**d D**	d_6 –	l E	t GA	u F
180	1PL6184		14.5 (0.57)	121 (4.76)	**60 (2.36)**	M20	140 (5.51)	64 (2.52)	18 (0.71)
	1PL6186				**65 (2.56)**			69 (2.72)	
225	1PL6224 1PL6226 1PL6228		18.5 (0.73)	149 (5.87)	**75 (2.95)**	M20	140 (5.51)	79.5 (3.13)	20 (0.79)



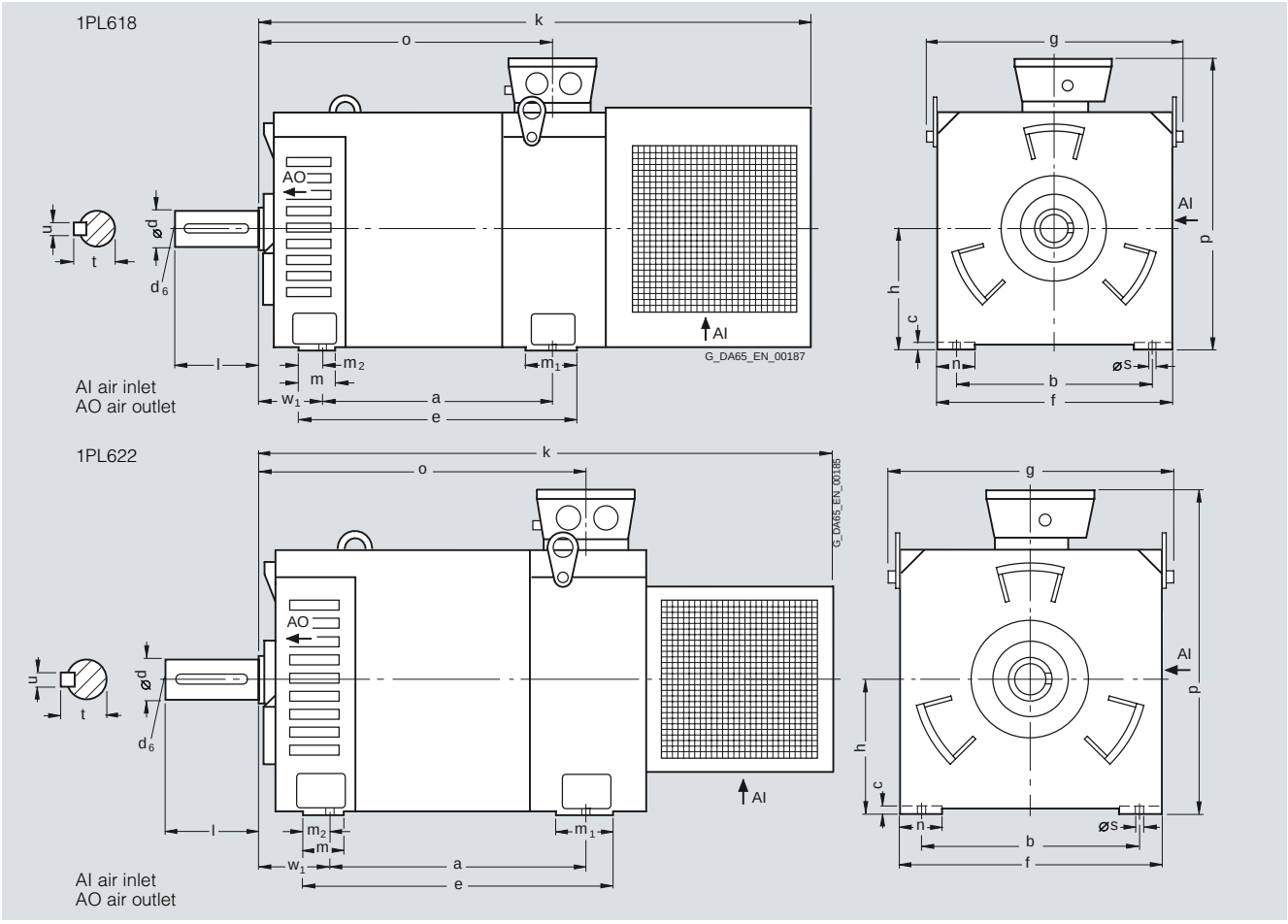
[1] Maximum dimensions, depending on electrical version (terminal box).

1PL6 asynchronous motors
Forced ventilation

Dimensional drawings

For motor			Dimensions in mm (inches)														Terminal box type 1XB7...		
																	322	422	700
Shaft height	Type	DIN IEC	a B	b A	c LA	e M	f AB	g AC	h H	k LB	m BA	m_1 –	m_2 –	n AA	o –		$p^{1)}$ HD	$p^{1)}$ HD	$p^{1)}$ HD
1PL6, type of construction IM B3, forced ventilation, direction of air flow NDE → DE																			
180	1PL6184		430 (16.93)	279 (10.98)	14 (0.55)	525 (20.67)	360 (14.17)	405 (15.94)	180 (7.09)	1010 (39.76)	78 (3.07)	120 (4.72)	50 (1.97)	65 (2.56)	541 (21.30)		495 (19.49)	560 (22.05)	–
	1PL6186		520 (20.47)			615 (24.21)				1100 (43.31)					631 (24.84)				580 (22.83)
225	1PL6224		445 (17.52)	356 (14.02)	18 (0.71)	545 (21.46)	450 (17.72)	498 (19.61)	225 (8.86)	1090 (42.91)	80 (3.15)	120 (4.72)	60 (2.36)	85 (3.35)	629 (24.76)		595 (23.43)	645 (25.39)	680 (26.77)
	1PL6226		545 (21.46)			645 (25.39)				1190 (46.85)					729 (28.70)			–	
	1PL6228		635 (25.00)			735 (28.94)				1280 (50.39)					819 (32.24)			–	

			Shaft extension DE						
Shaft height	Type	DIN IEC	s K	w_1 C	**d D**	d_6 –	l E	t GA	u F
180	1PL6184		14.5 (0.57)	121 (4.76)	**60 (2.36)**	M20	140 (5.51)	64 (2.52)	18 (0.71)
	1PL6186				**65 (2.56)**			69 (2.72)	
225	1PL6224 1PL6226 1PL6228		18.5 (0.73)	149 (5.87)	**75 (2.95)**	M20	140 (5.51)	79.5 (3.13)	20 (0.79)



[1] Maximum dimensions, depending on electrical version (terminal box).

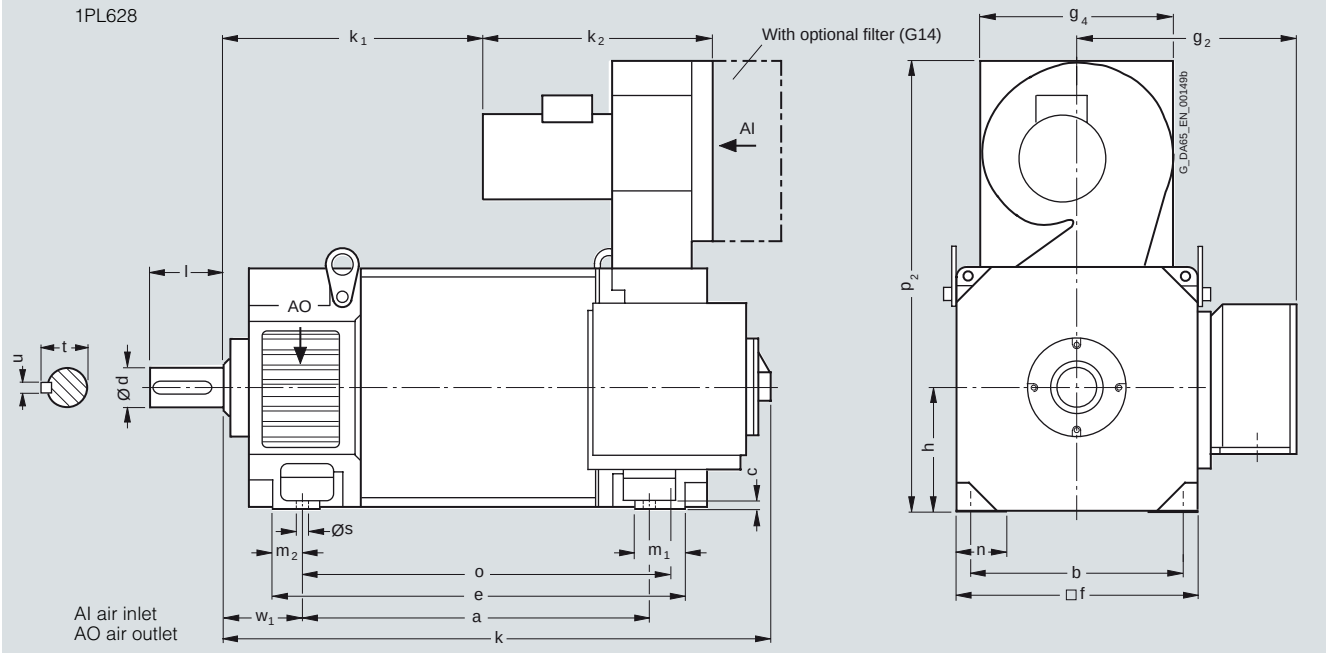
Dimensional drawings

For motor — Dimensions in mm (inches)

Shaft height	Type	DIN IEC	a B	b A	c LA	e M	f AB	g_2 AD	g_4 –	h H	k LB	k_1 –	k_2 –	m_1 –	m_2 –	n AA
1PL6, type of construction IM B3, forced ventilation, direction of air flow NDE → DE																
280	1PL6284		684 (26.93)	457 (17.99)	22 (0.87)	840 (33.07)	560 (22.05)	518 (20.39)	449 (17.68)	280 (11.02)	1146 (45.12)	489 (19.25)	546 (21.50)	108 (4.25)	78 (3.07)	100 (3.94)
	1PL6286		794 (31.26)			950 (37.40)					1256 (49.45)	599 (23.58)				
	1PL6288		924 (36.38)			1080 (42.52)					1386 (54.57)	729 (28.70)				

Shaft extension DE

Shaft height	Type	DIN IEC	o –	p_2 –	s K	w_1 C	**d D**	d_6 –	l E	t GA	u F
280	1PL6284		731 (28.78)	1042 (41.02)	24 (0.94)	190 (7.48)	**95 (3.74)**	170 (6.69)	100 (3.94)	25 (0.98)	
	1PL6286		841 (33.11)								
	1PL6288		971 (38.23)								



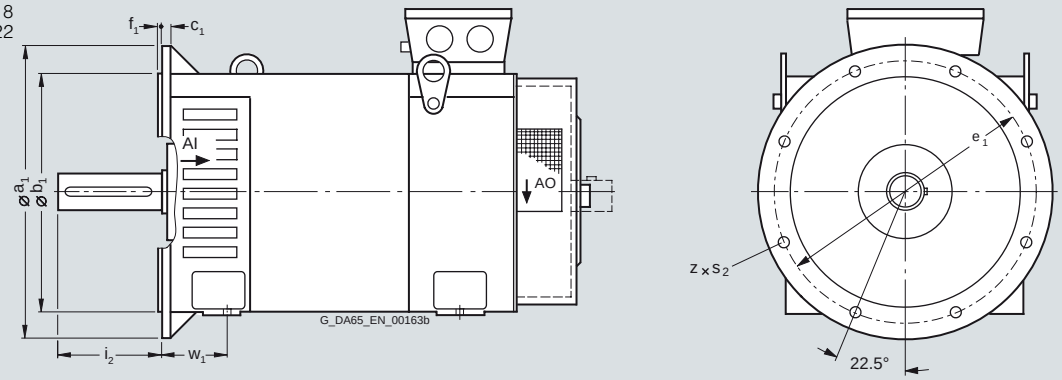
1PL6 asynchronous motors
Forced ventilation

Dimensional drawings

For motor — Dimensions in mm (inches) — For dimensions for foot mounting, shaft and terminal box, see dimensional drawing of 1PL618/1PL622 motors, type of construction IM B3.

Shaft height	Type	DIN IEC	a_1 P	b_1 N	c_1 LA	e_1 M	f_1 T	i_2 –	s_2 S	z –	w_1 –
1PL6, type of construction IM B35, forced ventilation, direction of air flow DE → NDE											
180	1PL6184 1PL6186		450 (17.72)	350 (13.78)	16 (0.63)	400 (15.75)	5 (0.20)	140 (5.51)	19 (0.75)	8	121 (4.76)
225	1PL6224 1PL6226 1PL6228		550 (21.65)	450 (17.72)	18 (0.71)	500 (19.69)	5 (0.20)	140 (5.51)	19 (0.75)	8	149 (5.87)

1PL618
1PL622



AI air inlet
AO air outlet

5

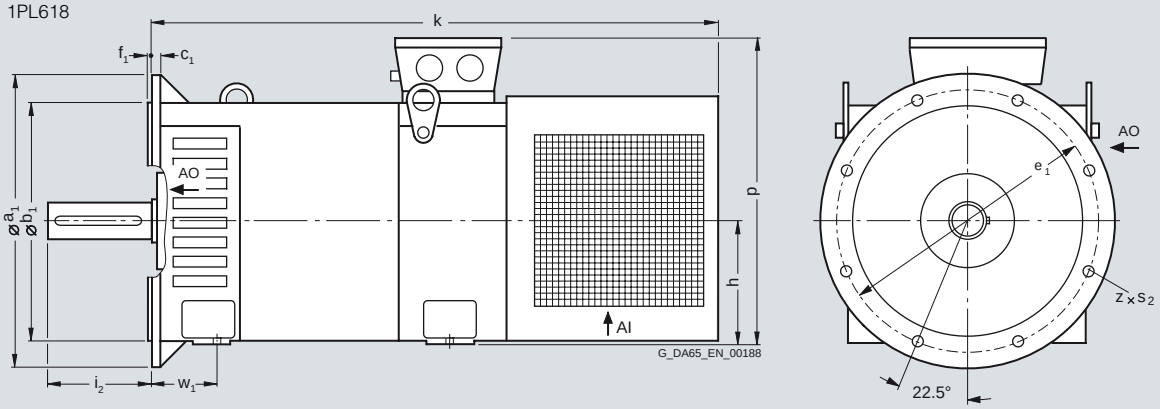
Dimensional drawings

For motor — Dimensions in mm (inches)

For dimensions for foot mounting, shaft and terminal box see dimensional drawing of 1PL618/1PL622 motors, type of construction IM B3.

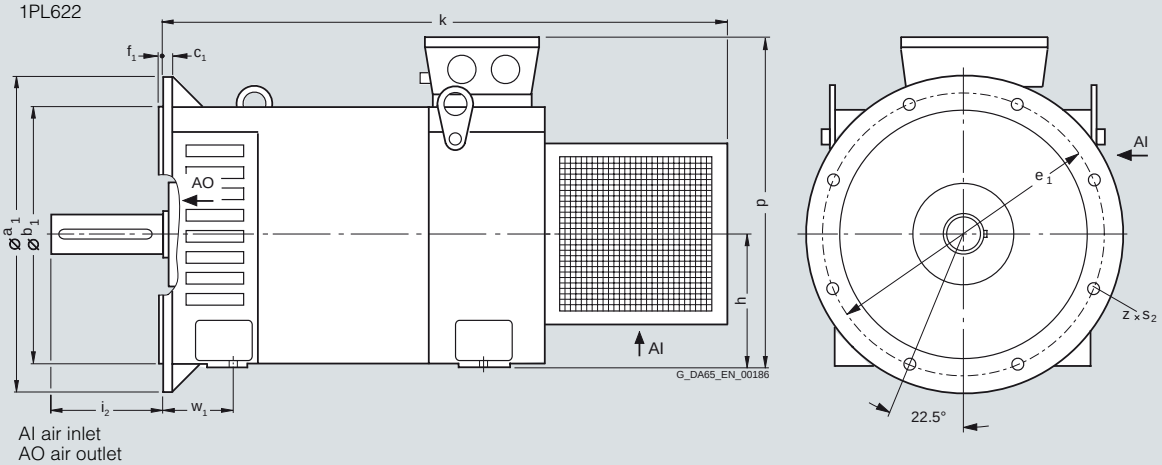
Shaft height	Type	DIN IEC	a_1 P	b_1 N	c_1 LA	e_1 M	f_1 T	h H	k LB	Terminal box type 1XB7322 p[1] HD	1XB7422 p[1] HD	1XB7700 p[1] HD	s_2 S	z –
1PL6, type of construction IM B35, forced ventilation, direction of air flow NDE → DE														
180	1PL6184		450 (17.72)	350 (13.78)	16 (0.63)	400 (15.75)	5 (0.20)	180 (7.09)	1010 (39.76)	495 (19.49)	560 (22.05)	–	19 (0.75)	8
	1PL6186								1100 (43.31)			580 (22.83)		
225	1PL6224		550 (21.65)	450 (17.72)	18 (0.71)	500 (19.69)	5 (0.20)	225 (8.86)	1090 (42.91)	595 (23.43)	645 (25.39)	680 (26.77)	19 (0.75)	8
	1PL6226								1190 (46.85)		–			
	1PL6228								1280 (50.39)		–			

1PL618



AI air inlet
AO air outlet

1PL622



AI air inlet
AO air outlet

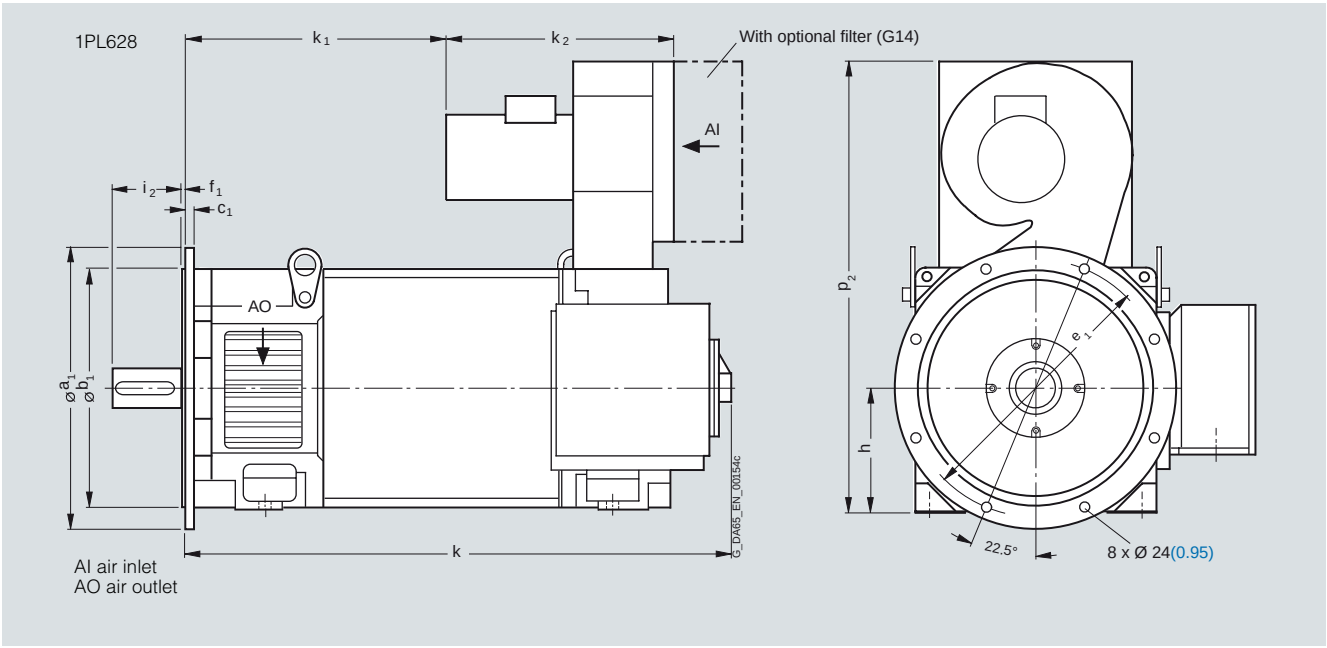
[1] Maximum dimensions, depending on electrical version (terminal box).

1PL6 asynchronous motors
Forced ventilation

Dimensional drawings

For motor — Dimensions in mm (inches) — For dimensions for foot mounting, shaft and terminal box, see the dimensional drawing of 1PL628 motors, type of construction IM B3.

Shaft height	Type	DIN IEC	a_1 P	b_1 N	c_1 LA	e_1 M	f_1 T	h H	i_2 –	k LB	k_1 –	k_2 –	p_2 –
1PL6, type of construction IM B35, forced ventilation, direction of air flow NDE → DE													
280	1PL6284		660 (25.98)	550 (21.65)	24 (0.94)	600 (23.62)	6 (0.24)	280 (11.02)	170 (6.69)	1146 (45.12)	489 (19.25)	546 (21.50)	1042 (41.02)
	1PL6286									1256 (49.45)	599 (23.58)		
	1PL6288									1386 (54.57)	729 (28.70)		



Direct drives

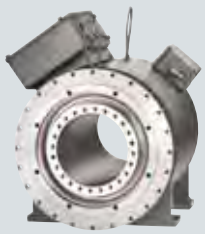
6/2	**Overview**
6/4	**Linear motors for SINAMICS S120**
6/4	1FN3 linear motors
6/6	Version for peak load Water cooling
6/10	Version for continuous load Water cooling
6/14	Hall-effect sensor box
6/15	1FN3/1FN6 linear motors Measuring systems/ Liquid cooling
6/16	1FN6 linear motors
6/18	Natural cooling
6/22	Water cooling
6/24	**Torque motors for SINAMICS S120**
6/24	1FW6 built-in torque motors
6/26	Water cooling
6/36	1FW3 complete torque motors
6/38	Water cooling
6/52	**Dimension drawings**
6/52	1FN3 linear motors
6/54	1FN6 linear motors
6/56	1FW6 built-in torque motors
6/58	1FW3 complete torque motors
Part 4	**Technical definitions for AC motors**
Part 14	**CAD CREATOR** Dimension drawing and 2D/3D CAD generator www.siemens.com/cadcreator

Direct drives

Overview

Motor type	Features	Degree of protection	Type of cooling
1FN3 linear motors 	Synchronous linear motor Permanent-magnet-excited Secondary section equipped with permanent magnets	IP65	Water cooling
1FN6 linear motors 	Synchronous linear motor Permanent-magnet-excited Nonmagnetic secondary section	Primary section: IP65[1)]	Natural cooling Water cooling

Motor type	Features	Degree of protection	Type of cooling
1FW6 built-in torque motors 	Synchronous motor Permanent-magnet-excited Hollow shaft Built-in components	IP23[2)]	Water cooling

Motor type	Features	Degree of protection	Type of cooling
1FW3 complete torque motors 	Synchronous motor Permanent-magnet-excited Hollow shaft	IP54	Water cooling

The selection and ordering data for the SINAMICS S120 Motor Modules are based on the booksize format by way of example. Other formats are also possible. The SIZER configuration tool is available for detailed configuration.

For technical definitions for AC motors, see chapter Servomotors.

[1)] Degree of protection of the motor is determined by the construction of the motor's installation in the machine. Minimum requirement: IP23.
[2)] The final degree of protection (minimum degree of protection is IP54) for the installed motor is determined by the machine manufacturer.

Primary section width mm	Feedrate force F_{rated} N (lb_f)	Velocity v_{max} at F_{rated}	Page
without precision cooling: 67/96/126/141/188/248/342 with precision cooling: 76/105/135/150/257/197/351	Peak load: 200 (45) – 8100 (1821) Continuous load: 150 (33.7) – 10375 (2332)	105 ... 836 m/min (345 ... 2743 ft/min) 129 ... 435 m/min (423 ... 1427 ft/min)	6/6 6/10
80/115/130/209/289 80/115	66.3 (14.9) – 3000 (674) 119 (26.8) – 1430 (321)	93.9 ... 1280 m/min (308 ... 4200 ft/min) 57.5 ... 852 m/min (189 ... 2795 ft/min)	6/18 6/22

Diameter mm	Rated torque M_{rated} Nm (lb_f-in)	Max. speed n_{max} at M_{rated}	Page
Outer diameter 230/310/385/440/502/576/730	109 (965) – 5760 (50982)	38 ... 650 rpm	6/26

Shaft height	Rated power P_{rated} for S1 duty kW (HP)	Rated torque M_{rated}	Page
SH 150/SH 200/SH 280	2.8 (3.75) – 402 (539)	100 ... 7000 Nm (73.8 ... 5163 lb_f-ft)	6/38

1FN3 linear motors

Overview

1FN3 linear motor, primary section

In combination with the SINAMICS S120 drive system, 1FN3 linear motors provide an optimally tuned linear direct drive system for the requirements of modern mechanical engineering.

The motors comprise a primary section and a secondary section with magnets made of rare-earth magnet material. The primary section has fixed dimensions, while the secondary section is made up of individual elements (segments) to suit the required traversing range. Through parallel operation of the motors, feedrate force and length can be scaled beyond the available spectrum.

Benefits

- Outstanding dynamic response and very high traversing velocity
- Excellent precision
- Easy installation
- Drive components are free of wear thanks to contactless drive force transmission

The main advantage of linear direct drive technology is the extensive avoidance of the effects of elasticity, play, and friction, as well as natural oscillation in the drive train. This results in a higher dynamic response and increased precision. If suitable measuring systems are used and the temperature conditions are appropriate, the motors can be positioned in the nanometer range.

Application

Version for peak load

Used in machine axes that are temporarily accelerated, e.g. S3 duty or when large forces are required for a short time.

Typical applications:

- High-dynamic, flexible machine tool and production machine construction
- Laser machining
- Handling

Version for continuous load

Used in machine axes with constant acceleration changes, e.g. S1 duty, with high process/weight forces or for operation without water cooling.

Typical applications:

- Grinding
- Non-circular machining (e.g. oscillating applications)
- z-axes without weight compensation, quills
- Handling, Cartesian robots

Design

The simple mechanical construction without transmission elements, e.g. ballscrew, coupling or belt, enhances the reliability of the drive components.

Heat loss occurs almost exclusively in the primary section and is dissipated via an integrated liquid cooling system. The optional Thermo-Sandwich dual-circuit cooling system permits both a thermal decoupling of the motor from the machine, and also a low-priced cooling design.

The stainless metal encapsulation of the primary section ensures the high mechanical ruggedness and resistance to soiling required for use in machine tools and production machines, as well as high resistance to corrosive liquids. In addition, the motor places minimal demands on the preparation of mounting surfaces thanks to the large air gap. The mounting tolerances for the air gap are ± 0.3 mm (0.012 in).

Design variants

1FN3 linear motors are available as single-sided or double-sided motors.

- Single-sided motors
  The single-sided version consists of a primary section that is mounted parallel to the associated secondary section.
- Double-sided motors
  The special secondary section of the double-sided version lies between two primary sections (one primary section with standard winding and one with complementary winding). The design as a double-sided motor is particularly suitable for applications with movable secondary section and small traversing paths with fast acceleration, e.g. non-circular machining.

More information

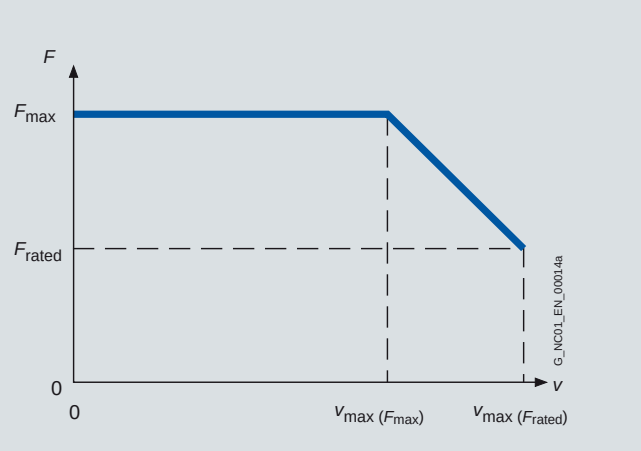
Some motor types can be express delivered as replacement motors in the event of plant outages and offer the advantage of a quicker spare parts supply.

Any questions regarding 1FN3 linear motors can be e-mailed to: info.drives@siemens.com

Technical specifications

1FN3 linear motors	
Type of motor	Permanent-magnet synchronous linear motor
Magnet material	
• Primary section	Rare-earth permanent magnets
• Secondary section	Rare-earth permanent magnets
Overload ratio (F_{max}:F_{rated}) up to max.	
• Version for peak load	2.75
• Version for continuous load	1.7
Cooling	Water cooling[1)]
Water cooler connections	G 1/8" internal thread on all primary and secondary section coolers
Temperature influence on surrounding construction with precision cooling, max.	+4 K
Coolant inlet temperature, permissible	35 °C (95 °F) (avoid condensation) > 35 °C (95 °F) on reduction of rated motor power
Temperature monitoring integrated in the primary section winding	2 monitoring circuits: Temp-S with PTC thermistor and Temp-F with KTY84 temperature sensor (for 1FN3050 Temp-S only). Evaluation via Sensor Module External SME120/SME125, see chapter SINAMICS S120 drive system.
Insulation according to EN 60034-1 (IEC 60034-1)	Temperature class 155 (F) for a winding temperature of 120 °C (248 °F)
Degree of protection in accordance with EN 60034-5 (IEC 60034-5)	IP65
Available configurations	Different graduations due to modular construction
Secondary section cover	Exchangeable through all segments or segment by segment
2nd rating plate	Enclosed separately
Encoder system[2)] (Not included in scope of delivery)	Select according to basic conditions specific to the application and the drive
Connection	
• 1FN3050	Permanently connected pre-assembled signal and power cables with connectors or with exposed core ends
• 1FN3100 ... 1FN3900	Connection cover prepared for separate power and signal cables
Approvals, according to	cURus UR for 1FN3900-4WC00-...

Characteristic curves



Velocity/force characteristic curve

The 1FN3 linear motors have an overload range available for acceleration processes. The maximum force F_{max} can only be utilized up to a maximum velocity $v_{max\ (Fmax)}$; up to velocity $v_{max\ (Frated)}$ only the feedrate force F_{rated} is available.

6

[1)] Refer to Liquid cooling on page 6/15.
[2)] Refer to Recommended linear measuring systems on page 6/15.

1FN3 linear motors
Version for peak load – water cooling

Selection and ordering data

Feedrate force		Maximum velocity[3]		1FN3 linear motors – Version for peak load		Weight, approx.	
				Primary section	Secondary section	Primary section without/with precision cooling	Secondary section without/with heatsink profiles
F_{rated}[1)2)]	F_{max}	v_{max} at F_{max}	v_{max} at F_{rated}				
N (lb$_f$)	N (lb$_f$)	m/min (ft/min)	m/min (ft/min)	Order No.	Order No.	kg (lb)	kg (lb)
Water cooling							
200 (45)	550 (124)	146 (479)	373 (1224)	**1FN3050-2WC00-0EA1**	**1FN3050-4SA00-0AA0**	2.4/2.9	0.4/0.5 (0.9/1.1)
		146 (479)	373 (1224)	**1FN3050-2WC00-0FA1**		(5.3/6.4)	
200 (45)	490 (110)	138 (453)	322 (1056)	**1FN3100-1WC00-0BA1**	**1FN3100-4SA00-0AA0**	2.2/– (4.9/–)[4]	0.7/0.8 (1.5/1.8)
450 (101)	1100 (247)	131 (430)	297 (974)	**1FN3100-2WC00-0BA1**		3.8/4.4 (8.4/9.7)	
		237 (778)	497 (1631)	**1FN3100-2WE00-0BA1**			
675 (152)	1650 (371)	120 (394)	277 (909)	**1FN3100-3WC00-0BA1**		5.4/6.2 (11.9/13.7)	
		237 (778)	497 (1631)	**1FN3100-3WE00-0BA1**			
900 (202)	2200 (495)	131 (430)	297 (974)	**1FN3100-4WC00-0BA1**		7.4/8.5 (16.3/18.7)	
		237 (778)	497 (1631)	**1FN3100-4WE00-0BA1**			
1125 (253)	2750 (618)	109 (358)	255 (837)	**1FN3100-5WC00-0BA1**		9.1/10.4 (20.1/22.9)	
340 (76)	820 (184)	126 (413)	282 (925)	**1FN3150-1WC00-0BA1**	**1FN3150-4SA00-0AA0**	3.0/– (6.6/–)[4]	1.2/1.3 (2.7/2.9)
675 (152)	1650 (371)	126 (413)	282 (925)	**1FN3150-2WC00-0BA1**		5.3/6 (11.7/13.2)	
1010 (227)	2470 (555)	126 (413)	282 (925)	**1FN3150-3WC00-0BA1**		7.8/8.7 (17.2/19.2)	
1350 (304)	3300 (742)	126 (413)	282 (925)	**1FN3150-4WC00-0BA1**		10.2/11.4 (22.5/25.1)	
1690 (380)	4120 (926)	126 (413)	282 (925)	**1FN3150-5WC00-0BA1**		12.8/14.2 (28.2/31.3)	
610 (137)	1720 (387)	128 (420)	309 (1014)	**1FN3300-1WC00-0BA1**	**1FN3300-4SA00-0AA0**	6.2/ – (13.7/–)[4]	2.4/2.6 (5.3/5.7)
1225 (275)	3450 (776)	63 (207)	176 (577)	**1FN3300-2WB00-0BA1**		11.4/12.4 (25.1/27.3)	
		125 (410)	297 (974)	**1FN3300-2WC00-0BA1**			
		369 (1211)	805 (2641)	**1FN3300-2WG00-0BA1**			
1840 (414)	5170 (1162)	125 (410)	297 (974)	**1FN3300-3WC00-0BA1**		17.0/18.4 (37.5/40.6)	
		383 (1257)	836 (2743)	**1FN3300-3WG00-0BA1**			
2450 (551)	6900 (1551)	63 (207)	176 (577)	**1FN3300-4WB00-0BA1**		22.2/24 (48.9/52.9)	
		125 (410)	297 (974)	**1FN3300-4WC00-0BA1**			

Type of connection:	
1FN3100 to 1FN3900 motors	
Connection cover prepared for separate power and signal cables	**B**
1FN3050 motor	
Permanently connected power and signal cables with exposed core ends Length: 2 m (6.56 ft)	**E**
1FN3050 motor	
Permanently connected power and signal cables pre-assembled, with connectors Length: 0.5 m (1.64 ft)	**F**

Motor type Primary section (repeated)	Rated current	Maximum current	Calculated power	SINAMICS S120 Motor Module		Power cable with complete shield Motor connection via adapter cable with power connector for increased velocity/acceleration			
				Required rated current	Booksize format For additional versions and components see chapter SINAMICS S120 drive system	Pre-assembled adapter cable for motor	Power connector	Cable cross-section[5]	Pre-assembled basic cable to the drive system
	I_{rated}[1]	I_{max}	$P_{el, max}$	I_{rated}/I_{max}					
	A	A	kW (HP)	A	Order No.	Order No.	Size	mm^2	Order No.
1FN3050-2WC00-...	2.7	8.2	4.1 (5.5)	5/10	**6SL312■-■TE15-0AA3**	[6]	1	4 × 2.5	**6FX8002-5CS11-....**
1FN3050-2WC00-...	2.7	8.2	4.1 (5.5)	5/10	**6SL312■-■TE15-0AA3**	[7]	1	4 × 2.5	**6FX8002-5CS11-....**
1FN3100-1WC00-...	2.4	6.5	3.1 (4.2)	5/10	**6SL312■-■TE15-0AA3**	**6FX7002-5LM42-....**	1	4 × 2.5	**6FX8002-5CS11-....**
1FN3100-2WC00-...	5.1	13.5	6.3 (8.5)	9/18	**6SL312■-■TE21-0AA3**	**6FX7002-5LM42-....**	1	4 × 2.5	**6FX8002-5CS11-....**
1FN3100-2WE00-...	8.1	21.5	8.3 (11.1)	18/36	**6SL312■-■TE21-8AA3**	**6FX7002-5LM42-....**	1	4 × 2.5	**6FX8002-5CS11-....**
1FN3100-3WC00-...	7.2	19.1	9.2 (12.3)	18/36	**6SL312■-■TE21-8AA3**	**6FX7002-5LM42-....**	1	4 × 2.5	**6FX8002-5CS11-....**
1FN3100-3WE00-...	12.1	32.2	12.4 (16.6)	18/36	**6SL312■-■TE21-8AA3**	**6FX7002-5LM42-....**	1	4 × 2.5	**6FX8002-5CS11-....**
1FN3100-4WC00-...	10.1	27.0	12.6 (16.9)	18/36	**6SL312■-■TE21-8AA3**	**6FX7002-5LM42-....**	1	4 × 2.5	**6FX8002-5CS11-....**
1FN3100-4WE00-...	16.1	43.0	16.6 (22.3)	30/56	**6SL312■-1TE23-0AA3**	**6FX7002-5LM42-....**	1	4 × 2.5	**6FX8002-5CS11-....**
1FN3100-5WC00-...	11.0	29.5	14.4 (19.3)	18/36	**6SL312■-■TE21-8AA3**	**6FX7002-5LM42-....**	1	4 × 2.5	**6FX8002-5CS11-....**
1FN3150-1WC00-...	3.6	9.5	4.3 (5.8)	5/10	**6SL312■-■TE15-0AA3**	**6FX7002-5LM42-....**	1	4 × 2.5	**6FX8002-5CS11-....**
1FN3150-2WC00-...	7.2	19.1	8.7 (11.7)	18/36	**6SL312■-■TE21-8AA3**	**6FX7002-5LM42-....**	1	4 × 2.5	**6FX8002-5CS11-....**
1FN3150-3WC00-...	10.7	28.6	13.0 (17.4)	18/36	**6SL312■-■TE21-8AA3**	**6FX7002-5LM42-....**	1	4 × 2.5	**6FX8002-5CS11-....**
1FN3150-4WC00-...	14.3	38.2	17.4 (23.3)	30/56	**6SL312■-1TE23-0AA3**	**6FX7002-5LM42-....**	1	4 × 2.5	**6FX8002-5CS11-....**
1FN3150-5WC00-...	17.9	47.7	21.7 (29.1)	30/56	**6SL312■-1TE23-0AA3**	**6FX7002-5LM42-....**	1	4 × 2.5	**6FX8002-5CS11-....**
1FN3300-1WC00-...	6.5	20.0	8.7 (11.7)	18/36	**6SL312■-■TE21-8AA3**	**6FX7002-5LM62-....**	1	4 × 2.5	**6FX8002-5CS11-....**
1FN3300-2WB00-...	8.0	24.7	13.2 (17.7)	18/36	**6SL312■-■TE21-8AA3**	**6FX7002-5LM62-....**	1	4 × 2.5	**6FX8002-5CS11-....**
1FN3300-2WC00-...	12.6	39.2	16.7 (22.4)	30/56	**6SL312■-1TE23-0AA3**	**6FX7002-5LM62-....**	1	4 × 2.5	**6FX8002-5CS11-....**
1FN3300-2WG00-...	32.2	99.7	30.1 (40.4)	60/113	**6SL312■-1TE26-0AA3**	**6FX7002-5LM82-....**	1.5	4 × 6	**6FX8002-5CS54-....**
1FN3300-3WC00-...	19.0	58.7	25.1 (33.7)	30/56	**6SL312■-1TE23-0AA3**	**6FX7002-5LM62-....**	1	4 × 2.5	**6FX8002-5CS11-....**
1FN3300-3WG00-...	50.0	154.9	46.2 (61.9)	132/210	**6SL312■-1TE31-3AA3**	**6FX7002-5LM02-....**	1.5	4 × 16	**6FX8002-5CS24-....**
1FN3300-4WB00-...	16.0	49.4	26.3 (35.3)	30/56	**6SL312■-1TE23-0AA3**	**6FX7002-5LM62-....**	1	4 × 2.5	**6FX8002-5CS11-....**
1FN3300-4WC00-...	25.3	78.3	33.5 (44.9)	45/85	**6SL312■-1TE24-5AA3**	**6FX7002-5LM72-....**	1.5	4 × 4	**6FX8002-5CS54-....**

Cooling:
Internal air cooling **0**
External air cooling **1**

Motor Module:
Single Motor Module **1**
Double Motor Module **2**

.... Length code **....**

Further information about the cables can be found in chapter Connection system MOTION-CONNECT.

[1] For water cooling with inlet temperature 35 °C (95 °F).
[2] A reduction of up to 30 % must be expected in case of motor standstill, at very low velocities, or with very short traverse paths.
[3] Velocity values refer to a DC link voltage of the drive system of 600 V DC.
[4] No precision cooler available.
[5] The current carrying capacity of the power cables complies with EN 60204-1 for installation type C, for continuous duty at an ambient air temperature of 40 °C (104 °F).
[6] Permanently connected power and signal cables, length 2 m (6.56 ft), with exposed core ends.
[7] Permanently connected power and signal cables, length 0.5 m (1.64 ft), with power connector size 1 and M17 signal connector.

Selection and ordering data

Feedrate force		Maximum velocity[3]		1FN3 linear motors – Version for peak load		Weight, approx.	
				Primary section	Secondary section	Primary section without/with precision cooling	Secondary section without/with heatsink profiles
F_{rated}[1)2)]	F_{max}	v_{max} at F_{max}	v_{max} at F_{rated}				
N (lb_f)	N (lb_f)	m/min (ft/min)	m/min (ft/min)	Order No.	Order No.	kg (lb)	kg (lb)
Water cooling							
1930 (434)	5180 (1165)	30 (98)	112 (368)	**1FN3450-2WA50-0BA1**	**1FN3450-4SA00-0AA0**	15.9/17.1 (35.1/37.7)	3.8/4 (8.4/8.8)
		120 (394)	275 (902)	**1FN3450-2WC00-0BA1**			
		240 (787)	519 (1703)	**1FN3450-2WE00-0BA1**			
2895 (651)	7760 (1745)	62 (203)	164 (538)	**1FN3450-3WB00-0BA1**		22.6/24.3 (49.8/53.6)	
		90 (295)	217 (712)	**1FN3450-3WB50-0BA1**			
		120 (394)	275 (902)	**1FN3450-3WC00-0BA1**			
		240 (787)	519 (1703)	**1FN3450-3WE00-0BA1**			
3860 (868)	10350 (2327)	62 (203)	164 (538)	**1FN3450-4WB00-0BA1**		30.9/33.1 (68.1/73)	
		90 (295)	217 (712)	**1FN3450-4WB50-0BA1**			
		120 (394)	275 (902)	**1FN3450-4WC00-0BA1**			
		240 (787)	519 (1703)	**1FN3450-4WE00-0BA1**			
2610 (587)	6900 (1551)	36 (118)	120 (394)	**1FN3600-2WA50-0BA1**	**1FN3600-4SA00-0AA0**	22.2/24.7 (49/54.5)	4.6/5 (10.1/11)
3915 (880)	10350 (2327)	58 (190)	155 (509)	**1FN3600-3WB00-0BA1**		31.5/33.4 (69.5/73.7)	
		127 (417)	279 (915)	**1FN3600-3WC00-0BA1**			
5220 (1174)	13800 (3102)	26 (85)	105 (345)	**1FN3600-4WA30-0BA1**		40.8/43.3 (90/95.5)	
		58 (190)	155 (509)	**1FN3600-4WB00-0BA1**			
		91 (299)	215 (705)	**1FN3600-4WB50-0BA1**			
		112 (367)	254 (833)	**1FN3600-4WC00-0BA1**			
4050 (910)	10350 (2327)	65 (213)	160 (525)	**1FN3900-2WB00-0BA1**	**1FN3900-4SA00-0AA0**	28.2/29.7 (62.2/65.4)	7.5/7.9 (16.5/17.4)
		115 (377)	253 (830)	**1FN3900-2WC00-0BA1**			
6075 (1366)	15530 (3491)	75 (246)	181 (594)	**1FN3900-3WB00-0BA1**		42.2/44.3 (93.1/97.6)	
8100 (1821)	20700 (4653)	65 (213)	160 (525)	**1FN3900-4WB00-0BA1**		56.2/58.9 (124/130)	
		88 (290)	203 (666)	**1FN3900-4WB50-0BA1**			
		115 (377)	253 (830)	**1FN3900-4WC00-0BA1**			

Type of connection:	
1FN3100 to 1FN3900 motors	
Connection cover prepared for separate power and signal cables	**B**

Motor type Primary section (repeated)	Rated current	Maximum current	Calculated power	SINAMICS S120 Motor Module		Power cable with complete shield Motor connection via adapter cable with power connector for increased velocity/acceleration			
				Required rated current	Booksize format For additional versions and components see chapter SINAMICS S120 drive system	Pre-assembled adapter cable for motor	Power connector	Cable cross-section[4]	Pre-assembled basic cable to the drive system
	I_{rated}[1]	I_{max}	$P_{el, max}$	I_{rated}/I_{max}					
	A	A	kW (HP)	A	Order No.	Order No.	Size	mm²	Order No.
1FN3450-2WA50-...	8.6	25.3	15.9 (21.3)	18/36	**6SL312■-■TE21-8AA3**	**6FX7002-5LM62- ....**	1	4 × 2.5	**6FX8002-5CS11- ....**
1FN3450-2WC00-...	18.8	55.3	23.1 (31)	30/56	**6SL312■-1 TE23-0AA3**	**6FX7002-5LM62- ....**	1	4 × 2.5	**6FX8002-5CS11- ....**
1FN3450-2WE00-...	33.8	99.7	32.6 (43.7)	60/113	**6SL312■-1 TE26-0AA3**	**6FX7002-5LM82- ....**	1.5	4 × 6	**6FX8002-5CS54- ....**
1FN3450-3WB00-...	17.9	52.7	27.5 (36.9)	30/56	**6SL312■-1 TE23-0AA3**	**6FX7002-5LM62- ....**	1	4 × 2.5	**6FX8002-5CS11- ....**
1FN3450-3WB50-...	22.8	67.3	31.1 (41.7)	45/85	**6SL312■-1 TE24-5AA3**	**6FX7002-5LM72- ....**	1.5	4 × 4	**6FX8002-5CS54- ....**
1FN3450-3WC00-...	28.1	83.0	34.6 (46.4)	45/85	**6SL312■-1 TE24-5AA3**	**6FX7002-5LM72- ....**	1.5	4 × 4	**6FX8002-5CS54- ....**
1FN3450-3WE00-...	50.7	149.6	49.0 (65.7)	132/210	**6SL312■-1 TE31-3AA3**	**6FX7002-5LM02- ....**	1.5	4 × 16	**6FX8002-5CS24- ....**
1FN3450-4WB00-...	23.8	70.3	36.7 (49.2)	45/85	**6SL312■-1 TE24-5AA3**	**6FX7002-5LM72- ....**	1.5	4 × 4	**6FX8002-5CS54- ....**
1FN3450-4WB50-...	30.4	89.8	41.4 (55.5)	60/113	**6SL312■-1 TE26-0AA3**	**6FX7002-5LM82- ....**	1.5	4 × 6	**6FX8002-5CS54- ....**
1FN3450-4WC00-...	37.5	110.6	46.2 (61.9)	60/113	**6SL312■-1 TE26-0AA3**	**6FX7002-5LM32- ....**	1.5	4 × 10	**6FX8002-5CS64- ....**
1FN3450-4WE00-...	67.6	199.5	65.3 (87.5)	132/210	**6SL312■-1 TE31-3AA3**	**6FX7008-1BB61- ....**[5]	–	4 × 25	**6FX7008-1BB25- ....**[6]
1FN3600-2WA50-...	12.4	36.0	21.9 (29.4)	18/36	**6SL312■-■TE21-8AA3**	**6FX7002-5LM62- ....**	1	4 × 2.5	**6FX8002-5CS11- ....**
1FN3600-3WB00-...	23.2	67.3	35.4 (47.5)	45/85	**6SL312■-1 TE24-5AA3**	**6FX7002-5LM72- ....**	1.5	4 × 4	**6FX8002-5CS54- ....**
1FN3600-3WC00-...	35.7	105.9	44.6 (59.8)	60/113	**6SL312■-1 TE26-0AA3**	**6FX7002-5LM82- ....**	1.5	4 × 6	**6FX8002-5CS54- ....**
1FN3600-4WA30-...	22.3	64.9	41.9 (56.2)	45/85	**6SL312■-1 TE24-5AA3**	**6FX7002-5LM72- ....**	1.5	4 × 4	**6FX8002-5CS54- ....**
1FN3600-4WB00-...	30.9	89.8	47.2 (63.3)	60/113	**6SL312■-1 TE26-0AA3**	**6FX7002-5LM82- ....**	1.5	4 × 6	**6FX8002-5CS54- ....**
1FN3600-4WB50-...	40.8	118.5	53.2 (71.3)	85/141	**6SL312■-1 TE28-5AA3**	**6FX7002-5LM32- ....**	1.5	4 × 10	**6FX8002-5CS64- ....**
1FN3600-4WC00-...	46.9	136.5	55.5 (74.4)	85/141	**6SL312■-1 TE28-5AA3**	**6FX7002-5LM32- ....**	1.5	4 × 10	**6FX8002-5CS64- ....**
1FN3900-2WB00-...	24.7	69.5	34.5 (46.3)	45/85	**6SL312■-1 TE24-5AA3**	**6FX7002-5LM72- ....**	1.5	4 × 4	**6FX8002-5CS54- ....**
1FN3900-2WC00-...	36.7	103.3	40.9 (54.8)	60/113	**6SL312■-1 TE26-0AA3**	**6FX7002-5LM32- ....**	1.5	4 × 10	**6FX8002-5CS64- ....**
1FN3900-3WB00-...	40.6	114.0	54.5 (73.1)	85/141	**6SL312■-1 TE28-5AA3**	**6FX7002-5LM32- ....**	1.5	4 × 10	**6FX8002-5CS64- ....**
1FN3900-4WB00-...	49.4	138.9	68.9 (92.4)	132/210	**6SL312■-1 TE31-3AA3**	**6FX7002-5LM32- ....**	1.5	4 × 10	**6FX8002-5CS64- ....**
1FN3900-4WB50-...	60.6	170.3	76.3 (102.3)	132/210	**6SL312■-1 TE31-3AA3**	**6FX7002-5LM02- ....**	1.5	4 × 16	**6FX8002-5CS24- ....**
1FN3900-4WC00-...	73.5	206.5	81.9 (109.8)	132/210	**6SL312■-1 TE31-3AA3**	**6FX7008-1BB61- ....**[5]	–	4 × 25	**6FX7008-1BB25- ....**[6]

Cooling:
Internal air cooling **0**
External air cooling **1**

Motor Module:
Single Motor Module **1**
Double Motor Module **2**

.... Length code ....

Further information about the cables can be found in chapter Connection system MOTION-CONNECT.

[1] For water cooling with inlet temperature 35 °C (95 °F).
[2] A reduction of up to 30 % must be expected in case of motor standstill, at very low velocities, or with very short traverse paths.
[3] Velocity values refer to a DC link voltage of the drive system of 600 V DC.
[4] The current carrying capacity of the power cables complies with EN 60204-1 for installation type C, for continuous duty at an ambient air temperature of 40 °C (104 °F).
[5] Sold by the meter only (4 × 16 mm²). Connected to primary section with 16 mm² (< 1.5 m (4.92 ft)), then routed onwards through terminal box with 25 mm².
[6] Sold by the meter only (4 × 25 mm²).

Selection and ordering data

Feedrate force		Maximum velocity[3]		1FN3 linear motors – Version for continuous load		Weight, approx.	
				Primary section	Secondary section	Primary section without/with precision cooling	Secondary section without/with heatsink profiles
F_{rated}[1)2)]	F_{max}	v_{max} at F_{max}	v_{max} at F_{rated}				
N (lb$_f$)	N (lb$_f$)	m/min (ft/min)	m/min (ft/min)	Order No.	Order No.	kg (lb)	kg (lb)
Water cooling							
150 (34)	260 (58)	242 (794)	435 (1427)	**1FN3050-1ND00-0EA1**	**1FN3050-4SA00-0AA0**	1.9/2.4 (4.2/5.3)	0.4/0.5 (0.9/1.1)
		242 (794)	435 (1427	**1FN3050-1ND00-0FA1**			
300 (67)	510 (115)	106 (348)	202 (663)	**1FN3050-2NB80-0EA1**		3.2/4.0 (7.1/8.8)	
		106 (348)	202 (663)	**1FN3050-2NB80-0FA1**			
300 (67)	510 (115)	117 (384)	214 (702)	**1FN3100-1NC00-0BA1**	**1FN3100-4SA00-0AA0**	3/3.5 (6.6/7.7)	0.7/0.8 (1.5/1.8)
605 (136)	1020 (229)	170 (558)	307 (1007)	**1FN3100-2NC80-0BA1**		5.1/5.9 (11.3/13.1)	
905 (203)	1530 (344)	115 (337)	211 (692)	**1FN3100-3NC00-0BA1**		7.3/8.3 (16.1/18.03)	
1205 (271)	2040 (459)	169 (555)	305 (1001)	**1FN3100-4NC80-0BA1**		10/11.3 (22.1/24.9)	
455 (102)	770 (173)	129 (423)	234 (768)	**1FN3150-1NC20-0BA1**	**1FN3150-4SA00-0AA0**	4.1/4.6 (9.0/10.1)	1.2/1.3 (2.7/2.9)
905 (203)	1530 (344)	110 (361)	201 (660)	**1FN3150-2NB80-0BA1**		7.2/8.1 (15.9/17.9)	
1360 (306)	2300 (517)	163 (535)	292 (958)	**1FN3150-3NC70-0BA1**		10.5/11.7 (23.2/25.8)	
1810 (407)	3060 (688)	109 (358)	200 (656)	**1FN3150-4NB80-0BA1**		13.8/15.2 (30.4/33.5)	
865 (195)	1470 (331)	129 (423)	230 (755)	**1FN3300-1NC10-0BA1**	**1FN3300-4SA00-0AA0**	8.8/9.5 (19.4/20.9)	2.4/2.6 (5.3/5.7)
1730 (389)	2940 (661)	127 (417)	228 (748)	**1FN3300-2NC10-0BA1**		16.1/17.2 (35.5/37.9)	
2595 (583)	4400 (989)	144 (473)	257 (843)	**1FN3300-3NC40-0BA1**		22.8/24.3 (50.3/53.6)	
3460 (778)	5870 (1320)	109 (358)	196 (643)	**1FN3300-4NB80-0BA1**		30.4/32.3 (67.0/71.2)	
2595 (583)	4400 (989)	153 (502)	271 (889)	**1FN3450-2NC50-0BA1**	**1FN3450-4SA00-0AA0**	22/23.2 (48.5/51.2)	3.8/4 (8.4/8.8)
3890 (875)	6600 (1484)	152 (499)	270 (886)	**1FN3450-3NC50-0BA1**		32/33.6 (70.6/74.1)	
5185 (1166)	8810 (1981)	106 (348)	190 (623)	**1FN3450-4NB80-0BA1**		42.3/44.4 (93.3/97.9)	
3460 (778)	5870 (1320)	112 (368)	200 (656)	**1FN3600-2NB80-0BA1**	**1FN3600-4SA00-0AA0**	28.9/30.4 (63.7/67.0)	4.6/5 (10.1/11)
5185 (1166)	8810 (1981)	111 (364)	199 (653)	**1FN3600-3NB80-0BA1**		42.9/45.0 (94.6/99.2)	
6915 (1555)	11740 (2639)	111 (364)	199 (653)	**1FN3600-4NB80-0BA1**		56.6/59.2 (124.8/130.54)	
5185 (1166)	8810 (1981)	71 (233)	130 (427)	**1FN3900-2NB20-0BA1**	**1FN3900-4SA00-0AA0**	42.4/44.2 (93.5/97.5)	7.5/7.9 (16.5/17.4)
7780 (1749)	13210 (2970)	71 (233)	129 (423)	**1FN3900-3NB20-0BA1**		62/64.5 (136.7/142.2)	
10375 (2332)	17610 (3959)	70 (230)	129 (423)	**1FN3900-4NB20-0BA1**		82.2/85.3 (181.3/188.1)	

Type of connection:	
1FN3100 to 1FN3900 motors	
Connection cover prepared for separate power and signal cables	**B**
1FN3050 motor	
Permanently connected power and signal cables with exposed core ends Length: 2 m (6.56 ft)	**E**
1FN3050 motor	
Permanently connected power and signal cables pre-assembled, with connectors Length: 0.5 m (1.64 ft)	**F**

Motor type Primary section (repeated)	Rated current	Maximum current	Calculated power	SINAMICS S120 Motor Module		Power cable with complete shield Motor connection via adapter cable with power connector for increased velocity/acceleration			
				Required rated current	Booksize format For additional versions and components see chapter SINAMICS S120 drive system	Pre-assembled adapter cable for motor	Power connector	Cable cross-section[5]	Pre-assembled basic cable to the drive system
	I_{rated}[1]	I_{max}	$P_{el, max}$	I_{rated}/I_{max}					
	A	A	kW (HP)	A	Order No.	Order No.	Size	mm^2	Order No.
1FN3050-1ND...	2.8	5.9	1.7 (2.28)	3/6	**6SL312■-■TE13-0AA3**	[6]	1	4 × 2.5	**6FX8002-5CS11- ....**
1FN3050-1ND...	2.8	5.9	1.7 (2.28)	3/6	**6SL312■-■TE13-0AA3**	[6]	1	4 × 2.5	**6FX8002-5CS11- ....**
1FN3050-2NB...	2.8	5.9	2.3 (3.08)	3/6	**6SL312■-■TE13-0AA3**	[6]	1	4 × 2.5	**6FX8002-5CS11- ....**
1FN3050-2NB...	2.8	5.9	2.3 (3.08)	3/6	**6SL312■-■TE13-0AA3**	[6]	1	4 × 2.5	**6FX8002-5CS11- ....**
1FN3100-1NC...	2.8	5.9	2.1 (2.8)	3/6	**6SL312■-■TE13-0AA3**	**6FX7002-5LM42- ....**	1	4 × 2.5	**6FX8002-5CS11- ....**
1FN3100-2NC...	8	16.5	5.1 (6.84)	9/18	**6SL312■-■TE21-0AA3**	**6FX7002-5LM42- ....**	1	4 × 2.5	**6FX8002-5CS11- ....**
1FN3100-3NC...	8.5	17.6	6.3 (8.5)	9/18	**6SL312■-■TE21-0AA3**	**6FX7002-5LM42- ....**	1	4 × 2.5	**6FX8002-5CS11- ....**
1FN3100-4NC...	15.9	33.1	10.2 (13.9)	18/36	**6SL312■-■TE21-8AA3**	**6FX7002-5LM42- ....**	1	4 × 2.5	**6FX8002-5CS11- ....**
1FN3150-1NC...	4.5	9.4	3.2 (4.3)	5/10	**6SL312■-■TE15-0AA3**	**6FX7002-5LM42- ....**	1	4 × 2.5	**6FX8002-5CS11- ....**
1FN3150-2NB...	8	16.5	5.8 (7.78)	9/18	**6SL312■-■TE21-0AA3**	**6FX7002-5LM42- ....**	1	4 × 2.5	**6FX8002-5CS11- ....**
1FN3150-3NC...	16.9	35.2	10.8 (14.5)	18/36	**6SL312■-■TE21-8AA3**	**6FX7002-5LM42- ....**	1	4 × 2.5	**6FX8002-5CS11- ....**
1FN3150-4NB...	15.9	33.1	11.6 (15.6)	18/36	**6SL312■-■TE21-8AA3**	**6FX7002-5LM42- ....**	1	4 × 2.5	**6FX8002-5CS11- ....**
1FN3300-1NC...	8.1	17.1	5.4 (7.2)	9/18	**6SL312■-■TE21-0AA3**	**6FX7002-5LM62- ....**	1	4 × 2.5	**6FX8002-5CS11- ....**
1FN3300-2NC...	16.2	34.1	10.7 (14.3)	18/36	**6SL312■-■TE21-8AA3**	**6FX7002-5LM62- ....**	1	4 × 2.5	**6FX8002-5CS11- ....**
1FN3300-3NC...	27.3	57.4	17.3 (23.2)	30/56[4]	**6SL312■-1 TE23-0AA3**	**6FX7002-5LM72- ....**	1.5	4 × 4	**6FX8002-5CS41- ....**
1FN3300-4NB...	28.4	59.6	19.6 (26.3)	30/56[4]	**6SL312■-1 TE23-0AA3**	**6FX7002-5LM72- ....**	1.5	4 × 4	**6FX8002-5CS41- ....**
1FN3450-2NC...	28.4	59.6	17.4 (23.3)	30/56[4]	**6SL312■-1 TE23-0AA3**	**6FX7002-5LM72- ....**	1.5	4 × 4	**6FX8002-5CS41- ....**
1FN3450-3NC...	42.5	89.5	26.1 (35.0)	45/85[4]	**6SL312■-1 TE24-5AA3**	**6FX7002-5LM32- ....**	1.5	4 × 10	**6FX8002-5CS64- ....**
1FN3450-4NB...	40.8	85.8	27.9 (37.4)	45/85[4]	**6SL312■-1 TE24-5AA3**	**6FX7002-5LM32- ....**	1.5	4 × 10	**6FX8002-5CS64- ....**
1FN3600-2NB...	28.4	59.6	19.3 (25.9)	30/56[4]	**6SL312■-1 TE23-0AA3**	**6FX7002-5LM72- ....**	1.5	4 × 4	**6FX8002-5CS41- ....**
1FN3600-3NB...	42.5	89.5	28.9 (38.8)	45/85[4]	**6SL312■-1 TE24-5AA3**	**6FX7002-5LM32- ....**	1.5	4 × 10	**6FX8002-5CS64- ....**
1FN3600-4NB...	56.7	119.3	38.5 (51.6)	60/113[4]	**6SL312■-1 TE26-0AA3**	**6FX7002-5LM02- ....**	1.5	4 × 16	**6FX8002-5CS24- ....**
1FN3900-2NB...	28.4	59.6	22.3 (29.9)	30/56[4]	**6SL312■-1 TE23-0AA3**	**6FX7002-5LM72- ....**	1.5	4 × 4	**6FX8002-5CS41- ....**
1FN3900-3NB...	42.5	89.5	33.4 (44.8)	45/85[4]	**6SL312■-1 TE24-5AA3**	**6FX7002-5LM32- ....**	1.5	4 × 10	**6FX8002-5CS64- ....**
1FN3900-4NB...	56.7	119.3	44.5 (59.7)	60/113[4]	**6SL312■-1 TE26-0AA3**	**6FX7002-5LM02- ....**	1.5	4 × 16	**6FX8002-5CS24- ....**

Cooling:
Internal air cooling **0**
External air cooling **1**

Motor Module:
Single Motor Module **1**
Double Motor Module **2**

.... Length code **....**

Further information about the cables can be found in chapter Connection system MOTION-CONNECT.

[1] For water cooling with inlet temperature 35 °C (95 °F).

[2] A reduction of up to 30 % must be expected in case of motor standstill, at very low velocities, or with very short traverse paths.

[3] Velocity values refer to a DC link voltage of the drive system of 600 V DC.

[4] Motor Modules are designed for feedrate force F_{rated}. If feedrate force F_{max} is utilized, the next largest Motor Module must be used. If a Motor Module with a higher rating is used, you must check whether the specified power cable can be connected to it.

[5] The current carrying capacity of the power cables complies with EN 60204-1 for installation type C, for continuous duty at an ambient air temperature of 40 °C (104 °F).

[6] Permanently connected power and signal cables.

Selection and ordering data

1FN3 linear motors	Optional components		
	Secondary section cover		Cover end pieces for secondary section cover
Type	Continuous[1]	Segmented	Retaining of the continuous cover without heatsink profiles
	Order No.	Order No.	Order No.
1FN3050-...	**1FN3050-0TB00-1 ■ ■ 0**	**1FN3050-4TP00-1A ■ ■**	**1FN3050-0TC00-0AA0**
1FN3100-...	**1FN3100-0TB00-1 ■ ■ 0**	**1FN3100-4TP00-1A ■ ■**	**1FN3100-0TC00-0AA0**
1FN3150-...	**1FN3150-0TB00-1 ■ ■ 0**	**1FN3150-4TP00-1A ■ ■**	**1FN3150-0TC00-0AA0**
1FN3300-...	**1FN3300-0TB00-1 ■ ■ 0**	**1FN3300-4TP00-1A ■ ■**	**1FN3300-0TC00-0AA0**
1FN3450-...	**1FN3450-0TB00-1 ■ ■ 0**	**1FN3450-4TP00-1A ■ ■**	**1FN3450-0TC00-0AA0**
1FN3600-...	**1FN3600-0TB00-1 ■ ■ 0**	**1FN3600-4TP00-1A ■ ■**	–
1FN3900-...	**1FN3900-0TB00-1 ■ ■ 0**	**1FN3900-4TP00-1A ■ ■**	–

Number of secondary sections	0	**A**
	10	**B**
	20	**C**
	30	**D**
	40	**E**
	50	**F**
	0	**A**
	1	**B**
	2	**C**
	3	**D**
	4	**E**
	5	**F**
	6	**G**
	7	**H**
	8	**J**
	9	**K**

Number of secondary sections for all motors	2.5	**C**
	3	**D**
	3.5	**D**
	4	**E**
	5	**F**
Number of secondary sections for motors 1FN3600/1FN3900	5.5	**F**
	6.5	**G**

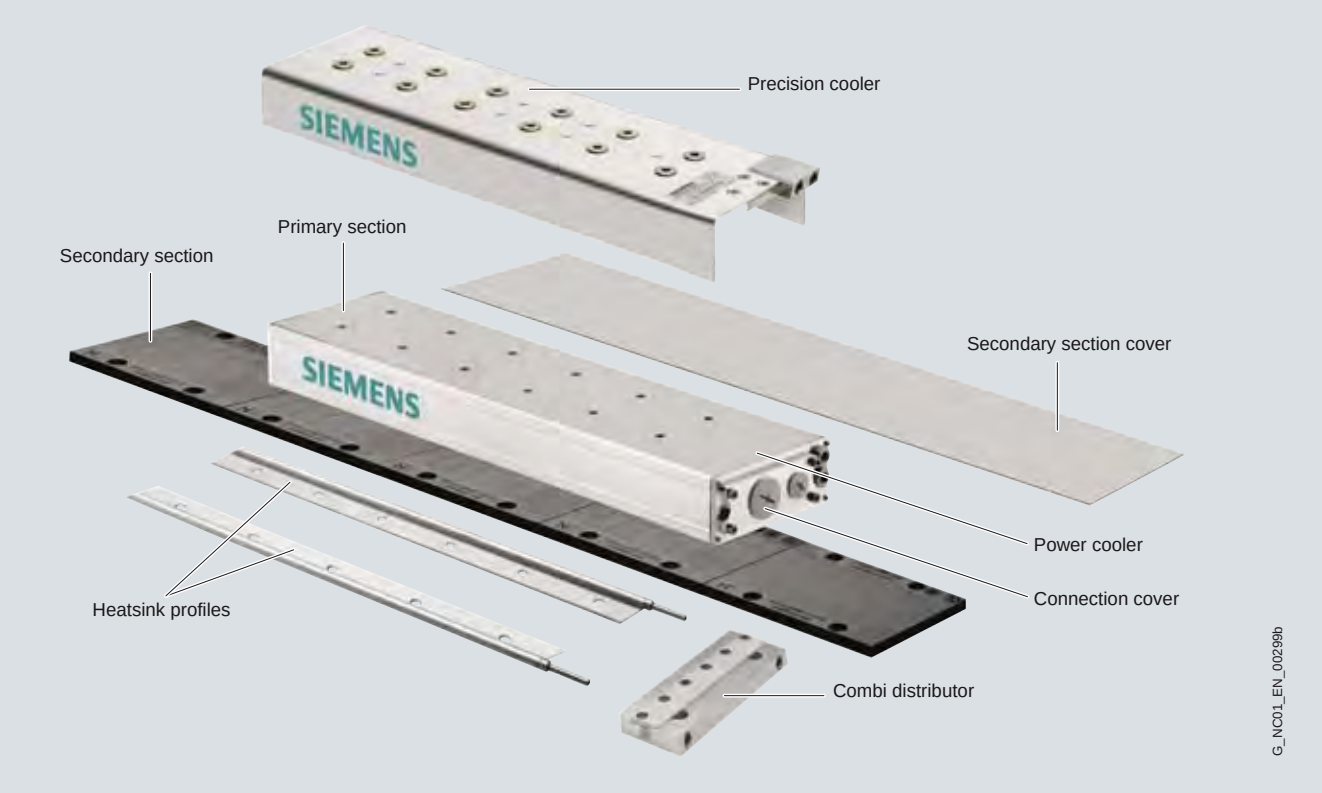
5	**0**	**0**
5	**0**	**5**
5	**5**	**0**
5	**5**	**5**

1FN3 linear motors Version for peak load	Optional components Precision cooler
Type	Order No.
1FN3050-2W...	**1FN3050-2PK00-0AA0**
1FN3100-2W...	**1FN3100-2PK00-0AA0**
1FN3100-3W...	**1FN3100-3PK00-0AA0**
1FN3100-4W...	**1FN3100-4PK00-0AA0**
1FN3100-5W...	**1FN3100-5PK00-0AA0**
1FN3150-2W...	**1FN3150-2PK00-0AA0**
1FN3150-3W...	**1FN3150-3PK00-0AA0**
1FN3150-4W...	**1FN3150-4PK00-0AA0**
1FN3150-5W...	**1FN3150-5PK00-0AA0**
1FN3300-2W...	**1FN3300-2PK00-0AA0**
1FN3300-3W...	**1FN3300-3PK00-0AA0**
1FN3300-4W...	**1FN3300-4PK00-0AA0**
1FN3450-2W...	**1FN3450-2PK00-0AA0**
1FN3450-3W...	**1FN3450-3PK00-0AA0**
1FN3450-4W...	**1FN3450-4PK00-0AA0**
1FN3600-2W...	**1FN3600-2PK00-0AA0**
1FN3600-3W...	**1FN3600-3PK00-0AA0**
1FN3600-4W...	**1FN3600-4PK00-0AA0**
1FN3900-2W...	**1FN3900-2PK00-0AA0**
1FN3900-3W...	**1FN3900-3PK00-0AA0**
1FN3900-4W...	**1FN3900-4PK00-0AA0**

1FN3 linear motors Version for continuous load	Optional components Precision cooler
Type	Order No.
1FN3050-1N...	**1FN3050-1PK10-0AA0**
1FN3050-2N...	**1FN3050-2PK10-0AA0**
1FN3100-1N...	**1FN3100-1PK10-0AA0**
1FN3100-2N...	**1FN3100-2PK10-0AA0**
1FN3100-3N...	**1FN3100-3PK10-0AA0**
1FN3100-4N...	**1FN3100-4PK10-0AA0**
1FN3150-1N...	**1FN3150-1PK10-0AA0**
1FN3150-2N...	**1FN3150-2PK10-0AA0**
1FN3150-3N...	**1FN3150-3PK10-0AA0**
1FN3150-4N...	**1FN3150-4PK10-0AA0**
1FN3300-1N...	**1FN3300-1PK10-0AA0**
1FN3300-2N...	**1FN3300-2PK10-0AA0**
1FN3300-3N...	**1FN3300-3PK10-0AA0**
1FN3300-4N...	**1FN3300-4PK10-0AA0**
1FN3450-2N...	**1FN3450-2PK10-0AA0**
1FN3450-3N...	**1FN3450-3PK10-0AA0**
1FN3450-4N...	**1FN3450-4PK10-0AA0**
1FN3600-2N...	**1FN3600-2PK10-0AA0**
1FN3600-3N...	**1FN3600-3PK10-0AA0**
1FN3600-4N...	**1FN3600-4PK10-0AA0**
1FN3900-2N...	**1FN3900-2PK10-0AA0**
1FN3900-3N...	**1FN3900-3PK10-0AA0**
1FN3900-4N...	**1FN3900-4PK10-0AA0**

[1] Continuous cover for several secondary sections. The maximum length of the secondary section cover is 6 m (19.7 ft). For 1FN3050 to 1FN3150 motors, this corresponds to a maximum number of 50 secondary sections (AB to FA), for 1FN3300 to 1FN3900 motors, this corresponds to a maximum number of 32 secondary sections (AB to DC).

Selection and ordering data (continued)



1FN3 linear motor, design

Linear motors	Optional components			
Type	Heatsink profile[1]	Secondary section end pieces[2]		
		Combi distributor	Combi adapter	Combi end piece
		Parallel water connection for all heatsink profiles	Combi adapter and end piece can only be implemented together.	
			Single-sided water connection	Water diversion
	Order No.	Order No.	Order No.	Order No.
1FN3050-...	**1FN3002-0TK0 ■ -1 ■ ■ 0**	**1FN3050-0TJ01-0AA0**	**1FN3050-0TG01-0AA0**	**1FN3050-0TF01-0AA0**
1FN3100-...	**1FN3002-0TK0 ■ -1 ■ ■ 0**	**1FN3100-0TJ01-0AA0**	**1FN3100-0TG01-0AA0**	**1FN3100-0TF01-0AA0**
1FN3150-...	**1FN3002-0TK0 ■ -1 ■ ■ 0**	**1FN3150-0TJ01-0AA0**	**1FN3150-0TG01-0AA0**	**1FN3150-0TF01-0AA0**
1FN3300-...	**1FN3003-0TK0 ■ -1 ■ ■ 0**	**1FN3300-0TJ01-0AA0**	**1FN3300-0TG01-0AA0**	**1FN3300-0TF01-0AA0**
1FN3450-...	**1FN3003-0TK0 ■ -1 ■ ■ 0**	**1FN3450-0TJ01-0AA0**	**1FN3450-0TG01-0AA0**	**1FN3450-0TF01-0AA0**
1FN3600-...	**1FN3004-0TK0 ■ -1 ■ ■ 0**	**1FN3600-0TJ01-0AA0**	–	–
1FN3900-...	**1FN3005-0TK0 ■ -1 ■ ■ 0**	**1FN3900-0TJ01-0AA0**	–	–

				Number of secondary sections
With plug-in coupling prepared for connection to combi distributor with plug-in coupling, combi adapter with plug-in coupling, combi end piece with plug-in coupling or as intermediate unit for heat-sink profile with cable grommet nipple	**4**		**A**	0
			B	10
			C	20
1FN3050 to 1FN3450 motors[3]: **Grommet nipple only on right end** of secondary section track	**6**		**A**	0
			B	1
			C	2
			D	3
1FN3600/1FN3900 motors: **Grommet nipple on both ends** of secondary section track	**6**		**E**	4
			F	5
			G	6
1FN3050 to 1FN3450 motors[3]: **Grommet nipple only on left end** of secondary section track	**7**		**H**	7
			J	8
			K	9

1) 1FN3050 to 1FN3450 motors:
2 units required per secondary section track.
1FN3600 to 1FN3900:
3 units required per secondary section track.
The maximum available length of a single-part heatsink profile is 3 m (9.84 ft).
For the following frame sizes, this corresponds to:
1FN3050 to 1FN3150, a maximum of 24 secondary sections (AB to CE)
1FN3300 to 1FN3900, a maximum of 16 secondary sections (AB to BG).

2) The secondary section end pieces are designed to allow clamping of the integrated secondary section cover.

3) Available only in length AC (equals 2 secondary sections). The difference in the secondary section track length must be compensated through assembly with the heatsink profile 1FN300.-0TK04-1..0.

Overview

Hall-effect sensor box

The hall-effect sensor box may be required with incremental linear measuring systems when the software method for the identification of the pole position cannot be applied.

Selection and ordering data

Linear motor	Hall-effect sensor box	
1FN3	Straight cable outlet	Cable outlet at side
Type	Order No.	Order No.
Mounted opposite primary section terminal end		
1FN3050-2... 1FN3100-2... 1FN3100-4... 1FN3150-2... 1FN3150-4...	**1FN3002-0PH00-0AA0**	**1FN3002-0PH01-0AA0**
1FN3100-1... 1FN3100-3... 1FN3100-5... 1FN3150-1... 1FN3150-3... 1FN3150-5...	**1FN3005-0PH00-0AA0**	**1FN3005-0PH01-0AA0**
1FN3300-2... 1FN3300-4... 1FN3450-2... 1FN3450-4... 1FN3600-2... 1FN3600-4... 1FN3900-2... 1FN3900-4...	**1FN3003-0PH00-0AA0**	**1FN3003-0PH01-0AA0**
1FN3300-1... 1FN3300-3... 1FN3450-3... 1FN3600-3... 1FN3900-3...	**1FN3006-0PH00-0AA0**	**1FN3006-0PH01-0AA0**
Mounted on primary section terminal end		
1FN3050-... 1FN3100-... 1FN3150-...	**1FN3002-0PH00-0AA0**	**1FN3002-0PH01-0AA0**
1FN3300-... 1FN3450-... 1FN3600-... 1FN3900-...	**1FN3003-0PH00-0AA0**	**1FN3003-0PH01-0AA0**

Overview

Recommended linear measuring systems for 1FN3/1FN6 linear motors

	Absolute encoder EnDat enclosed	
Type	**LC 183**	**LC 483**
Signal cycle	20 µm	20 µm
Acceleration in measuring direction, max.	100 m/s^2 (328 ft/s^2)	100 m/s^2 (328 ft/s^2)
Traversing velocity, max.	180 m/min (591 ft/min)	180 m/min (591 ft/min)
Measuring length, max.	3040 mm (120 in)	2040 mm (80.3 in)
Output signal	1 V_{pp}	1 V_{pp}

	Incremental encoder sin/cos 1 V_{pp} enclosed	
Type	**LS 187**	**LS 487**
Signal cycle	20 µm	20 µm
Acceleration in measuring direction, max.	100 m/s^2 (328 ft/s^2)	100 m/s^2 (328 ft/s^2)
Traversing velocity, max.	120 m/min (394 ft/min)	120 m/min (394 ft/min)
Measuring length, max.	3040 mm (120 in)	2040 mm (80.3 in)
Output signal	1 V_{pp}	1 V_{pp}

	Incremental encoder sin/cos 1 V_{pp} open	
Type	**LIDA 485**	**Renishaw RG2**
Signal cycle	20 µm	20 µm
Acceleration in measuring direction, max.[1)]	200 m/s^2 (656 ft/s^2)	300 m/s^2 (984 ft/s^2)
Traversing velocity, max.	480 m/min (1575 ft/min)	300 m/min (984 ft/min)
Measuring length, max.	30040 mm (1183 in)	50000 mm (1968 in)
Output signal	1 V_{pp}	1 V_{pp}

Liquid cooling

Non-Siemens products whose fundamental suitability is familiar to us. It goes without saying that equivalent products from other manufacturers may be used. Our recommendations are to be seen as helpful information, not as requirements or dictates. We do not warrant the composition, nature, state or quality of non-Siemens products.

Please get in touch with the cooler manufacturers listed below for technical information:

BKW Kälte-Wärme-Versorgungstechnik GmbH
www.bkw-kuema.de

Helmut Schimpke and Team Industriekühlanlagen GmbH + Co. KG
www.schimpke.com

Hydac System GmbH
www.hydac.com

Pfannenberg GmbH
www.pfannenberg.com

Rittal GmbH & Co. KG
www.rittal.com

For design of the coolers, see also the Configuration Manual for 1FN3 or 1FN6 Linear Motors.

6

1) Refers to the measuring head.

1FN6 linear motors

Overview

1FN6 linear motors, left: with 2 integrated sockets, separately for power and signal cables, right: with permanently connected power and signal cables

In combination with the SINAMICS S120 drive system, 1FN6 linear motors provide an optimally tuned linear direct drive system for the requirements of modern mechanical engineering.

The 1FN6 motors comprise a primary section and a secondary section equipped with magnets which are not made of rare-earth material – in contrast to the current synchronous linear motor technology. The primary section has fixed dimensions, while the secondary section is made up of individual elements (segments) to suit the required traversing range. Through parallel operation of the motors, feedrate force and length can be scaled beyond the available spectrum.

Benefits

- High dynamic response and very high traversing velocity
- Excellent precision
- Very easy installation due to magnet-free secondary section track
- Drive components are free of wear thanks to contactless drive force transmission

The main advantages of linear direct drive technology are the extensive avoidance of

- Effects of elasticity, play and friction
- Natural oscillation in the drive train

This results in a higher dynamic response and increased precision. If suitable measuring systems are used and the temperature conditions are appropriate, the motors can be positioned in the nanometer range.

Application

Typical applications:

- Linear axes with traverse paths of approximately 4 m (13.1 ft) or more
- Handling and concatenated axes in the area of machine tools and production machines
- High-dynamic and high-precision feed axes in water jet and laser cutting machines
- Ambient conditions which require a non-magnetic secondary section track

Design

The simple mechanical construction without transmission elements, e.g. ballscrew, coupling or belt, enhances the reliability of the drive components.

Heat loss occurs almost exclusively in the primary section and is dissipated via the optimized housing type.

In addition, the 1FN6003/1FN6007 motors are available with water cooling.

The stainless metal encapsulation of the primary section ensures the high mechanical ruggedness and resistance to soiling required for use in machine tools and production machines, as well as high resistance to corrosive liquids. The motor places minimal demands on the preparation of mounting surfaces thanks to the large air gap. The mounting tolerances for the air gap are ± 0.3 mm (0.012 in).

Design variant

1FN6 linear motors are constructed as single-sided motors. The primary section is mounted parallel to the associated secondary section. Several primary sections can traverse one secondary section track.

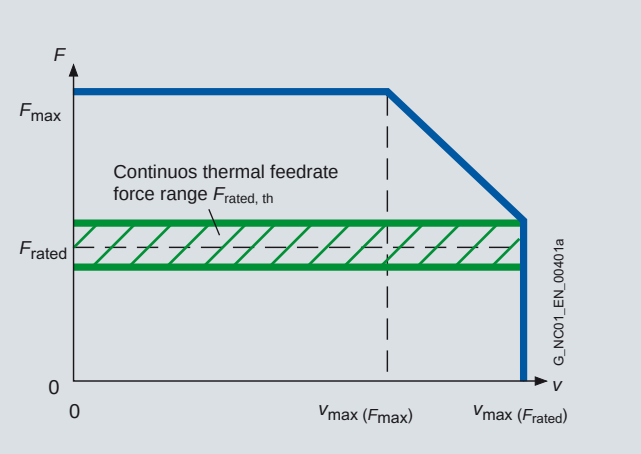
More information

Any questions regarding 1FN6 linear motors can be e-mailed to: info.drives@siemens.com

Technical specifications

1FN6 linear motor	
Type of motor	Permanent-magnet synchronous linear motor
Magnet material	
• Primary section	Rare-earth permanent magnets
• Secondary section	Non-magnetic
Cooling	
• 1FN6003 ... 1FN6024	Natural cooling
• 1FN6003 ... 1FN6007	Water cooling[1)]
Temperature monitoring in primary section	Evaluation via Sensor Module External SME120/SME125, see chapter SINAMICS S120 drive system.
• In accordance with DIN 44081/DIN 44082	PTC thermistor in triple connection
• In accordance with EN 60034-11 (IEC 60034-11)	KTY84 temperature sensor
Insulation in accordance with EN 60034-1 (IEC 60034-1)	Temperature class 155 (F)
Type of construction	Individual components
Degree of protection in accordance with EN 60034-5 (IEC 60034-5)	Primary section: IP65 Degree of protection of the motor is determined by the construction of the motor's installation in the machine. Minimum requirement: IP23
Encoder system[2)] (Not included in scope of delivery)	Select according to basic conditions specific to the application and the drive
Connection	
• 1FN6003	Permanently connected signal and power cables with connectors Length 0.5 m (1.64 ft)
• 1FN6007 ... 1FN6024	Power and signal cables are connected via two separate integrated sockets on the front
Approvals, according to	cURus

Characteristic curves



Velocity/force characteristic curve

The 1FN6 linear motors have an overload range available for acceleration processes. The maximum force F_{max} can only be utilized up to a maximum velocity $v_{max\ (Fmax)}$; up to velocity $v_{max\ (Frated)}$ only the feedrate force F_{rated} is available.

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[1)] Refer to Liquid cooling on page 6/15.
[2)] Refer to Recommended linear measuring systems on page 6/15.

Selection and ordering data

Continuous thermal feedrate force range[1)3)]	Rated feedrate force, typ.[2)3)]	Feedrate force, max.	Maximum velocity[4)]		1FN6 linear motors		Weight, approx.	
$F_{rated, th}$	F_{rated}	F_{max}	v_{max} at F_{max}	v_{max} at F_{rated}	**Primary section**	**Secondary section**	Primary section	Secondary section 200 mm (7.87 in)/ 500 mm (19.69 in)
N (lb$_f$)	N (lb$_f$)	N (lb$_f$)	m/min (ft/min)	m/min (ft/min)	Order No.	Order No.	kg (lb)	kg (lb)
Natural cooling								
49 ... 119	66.3 (14.9)	157 (35.3)	345 (1132)	748 (2454)	**1FN6003-1LC57-0FA1**	**1FN6003-1S■00-0AA0**	3.19 (7.03)	0.76/1.89 (1.68/4.17)
(11 ... 27)			503 (1650)	1080 (3543)	**1FN6003-1LC84-0FA1**			
98 ... 239	133 (29.9)	315 (70.8)	226 (742)	515 (1690)	**1FN6003-1LE38-0FA1**		4.99 (11.0)	
(22 ... 54)			572 (1877)	1280 (4200)	**1FN6003-1LE88-0FA1**			
147 ... 358	199 (44.7)	472 (106)	141 (463)	333 (1093)	**1FN6003-1LG24-0FA1**		6.79 (15.0)	
(33 ... 80)			366 (1201)	836 (2743)	**1FN6003-1LG61-0FA1**			
196 ... 477	265 (59.6)	630 (142)	99.6(327)	243 (797)	**1FN6003-1LJ17-0FA1**		8.59 (18.9)	
(44 ... 107)			267 (876)	618 (2028)	**1FN6003-1LJ44-0FA1**			
245 ... 597	332 (74.6)	787 (177)	74.7(245)	190 (623)	**1FN6003-1LL12-0FA1**		10.4 (22.9)	
(55 ... 134)			208 (682)	488 (1601)	**1FN6003-1LL35-0FA1**			
294 ... 716	398 (89.5)	945 (212)	57.9(190)	155 (509)	**1FN6003-1LN10-0FA1**		12.2 (26.9)	
(66 ... 161)			169 (554)	402 (1319)	**1FN6003-1LN28-0FA1**			
98 ... 239	133 (29.9)	315 (70.8)	187 (614)	386 (1266)	**1FN6007-1LC31-0KA1**	**1FN6007-1S■00-0AA0**	5.08 (11.2)	1.61/4.03 (3.55/8.89)
(22 ... 54)			276 (906)	562 (1844)	**1FN6007-1LC46-0KA1**			
196 ... 477	265 (59.6)	630 (142)	120 (394)	265 (869)	**1FN6007-1LE20-0KA1**		8.39 (18.5)	
(44 ... 107)			315 (1034)	668 (2192)	**1FN6007-1LE53-0KA1**			
294 ... 716	398 (89.5)	945 (212)	71.7(235)	169 (554)	**1FN6007-1LG12-0KA1**		11.7 (25.8)	
(66 ... 161)			200 (656)	435 (1427)	**1FN6007-1LG33-0KA1**			
392 ... 955	531 (119)	1260 (283)	47.4(156)	122 (400)	**1FN6007-1LJ08-0KA1**		15 (33.1)	
(88 ... 215)			143 (469)	320 (1050)	**1FN6007-1LJ24-0KA1**			
490 ... 1190	663 (149)	1570 (353)	32.4(106)	93.9 (308)	**1FN6007-1LL05-0KA1**		18.3 (40.4)	
(110 ... 268)			110 (361)	251 (824)	**1FN6007-1LL18-0KA1**			
588 ... 1430	796 (179)	1890 (425)	87.9(288)	206 (676)	**1FN6007-1LN15-0KA1**		21.6 (47.6)	
(132 ... 321)			194 (637)	429 (1408)	**1FN6007-1LN32-0KA1**			

Type of connection:	
1FN6003 motors	
Permanently connected power and signal cables pre-assembled with connectors Length: 0.5 m (1.64 ft)	**F**
1FN6007 motors	
Two separate integrated sockets, for power and signal cables	**K**
Secondary section:	
Length: 200 mm (7.87 in)	**C**
Length: 500 mm (19.69 in)	**F**

Motor type Primary section (repeated)	Continuous thermal current range[1)3)]	Rated current, typ.[2)3)]	Maximum current	Calculated power	SINAMICS S120 Motor Module		Power cable with complete shield		
					Required rated current[5)]	Booksize format For additional versions and components see chapter SINAMICS S120 drive system	Pre-assembled cable to the drive system		
							Power connector	Cable cross-section[6)]	
	$I_{rated, th}$	I_{rated}	I_{max}	$P_{el, max}$	I_{rated} / I_{max}				
		A	A	kW (HP)	A	Order No.	Size	mm^2	Order No.
1FN6003-1LC57-....	1.17 ... 3.2	1.61	5.18	1.29 (1.73)	5/10	**6SL312■-■TE15-0AA3**	1	4 × 1.5	**6FX8002-5CN01-....**
1FN6003-1LC84-....	1.69 ... 4.6	2.31	7.45	1.71 (2.29)	5/10	**6SL312■-■TE15-0AA3**	1	4 × 1.5	**6FX8002-5CN01-....**
1FN6003-1LE38-....	1.69 ... 4.6	2.31	7.45	1.97 (2.64)	5/10	**6SL312■-■TE15-0AA3**	1	4 × 1.5	**6FX8002-5CN01-....**
1FN6003-1LE88-....	4.11 ... 11.2	5.63	18.2	3.86 (5.18)	9/18	**6SL312■-■TE21-0AA3**	1	4 × 1.5	**6FX8002-5CN01-....**
1FN6003-1LG24-....	1.69 ... 4.6	2.31	7.45	2.28 (3.06)	5/10	**6SL312■-■TE15-0AA3**	1	4 × 1.5	**6FX8002-5CN01-....**
1FN6003-1LG61-....	4.11 ... 11.2	5.63	18.2	4.16 (5.58)	9/18	**6SL312■-■TE21-0AA3**	1	4 × 1.5	**6FX8002-5CN01-....**
1FN6003-1LJ17-....	1.69 ... 4.6	2.31	7.45	2.61 (3.50)	5/10	**6SL312■-■TE15-0AA3**	1	4 × 1.5	**6FX8002-5CN01-....**
1FN6003-1LJ44-....	4.11 ... 11.2	5.63	18.2	4.49 (6.02)	9/18	**6SL312■-■TE21-0AA3**	1	4 × 1.5	**6FX8002-5CN01-....**
1FN6003-1LL12-....	1.69 ... 4.6	2.31	7.45	2.93 (3.93)	5/10	**6SL312■-■TE15-0AA3**	1	4 × 1.5	**6FX8002-5CN01-....**
1FN6003-1LL35-....	4.11 ... 11.2	5.63	18.2	4.84 (6.49)	9/18	**6SL312■-■TE21-0AA3**	1	4 × 1.5	**6FX8002-5CN01-....**
1FN6003-1LN10-....	1.69 ... 4.6	2.31	7.45	3.25 (4.36)	5/10	**6SL312■-■TE15-0AA3**	1	4 × 1.5	**6FX8002-5CN01-....**
1FN6003-1LN28-....	4.11 ... 11.2	5.63	18.2	5.2 (6.97)	9/18	**6SL312■-■TE21-0AA3**	1	4 × 1.5	**6FX8002-5CN01-....**
1FN6007-1LC31-....	1.17 ... 3.2	1.61	5.18	1.59 (2.13)	5/10	**6SL312■-■TE15-0AA3**	1	4 × 1.5	**6FX8002-5CN01-....**
1FN6007-1LC46-....	1.69 ... 4.6	2.31	7.45	2.07 (2.78)	5/10	**6SL312■-■TE15-0AA3**	1	4 × 1.5	**6FX8002-5CN01-....**
1FN6007-1LE20-....	1.69 ... 4.6	2.31	7.45	2.5 (3.35)	5/10	**6SL312■-■TE15-0AA3**	1	4 × 1.5	**6FX8002-5CN01-....**
1FN6007-1LE53-....	4.11 ... 11.2	5.63	18.2	4.65 (6.24)	9/18	**6SL312■-■TE21-0AA3**	1	4 × 1.5	**6FX8002-5CN01-....**
1FN6007-1LG12-....	1.69 ... 4.6	2.31	7.45	2.98 (4.00)	5/10	**6SL312■-■TE15-0AA3**	1	4 × 1.5	**6FX8002-5CN01-....**
1FN6007-1LG33-....	4.11 ... 11.2	5.63	18.2	5.14 (6.89)	9/18	**6SL312■-■TE21-0AA3**	1	4 × 1.5	**6FX8002-5CN01-....**
1FN6007-1LJ08-....	1.69 ... 4.6	2.31	7.45	3.46 (4.64)	5/10	**6SL312■-■TE15-0AA3**	1	4 × 1.5	**6FX8002-5CN01-....**
1FN6007-1LJ24-....	4.11 ... 11.2	5.63	18.2	5.67 (7.60)	9/18	**6SL312■-■TE21-0AA3**	1	4 × 1.5	**6FX8002-5CN01-....**
1FN6007-1LL05-....	1.69 ... 4.6	2.31	7.45	3.93 (5.27)	5/10	**6SL312■-■TE15-0AA3**	1	4 × 1.5	**6FX8002-5CN01-....**
1FN6007-1LL18-....	4.11 ... 11.2	5.63	18.2	6.21 (8.33)	9/18	**6SL312■-■TE21-0AA3**	1	4 × 1.5	**6FX8002-5CN01-....**
1FN6007-1LN15-....	4.11 ... 11.2	5.63	18.2	6.74 (9.04)	9/18	**6SL312■-■TE21-0AA3**	1	4 × 1.5	**6FX8002-5CN01-....**
1FN6007-1LN32-....	8.22 ... 21	11.3	36.3	10.1 (13.5)	18/36	**6SL312■-■TE21-8AA3**	1	4 × 2.5	**6FX8002-5CN11-....**

Cooling:	
Internal air cooling	**0**
External air cooling	**1**
Motor Module:	
Single Motor Module	**1**
Double Motor Module	**2**

Length code	**....**

Further information about the cables can be found in chapter Connection system MOTION-CONNECT.

[1)] The continuous thermal feedrate force $F_{rated,th}$, that the linear motor can achieve, depends on the installation position and ambient conditions and the cooling efficiency that is achieved. Large cooling surfaces and/or high air flow speeds ensure that the linear motors achieve a higher continuous thermal current $I_{rated,th}$ and therefore a higher feedrate force. The winding is protected against overloading by means of temperature monitoring circuits.
Selection of the Motor Modules and power cables is based on increased continuous current. If a lower continuous current is required in the application, where necessary, a Motor Module with a lower rating and the appropriate power cable can be used.

[2)] The rated feedrate force F_{rated} and the corresponding rated current I_{rated} specify values that are typically achieved. The values refer to a black aluminum plate to which the motor is bolted. The radiation surface of the plate is three times the size of the area to which the primary section is bolted.

[3)] A reduction of up to 30 % must be expected in case of motor standstill, at very low velocities, or with very short traverse paths.

[4)] Velocity values refer to a DC link voltage of the drive system of 600 V DC.

[5)] The Motor Module is selected on the basis of the maximum current I_{max}. In some cases, to fully utilize the feedrate force $F_{max}$the next largest Motor Module must be used. If a Motor Module with a higher rating is used, you must check whether the specified power cable can be connected to it.

[6)] The current carrying capacity of the power cables complies with EN 60204-1 for installation type C, for continuous duty at an ambient air temperature of 40 °C (104 °F).

Selection and ordering data

Continuous thermal feed-rate force range[1)3)]	Rated feedrate force, typ.[2)3)]	Feedrate force, max.	Maximum velocity[4)]		1FN6 linear motors		Weight, approx.	
$F_{rated, th}$	F_{rated}	F_{max}	v_{max} at F_{max}	v_{max} at F_{rated}	**Primary section**	**Secondary section**	Primary section	Secondary section 200 mm (7.87 in)
N (lb_f)	N (lb_f)	N (lb_f)	m/min (ft/min)	m/min (ft/min)	Order No.	Order No.	kg (lb)	kg (lb)
Natural cooling								
309 ... 572	374 (84.1)	898 (202)	98.5 (323)	218 (715)	**1FN6008-1LC17-0KA1**	**1FN6008-1SC00-0AA0**	16.3 (35.9)	2.81 (6.20)
(69 ... 129)			224 (735)	473 (1552)	**1FN6008-1LC37-0KA1**			
617 ... 1140	749 (168)	1800 (405)	96.8 (318)	221 (725)	**1FN6008-1LE16-0KA1**		27.9 (61.5)	
(139 ... 256)			207 (679)	456 (1496)	**1FN6008-1LE34-0KA1**			
926 ... 1720	1120 (252)	2690 (605)	96.7 (317)	224 (735)	**1FN6008-1LG16-0KA1**		39.6 (87.3)	
(208 ... 387)			200 (656)	449 (1473)	**1FN6008-1LG33-0KA1**			
543 ... 1140	692 (156)	1800 (405)	110 (361)	241 (791)	**1FN6016-1LC18-0KA1**	**1FN6016-1SC00-0AA0**	27.6 (60.9)	5.42 (11.9)
(122 ... 256)			176 (577)	377 (1237)	**1FN6016-1LC30-0KA1**			
1090 ... 2290	1380 (310)	3590 (807)	101 (331)	233 (764)	**1FN6016-1LE17-0KA1**		48.2 (106)	
(245 ... 515)			162 (532)	365 (1198)	**1FN6016-1LE27-0KA1**			
1630 ... 3430	2070 (465)	5390 (1212)	98.2 (322)	230 (755)	**1FN6016-1LG16-0KA1**		68.5 (151)	
(366 ... 771)			156 (512)	360 (1181)	**1FN6016-1LG26-0KA1**			
758 ... 1720	1000 (225)	2690 (605)	70.1 (230)	160 (525)	**1FN6024-1LC12-0KA1**	**1FN6024-1SC00-0AA0**	39.9 (88.0)	7.96 (17.6)
(170 ... 387)			115 (377)	252 (827)	**1FN6024-1LC20-0KA1**			
1520 ... 3430	2000 (450)	5390 (1212)	64.8 (213)	155 (509)	**1FN6024-1LE11-0KA1**		69.5 (153)	
(342 ... 771)			106 (348)	244 (801)	**1FN6024-1LE18-0KA1**			
2270 ... 5140	3000 (674)	8080 (1816)	62.8 (206)	153 (502)	**1FN6024-1LG10-0KA1**		99.2 (219)	
(510 ... 1156)			102 (335)	241 (791)	**1FN6024-1LG17-0KA1**			

Type of connection:	
1FN6008 to 1FN6024 motors	
Two separate integrated sockets, for power and signal cables	**K**

Motor type Primary section (repeated)	Continuous thermal current range[1)3)]	Rated current, typ.[2)3)]	Maximum current	Calculated power	SINAMICS S120 Motor Module		Power cable with complete shield		
					Required rated current[5)]	Booksize format For additional versions and components see chapter SINAMICS S120 drive system	Pre-assembled cable to the drive system		
							Power connector	Cable cross-section[6)]	
	$I_{rated, th}$	I_{rated}	I_{max}	$P_{el, max}$	I_{rated} / I_{max}				
		A	A	kW (HP)	A	Order No.	Size	mm^2	Order No.
1FN6008-1LC17-...	2.22 ... 4.32	2.71	8.64	3.09 (4.14)	5/10	**6SL312■-■TE15-0AA3**	1	4 × 1.5	**6FX8002-5CN01-....**
1FN6008-1LC37-...	4.62 ... 9	5.65	18	4.88 (6.54)	9/18	**6SL312■-■TE21-0AA3**	1	4 × 1.5	**6FX8002-5CN01-....**
1FN6008-1LE16-...	4.62 ... 9	5.65	18	5.93 (7.95)	9/18	**6SL312■-■TE21-0AA3**	1	4 × 1.5	**6FX8002-5CN01-....**
1FN6008-1LE34-...	9.24 ... 18	11.3	36	9.28 (12.4)	18/36	**6SL312■-■TE21-8AA3**	1	4 × 2.5	**6FX8002-5CN11-....**
1FN6008-1LG16-...	7.11 ... 13.8	8.69	27.7	8.87 (11.9)	18/36	**6SL312■-■TE21-8AA3**	1	4 × 1.5	**6FX8002-5CN01-....**
1FN6008-1LG33-...	13.9 ... 27	17	54	13.7 (18.4)	30/56	**6SL312■-1 TE23-0AA3**	1.5	4 × 4	**6FX8002-5CN41-....**
1FN6016-1LC18-...	4.05 ... 9	5.2	18	5.77 (7.74)	9/18	**6SL312■-■TE21-0AA3**	1	4 × 1.5	**6FX8002-5CN01-....**
1FN6016-1LC30-...	6.23 ... 13.8	8	27.7	7.75 (10.4)	18/36	**6SL312■-■TE21-8AA3**	1	4 × 1.5	**6FX8002-5CN01-....**
1FN6016-1LE17-...	8.11 ... 18	10.4	36	11.1 (14.9)	18/36	**6SL312■-■TE21-8AA3**	1	4 × 2.5	**6FX8002-5CN11-....**
1FN6016-1LE27-...	12.5 ... 27.7	16	55.4	14.8 (19.8)	30/56	**6SL312■-1 TE23-0AA3**	1.5	4 × 4	**6FX8002-5CN41-....**
1FN6016-1LG16-...	12.2 ... 27	15.6	54.1	16.4 (22.0)	30/56	**6SL312■-1 TE23-0AA3**	1.5	4 × 4	**6FX8002-5CN41-....**
1FN6016-1LG26-...	18.7 ... 41.5	24	83.1	21.9 (29.4)	45/85	**6SL312■-1 TE24-5AA3**	1.5	4 × 10	**6FX8002-5CN64-....**
1FN6024-1LC12-...	3.76 ... 9	5	18	6.59 (8.84)	9/18	**6SL312■-■TE21-0AA3**	1	4 × 1.5	**6FX8002-5CN01-....**
1FN6024-1LC20-...	5.79 ... 13.8	7.69	27.7	8.6 (11.5)	18/36	**6SL312■-■TE21-8AA3**	1	4 × 1.5	**6FX8002-5CN01-....**
1FN6024-1LE11-...	7.53 ... 18	10	36	12.8 (17.2)	18/36	**6SL312■-■TE21-8AA3**	1	4 × 2.5	**6FX8002-5CN11-....**
1FN6024-1LE18-...	11.6 ... 27.7	15.4	55.4	16.5 (22.1)	30/56	**6SL312■-1 TE23-0AA3**	1.5	4 × 4	**6FX8002-5CN41-....**
1FN6024-1LG10-...	11.3 ... 27	15	54.1	18.9 (25.3)	30/56	**6SL312■-1 TE23-0AA3**	1.5	4 × 4	**6FX8002-5CN41-....**
1FN6024-1LG17-...	17.4 ... 41.5	23.1	83.1	24.5 (32.9)	45/85	**6SL312■-1 TE24-5AA3**	1.5	4 × 10	**6FX8002-5CN64-....**

Cooling:	
Internal air cooling	**0**
External air cooling	**1**

Motor Module:	
Single Motor Module	**1**
Double Motor Module	**2**

Length code	....

Further information about the cables can be found in chapter Connection system MOTION-CONNECT.

6

1) The continuous thermal feedrate force $F_{rated,th}$, that the linear motor can achieve, depends on the installation position and ambient conditions and the cooling efficiency that is achieved. Large cooling surfaces and/or high air flow speeds ensure that the linear motors achieve a higher continuous thermal current $I_{rated,th}$ and therefore a higher feedrate force. The winding is protected against overloading by means of temperature monitoring circuits.
Selection of the Motor Modules and power cables is based on increased continuous current. If a lower continuous current is required in the application, where necessary, a Motor Module with a lower rating and the appropriate power cable can be used.

2) The rated feedrate force F_{rated} and the corresponding rated current I_{rated} specify values that are typically achieved. The values refer to a black aluminum plate to which the motor is bolted. The radiation surface of the plate is three times the size of the area to which the primary section is bolted.

3) A reduction of up to 30 % must be expected in case of motor standstill, at very low velocities, or with very short traverse paths.

4) Velocity values refer to a DC link voltage of the drive system of 600 V DC.

5) The Motor Module is selected on the basis of the maximum current I_{max}. In some cases, to fully utilize the feedrate force $F_{max}$the next largest Motor Module must be used. If a Motor Module with a higher rating is used, you must check whether the specified power cable can be connected to it.

6) The current carrying capacity of the power cables complies with EN 60204-1 for installation type C, for continuous duty at an ambient air temperature of 40 °C (104 °F).

Selection and ordering data

Feedrate force[1)2)]		Maximum velocity[3)]		1FN6 linear motors		Weight, approx.	
F_{rated}	F_{max}	v_{max} at F_{max}	v_{max} at F_{rated}	Primary section	Secondary section	Primary section	Secondary section 200 mm (7.87 in)/ 500 mm (19.69 in)
N (lb$_f$)	N (lb$_f$)	m/min (ft/min)	m/min (ft/min)	Order No.	Order No.	kg (lb)	kg (lb)
Water cooling							
119 (27)	157 (35.3)	345 (1132)	509 (1670)	**1FN6003-1WC57-0FA1**	**1FN6003-1S■00-0AA0**	3.19 (7.03)	0.76/1.89 (1.68/4.17)
		503 (1650)	740 (2428)	**1FN6003-1WC84-0FA1**			
239 (54)	315 (70.8)	226 (742)	339 (1112)	**1FN6003-1WE38-0FA1**		4.99 (11.0)	
		572 (1877)	852 (2795)	**1FN6003-1WE88-0FA1**			
358 (80)	472 (106)	141 (463)	215 (705)	**1FN6003-1WG24-0FA1**		6.79 (15.0)	
		366 (1201)	549 (1801)	**1FN6003-1WG61-0FA1**			
477 (107)	630 (142)	99.6 (327)	155 (509)	**1FN6003-1WJ17-0FA1**		8.59 (18.9)	
		267 (876)	402 (1319)	**1FN6003-1WJ44-0FA1**			
597 (134)	787 (177)	74.7 (245)	119 (390)	**1FN6003-1WL12-0FA1**		10.4 (22.9)	
		208 (682)	316 (1037)	**1FN6003-1WL35-0FA1**			
716 (161)	945 (212)	57.9 (190)	95.1 (312)	**1FN6003-1WN10-0FA1**		12.2 (26.9)	
		169 (554)	258 (846)	**1FN6003-1WN28-0FA1**			
239 (54)	315 (70.8)	187 (614)	272 (892)	**1FN6007-1WC31-0KA1**	**1FN6007-1S■00-0AA0**	5.08 (11.2)	1.61/4.03 (3.55/8.89)
		276 (906)	399 (1309)	**1FN6007-1WC46-0KA1**			
477 (107)	630 (142)	120 (394)	180 (591)	**1FN6007-1WE20-0KA1**		8.39 (18.5)	
		315 (1034)	462 (1516)	**1FN6007-1WE53-0KA1**			
716 (161)	945 (212)	71.7 (235)	111 (364)	**1FN6007-1WG12-0KA1**		11.7 (25.8)	
		200 (656)	296 (971)	**1FN6007-1WG33-0KA1**			
955 (215)	1260 (283)	47.4 (156)	77.6 (255)	**1FN6007-1WJ08-0KA1**		15 (33.1)	
		143 (469)	215 (705)	**1FN6007-1WJ24-0KA1**			
1190 (268)	1570 (353)	32.4 (106)	57.5 (189)	**1FN6007-1WL05-0KA1**		18.3 (40.4)	
		110 (361)	167 (548)	**1FN6007-1WL18-0KA1**			
1430 (321)	1890 (425)	87.9 (288)	135 (443)	**1FN6007-1WN15-0KA1**		21.6 (47.6)	
		194 (637)	288 (879)	**1FN6007-1WN32-0KA1**			

Type of connection:	
1FN6003 motors	
Permanently connected power and signal cables pre-assembled with connectors Length: 0.5 m (1.64 ft)	**F**
1FN6007 motors	
Two separate integrated sockets, for power and signal cables	**K**

Secondary section:	
Length: 200 mm (7.87 in)	**C**
Length: 500 mm (19.69 in)	**F**

Motor type Primary section (repeated)	Rated current, typ.[1]	Maximum current	Calculated power	SINAMICS S120 Motor Module		Power cable with complete shield		
				Required rated current	Booksize format For additional versions and components see chapter SINAMICS S120 drive system	Pre-assembled cable to the drive system		
						Power connector	Cable cross-section[4]	
	I_{rated}	I_{max}	$P_{el, max}$	I_{rated}/I_{max}				
	A	A	kW (HP)	A	Order No.	Size	mm^2	Order No.
1FN6003-1WC57-...	3.2	5.18	1.29 (1.73)	5/10	**6SL312■-■TE15-0AA3**	1	4 × 1.5	**6FX8002-5CN01-....**
1FN6003-1WC84-...	4.6	7.45	1.71 (2.29)	5/10	**6SL312■-■TE15-0AA3**	1	4 × 1.5	**6FX8002-5CN01-....**
1FN6003-1WE38-...	4.6	7.45	1.97 (2.64)	5/10	**6SL312■-■TE15-0AA3**	1	4 × 1.5	**6FX8002-5CN01-....**
1FN6003-1WE88-...	11.2	18.2	3.86 (5.18)	18/36	**6SL312■-■TE21-8AA3**	1	4 × 1.5	**6FX8002-5CN01-....**
1FN6003-1WG24-...	4.6	7.45	2.28 (3.06)	5/10	**6SL312■-■TE15-0AA3**	1	4 × 1.5	**6FX8002-5CN01-....**
1FN6003-1WG61-...	11.2	18.2	4.16 (5.58)	18/36	**6SL312■-■TE21-8AA3**	1	4 × 1.5	**6FX8002-5CN01-....**
1FN6003-1WJ17-...	4.6	7.45	2.61 (3.50)	5/10	**6SL312■-■TE15-0AA3**	1	4 × 1.5	**6FX8002-5CN01-....**
1FN6003-1WJ44-...	11.2	18.2	4.49 (6.02)	18/36	**6SL312■-■TE21-8AA3**	1	4 × 1.5	**6FX8002-5CN01-....**
1FN6003-1WL12-...	4.6	7.45	2.93 (3.93)	5/10	**6SL312■-■TE15-0AA3**	1	4 × 1.5	**6FX8002-5CN01-....**
1FN6003-1WL35-...	11.2	18.2	4.84 (6.49)	18/36	**6SL312■-■TE21-8AA3**	1	4 × 1.5	**6FX8002-5CN01-....**
1FN6003-1WN10-...	4.6	7.45	3.25 (4.36)	5/10	**6SL312■-■TE15-0AA3**	1	4 × 1.5	**6FX8002-5CN01-....**
1FN6003-1WN28-...	11.2	18.2	5.2 (6.97)	18/36	**6SL312■-■TE21-8AA3**	1	4 × 1.5	**6FX8002-5CN01-....**
1FN6007-1WC31-...	3.2	5.18	1.59 (2.13)	5/10	**6SL312■-■TE15-0AA3**	1	4 × 1.5	**6FX8002-5CN01-....**
1FN6007-1WC46-...	4.6	7.45	2.07 (2.78)	5/10	**6SL312■-■TE15-0AA3**	1	4 × 1.5	**6FX8002-5CN01-....**
1FN6007-1WE20-...	4.6	7.45	2.5 (3.35)	5/10	**6SL312■-■TE15-0AA3**	1	4 × 1.5	**6FX8002-5CN01-....**
1FN6007-1WE53-...	11.2	18.2	4.65 (6.24)	18/36	**6SL312■-■TE21-8AA3**	1	4 × 1.5	**6FX8002-5CN01-....**
1FN6007-1WG12-...	4.6	7.45	2.98 (4.00)	5/10	**6SL312■-■TE15-0AA3**	1	4 × 1.5	**6FX8002-5CN01-....**
1FN6007-1WG33-...	11.2	18.2	5.14 (6.89)	18/36	**6SL312■-■TE21-8AA3**	1	4 × 1.5	**6FX8002-5CN01-....**
1FN6007-1WJ08-...	4.6	7.45	3.46 (4.64)	5/10	**6SL312■-■TE15-0AA3**	1	4 × 1.5	**6FX8002-5CN01-....**
1FN6007-1WJ24-...	11.2	18.2	5.67 (7.60)	18/36	**6SL312■-■TE21-8AA3**	1	4 × 1.5	**6FX8002-5CN01-....**
1FN6007-1WL05-...	4.6	7.45	3.93 (5.27)	5/10	**6SL312■-■TE15-0AA3**	1	4 × 1.5	**6FX8002-5CN01-....**
1FN6007-1WL18-...	11.2	18.2	6.21 (8.33)	18/36	**6SL312■-■TE21-8AA3**	1	4 × 1.5	**6FX8002-5CN01-....**
1FN6007-1WN15-...	11.2	18.2	6.74 (9.04)	18/36	**6SL312■-■TE21-8AA3**	1	4 × 1.5	**6FX8002-5CN01-....**
1FN6007-1WN32-...	21	36.3	10.1 (13.5)	30/56	**6SL312■-1 TE23-0AA3**	1	4 × 2.5	**6FX8002-5CN11-....**

Cooling:	
Internal air cooling	**0**
External air cooling	**1**

Motor Module:	
Single Motor Module	**1**
Double Motor Module	**2**

Length code	....

Further information about the cables can be found in chapter Connection system MOTION-CONNECT.

[1] For water cooling with inlet temperature 35 °C (95 °F).

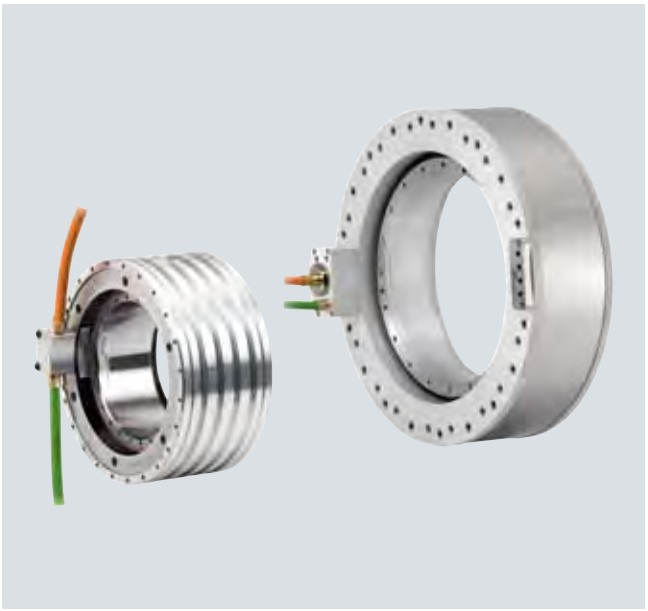
[2] A reduction of up to 30 % must be expected in case of motor standstill, at very low velocities, or with very short traverse paths.

[3] Velocity values refer to a DC link voltage of the drive system of 600 V DC.

[4] The current carrying capacity of the power cables complies with IEC 60204-1 for installation type C, for continuous duty at an ambient air temperature of 40 °C (104 °F).

1FW6 built-in torque motors

Overview



1FW6 built-in torque motors, left: with jacket cooling and right: with integrated cooling

1FW6 built-in torque motors are liquid-cooled, multi-pole permanent-magnet AC synchronous motors with hollow-shaft rotor. The 1FW6 motors are supplied as built-in components that are held together in the delivered state by transport locks. For a complete drive unit, an additional bearing and shaft encoder are required.

Each frame size is available in different axis lengths. The stator and rotor are equipped with flanges at each end with centering surfaces and threaded holes for installation in the machine.

Please note that when 1FW6 direct motors (torque motors) are used in fork heads for machine tools or robots, a license for US patent US5584621 and the associated international patent protection may be required.

Benefits

- No elasticity in the drive train
- High availability, since there are no gear components subject to wear in the drive train
- High torque, compact design and low construction volume
- Low moment of inertia
- Direct coupling to the machine using flanges

Application

In conjunction with the SINAMICS S120 drive system, the built-in torque motors can be used as direct drive for the following machine applications:

- Rotary indexing machines, rotary tables, swivel axes
- Rotary axes (A, B, C axis in 5-axis machine tools)
- Turret indexing and cylinder indexing for single-spindle and multi-spindle machines
- Dynamic tool magazines
- Workpiece spindles in turning machines
- Roller and cylinder drives
- Infeed and handling axes

Design

The 1FW6 built-in torque motor comprises the following components:

Stator

Iron core with a 3-phase AC winding. To improve dissipation of the heat loss, the motor can be force-cooled by means of a liquid cooler (main cooler).

Rotor

Cylindrical hollow shaft made of steel with permanent magnets fixed to the circumference.

If the main cooler and precision cooler are used together in a heat exchanger, a cooling connection adapter (accessory) can be ordered separately for simpler connection.

Cooler types

The design of the cooler system is dependent on the size (external diameter) of the motor.

1FW6 motor Type	**Type of cooling**
1FW6090 to 1FW6150	Jacket cooling
1FW6160 to 1FW6290	Integrated cooling

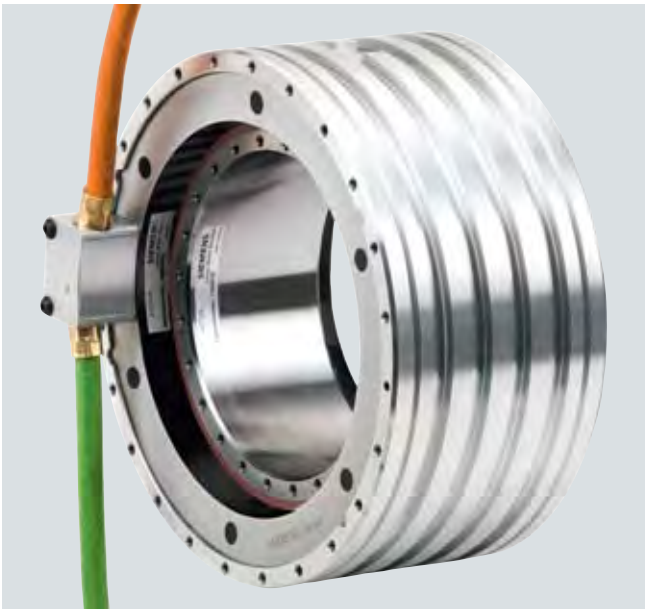
More information

Any questions regarding 1FW6 built-in torque motors can be e-mailed to:
info.drives@siemens.com

Design (continued)

Motors with jacket cooling

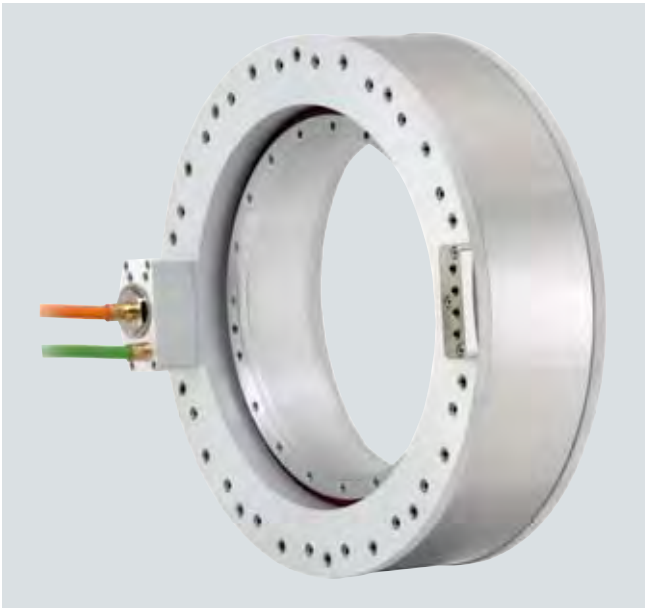
The coolant inlet and outlet must be provided by the machine manufacturer in the surrounding construction.



Motor components of sizes 1FW6090 to 1FW6150 with jacket cooling (rotor, stator)

Motors with integrated cooling

These motors feature a ready-to-connect, integrated dual-circuit cooling system and are therefore thermally insulated against the mechanical axis construction to a considerable extent.



Motor components of sizes 1FW6160 to 1FW6290 with integrated cooling (rotor, stator)

Integration

The 1FW6 motors which must be fed from the SINAMICS S120 drive system are designed for operation on a 600 V DC link voltage level and require a sinusoidal current.

The cable connection is brought out of the front face of the stator and the free cable end must be connected to a terminal box provided by the machine manufacturer. The length of the power and signal cables from the motor to the drive system must not exceed 50 m (164 ft).

Technical specifications

1FW6 built-in torque motor	
Type of motor	Synchronous motor with permanent magnet rotor, multi-pole (number of rotor poles 44 ... 98)
Torque ripple	≤ 1.5 % M_0
Coolant inlet temperature, max.	35 °C (95 °F)
Pressure in cooling circuit, max.	10 bar (static)
Temperature monitoring in the stator	Evaluation via Sensor Module External SME120/SME125, see chapter SINAMICS S120 drive system.
• In accordance with DIN 44081/DIN 44082	2 × PTC thermistor in triple connection with response threshold 130 °C/150 °C
• In accordance with EN 60034-11 (IEC 60034-11)	1 × KTY84 temperature sensor
Insulation of the stator winding in accordance with EN 60034-1 (IEC 60034-1)	Temperature class 155 (F)
Type of construction	Individual components: Stator, rotor
Degree of protection in accordance with IEC 60034-5	IP23 The final degree of protection (minimum degree of protection is IP54) for the installed motor is determined by the machine manufacturer. Protection against touch, foreign bodies and water for electrical equipment is specified in accordance with IEC 60034-5.
Encoder system (Not included in scope of delivery)	Select according to basic conditions specific to the application and the drive
Connection, electrical	Permanently connected power and signal cables, optionally with connector or exposed core ends
Paint finish	Unpainted
Rating plate	1 unit enclosed separately
Approvals, according to	cURus

1FW6 built-in torque motors
Water cooling

Selection and ordering data

Maximum torque	Static torque[1)3)]	Rated torque[2)3)]	Speed at maximum torque, max.[2)]	Speed at rated torque, max.[2)]	1FW6 built-in torque motors	Moment of inertia of rotor	Weight, approx. stator + rotor
M_{max}	M_0	M_{rated}	n_{max} at M_{max}	n_{max} at M_{rated}		J	m
Nm (lb_f-ft)	Nm (lb_f-ft)	Nm (lb_f-ft)	rpm	rpm	Order No.	$10^{-2}kgm^2$ (lb_f-in-s^2)	kg (lb)
Water cooling							
179 (132)	119 (87.8)	113 (83.3)	46	140	**1FW6090-0■B05-0F■2**	1.52 (0.13)	9.2 (20.3)
		109 (80.4)	140	250	**1FW6090-0■B05-0K■2**		
251 (185)	166 (122)	154 (114)	120	220	**1FW6090-0■B07-0K■2**	2.2 (0.19)	12.2 (27)
		142 (105)	270	430	**1FW6090-0■B07-1J■2**		
358 (264)	238 (176)	231 (170)	8.7	82	**1FW6090-0■B10-0K■2**	3.09 (0.27)	17.2 (37.9)
		216 (159)	170	270	**1FW6090-0■B10-1J■2**		
537 (396)	357 (263)	338 (249)	78	150	**1FW6090-0■B15-1J■2**	4.65 (0.41)	27.2 (60)
		319 (235)	200	310	**1FW6090-0■B15-2J■2**		
439 (324)	258 (190)	241 (178)	47	130	**1FW6130-0■B05-0K■2**	6.37 (0.56)	13.2 (29.1)
		217 (160)	180	310	**1FW6130-0■B05-1J■2**		
614 (453)	361 (266)	344 (254)	21	96	**1FW6130-0■B07-0K■2**	8.92 (0.79)	18.2 (40.1)
		324 (239)	110	200	**1FW6130-0■B07-1J■2**		
878 (648)	516 (381)	484 (357)	50	120	**1FW6130-0■B10-1J■2**	12.7 (1.12)	25.2 (55.6)
		450 (332)	150	250	**1FW6130-0■B10-2J■2**		
1320 (974)	775 (572)	744 (549)	14	78	**1FW6130-0■B15-1J■2**	19.1 (1.69)	38.2 (84.2)
		714 (527)	77	150	**1FW6130-0■B15-2J■2**		
710 (524)	360 (266)	338 (249)	110	230	**1FW6150-0■B05-1J■2**	10.1 (0.8939)	21.7 (47.8)
		298 (220)	330	650	**1FW6150-0■B05-4F■2**		
994 (733)	504 (372)	470 (347)	130	260	**1FW6150-0■B07-2J■2**	14.2 (1.2568)	33.5 (73.9)
		445 (328)	230	450	**1FW6150-0■B07-4F■2**		
1420 (1047)	720 (531)	688 (507)	76	170	**1FW6150-0■B10-2J■2**	20.9 (1.8498)	47.5 (105)
		664 (490)	150	300	**1FW6150-0■B10-4F■2**		
2130 (1571)	1080 (797)	1050 (774)	32	100	**1FW6150-0■B15-2J■2**	31.3 (2.7703)	70.8 (156)
		1030 (760)	89	190	**1FW6150-0■B15-4F■2**		

Cable outlet only for 1FW6090/1FW6130/1FW6150:	
Axial	**P**
Radially outwards	**Q**
Tangential	**N**
Type of connection:	
Permanently connected power and signal cables with exposed core ends[5)] Length: 2 m (6.56 ft)	**C**
Permanently connected power and signal cables pre-assembled with connectors Length: 0.5 m (1.64 ft)	**D**

Motor type (repeated)	Static current 1)3)	Rated current 2)3)	Maximum current 2)	Calculated power	SINAMICS S120 Motor Module: Required rated current	SINAMICS S120 Motor Module: Booksize format. For additional versions and components see chapter SINAMICS S120 drive system	Power cable with complete shield. Motor connection via power connector 5): Power connector	Cable cross-section 6)	Pre-assembled basic cable to the drive system
	I_0	I_{rated}	I_{max}	$P_{el, max}$	I_{rated}/I_{max}	Order No.	Size	mm^2	Order No.
	A	A	A	kW (HP)	A				
1FW6090-0.B05-0F..	5.9	5.6	9.5	6.55 (8.78)	5/10 4)	6SL312■-■TE15-0AA3	1	4 × 2.5	6FX8002-5CS11-....
1FW6090-0.B05-0K..	8.2	7.4	13	8.12(10.88)	9/18	6SL312■-■TE21-0AA3	1	4 × 2.5	6FX8002-5CS11-....
1FW6090-0.B07-0K..	10	9.5	16	10.3 (13.8)	9/18 4)	6SL312■-■TE21-0AA3	1	4 × 2.5	6FX8002-5CS11-....
1FW6090-0.B07-1J..	16	13	26	14.1 (18.9)	18/36	6SL312■-■TE21-8AA3	1	4 × 2.5	6FX8002-5CS11-....
1FW6090-0.B10-0K..	8.2	7.9	13	9.43 (12.6)	9/18	6SL312■-■TE21-0AA3	1	4 × 2.5	6FX8002-5CS11-....
1FW6090-0.B10-1J..	16	14	26	15.3 (20.5)	18/36	6SL312■-■TE21-8AA3	1	4 × 2.5	6FX8002-5CS11-....
1FW6090-0.B15-1J..	16	15	26	17.1 (22.9)	18/36	6SL312■-■TE21-8AA3	1	4 × 2.5	6FX8002-5CS11-....
1FW6090-0.B15-2J..	26	23	43	24.1 (32.3)	30/56	6SL312■-1TE23-0AA3	1.5	4 × 4	6FX8002-5CS41-....
1FW6130-0.B05-0K..	9.7	9	18	12.2 (16.4)	9/18 4)	6SL312■-■TE21-0AA3	1	4 × 2.5	6FX8002-5CS11-....
1FW6130-0.B05-1J..	17	14	32	18.3 (24.5)	18/36	6SL312■-■TE21-8AA3	1	4 × 2.5	6FX8002-5CS11-....
1FW6130-0.B07-0K..	10	10	20	14.2 (19)	9/18 4)	6SL312■-■TE21-0AA3	1	4 × 2.5	6FX8002-5CS11-....
1FW6130-0.B07-1J..	17	15	32	19.7 (26.4)	18/36	6SL312■-■TE21-8AA3	1	4 × 2.5	6FX8002-5CS11-....
1FW6130-0.B10-1J..	17	16	32	21.4 (28.7)	18/36	6SL312■-■TE21-8AA3	1	4 × 2.5	6FX8002-5CS11-....
1FW6130-0.B10-2J..	28	24	53	30.6 (41)	30/56	6SL312■-1TE23-0AA3	1.5	4 × 4	6FX8002-5CS41-....
1FW6130-0.B15-1J..	19	18	36	25.4 (34.1)	18/36 4)	6SL312■-■TE21-8AA3	1	4 × 2.5	6FX8002-5CS11-....
1FW6130-0.B15-2J..	28	26	54	34.1 (45.7)	30/56	6SL312■-1TE23-0AA3	1.5	4 × 4	6FX8002-5CS41-....
1FW6150-0.B05-1J..	18	17	44	22.8 (30.6)	18/36	6SL312■-■TE21-8AA3	1	4 × 2.5	6FX8002-5CS11-....
1FW6150-0.B05-4F..	44	36	100	39.4 (52.8)	45/85	6SL312■-1TE24-5AA3	1.5	4 × 10	6FX8002-5CS64-....
1FW6150-0.B07-2J..	27	25	66	32.0 (42.9)	30/56	6SL312■-1TE23-0AA3	1.5	4 × 4	6FX8002-5CS41-....
1FW6150-0.B07-4F..	44	38	100	42.7 (57.3)	45/85	6SL312■-1TE24-5AA3	1.5	4 × 10	6FX8002-5CS64-....
1FW6150-0.B10-2J..	27	26	66	36.2 (48.5)	30/56	6SL312■-1TE23-0AA3	1.5	4 × 4	6FX8002-5CS41-....
1FW6150-0.B10-4F..	44	40	100	47.3 (63.4)	45/85	6SL312■-1TE24-5AA3	1.5	4 × 10	6FX8002-5CS64-....
1FW6150-0.B15-2J..	27	26	66	42.4 (56.9)	30/56	6SL312■-1TE23-0AA3	1.5	4 × 4	6FX8002-5CS41-....
1FW6150-0.B15-4F..	44	41	100	54.5 (73.1)	45/85	6SL312■-1TE24-5AA3	1.5	4 × 10	6FX8002-5CS64-....

Cooling:	
Internal air cooling	**0**
External air cooling	**1**

Motor Module:	
Single Motor Module	**1**
Double Motor Module	**2**

Length code	....

Further information about the cables can be found in chapter Connection system MOTION-CONNECT.

1) Torque and current at low speeds.

2) The values refer to a DC link voltage of the drive system of 600 V DC.

3) In case of water cooling with inlet temperature of 35 °C (95 °F) and maximum rotor flange temperature of 60 °C (140 °F).

4) The selection is optimized to size of the Motor Module. The next higher Motor Module offers 100 % torque utilization.

5) For type of connection with exposed core ends, power and signal connectors are not included in the scope of supply of the motor. They must be ordered separately (see chapter Connection system MOTION-CONNECT).

6) The current carrying capacity of the power cables complies with EN 60204-1 for installation type C, for continuous duty at an ambient air temperature of 40 °C (104 °F).

Selection and ordering data

Maximum torque	Static torque[1)3)]	Rated torque[2)3)]	Speed at maximum torque, max.[2)]	Speed at rated torque, max.[2)]	1FW6 built-in torque motors	Moment of inertia of rotor	Weight, approx. stator + rotor
M_{max}	M_0	M_{rated}	n_{max} at M_{max}	n_{max} at M_{rated}		J	m
Nm (lb$_f$-ft)	Nm (lb$_f$-ft)	Nm (lb$_f$-ft)	rpm	rpm	Order No.	10^{-2}kgm^2 (lb$_f$-in-s^2)	kg (lb)
Water cooling							
716 (528)	467 (344)	431 (318)	84	140	**1FW6160-0■B05-1J■2**	19.0 (1.68)	36.3 (80.0)
		404 (298)	150	250	**1FW6160-0■B05-2J■2**		
		314 (232)	320	590	**1FW6160-0■B05-5G■2**		
1000 (738)	653 (482)	620 (457)	53	96	**1FW6160-0■B07-1J■2**	25.8 (2.28)	48.3 (107)
		594 (438)	100	170	**1FW6160-0■B07-2J■2**		
		514 (379)	230	390	**1FW6160-0■B07-5G■2**		
		432 (319)	330	610	**1FW6160-0■B07-8F B2**		
1430 (1055)	933 (688)	903 (666)	29	60	**1FW6160-0■B10-1J■2**	36.0 (3.19)	66.3 (146)
		878 (648)	65	110	**1FW6160-0■B10-2J■2**		
		804 (593)	160	260	**1FW6160-0■B10-5G■2**		
		732 (540)	230	390	**1FW6160-0■B10-8F B2**		
		622 (459)	330	600	**1FW6160-0■B10-2P B2**		67.4 (149)
2150 (1586)	1400 (1033)	1350 (996)	34	66	**1FW6160-0■B15-2J■2**	53.1 (4.70)	95.3 (210)
		1280 (944)	97	160	**1FW6160-0■B15-5G■2**		
		1220 (900)	150	240	**1FW6160-0■B15-8F B2**		
		1120 (826)	220	360	**1FW6160-0■B15-2P B2**		96.4 (213)
		961 (709)	320	560	**1FW6160-0■B15-0W B2**		
2860 (2110)	1870 (1379)	1750 (1291)	68	110	**1FW6160-0■B20-5G■2**	70.1 (6.20)	124.3 (274)
		1690 (1247)	110	170	**1FW6160-0■B20-8F B2**		
		1600 (1180)	160	260	**1FW6160-0■B20-2P B2**		125.4 (277)
		1460 (1077)	240	400	**1FW6160-0■B20-0W B2**		

Cable outlet only for 1FW6160 to 1FW6290:	
Axial	**W**
Radially outwards	**V**
Tangential (only for types of connection C and D)	**T**
Type of connection:	
Permanently connected power and signal cables with exposed core ends[4)] Length: 2 m (6.56 ft)	**C**
Permanently connected power and signal cables pre-assembled with connectors Length: 0.5 m (1.64 ft)	**D**
Type of connection only for specific motors (Not selectable):	
Permanently connected power and signal cables with exposed core ends[4)] Length: 1 m (3.28 ft)	**B**

Motor type (repeated)	Static current 1)3)	Rated current 2)3)	Maximum current 2)	Calculated power	SINAMICS S120 Motor Module: Required rated current	SINAMICS S120 Motor Module: Booksize format (For additional versions and components see chapter SINAMICS S120 drive system)	Power cable with complete shield, Motor connection via power connector 4): Power connector	Cable cross-section 5)	Pre-assembled basic cable to the drive system
	I_0	I_{rated}	I_{max}	$P_{el, max}$	I_{rated}/I_{max}				
	A	A	A	kW (HP)	A	Order No.	Size	mm^2	Order No.
1FW6160-0.B05-1J..	17	16	31	15.1 (20.2)	18/36	**6SL312■-■TE21-8AA3**	1	4 × 2.5	**6FX8002-5CS11-....**
1FW6160-0.B05-2J..	28	24	49	20 (26.8)	30/56	**6SL312■-1TE23-0AA3**	1.5	4 × 4	**6FX8002-5CS41-....**
1FW6160-0.B05-5G..	56	36	98	33.1 (44.4)	60/113	**6SL312■-1TE26-0AA3**	1.5	4 × 16	**6FX8002-5CS24-....**
1FW6160-0.B07-1J..	17	16	31	16.7 (22.4)	18/36	**6SL312■-■TE21-8AA3**	1	4 × 2.5	**6FX8002-5CS11-....**
1FW6160-0.B07-2J..	28	25	49	21.8 (29.2)	30/56	**6SL312■-1TE23-0AA3**	1.5	4 × 4	**6FX8002-5CS41-....**
1FW6160-0.B07-5G..	56	43	98	35.2 (47.2)	60/113	**6SL312■-1TE26-0AA3**	1.5	4 × 16	**6FX8002-5CS24-....**
1FW6160-0.B07-8FB.	80	51	140	46.7 (62.6)	85/141	**6SL312■-1TE28-5AA3**	–	–	–
1FW6160-0.B10-1J..	17	17	31	19 (25.5)	18/36	**6SL312■-■TE21-8AA3**	1	4 × 2.5	**6FX8002-5CS11-....**
1FW6160-0.B10-2J..	28	26	49	24.4 (32.7)	30/56	**6SL312■-1TE23-0AA3**	1.5	4 × 4	**6FX8002-5CS41-....**
1FW6160-0.B10-5G..	56	47	98	38.1 (51.1)	60/113	**6SL312■-1TE26-0AA3**	1.5	4 × 16	**6FX8002-5CS24-....**
1FW6160-0.B10-8FB.	80	61	140	49.8 (66.8)	85/141	**6SL312■-1TE28-5AA3**	–	–	–
1FW6160-0.B10-2PB.	110	73	190	64.6 (86.6)	132/210	**6SL312■-1TE31-3AA3**	–	–	–
1FW6160-0.B15-2J..	28	26	49	28.2 (37.8)	30/56	**6SL312■-1TE23-0AA3**	1.5	4 × 4	**6FX8002-5CS41-....**
1FW6160-0.B15-5G..	56	50	98	42.6 (57.1)	60/113	**6SL312■-1TE26-0AA3**	1.5	4 × 16	**6FX8002-5CS24-....**
1FW6160-0.B15-8FB.	80	68	140	54.6 (73.2)	85/141	**6SL312■-1TE28-5AA3**	–	–	–
1FW6160-0.B15-2PB.	110	88	190	69.5 (93.2)	132/210	**6SL312■-1TE31-3AA3**	–	–	–
1FW6160-0.B15-0WB.	160	100	280	92.8 (124)	200/282	**6SL312■-1TE32-0AA3**	–	–	–
1FW6160-0.B20-5G..	56	52	98	46.9 (62.9)	60/113	**6SL312■-1TE26-0AA3**	1.5	4 × 16	**6FX8002-5CS24-....**
1FW6160-0.B20-8FB.	80	72	140	59.2 (79.4)	85/141	**6SL312■-1TE28-5AA3**	–	–	–
1FW6160-0.B20-2PB.	110	95	190	74.2 (99.5)	132/210	**6SL312■-1TE31-3AA3**	–	–	–
1FW6160-0.B20-0WB.	160	120	280	97.7 (131)	200/282	**6SL312■-1TE32-0AA3**	–	–	–

Cooling:
Internal air cooling **0**
External air cooling **1**

Motor Module:
Single Motor Module **1**
Double Motor Module **2**

Length code ....

Further information about the cables can be found in chapter Connection system MOTION-CONNECT.

1) Torque and current at low speeds.
2) The values refer to a DC link voltage of the drive system of 600 V DC.
3) In case of water cooling with inlet temperature of 35 °C (95 °F) and maximum rotor flange temperature of 60 °C (140 °F).
4) For type of connection with exposed core ends, power and signal connectors are not included in the scope of supply of the motor. They must be ordered separately (see chapter Connection system MOTION-CONNECT).
5) The current carrying capacity of the power cables complies with EN 60204-1 for installation type C, for continuous duty at an ambient air temperature of 40 °C (104 °F).

Selection and ordering data

Maximum torque	Static torque[1)3)]	Rated torque[2)3)]	Speed at maximum torque, max.[2)]	Speed at rated torque, max.[2)]	**1FW6 built-in torque motors**	Moment of inertia of rotor	Weight, approx. stator + rotor
M_{max}	M_0	M_{rated}	n_{max} at M_{max}	n_{max} at M_{rated}		J	m
Nm (lb_f-ft)	Nm (lb_f-ft)	Nm (lb_f-ft)	rpm	rpm	Order No.	10^{-2}kgm^2 (lb_f-in-s^2)	kg (lb)
Water cooling							
990 (730)	672 (496)	633 (467)	54	97	**1FW6190-0■B05-1J■2**	35.8 (3.17)	42.8 (94.4)
		605 (446)	96	160	**1FW6190-0■B05-2J■2**		
		509 (375)	210	380	**1FW6190-0■B05-5G■2**		
1390 (1025)	941 (694)	905 (668)	33	63	**1FW6190-0■B07-1J■2**	48.6 (4.30)	55.8 (123)
		879 (648)	64	110	**1FW6190-0■B07-2J■2**		
		791 (583)	150	250	**1FW6190-0■B07-5G■2**		
		704 (519)	220	390	**1FW6190-0■B07-8FB2**		
1980 (1460)	1340 (988)	1310 (966)	14	38	**1FW6190-0■B10-1J■2**	67.8 (6.0)	75.8 (167)
		1290 (952)	39	70	**1FW6190-0■B10-2J■2**		
		1210 (892)	100	170	**1FW6190-0■B10-5G■2**		
		1130 (833)	150	260	**1FW6190-0■B10-8FB2**		
		955 (704)	250	450	**1FW6190-0■B10-2PB2**		77.1 (170)
2970 (2191)	2020 (1490)	1970 (1453)	17	40	**1FW6190-0■B15-2J■2**	99.8 (8.83)	107.8 (238)
		1890 (1394)	62	100	**1FW6190-0■B15-5G■2**		
		1820 (1342)	97	160	**1FW6190-0■B15-8FB2**		
		1670 (1232)	160	270	**1FW6190-0■B15-2PB2**		109.1 (241)
		1540 (1136)	210	370	**1FW6190-0■B15-0WB2**		
3960 (2921)	2690 (1984)	2570 (1896)	42	73	**1FW6190-0■B20-5G■2**	132.0 (11.68)	136.2 (300)
		2500 (1844)	68	110	**1FW6190-0■B20-8FB2**		
		2360 (1741)	120	200	**1FW6190-0■B20-2PB2**		137.5 (303)
		2250 (1660)	160	260	**1FW6190-0■B20-0WB2**		

Cable outlet only for 1FW6160 to 1FW6290:	
Axial	**W**
Radially outwards	**V**
Tangential (only for types of connection C and D)	**T**
Type of connection:	
Permanently connected power and signal cables with exposed core ends[4)] Length: 2 m (6.56 ft)	**C**
Permanently connected power and signal cables pre-assembled with connectors Length: 0.5 m (1.64 ft)	**D**
Type of connection only for specific motors (Not selectable):	
Permanently connected power and signal cables with exposed core ends[4)] Length: 1 m (3.28 ft)	**B**

Motor type (repeated)	Static current 1) 3)	Rated current 2)3)	Maximum current 2)	Calculated power	SINAMICS S120 Motor Module: Required rated current	SINAMICS S120 Motor Module: Booksize format (For additional versions and components see chapter SINAMICS S120 drive system)	Power cable with complete shield, Motor connection via power connector 4): Power connector	Cable cross-section 5)	Pre-assembled basic cable to the drive system
	I_0	I_{rated}	I_{max}	$P_{el, max}$	I_{rated}/I_{max}				
	A	A	A	kW (HP)	A	Order No.	Size	mm^2	Order No.
1FW6190-0.B05-1J..	18	17	31	16.3 (21.9)	18/36	**6SL312■-■TE21-8AA3**	1	4 × 2.5	**6FX8002-5CS11-....**
1FW6190-0.B05-2J..	27	24	47	20.6 (27.6)	30/56	**6SL312■-1TE23-0AA3**	1.5	4 × 4	**6FX8002-5CS41-....**
1FW6190-0.B05-5G..	54	40	95	32.9 (44.1)	60/113	**6SL312■-1TE26-0AA3**	1.5	4 × 16	**6FX8002-5CS24-....**
1FW6190-0.B07-1J..	18	17	31	18.2 (24.4)	18/36	**6SL312■-■TE21-8AA3**	1	4 × 2.5	**6FX8002-5CS11-....**
1FW6190-0.B07-2J..	27	25	47	22.7 (30.4)	30/56	**6SL312■-1TE23-0AA3**	1.5	4 × 4	**6FX8002-5CS41-....**
1FW6190-0.B07-5G..	54	44	95	35.4 (47.5)	60/113	**6SL312■-1TE26-0AA3**	1.5	4 × 16	**6FX8002-5CS24-....**
1FW6190-0.B07-8FB.	78	56	130	46.3 (62.1)	85/141	**6SL312■-1TE28-5AA3**	–	–	–
1FW6190-0.B10-1J..	18	17	31	20.7 (27.8)	18/36	**6SL312■-■TE21-8AA3**	1	4 × 2.5	**6FX8002-5CS11-....**
1FW6190-0.B10-2J..	27	26	47	25.7 (34.5)	30/56	**6SL312■-1TE23-0AA3**	1.5	4 × 4	**6FX8002-5CS41-....**
1FW6190-0.B10-5G..	54	48	95	38.7 (51.9)	60/113	**6SL312■-1TE26-0AA3**	1.5	4 × 16	**6FX8002-5CS24-....**
1FW6190-0.B10-8FB.	78	64	130	49.9 (66.9)	85/141	**6SL312■-1TE28-5AA3**	–	–	–
1FW6190-0.B10-2PB.	120	84	210	69.9 (93.7)	132/210	**6SL312■-1TE31-3AA3**	–	–	–
1FW6190-0.B15-2J..	27	26	47	30.1 (40.4)	30/56	**6SL312■-1TE23-0AA3**	1.5	4 × 4	**6FX8002-5CS41-....**
1FW6190-0.B15-5G..	54	50	95	44.1 (59.1)	60/113	**6SL312■-1TE26-0AA3**	1.5	4 × 16	**6FX8002-5CS24-....**
1FW6190-0.B15-8FB.	78	69	130	55.6 (74.6)	85/141	**6SL312■-1TE28-5AA3**	–	–	–
1FW6190-0.B15-2PB.	120	99	210	75.8 (102)	132/210	**6SL312■-1TE31-3AA3**	–	–	–
1FW6190-0.B15-0WB.	150	110	270	91.5 (123)	200/282	**6SL312■-1TE32-0AA3**	–	–	–
1FW6190-0.B20-5G..	54	51	95	49 (54.7)	60/113	**6SL312■-1TE26-0AA3**	1.5	4 × 16	**6FX8002-5CS24-....**
1FW6190-0.B20-8FB.	78	71	130	61.1 (81.9)	85/141	**6SL312■-1TE28-5AA3**	–	–	–
1FW6190-0.B20-2PB.	120	100	210	81.5 (109)	132/210	**6SL312■-1TE31-3AA3**	–	–	–
1FW6190-0.B20-0WB.	150	120	270	97.4 (131)	200/282	**6SL312■-1TE32-0AA3**	–	–	–

Cooling:	
Internal air cooling	**0**
External air cooling	**1**
Motor Module:	
Single Motor Module	**1**
Double Motor Module	**2**

Length code	**....**

Further information about the cables can be found in chapter Connection system MOTION-CONNECT.

1) Torque and current at low speeds.

2) The values refer to a DC link voltage of the drive system of 600 V DC.

3) In case of water cooling with inlet temperature of 35 °C (95 °F) and maximum rotor flange temperature of 60 °C (140 °F).

4) For type of connection with exposed core ends, power and signal connectors are not included in the scope of supply of the motor. They must be ordered separately (see chapter Connection system MOTION-CONNECT).

5) The current carrying capacity of the power cables complies with EN 60204-1 for installation type C, for continuous duty at an ambient air temperature of 40 °C (104 °F).

Selection and ordering data

Maximum torque	Static torque[1)3)]	Rated torque[2)3)]	Speed at maximum torque, max.[2)]	Speed at rated torque, max.[2)]	**1FW6 built-in torque motors**	Moment of inertia of rotor	Weight, approx. stator + rotor
M_{max}	M_0	M_{rated}	n_{max} at M_{max}	n_{max} at M_{rated}		J	m
Nm (lb_f-ft)	Nm (lb_f-ft)	Nm (lb_f-ft)	rpm	rpm	Order No.	10^{-2}kgm^2 (lb_f-in-s^2)	kg (lb)
Water cooling							
1320 (974)	841 (620)	799 (589)	34	69	**1FW6230-0■B05-1J■2**	62.2 (5.51)	44.8 (98.8)
		774 (571)	59	110	**1FW6230-0■B05-2J■2**		
		660 (487)	160	290	**1FW6230-0■B05-5G■2**		
1840 (1357)	1180 (870)	1140 (841)	19	45	**1FW6230-0■B07-1J■2**	84.3 (7.46)	58.8 (130)
		1120 (826)	38	73	**1FW6230-0■B07-2J■2**		
		1010 (745)	110	190	**1FW6230-0■B07-5G■2**		
		923 (681)	160	290	**1FW6230-0■B07-8FB2**		
2630 (1940)	1680 (1239)	1630 (1202)	21	46	**1FW6230-0■B10-2J■2**	118.0 (10.4)	81.8 (180)
		1520 (1121)	74	130	**1FW6230-0■B10-5G■2**		
		1450 (1070)	110	190	**1FW6230-0■B10-8FB2**		
		1320 (974)	160	290	**1FW6230-0■B10-2PB2**		
3950 (2914)	2520 (1859)	2440 (1800)	19	43	**1FW6230-0■B15-4C■2**	173.0 (15.3)	117.8 (260)
		2380 (1755)	44	80	**1FW6230-0■B15-5G■2**		
		2310 (1704)	67	120	**1FW6230-0■B15-8FB2**		
		2190 (1615)	100	180	**1FW6230-0■B15-2PB2**		
		2020 (1490)	150	270	**1FW6230-0■B15-0WB2**		119.4 (263)
5260 (3880)	3360 (2478)	3230 (2382)	29	56	**1FW6230-0■B20-5G■2**	228.0 (20.2)	153.8 (339)
		3160 (2331)	47	84	**1FW6230-0■B20-8FB2**		
		3050 (2250)	74	130	**1FW6230-0■B20-2PB2**		
		2890 (2132)	110	190	**1FW6230-0■B20-0WB2**		155.4 (343)

Cable outlet only for 1FW6160 to 1FW6290:	
Axial	**W**
Radially outwards	**V**
Tangential (only for types of connection C and D)	**T**
Type of connection:	
Permanently connected power and signal cables with exposed core ends[4)] Length: 2 m (6.56 ft)	**C**
Permanently connected power and signal cables pre-assembled with connectors Length: 0.5 m (1.64 ft)	**D**
Type of connection only for specific motors (Not selectable):	
Permanently connected power and signal cables with exposed core ends[4)] Length: 1 m (3.28 ft)	**B**

Motor type (repeated)	Static current [1)3)]	Rated current [2)3)]	Maximum current [2)]	Calculated power	SINAMICS S120 Motor Module: Required rated current	SINAMICS S120 Motor Module: Booksize format (For additional versions and components see chapter SINAMICS S120 drive system)	Power cable with complete shield, Motor connection via power connector [4)]: Power connector	Cable cross-section [5)]	Pre-assembled basic cable to the drive system
	I_0	I_{rated}	I_{max}	$P_{el, max}$	I_{rated}/I_{max}				
	A	A	A	kW (HP)	A	Order No.	Size	mm^2	Order No.
1FW6230-0.B05-1J..	16	15	31	17.3 (23.2)	18/36	**6SL312■-■TE21-8AA3**	1	4 × 2.5	**6FX8002-5CS11-....**
1FW6230-0.B05-2J..	24	22	45	21 (28.2)	30/56	**6SL312■-1TE23-0AA3**	1.5	4 × 4	**6FX8002-5CS41-....**
1FW6230-0.B05-5G..	53	40	100	34.1 (45.7)	60/113	**6SL312■-1TE26-0AA3**	1.5	4 × 16	**6FX8002-5CS24-....**
1FW6230-0.B07-1J..	16	16	31	19.4 (26.0)	18/36	**6SL312■-■TE21-8AA3**	1	4 × 2.5	**6FX8002-5CS11-....**
1FW6230-0.B07-2J..	24	22	45	23.6 (31.6)	30/56	**6SL312■-1TE23-0AA3**	1.5	4 × 4	**6FX8002-5CS41-....**
1FW6230-0.B07-5G..	53	44	100	36.9 (49.5)	60/113	**6SL312■-1TE26-0AA3**	1.5	4 × 16	**6FX8002-5CS24-....**
1FW6230-0.B07-8FB.	74	56	130	46.3 (62.1)	85/141	**6SL312■-1TE28-5AA3**	–	–	–
1FW6230-0.B10-2J..	24	23	45	27.1 (36.3)	30/56	**6SL312■-1TE23-0AA3**	1.5	4 × 4	**6FX8002-5CS41-....**
1FW6230-0.B10-5G..	54	48	100	42 (56.3)	60/113	**6SL312■-1TE26-0AA3**	1.5	4 × 16	**6FX8002-5CS24-....**
1FW6230-0.B10-8FB.	74	62	130	50.6 (67.9)	85/141	**6SL312■-1TE28-5AA3**	–	–	–
1FW6230-0.B10-2PB.	100	80	190	65.4 (87.7)	132/210	**6SL312■-1TE31-3AA3**	–	–	–
1FW6230-0.B15-4C..	33	32	63	38 (50.9)	45/85	**6SL312■-1TE24-5AA3**	1.5	4 × 6	**6FX8002-5CS54-....**
1FW6230-0.B15-5G..	53	49	100	47.4 (63.5)	60/113	**6SL312■-1TE26-0AA3**	1.5	4 × 16	**6FX8002-5CS24-....**
1FW6230-0.B15-8FB.	74	66	130	57.3 (76.8)	85/141	**6SL312■-1TE28-5AA3**	–	–	–
1FW6230-0.B15-2PB.	100	90	190	72.5 (97.2)	132/210	**6SL312■-1TE31-3AA3**	–	–	–
1FW6230-0.B15-0WB.	140	110	270	91.2 (122)	200/282	**6SL312■-1TE32-0AA3**	–	–	–
1FW6230-0.B20-5G..	53	51	100	53.5 (71.7)	60/113	**6SL312■-1TE26-0AA3**	1.5	4 × 16	**6FX8002-5CS24-....**
1FW6230-0.B20-8FB.	74	69	130	63.7 (85.4)	85/141	**6SL312■-1TE28-5AA3**	–	–	–
1FW6230-0.B20-2PB.	100	94	190	79.4 (106)	132/210	**6SL312■-1TE31-3AA3**	–	–	–
1FW6230-0.B20-0WB.	140	120	270	98.1 (132)	200/282	**6SL312■-1TE32-0AA3**	–	–	–

Cooling:	
Internal air cooling	**0**
External air cooling	**1**
Motor Module:	
Single Motor Module	**1**
Double Motor Module	**2**

Length code	**....**

Further information about the cables can be found in chapter Connection system MOTION-CONNECT.

[1)] Torque and current at low speeds.

[2)] The values refer to a DC link voltage of the drive system of 600 V DC.

[3)] In case of water cooling with inlet temperature of 35 °C (95 °F) and maximum rotor flange temperature of 60 °C (140 °F).

[4)] For type of connection with exposed core ends, power and signal connectors are not included in the scope of supply of the motor. They must be ordered separately (see chapter Connection system MOTION-CONNECT).

[5)] The current carrying capacity of the power cables complies with EN 60204-1 for installation type C, for continuous duty at an ambient air temperature of 40 °C (104 °F).

Selection and ordering data

Maximum torque	Static torque[1)3)]	Rated torque[2)3)]	Speed at maximum torque, max.[2)]	Speed at rated torque, max.[2)]	**1FW6 built-in torque motors**	Moment of inertia of rotor	Weight, approx. stator + rotor
M_{max}	M_0	M_{rated}	n_{max} at M_{max}	n_{max} at M_{rated}		J	m
Nm (lb_f-ft)	Nm (lb_f-ft)	Nm (lb_f-ft)	rpm	rpm	Order No.	$10^{-2}kgm^2$ (lb_f-in-s^2)	kg (lb)
Water cooling							
4000 (2950)	2220 (1637)	2060 (1519)	59	110	**1FW6290-0■B07-5G■2**	228 (20.2)	103.6 (228)
		1910 (1409)	110	210	**1FW6290-0■B07-0LB2**		
		1810 (1335)	150	270	**1FW6290-0■B07-2PB2**		108.8 (240)
6280 (4632)	3490 (2574)	3320 (2449)	40	73	**1FW6290-0■B11-7A■2**	334 (29.6)	159 (351)
		3200 (2360)	71	130	**1FW6290-0■B11-0LB2**		
		3100 (2287)	93	170	**1FW6290-0■B11-2PB2**		164.2 (362)
8570 (6321)	4760 (3511)	4590 (3386)	28	53	**1FW6290-0■B15-7A■2**	440 (38.9)	214.6 (473)
		4480 (3304)	50	89	**1FW6290-0■B15-0LB2**		
		4390 (3238)	67	120	**1FW6290-0■B15-2PB2**		219.8 (485)
10900 (8040)	6030 (4448)	5760 (4249)	38	68	**1FW6290-0■B20-0LB2**	546 (48.3)	260.6 (575)
		5670 (4182)	51	91	**1FW6290-0■B20-2PB2**		265.8 (586)

Cable outlet only for 1FW6160 to 1FW6290:	
Axial	**W**
Radially outwards	**V**
Tangential (only for types of connection C and D)	**T**
Type of connection:	
Permanently connected power and signal cables with exposed core ends[4)] Length: 2 m (6.56 ft)	**C**
Permanently connected power and signal cables pre-assembled with connectors Length: 0.5 m (1.64 ft)	**D**
Type of connection only for specific motors (Not selectable):	
Permanently connected power and signal cables with exposed core ends[4)] Length: 1 m (3.28 ft)	**B**

Motor type (repeated)	Static current 1)3)	Rated current 2)3)	Maximum current 2)	Calculated power	SINAMICS S120 Motor Module: Required rated current	SINAMICS S120 Motor Module: Booksize format. For additional versions and components see chapter SINAMICS S120 drive system	Power cable with complete shield, Motor connection via power connector 4): Power connector	Cable cross-section 5)	Pre-assembled basic cable to the drive system
	I_0	I_{rated}	I_{max}	$P_{el, max}$	I_{rated}/I_{max}				
	A	A	A	kW (HP)	A	Order No.	Size	mm^2	Order No.
1FW6290-0.B07-5G..	56	52	110	47.7 (64.0)	60/113	**6SL312■-1TE26-0AA3**	1.5	4 × 16	**6FX8002-5CS24-....**
1FW6290-0.B07-0LB.	100	86	210	70.6 (94.7)	132/210	**6SL312■-1TE31-3AA3**	–	–	–
1FW6290-0.B07-2PB.	120	100	270	85.4 (115)	200/282	**6SL312■-1TE32-0AA3**	–	–	–
1FW6290-0.B11-7A..	62	59	130	58 (77.8)	85/141	**6SL312■-1TE28-5AA3**	1.5	4 × 16	**6FX8002-5CS24-....**
1FW6290-0.B11-0LB.	100	91	210	78.2 (105)	132/210	**6SL312■-1TE31-3AA3**	–	–	–
1FW6290-0.B11-2PB.	120	110	270	93.2 (125)	200/282	**6SL312■-1TE32-0AA3**	–	–	–
1FW6290-0.B15-7A..	64	61	130	65.2 (87.4)	85/141	**6SL312■-1TE28-5AA3**	1.5	4 × 16	**6FX8002-5CS24-....**
1FW6290-0.B15-0LB.	100	94	210	85.2 (114)	132/210	**6SL312■-1TE31-3AA3**	–	–	–
1FW6290-0.B15-2PB.	120	110	270	101 (135)	200/282	**6SL312■-1TE32-0AA3**	–	–	–
1FW6290-0.B20-0LB.	100	95	210	91.9 (123)	132/210	**6SL312■-1TE31-3AA3**	–	–	–
1FW6290-0.B20-2PB.	120	120	270	107 (144)	200/282	**6SL312■-1TE32-0AA3**	–	–	–

Cooling:	
Internal air cooling	**0**
External air cooling	**1**
Motor Module:	
Single Motor Module	**1**

Length code	**....**

Further information about the cables can be found in chapter Connection system MOTION-CONNECT.

Accessories

Description	Order No.
Cooling connection adapter for	
• Torque motors 1FW6160 to 1FW6230	**1FW6160-1BA00-0AA0**
• Torque motors 1FW6290	**1FW6290-1BA00-0AA0**

1) Torque and current at low speeds.

2) The values refer to a DC link voltage of the drive system of 600 V DC.

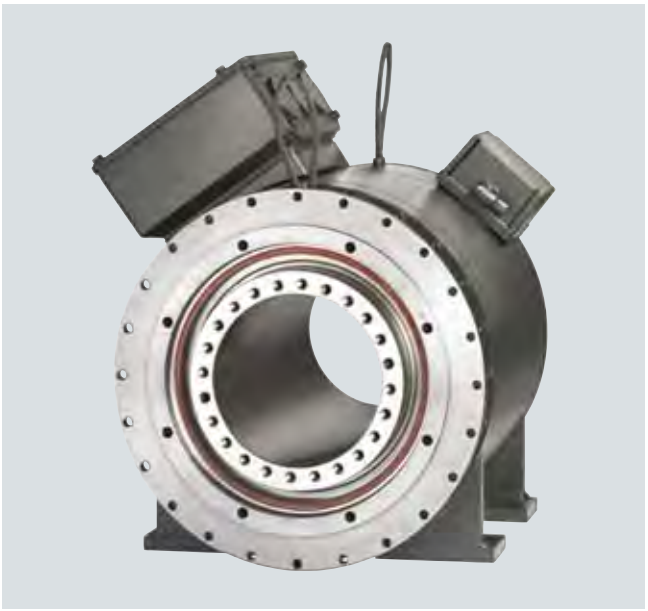
3) In case of water cooling with inlet temperature of 35 °C (95 °F) and maximum rotor flange temperature of 60 °C (140 °F).

4) For type of connection with exposed core ends, power and signal connectors are not included in the scope of supply of the motor. They must be ordered separately (see chapter Connection system MOTION-CONNECT).

5) The current carrying capacity of the power cables complies with EN 60204-1 for installation type C, for continuous duty at an ambient air temperature of 40 °C (104 °F).

1FW3 complete torque motors

Overview



1FW3 complete torque motors

1FW3 torque motors are liquid-cooled, high-pole (slow running) permanent-magnet synchronous motors with hollow shaft. The operating characteristics can be essentially compared to those of regular synchronous motors.

1FW3 complete torque motors are supplied as fully assembled units. The range includes 3 shaft heights with various lengths. For installation in the machine, the stator and rotor of motors 1FW315/1FW320 have a flange with centering rings and tapped holes at the drive end according to construction type IM B14. In 1FW328 motors, the flange is designed with centering ring and through-holes as for construction type IM B35.

1FW3 complete torque motors can be combined with the SINAMICS S120 drive system to create a powerful, high-performance system. The integrated encoder systems for speed and position control can be selected depending on the application.

Benefits

- High torque, compact design and low construction volume
- High overload capability
- No elasticity in the drive train
- No torsional backlash
- High availability, since there are no mechanical transmission elements subject to wear in the drive train
- Low moment of inertia
- Direct coupling to the machine using flanges
- Hollow-shaft rotor design allows flexible installation concepts
- Energy savings due to reduction in mechanical losses

Application

The 1FW3 complete torque motors were developed as direct drives. These direct drives form a compact drive unit where the mechanical motor power is transferred directly to the driven machine without any mechanical transmission elements.

- Extruder main drives
- Screw drives for injection molding machines
- Pull-roll drives for foil-stretching machines
- Stretch, calender and chill rolls
- Dynamic positioning tasks, e.g. rotary tables, cyclic conveyor belts
- Substitute for hydraulic motors
- Roller drives in paper machines
- Cross-cutter drives for continuous material webs, e.g. paper, textiles, metal sheet
- Wire-drawing machines
- Shredders

Technical specifications

1FW3 complete torque motor	
Type of motor	Permanent-magnet synchronous motor
Magnet material	Rare-earth magnetic material
Insulation of the stator winding in accordance with EN 60034-1 (IEC60034-1)	Temperature class 155 (F) for a winding temperature rise of ΔT = 100 K at a coolant (water) inlet temperature of 30 °C (86 °F)
Cooling in accordance with EN 60034-6 (IEC 60034-6)	Water cooling
Thermal motor protection in accordance with EN 60034-11 (IEC 60034-11)	KTY84 temperature sensor in stator winding
Type of construction in accordance with EN 60034-7 (IEC 60034-7)	
• 1FW315/1FW320	IM B14, IM V18, IM V19
• 1FW328	IM B35
Degree of protection in accordance with EN 60034-5 (IEC 60034-5)	IP54
Shaft extension in accordance with DIN 748-3 (IEC 60072-1)	Hollow shaft
• Inside diameter d_i	
- 1FW315/1FW320	153 mm (6.02 in)
- 1FW328	250 mm (9.84 in)
Shaft and flange accuracy in accordance with DIN 42955 (IEC 60072-1)[1]	Tolerance N (at normal running temperature)
Vibration magnitude in accordance with EN 60034-14 (IEC 60034-14)	Grade A (maintained up to rated speed)
Sound pressure level L_{pA} (1 m) in accordance with DIN EN ISO 1680 Tolerance + 3 dB	
• At rated pulse frequency	
- 4 kHz	70 dB
- 2 kHz	73 dB
Shock load	Maximum permissible radial acceleration 50 m/s^2 (not in operational state)
Bearings	Roller bearings with permanent grease lubrication (lubrication over the bearing lifetime = 20000 h)
Connection	Terminal box for power cable Connectors for encoder signals and temperature sensor
Paint finish	Anthracite RAL 7016
2nd rating plate	Enclosed separately
Approvals, according to	cURus

[1] Shaft extension run-out, concentricity of centering ring and shaft, and perpendicularity of flange to shaft.

1FW3 complete torque motors Water cooling

Selection and ordering data

Rated speed	Shaft height	Rated power	Rated torque	Rated current	Rated voltage	Rated frequency	Operating speed, max.[1]	Speed, max.[2]	1FW3 complete torque motors Water cooling
n_{rated}	SH	P_{rated} at ΔT=100 K	M_{rated} at ΔT=100 K	I_{rated} at ΔT=100 K	U_{rated}	f_{rated}	$n_{max, Inv}$	n_{max}	
rpm		kW (HP)	Nm (lb_f-ft)	A	V	Hz	rpm	rpm	Order No.
Line voltage 400 V 3 AC Smart Line Module/Basic Line Module									
140	200	4.4 (5.90)	300 (221)	13	351	32.7	380	1000	**1FW3201-1■E■2-■AA0**
		7.3 (9.79)	500 (369)	21	329	32.7	380	1000	**1FW3202-1■E■2-■AA0**
		11.0 (14.8)	750 (553)	31	335	32.7	370	1000	**1FW3203-1■E■2-■AA0**
		14.7 (19.7)	1000 (738)	40	330	32.7	360	1000	**1FW3204-1■E■2-■AA0**
		22.0 (29.5)	1500 (1106)	65	311	32.7	390	1000	**1FW3206-1■E■2-■AA0**
		29.3 (1475)	2000 (1475)	84	316	32.7	380	1000	**1FW3208-1■E■2-■AA0**
	280	36.7 (49.2)	2500 (1844)	82	367	23.3	290	1000	**1FW3281-2■E■3-■AA0**
		51.3 (68.8)	3500 (2582)	115	365	23.3	290	1000	**1FW3283-2■E■3-■AA0**
		73.3 (98.3)	5000 (3688)	160	368	23.3	290	1000	**1FW3285-2■E■3-■AA0**
		102.6 (138)	7000 (5163)	230	359	23.3	290	1000	**1FW3287-2■E■3-■AA0**
220	280	56.0 (75.1)	2450 (1807)	126	352	36.7	460	1000	**1FW3281-2■G■3-■AA0**
		79.5 (107)	3450 (2545)	176	352	36.7	460	1000	**1FW3283-2■G■3-■AA0**
		114.0 (153)	4950 (3651)	244	362	36.7	440	1000	**1FW3285-2■G■3-■AA0**
		160.1 (215)	6950 (5126)	355	350	36.7	460	1000	**1FW3287-2■G■3-■AA0**
270	150	2.8 (3.75)	100 (73.8)	8	369	31.5	630	1700	**1FW3150-1■H■2-■AA0**
		5.7 (7.64)	200 (148)	14	368	31.5	630	1700	**1FW3152-1■H■2-■AA0**
		8.5 (11.4)	300 (221)	20.5	368	31.5	610	1700	**1FW3154-1■H■2-■AA0**
		11.3 (15.2)	400 (295)	28	358	31.5	630	1700	**1FW3155-1■H■2-■AA0**
		14.1 (18.9)	500 (369)	34	366	31.5	610	1700	**1FW3156-1■H■2-■AA0**
	200	8.5 (11.4)	300 (221)	23	341	63.0	680	1000	**1FW3201-1■H■2-■AA0**
		14.1 (18.9)	500 (369)	37	330	63.0	670	1000	**1FW3202-1■H■2-■AA0**
		21.2 (28.4)	750 (553)	59	311	63.0	710	1000	**1FW3203-1■H■2-■AA0**
		28.3 (38.0)	1000 (738)	74	321	63.0	670	1000	**1FW3204-1■H■2-■AA0**
		42.4 (56.9)	1500 (1106)	118	317	63.0	700	1000	**1FW3206-1■H■2-■AA0**
		56.5 (75.8)	2000 (1475)	153	313	63.0	690	1000	**1FW3208-1■H■2-■AA0**
350	280	88.0 (118)	2400 (1770)	192	345	58.3	720	1000	**1FW3281-3■J■3-■AA0**
		122.8 (165)	3350 (2471)	279	330	58.3	750	1000	**1FW3283-3■J■3-■AA0**
		174.1 (233)	4750 (3504)	380	341	58.3	720	1000	**1FW3285-3■J■3-■AA0**
		243.7 (327)	6650 (4905)	508	357	58.3	690	1000	**1FW3287-3■J■3-■AA0**

For versions, see Order No. supplement and options.

Further rated speeds on request.

Motor type (repeated)	Static torque	Static current	Efficiency[3]	Moment of inertia	Weight, approx.	Terminal box	SINAMICS S120 Motor Module	
							Rated output current[4]	For additional versions and components see chapter SINAMICS S120 drive system
	M_0 at ΔT=100 K	I_0 at ΔT=100 K	η	J	m		I_{rated}	
	Nm (lb_f-ft)	A		kgm^2 (lb_f-in-s^2)	kg (lb)	Type	A	Order No.
1FW3201-1.E.2-....	315 (232)	13	0.91	0.22 (1.95)	127 (280)	gk230	18	6SL312■-1TE21-8AA3
1FW3202-1.E.2-....	525 (387)	22	0.93	0.36 (3.19)	156 (344)	gk230	30	6SL312■-1TE23-0AA3
1FW3203-1.E.2-....	790 (583)	32	0.94	0.49 (4.34)	182 (401)	gk230	45	6SL312■-1TE24-5AA3
1FW3204-1.E.2-....	1050 (774)	42	0.94	0.70 (6.20)	223 (492)	gk230	45	6SL312■-1TE24-5AA3
1FW3206-1.E.2-....	1575 (1162)	68	0.94	0.97 (8.59)	279 (615)	gk420	85	6SL312■-1TE28-5AA3
1FW3208-1.E.2-....	2100 (1549)	88	0.94	1.31 (11.6)	348 (767)	gk420	85	6SL312■-1TE28-5AA3
1FW3281-2.E.3-....	2550 (1881)	84	0.94	3.78 (33.5)	600 (1323)	1XB7700	85	6SL312■-1TE28-5AA3
1FW3283-2.E.3-....	3550 (2618)	116	0.95	4.64 (41.1)	690 (1521)	1XB7700	132	6SL312■-1TE31-3AA3
1FW3285-2.E.3-....	5100 (3782)	163	0.95	5.98 (52.9)	860 (1896)	1XB7700	200	6SL312■-1TE32-0AA3
1FW3287-2.E.3-....	7150 (5274)	234	0.96	7.81 (69.1)	1030 (2271)	1XB7700	260	6SL3320-1TE32-6AA3
1FW3281-2.G.3-....	2550 (1881)	131	0.95	3.78 (33.5)	600 (1323)	1XB7700	132	6SL312■-1TE31-3AA3
1FW3283-2.G.3-....	3550 (2618)	181	0.96	4.64 (41.1)	690 (1521)	1XB7700	200	6SL312■-1TE32-0AA3
1FW3285-2.G.3-....	5100 (3782)	251	0.96	5.98 (52.9)	860 (1896)	1XB7700	260	6SL3320-1TE32-6AA3
1FW3287-2.G.3-....	7150 (5274)	365	0.96	7.81 (69.1)	1030 (2271)	1XB7700	380	6SL3320-1TE33-8AA3
1FW3150-1.H.2-....	105 (77.4)	7.3	0.89	0.12 (1.06)	87 (192)	gk230	9	6SL312■-1TE21-0AA3
1FW3152-1.H.2-....	210 (155)	15	0.92	0.16 (1.42)	108 (238)	gk230	18	6SL312■-1TE21-8AA3
1FW3154-1.H.2-....	315 (232)	21.5	0.93	0.20 (1.77)	129 (284)	gk230	30	6SL312■-1TE23-0AA3
1FW3155-1.H.2-....	420 (310)	29	0.94	0.24 (2.12)	150 (331)	gk230	30	6SL312■-1TE23-0AA3
1FW3156-1.H.2-....	525 (387)	35	0.94	0.28 (2.48)	171 (377)	gk230	45	6SL312■-1TE24-5AA3
1FW3201-1.H.2-....	315 (232)	24	0.92	0.22 (1.95)	127 (280)	gk230	30	6SL312■-1TE23-0AA3
1FW3202-1.H.2-....	525 (387)	39	0.94	0.36 (3.19)	156 (344)	gk230	45	6SL312■-1TE24-5AA3
1FW3203-1.H.2-....	790 (583)	62	0.95	0.49 (4.34)	182 (401)	gk420	60	6SL312■-1TE26-0AA3
1FW3204-1.H.2-....	1050 (774)	77	0.95	0.70 (6.20)	223 (492)	gk420	85	6SL312■-1TE28-5AA3
1FW3206-1.H.2-....	1575 (1162)	121	0.95	0.97 (8.59)	279 (615)	gk630	132	6SL312■-1TE31-3AA3
1FW3208-1.H.2-....	2100 (1549)	160	0.94	1.31 (11.6)	348 (767)	gk630	200	6SL312■-1TE32-0AA3
1FW3281-3.J.3-....	2500 (1844)	200	0.96	3.78 (33.5)	600 (1323)	1XB7700	200	6SL312■-1TE32-0AA3
1FW3283-3.J.3-....	3500 (2582)	292	0.96	4.64 (41.1)	690 (1521)	1XB7700	310	6SL3320-1TE33-1AA3
1FW3285-3.J.3-....	5000 (3688)	400	0.96	5.98 (52.9)	860 (1896)	1XB7700	380	6SL3320-1TE33-8AA3
1FW3287-3.J.3-....	7000 (5163)	534	0.97	7.81 (69.1)	1030 (2271)	1XB7712	618[5]	6SL3320-1TE37-5AA3

Format:	
Booksize	1
Chassis	3
Cooling:	
Internal air cooling	0
External air cooling	1
Motor Module:	
Single Motor Module	1

1) Maximum permissible operating speed based on the induced voltage in the motor and the voltage strength of the converter (without protective circuit).
2) Maximum speed which must not be exceeded.
3) Optimum efficiency in continuous duty.
4) Compliance with the rated pulse frequencies is essential; the rated motor data is valid for 4 kHz or 2 kHz.
5) The rated output current of the Motor Module is lower than the rated motor current at 2 kHz.

1FW3 complete torque motors Water cooling

Selection and ordering data

Rated speed	Shaft height	Rated power	Rated torque	Rated current	Rated voltage	Rated frequency	Operating speed, max.[1]	Speed, max.[2]	1FW3 complete torque motors Water cooling
n_{rated}	SH	P_{rated} at ΔT=100 K	M_{rated} at ΔT=100 K	I_{rated} at ΔT=100 K	U_{rated}	f_{rated}	$n_{max, Inv}$	n_{max}	
rpm		kW (HP)	Nm (lb_f-ft)	A	V	Hz	rpm	rpm	Order No.
Line voltage 400 V 3 AC Smart Line Module/Basic Line Module									
450	150	4.7 (6.30)	100 (73.8)	12	370	52.5	960	1700	**1FW3150-1■L■2-■AA0**
		9.4 (12.6)	200 (148)	22	370	52.5	960	1700	**1FW3152-1■L■2-■AA0**
		14.1 (18.9)	300 (221)	32	370	52.5	950	1700	**1FW3154-1■L■2-■AA0**
		18.8 (25.2)	400 (295)	43	370	52.5	960	1700	**1FW3155-1■L■2-■AA0**
		23.6 (31.6)	500 (369)	53	370	52.5	950	1700	**1FW3156-1■L■2-■AA0**
	200	4.4 (5.90)	300 (221)	13	351	32.7	380	1000	**1FW3201-1■E■2-■AA0**
		7.3 (9.79)	500 (369)	21	329	32.7	380	1000	**1FW3202-1■E■2-■AA0**
		11.0 (14.8)	750 (553)	31	335	32.7	370	1000	**1FW3203-1■E■2-■AA0**
		14.7 (19.7)	1000 (738)	40	330	32.7	360	1000	**1FW3204-1■E■2-■AA0**
		22.0 (29.5)	1500 (1106)	65	311	32.7	390	1000	**1FW3206-1■E■2-■AA0**
		29.3 (39.3)	2000 (1475)	84	316	32.7	380	1000	**1FW3208-1■E■2-■AA0**
520	280	122.5 (164)	2250 (1660)	262	339	86.7	1050	1000	**1FW3281-3■M■3-■AA0**
		171.5 (230)	3150 (2323)	362	345	86.7	1030	1000	**1FW3283-3■M■3-■AA0**
		247.8 (332)	4550 (3356)	484	369	86.7	960	1000	**1FW3285-3■M■3-■AA0**
		337.6 (453)	6200 (4573)	713	341	86.7	1030	1000	**1FW3287-3■M■3-■AA0**
670	150	7.0 (9.39)	100 (73.8)	18	369	78.2	1470	1700	**1FW3150-1■P■2-■AA0**
		14.0 (18.8)	200 (148)	32.5	370	78.2	1450	1700	**1FW3152-1■P■2-■AA0**
		21.0 (28.2)	300 (221)	47.5	370	78.2	1420	1700	**1FW3154-1■P■2-■AA0**
		28.1 (37.7)	400 (295)	64	360	78.2	1450	1700	**1FW3155-1■P■2-■AA0**
		35.1 (47.1)	500 (369)	76	370	78.2	1380	1700	**1FW3156-1■P■2-■AA0**

For versions, see Order No. supplement and options.

Further rated speeds on request.

Motor type (repeated)	Static torque	Static current	Efficiency[3]	Moment of inertia	Weight, approx.	Terminal box	SINAMICS S120 Motor Module	
							Rated output current[4]	For additional versions and components see chapter SINAMICS S120 drive system
	M_0 at ΔT=100 K	I_0 at ΔT=100 K	η	J	m		I_{rated}	
	Nm (lb_f-ft)	A		kgm^2 (lb_f-in-s^2)	kg (lb)	Type	A	Order No.
1FW3150-1.L.2-....	105 (77.4)	11.5	0.90	0.12 (1.06)	87 (192)	gk230	18	**6SL312■-1TE21-8AA3**
1FW3152-1.L.2-....	210 (155)	22.5	0.92	0.16 (1.42)	108 (238)	gk230	30	**6SL312■-1TE23-0AA3**
1FW3154-1.L.2-....	315 (232)	33	0.93	0.20 (1.77)	129 (284)	gk230	45	**6SL312■-1TE24-5AA3**
1FW3155-1.L.2-....	420 (310)	45	0.94	0.24 (2.12)	150 (331)	gk230	45	**6SL312■-1TE24-5AA3**
1FW3156-1.L.2-....	525 (387)	55	0.94	0.28 (2.48)	171 (377)	gk420	60	**6SL312■-1TE26-0AA3**
1FW3201-1.E.2-....	315 (232)	13	0.91	0.22 (1.95)	127 (280)	gk230	18	**6SL312■-1TE21-8AA3**
1FW3202-1.E.2-....	525 (387)	22	0.93	0.36 (3.19)	156 (344)	gk230	30	**6SL312■-1TE23-0AA3**
1FW3203-1.E.2-....	790 (583)	32	0.94	0.49 (4.34)	182 (401)	gk230	45	**6SL312■-1TE24-5AA3**
1FW3204-1.E.2-....	1050 (774)	42	0.94	0.70 (6.20)	223 (492)	gk230	45	**6SL312■-1TE24-5AA3**
1FW3206-1.E.2-....	1575 (1162)	68	0.94	0.97 (8.59)	279 (615)	gk420	85	**6SL312■-1TE28-5AA3**
1FW3208-1.E.2-....	2100 (1549)	88	0.94	1.31 (11.6)	348 (767)	gk420	85	**6SL312■-1TE28-5AA3**
1FW3281-3.M.3-....	2500 (1844)	291	0.96	3.78 (33.5)	600 (1323)	1XB7700	310	**6SL3320-1TE33-1AA3**
1FW3283-3.M.3-....	3500 (2582)	402	0.96	4.64 (41.1)	690 (1521)	1XB7700	380	**6SL3320-1TE33-8AA3**
1FW3285-3.M.3-....	5000 (3688)	532	0.97	5.98 (52.9)	860 (1896)	1XB7712	490	**6SL3320-1TE35-0AA3**
1FW3287-3.M.3-....	6850 (5053)	787	0.97	7.81 (69.1)	1030 (2271)	1XB7712	734[5]	**6SL3320-1TE38-4AA3**
1FW3150-1.P.2-....	105 (77.4)	17.5	0.90	0.12 (1.06)	87 (192)	gk230	18	**6SL312■-1TE21-8AA3**
1FW3152-1.P.2-....	210 (155)	33.5	0.93	0.16 (1.42)	108 (238)	gk230	45	**6SL312■-1TE24-5AA3**
1FW3154-1.P.2-....	315 (232)	49	0.93	0.20 (1.77)	129 (284)	gk230	60	**6SL312■-1TE26-0AA3**
1FW3155-1.P.2-....	420 (310)	67	0.94	0.24 (2.12)	150 (331)	gk420	85	**6SL312■-1TE28-5AA3**
1FW3156-1.P.2-....	525 (387)	80	0.94	0.28 (2.48)	171 (377)	gk420	85	**6SL312■-1TE28-5AA3**

Format:	
Booksize	**1**
Chassis	**3**
Cooling:	
Internal air cooling	**0**
External air cooling	**1**
Motor Module:	
Single Motor Module	**1**

1) Maximum permissible operating speed based on the induced voltage in the motor and the voltage strength of the converter (without protective circuit).
2) Maximum speed which must not be exceeded.
3) Optimum efficiency in continuous duty.
4) Compliance with the rated pulse frequencies is essential; the rated motor data is valid for 4 kHz or 2 kHz.
5) The rated output current of the Motor Module is lower than the rated motor current at 2 kHz.

1FW3 complete torque motors Water cooling

Selection and ordering data

Rated speed	Shaft height	Rated power	Rated torque	Rated current	Rated voltage	Rated frequency	Operating speed, max.[1]	Speed, max.[2]	1FW3 complete torque motors Water cooling
n_{rated}	SH	P_{rated} at ΔT=100 K	M_{rated} at ΔT=100 K	I_{rated} at ΔT=100 K	U_{rated}	f_{rated}	$n_{max, Inv}$	n_{max}	
rpm		kW (HP)	Nm (lb_f-ft)	A	V	Hz	rpm	rpm	Order No.
Line voltage 400 V 3 AC Active Line Module									
150	200	4.7 (6.30)	300 (221)	13	373	35	380	1000	**1FW3201-1■E■2-■AA0**
		7.9 (10.6)	500 (369)	21	350	35	380	1000	**1FW3202-1■E■2-■AA0**
		11.8 (15.8)	750 (553)	31	357	35	370	1000	**1FW3203-1■E■2-■AA0**
		15.7 (21.1)	1000 (738)	40	351	35	360	1000	**1FW3204-1■E■2-■AA0**
		23.6 (31.7)	1500 (1106)	65	331	35	390	1000	**1FW3206-1■E■2-■AA0**
		31.4 (42.1)	2000 (1475)	84	337	35	380	1000	**1FW3208-1■E■2-■AA0**
	280	39.3 (52.7)	2500 (1844)	82	390	25	290	1000	**1FW3281-2■E■3-■AA0**
		55.0 (73.8)	3500 (2582)	115	388	25	290	1000	**1FW3283-2■E■3-■AA0**
		78.5 (105)	5000 (3688)	160	391	25	290	1000	**1FW3285-2■E■3-■AA0**
		110.0 (148)	7000 (5163)	230	382	25	290	1000	**1FW3287-2■E■3-■AA0**
250	280	64.1 (86.0)	2450 (1807)	126	396	41.7	460	1000	**1FW3281-2■G■3-■AA0**
		90.3 (121)	3450 (2545)	176	397	41.7	460	1000	**1FW3283-2■G■3-■AA0**
		129.6 (174)	4950 (3651)	244	408	41.7	440	1000	**1FW3285-2■G■3-■AA0**
		180.6 (242)	6900 (5089)	352	393	41.7	460	1000	**1FW3287-2■G■3-■AA0**
300	150	3.1 (4.16)	100 (73.8)	8	403	35	630	1700	**1FW3150-1■H■2-■AA0**
		6.3 (8.45)	200 (148)	14	404	35	630	1700	**1FW3152-1■H■2-■AA0**
		9.4 (12.6)	300 (221)	20.5	405	35	610	1700	**1FW3154-1■H■2-■AA0**
		12.6 (16.9)	400 (295)	28	395	35	630	1700	**1FW3155-1■H■2-■AA0**
		15.7 (21.1)	500 (369)	34	403	35	610	1700	**1FW3156-1■H■2-■AA0**
	200	9.4 (12.6)	300 (221)	23	377	70	680	1000	**1FW3201-1■H■2-■AA0**
		15.7 (21.1)	500 (369)	37	365	70	670	1000	**1FW3202-1■H■2-■AA0**
		23.6 (31.6)	750 (553)	59	343	70	710	1000	**1FW3203-1■H■2-■AA0**
		31.4 (42.1)	1000 (738)	74	355	70	670	1000	**1FW3204-1■H■2-■AA0**
		47.1 (63.2)	1500 (1106)	118	351	70	700	1000	**1FW3206-1■H■2-■AA0**
		62.8 (84.2)	2000 (1475)	153	346	70	690	1000	**1FW3208-1■H■2-■AA0**
400	280	98.0 (131)	2350 (1733)	188	389	66.7	720	1000	**1FW3281-3■J■3-■AA0**
		138.2 (185)	3300 (2434)	275	373	66.7	750	1000	**1FW3283-3■J■3-■AA0**
		196.9 (264)	4700 (3467)	376	386	66.7	720	1000	**1FW3285-3■J■3-■AA0**
		276.5 (371)	6600 (4868)	504	405	66.7	690	1000	**1FW3287-3■J■3-■AA0**

For versions, see Order No. supplement and options.

Further rated speeds on request.

Motor type (repeated)	Static torque	Static current	Efficiency[3]	Moment of inertia	Weight, approx.	Terminal box	SINAMICS S120 Motor Module	
							Rated output current[4]	For additional versions and components see chapter SINAMICS S120 drive system
	M_0 at ΔT=100 K	I_0 at ΔT=100 K	η	J	m		I_{rated}	
	Nm (lb_f-ft)	A		kgm^2 (lb_f-in-s^2)	kg (lb)	Type	A	Order No.
1FW3201-1.E.2-....	315 (232)	13	0.91	0.22 (1.95)	127 (280)	gk230	18	**6SL312■-1TE21-8AA3**
1FW3202-1.E.2-....	525 (387)	22	0.93	0.36 (3.19)	156 (344)	gk230	30	**6SL312■-1TE23-0AA3**
1FW3203-1.E.2-....	790 (583)	32	0.94	0.49 (4.34)	182 (401)	gk230	45	**6SL312■-1TE24-5AA3**
1FW3204-1.E.2-....	1050 (774)	42	0.94	0.70 (6.20)	223 (492)	gk230	45	**6SL312■-1TE24-5AA3**
1FW3206-1.E.2-....	1575 (1162)	68	0.94	0.97 (8.59)	279 (615)	gk420	85	**6SL312■-1TE28-5AA3**
1FW3208-1.E.2-....	2100 (1549)	88	0.94	1.31 (11.6)	348 (767)	gk420	85	**6SL312■-1TE28-5AA3**
1FW3281-2.E.3-....	2550 (1881)	84	0.94	3.78 (33.5)	600 (1323)	1XB7700	85	**6SL312■-1TE28-5AA3**
1FW3283-2.E.3-....	3550 (2618)	116	0.95	4.64 (41.1)	690 (1521)	1XB7700	132	**6SL312■-1TE31-3AA3**
1FW3285-2.E.3-....	5100 (3782)	163	0.95	5.98 (52.9)	860 (1896)	1XB7700	200	**6SL312■-1TE32-0AA3**
1FW3287-2.E.3-....	7150 (5274)	234	0.96	7.81 (69.1)	1030 (2271)	1XB7700	260	**6SL3320 -1TE32-6AA3**
1FW3281-2.G.3-....	2550 (1881)	131	0.95	3.78 (33.5)	600 (1323)	1XB7700	132	**6SL312■-1TE31-3AA3**
1FW3283-2.G.3-....	3550 (2618)	181	0.96	4.64 (41.1)	690 (1521)	1XB7700	200	**6SL312■-1TE32-0AA3**
1FW3285-2.G.3-....	5100 (3782)	251	0.96	5.98 (52.9)	860 (1896)	1XB7700	260	**6SL3320 -1TE32-6AA3**
1FW3287-2.G.3-....	7150 (5274)	365	0.96	7.81 (69.1)	1030 (2271)	1XB7700	380	**6SL3320 -1TE33-8AA3**
1FW3150-1.H.2-....	105 (77.4)	7.3	0.89	0.12 (1.06)	87 (192)	gk230	9	**6SL312■-1TE21-0AA3**
1FW3152-1.H.2-....	210 (155)	15	0.92	0.16 (1.42)	108 (238)	gk230	18	**6SL312■-1TE21-8AA3**
1FW3154-1.H.2-....	315 (232)	21.5	0.93	0.20 (1.77)	129 (284)	gk230	30	**6SL312■-1TE23-0AA3**
1FW3155-1.H.2-....	420 (310)	29	0.94	0.24 (2.12)	150 (331)	gk230	30	**6SL312■-1TE23-0AA3**
1FW3156-1.H.2-....	525 (387)	35	0.94	0.28 (2.48)	171 (377)	gk230	45	**6SL312■-1TE24-5AA3**
1FW3201-1.H.2-....	315 (232)	24	0.92	0.22 (1.95)	127 (280)	gk230	30	**6SL312■-1TE23-0AA3**
1FW3202-1.H.2-....	525 (387)	39	0.94	0.36 (3.19)	156 (344)	gk230	45	**6SL312■-1TE24-5AA3**
1FW3203-1.H.2-....	790 (583)	62	0.95	0.49 (4.34)	182 (401)	gk420	60	**6SL312■-1TE26-0AA3**
1FW3204-1.H.2-....	1050 (774)	77	0.95	0.70 (6.20)	223 (492)	gk420	85	**6SL312■-1TE28-5AA3**
1FW3206-1.H.2-....	1575 (1162)	121	0.95	0.97 (8.59)	279 (615)	gk630	132	**6SL312■-1TE31-3AA3**
1FW3208-1.H.2-....	2100 (1549)	160	0.94	1.31 (11.6)	348 (767)	gk630	200	**6SL312■-1TE32-0AA3**
1FW3281-3.J.3-....	2500 (1844)	200	0.96	3.78 (33.5)	600 (1323)	1XB7700	200	**6SL312■-1TE32-0AA3**
1FW3283-3.J.3-....	3500 (2582)	292	0.96	4.64 (41.1)	690 (1521)	1XB7700	310	**6SL3320 -1TE33-1AA3**
1FW3285-3.J.3-....	5000 (3688)	400	0.96	5.98 (52.9)	860 (1896)	1XB7700	380	**6SL3320 -1TE33-8AA3**
1FW3287-3.J.3-....	7000 (5163)	534	0.97	7.81 (69.1)	1030 (2271)	1XB7712	618[5]	**6SL3320 -1TE37-5AA3**

Format:	
Booksize	**1**
Chassis	**3**
Cooling:	
Internal air cooling	**0**
External air cooling	**1**
Motor Module:	
Single Motor Module	**1**

1) Maximum permissible operating speed based on the induced voltage in the motor and the voltage strength of the converter (without protective circuit).
2) Maximum speed which must not be exceeded.
3) Optimum efficiency in continuous duty.
4) Compliance with the rated pulse frequencies is essential; the rated motor data is valid for 4 kHz or 2 kHz.
5) The rated output current of the Motor Module is lower than the rated motor current at 2 kHz.

Selection and ordering data

Rated speed	Shaft height	Rated power	Rated torque	Rated current	Rated voltage	Rated frequency	Operating speed, max.[1]	Speed, max.[2]	1FW3 complete torque motors Water cooling
n_{rated}	SH	P_{rated} at ΔT=100 K	M_{rated} at ΔT=100 K	I_{rated} at ΔT=100 K	U_{rated}	f_{rated}	$n_{max, Inv}$	n_{max}	
rpm		kW (HP)	Nm (lb_f-ft)	A	V	Hz	rpm	rpm	Order No.
Line voltage 400 V 3 AC Active Line Module									
500	150	5.2 (6.97)	100 (73.8)	12	413	58.3	960	1700	**1FW3150-1■L ■2-■AA0**
		10.5 (14.1)	200 (148)	22	415	58.3	960	1700	**1FW3152-1■L ■2-■AA0**
		15.7 (21.1)	300 (221)	32	415	58.3	950	1700	**1FW3154-1■L ■2-■AA0**
		20.9 (28.0)	400 (295)	43	412	58.3	960	1700	**1FW3155-1■L ■2-■AA0**
		26.2 (35.1)	500 (369)	53	415	58.3	950	1700	**1FW3156-1■L ■2-■AA0**
	200	4.7 (6.30)	300 (221)	13	373	35.0	380	1000	**1FW3201-1■E ■2-■AA0**
		7.9 (10.6)	500 (369)	21	350	35.0	380	1000	**1FW3202-1■E ■2-■AA0**
		11.8 (15.8)	750 (553)	31	357	35.0	370	1000	**1FW3203-1■E ■2-■AA0**
		15.7 (21.1)	1000 (738)	40	351	35.0	360	1000	**1FW3204-1■E ■2-■AA0**
		23.6 (31.6)	1500 (1106)	65	331	35.0	390	1000	**1FW3206-1■E ■2-■AA0**
		31.4 (42.1)	2000 (1475)	84	337	35.0	380	1000	**1FW3208-1■E ■2-■AA0**
600	280	138.2 (185)	2200 (1623)	256	387	100.0	1050	1000	**1FW3281-3■M ■3-■AA0**
		194.5 (261)	3100 (2287)	357	394	100.0	1030	1000	**1FW3283-3■M ■3-■AA0**
		276.5 (371)	4400 (3245)	469	415	100.0	960	1000	**1FW3285-3■M ■3-■AA0**
		380.1 (510)	6050 (4462)	696	389	100.0	1030	1000	**1FW3287-3■M ■3-■AA0**
750	150	7.9 (10.6)	100 (73.8)	18	410	87.5	1470	1700	**1FW3150-1■P ■2-■AA0**
		15.7 (31.1)	200 (148)	32.5	415	87.5	1450	1700	**1FW3152-1■P ■2-■AA0**
		23.6 (31.6)	300 (221)	47.5	412	87.5	1420	1700	**1FW3154-1■P ■2-■AA0**
		31.4 (42.1)	400 (295)	64	401	87.5	1450	1700	**1FW3155-1■P ■2-■AA0**
		39.3 (52.7)	500 (369)	76	415	87.5	1380	1700	**1FW3156-1■P ■2-■AA0**

For versions, see Order No. supplement and options.

Further rated speeds on request.

Motor type (repeated)	Static torque	Static current	Efficiency[3]	Moment of inertia	Weight, approx.	Terminal box	SINAMICS S120 Motor Module	
							Rated output current[4]	For additional versions and components see chapter SINAMICS S120 drive system
	M_0 at ΔT=100 K	I_0 at ΔT=100 K	η	J	m		I_{rated}	
	Nm (lb_f-ft)	A		kgm^2 (lb_f-in-s^2)	kg (lb)	Type	A	Order No.
1FW3150-1.L.2-....	105 (77.4)	11.5	0.90	0.12 (1.06)	87 (192)	gk230	18	**6SL312■-1TE21-8AA3**
1FW3152-1.L.2-....	210 (155)	22.5	0.92	0.16 (1.42)	108 (238)	gk230	30	**6SL312■-1TE23-0AA3**
1FW3154-1.L.2-....	315 (232)	33	0.93	0.20 (1.77)	129 (284)	gk230	45	**6SL312■-1TE24-5AA3**
1FW3155-1.L.2-....	420 (310)	45	0.94	0.24 (2.12)	150 (331)	gk230	45	**6SL312■-1TE24-5AA3**
1FW3156-1.L.2-....	525 (387)	55	0.94	0.28 (2.48)	171 (377)	gk420	60	**6SL312■-1TE26-0AA3**
1FW3201-1.E.2-....	315 (232)	13	0.91	0.22 (1.95)	127 (280)	gk230	18	**6SL312■-1TE21-8AA3**
1FW3202-1.E.2-....	525 (387)	22	0.93	0.36 (3.19)	156 (344)	gk230	30	**6SL312■-1TE23-0AA3**
1FW3203-1.E.2-....	790 (583)	32	0.94	0.49 (4.34)	182 (401)	gk230	45	**6SL312■-1TE24-5AA3**
1FW3204-1.E.2-....	1050 (774)	42	0.94	0.70 (6.20)	223 (492)	gk230	45	**6SL312■-1TE24-5AA3**
1FW3206-1.E.2-....	1575 (1162)	68	0.94	0.97 (8.59)	279 (615)	gk420	85	**6SL312■-1TE28-5AA3**
1FW3208-1.E.2-....	2100 (1549)	88	0.94	1.31 (11.6)	348 (767)	gk420	85	**6SL312■-1TE28-5AA3**
1FW3281-3.M.3-....	2500 (1844)	291	0.96	3.78 (33.5)	600 (1323)	1XB7700	260	**6SL3320-1TE32-6AA3**
1FW3283-3.M.3-....	3500 (2582)	402	0.96	4.64 (41.1)	690 (1521)	1XB7700	380	**6SL3320-1TE33-8AA3**
1FW3285-3.M.3-....	5000 (3688)	532	0.97	5.98 (52.9)	860 (1896)	1XB7712	490	**6SL3320-1TE35-0AA3**
1FW3287-3.M.3-....	6850 (5053)	787	0.97	7.81 (69.1)	1030 (2271)	1XB7712	734[5]	**6SL3320-1TE38-4AA3**
1FW3150-1.P.2-....	105 (77.4)	17.5	0.90	0.12 (1.06)	87 (192)	gk230	30	**6SL312■-1TE23-0AA3**
1FW3152-1.P.2-....	210 (155)	33.5	0.93	0.16 (1.42)	108 (238)	gk230	45	**6SL312■-1TE24-5AA3**
1FW3154-1.P.2-....	315 (232)	49	0.93	0.20 (1.77)	129 (284)	gk230	60	**6SL312■-1TE26-0AA3**
1FW3155-1.P.2-....	420 (310)	67	0.94	0.24 (2.12)	150 (331)	gk420	85	**6SL312■-1TE28-5AA3**
1FW3156-1.P.2-....	525 (387)	80	0.94	0.28 (2.48)	171 (377)	gk420	85	**6SL312■-1TE28-5AA3**

Format:	
Booksize	**1**
Chassis	**3**
Cooling:	
Internal air cooling	**0**
External air cooling	**1**
Motor Module:	
Single Motor Module	**1**

1) Maximum permissible operating speed based on the induced voltage in the motor and the voltage strength of the converter (without protective circuit).
2) Maximum speed which must not be exceeded.
3) Optimum efficiency in continuous duty.
4) Compliance with the rated pulse frequencies is essential; the rated motor data is valid for 4 kHz or 2 kHz.
5) The rated output current of the Motor Module is lower than the rated motor current at 2 kHz.

1FW3 complete torque motors Water cooling

Selection and ordering data

Rated speed	Shaft height	Rated power	Rated torque	Rated current	Rated voltage	Rated frequency	Operating speed, max.[1]	Speed, max.[2]	1FW3 complete torque motors Water cooling
n_{rated}	SH	P_{rated} at ΔT=100 K	M_{rated} at ΔT=100 K	I_{rated} at ΔT=100 K	U_{rated}	f_{rated}	$n_{max, Inv}$	n_{max}	
rpm		kW (HP)	Nm (lb_f-ft)	A	V	Hz	rpm	rpm	Order No.
Line voltage 480 V 3 AC Smart Line Module/Basic Line Module/Active Line Module									
160	200	5.0 (6.71)	300 (221)	13	395	37.3	380	1000	**1FW3201-1■E■2-■AA0**
		8.4 (11.3)	500 (369)	21	371	37.3	380	1000	**1FW3202-1■E■2-■AA0**
		12.6 (16.9)	750 (553)	31	378	37.3	370	1000	**1FW3203-1■E■2-■AA0**
		16.8 (22.5)	1000 (738)	40	372	37.3	360	1000	**1FW3204-1■E■2-■AA0**
		25.1 (33.7)	1500 (1106)	65	351	37.3	390	1000	**1FW3206-1■E■2-■AA0**
		33.5 (44.9)	2000 (1475)	84	357	37.3	380	1000	**1FW3208-1■E■2-■AA0**
	280	41.9 (56.2)	2500 (1844)	82	413	26.7	290	1000	**1FW3281-2■E■3-■AA0**
		58.6 (78.6)	3500 (2582)	115	411	26.7	290	1000	**1FW3283-2■E■3-■AA0**
		83.8 (112)	5000 (3688)	160	415	26.7	290	1000	**1FW3285-2■E■3-■AA0**
		117.3 (157)	7000 (5163)	230	405	26.7	290	1000	**1FW3287-2■E■3-■AA0**
270	280	69.3 (92.9)	2450 (1807)	126	426	45.0	460	1000	**1FW3281-2■G■3-■AA0**
		96.1 (129)	3400 (2508)	173	424	45.0	460	1000	**1FW3283-2■G■3-■AA0**
		138.5 (186)	4900 (3614)	241	437	45.0	440	1000	**1FW3285-2■G■3-■AA0**
		195.1 (262)	6900 (5089)	352	423	45.0	460	1000	**1FW3287-2■G■3-■AA0**
330	150	3.5 (4.69)	100 (73.8)	8	437	38.5	630	1700	**1FW3150-1■H■2-■AA0**
		6.9 (9.25)	200 (148)	14	441	38.5	630	1700	**1FW3152-1■H■2-■AA0**
		10.4 (13.9)	300 (221)	20.5	442	38.5	610	1700	**1FW3154-1■H■2-■AA0**
		13.8 (18.5)	400 (295)	28	431	38.5	630	1700	**1FW3155-1■H■2-■AA0**
		17.3 (23.2)	500 (369)	34	440	38.5	610	1700	**1FW3156-1■H■2-■AA0**
	200	10.4 (13.9)	300 (221)	23	412	77.0	680	1000	**1FW3201-1■H■2-■AA0**
		17.3 (23.2)	500 (369)	37	399	77.0	670	1000	**1FW3202-1■H■2-■AA0**
		25.9 (34.7)	750 (553)	59	376	77.0	710	1000	**1FW3203-1■H■2-■AA0**
		34.6 (46.4)	1000 (738)	74	388	77.0	670	1000	**1FW3204-1■H■2-■AA0**
		51.8 (69.5)	1500 (1106)	118	384	77.0	700	1000	**1FW3206-1■H■2-■AA0**
		69.1 (92.7)	2000 (1475)	153	379	77.0	690	1000	**1FW3208-1■H■2-■AA0**

For versions, see Order No. supplement and options.

Further rated speeds on request.

Motor type (repeated)	Static torque	Static current	Efficiency[3]	Moment of inertia	Weight, approx.	Terminal box	SINAMICS S120 Motor Module	
							Rated output current[4]	For additional versions and components see chapter SINAMICS S120 drive system
	M_0 at ΔT=100 K	I_0 at ΔT=100 K	η	J	m		I_{rated}	
	Nm (lb_f-ft)	A		kgm^2 (lb_f-in-s^2)	kg (lb)	Type	A	Order No.
1FW3201-1.E.2-....	315 (232)	13	0.91	0.22 (1.95)	127 (280)	gk230	30	**6SL312■-1TE23-0AA3**
1FW3202-1.E.2-....	525 (387)	22	0.93	0.36 (3.19)	156 (344)	gk230	30	**6SL312■-1TE23-0AA3**
1FW3203-1.E.2-....	790 (583)	32	0.94	0.49 (4.34)	182 (401)	gk230	45	**6SL312■-1TE24-5AA3**
1FW3204-1.E.2-....	1050 (774)	42	0.94	0.70 (6.20)	223 (492)	gk230	45	**6SL312■-1TE24-5AA3**
1FW3206-1.E.2-....	1575 (1162)	68	0.94	0.97 (8.59)	279 (615)	gk420	85	**6SL312■-1TE28-5AA3**
1FW3208-1.E.2-....	2100 (1549)	88	0.94	1.31 (11.6)	348 (767)	gk420	85	**6SL312■-1TE28-5AA3**
1FW3281-2.E.3-....	2550 (1881)	84	0.94	3.78 (33.5)	600 (1323)	1XB7700	85	**6SL312■-1TE28-5AA3**
1FW3283-2.E.3-....	3550 (2618)	116	0.95	4.64 (41.1)	690 (1521)	1XB7700	132	**6SL312■-1TE31-3AA3**
1FW3285-2.E.3-....	5100 (3782)	163	0.95	5.98 (52.9)	860 (1896)	1XB7700	200	**6SL312■-1TE32-0AA3**
1FW3287-2.E.3-....	7150 (5274)	234	0.96	7.81 (69.1)	1030 (2271)	1XB7700	260	**6SL3320-1TE32-6AA3**
1FW3281-2.G.3-....	2550 (1881)	131	0.95	3.78 (33.5)	600 (1323)	1XB7700	132	**6SL312■-1TE31-3AA3**
1FW3283-2.G.3-....	3550 (2618)	181	0.96	4.64 (41.1)	690 (1521)	1XB7700	200	**6SL312■-1TE32-0AA3**
1FW3285-2.G.3-....	5100 (3782)	251	0.96	5.98 (52.9)	860 (1896)	1XB7700	260	**6SL3320-1TE32-6AA3**
1FW3287-2.G.3-....	7150 (5274)	365	0.96	7.81 (69.1)	1030 (2271)	1XB7700	380	**6SL3320-1TE33-8AA3**
1FW3150-1.H.2-....	105 (77.4)	7.3	0.89	0.12 (1.06)	87 (192)	gk230	9	**6SL312■-1TE21-0AA3**
1FW3152-1.H.2-....	210 (155)	15	0.92	0.16 (1.42)	108 (238)	gk230	18	**6SL312■-1TE21-8AA3**
1FW3154-1.H.2-....	315 (232)	21.5	0.93	0.20 (1.77)	129 (284)	gk230	30	**6SL312■-1TE23-0AA3**
1FW3155-1.H.2-....	420 (310)	29	0.94	0.24 (2.12)	150 (331)	gk230	30	**6SL312■-1TE23-0AA3**
1FW3156-1.H.2-....	525 (387)	35	0.94	0.28 (2.48)	171 (377)	gk230	45	**6SL312■-1TE24-5AA3**
1FW3201-1.H.2-....	315 (232)	24	0.92	0.22 (1.95)	127 (280)	gk230	30	**6SL312■-1TE23-0AA3**
1FW3202-1.H.2-....	525 (387)	39	0.94	0.36 (3.19)	156 (344)	gk230	45	**6SL312■-1TE24-5AA3**
1FW3203-1.H.2-....	790 (583)	62	0.95	0.49 (4.34)	182 (401)	gk420	60	**6SL312■-1TE26-0AA3**
1FW3204-1.H.2-....	1050 (774)	77	0.95	0.70 (6.20)	223 (492)	gk420	85	**6SL312■-1TE28-5AA3**
1FW3206-1.H.2-....	1575 (1162)	121	0.95	0.97 (8.59)	279 (615)	gk630	132	**6SL312■-1TE31-3AA3**
1FW3208-1.H.2-....	2100 (1549)	160	0.94	1.31 (11.6)	348 (767)	gk630	200	**6SL312■-1TE32-0AA3**

Format:	
Booksize	**1**
Chassis	**3**
Cooling:	
Internal air cooling	**0**
External air cooling	**1**
Motor Module:	
Single Motor Module	**1**

1) Maximum permissible operating speed based on the induced voltage in the motor and the voltage strength of the converter (without protective circuit).
2) Maximum speed which must not be exceeded.
3) Optimum efficiency in continuous duty.
4) Compliance with the rated pulse frequencies is essential; the rated motor data is valid for 4 kHz or 2 kHz.

1FW3 complete torque motors Water cooling

Selection and ordering data

Rated speed	Shaft height	Rated power	Rated torque	Rated current	Rated voltage	Rated frequency	Operating speed, max.[1]	Speed, max.[2]	1FW3 complete torque motors Water cooling
n_{rated}	SH	P_{rated} at ΔT=100 K	M_{rated} at ΔT=100 K	I_{rated} at ΔT=100 K	U_{rated}	f_{rated}	$n_{max, Inv}$	n_{max}	
rpm		kW (HP)	Nm (lb_f-ft)	A	V	Hz	rpm	rpm	Order No.
Line voltage 480 V 3 AC Smart Line Module/Basic Line Module/Active Line Module									
430	280	105.8 (142)	2350 (1733)	188	417	71.7	720	1000	**1FW3281-3■J■3-■AA0**
		146.3 (196)	3250 (2397)	271	398	71.7	750	1000	**1FW3283-3■J■3-■AA0**
		209.4 (281)	4650 (3430)	372	412	71.7	720	1000	**1FW3285-3■J■3-■AA0**
		294.9 (395)	6550 (4831)	500	433	71.7	690	1000	**1FW3287-3■J■3-■AA0**
550	150	5.8 (7.78)	100 (73.8)	12	448	64.2	960	1700	**1FW3150-1■L■2-■AA0**
		11.5 (15.4)	200 (148)	22	448	64.2	960	1700	**1FW3152-1■L■2-■AA0**
		17.3 (23.2)	300 (221)	32	448	64.2	950	1700	**1FW3154-1■L■2-■AA0**
		23.0 (30.8)	400 (295)	43	448	64.2	960	1700	**1FW3155-1■L■2-■AA0**
		28.8 (38.6)	500 (369)	53	448	64.2	950	1700	**1FW3156-1■L■2-■AA0**
	200	5.0 (6.71)	300 (221)	13	395	37.3	380	1000	**1FW3201-1■E■2-■AA0**
		8.4 (11.3)	500 (369)	21	371	37.3	380	1000	**1FW3202-1■E■2-■AA0**
		12.6 (16.9)	750 (553)	31	378	37.3	370	1000	**1FW3203-1■E■2-■AA0**
		16.8 (22.5)	1000 (738)	40	372	37.3	360	1000	**1FW3204-1■E■2-■AA0**
		25.1 (33.7)	1500 (1106)	65	351	37.3	390	1000	**1FW3206-1■E■2-■AA0**
		33.5 (44.9)	2000 (1475)	84	357	37.3	380	1000	**1FW3208-1■E■2-■AA0**
650	280	146.3 (196)	2150 (1586)	250	415	108.3	1050	1000	**1FW3281-3■M■3-■AA0**
		204.2 (274)	3000 (2213)	345	421	108.3	1030	1000	**1FW3283-3■M■3-■AA0**
		292.7 (393)	4300 (3172)	457	448	108.3	960	1000	**1FW3285-3■M■3-■AA0**
		401.6 (539)	5900 (4352)	678	418	108.3	1030	1000	**1FW3287-3■M■3-■AA0**
810	150	8.5 (11.4)	100 (73.8)	18	441	94.5	1470	1700	**1FW3150-1■P■2-■AA0**
		17 (22.8)	200 (148)	32.5	448	94.5	1450	1700	**1FW3152-1■P■2-■AA0**
		25.4 (34.1)	300 (221)	47.5	444	94.5	1420	1700	**1FW3154-1■P■2-■AA0**
		33.9 (45.5)	400 (295)	64	432	94.5	1450	1700	**1FW3155-1■P■2-■AA0**
		42.4 (56.9)	500 (369)	76	448	94.5	1380	1700	**1FW3156-1■P■2-■AA0**

For versions, see Order No. supplement and options.

Further rated speeds on request.

Motor type (repeated)	Static torque	Static current	Efficiency[3]	Moment of inertia	Weight, approx.	Terminal box	SINAMICS S120 Motor Module	
							Rated output current[4]	For additional versions and components see chapter SINAMICS S120 drive system
	M_0 at ΔT=100 K	I_0 at ΔT=100 K	η	J	m		I_{rated}	
	Nm (lb_f-ft)	A		kgm^2 (lb_f-in-s^2)	kg (lb)	Type	A	Order No.
1FW3281-3.J.3-....	2500 (1844)	200	0.96	3.78 (33.5)	600 (1323)	1XB7700	200	**6SL312■-1TE32-0AA3**
1FW3283-3.J.3-....	3500 (2582)	292	0.96	4.64 (41.1)	690 (1521)	1XB7700	310	**6SL3320-1TE33-1AA3**
1FW3285-3.J.3-....	5000 (3688)	400	0.96	5.98 (52.9)	860 (1896)	1XB7700	380	**6SL3320-1TE33-8AA3**
1FW3287-3.J.3-....	7000 (5163)	534	0.97	7.81 (69.1)	1030 (2271)	1XB7712	502[5]	**6SL3320-1TE36-1AA3**
1FW3150-1.L.2-....	105 (77.4)	11.5	0.90	0.12 (1.06)	87 (192)	gk230	18	**6SL312■-1TE21-8AA3**
1FW3152-1.L.2-....	210 (155)	22.5	0.92	0.16 (1.42)	108 (238)	gk230	30	**6SL312■-1TE23-0AA3**
1FW3154-1.L.2-....	315 (232)	33	0.93	0.20 (1.77)	129 (284)	gk230	45	**6SL312■-1TE24-5AA3**
1FW3155-1.L.2-....	420 (310)	45	0.94	0.24 (2.12)	150 (331)	gk230	45	**6SL312■-1TE24-5AA3**
1FW3156-1.L.2-....	525 (387)	55	0.94	0.28 (2.48)	171 (377)	gk420	60	**6SL312■-1TE26-0AA3**
1FW3201-1.E.2-....	315 (232)	13	0.91	0.22 (1.95)	127 (280)	gk230	18	**6SL312■-1TE21-8AA3**
1FW3202-1.E.2-....	525 (387)	22	0.93	0.36 (3.19)	156 (344)	gk230	30	**6SL312■-1TE23-0AA3**
1FW3203-1.E.2-....	790 (583)	32	0.94	0.49 (4.34)	182 (401)	gk230	45	**6SL312■-1TE24-5AA3**
1FW3204-1.E.2-....	1050 (774)	42	0.94	0.70 (6.20)	223 (492)	gk230	45	**6SL312■-1TE24-5AA3**
1FW3206-1.E.2-....	1575 (1162)	68	0.94	0.97 (8.59)	279 (615)	gk420	85	**6SL312■-1TE28-5AA3**
1FW3208-1.E.2-....	2100 (1549)	88	0.94	1.31 (11.6)	348 (767)	gk420	85	**6SL312■-1TE28-5AA3**
1FW3281-3.M.3-....	2500 (1844)	291	0.96	3.78 (33.5)	600 (1323)	1XB7700	260	**6SL3320-1TE32-6AA3**
1FW3283-3.M.3-....	3500 (2582)	402	0.96	4.64 (41.1)	690 (1521)	1XB7700	380	**6SL3320-1TE33-8AA3**
1FW3285-3.M.3-....	5000 (3688)	532	0.97	5.98 (52.9)	860 (1896)	1XB7712	490	**6SL3320-1TE35-0AA3**
1FW3287-3.M.3-....	6850 (5053)	787	0.97	7.81 (69.1)	1030 (2271)	1XB7712	734[5]	**6SL3320-1TE38-4AA3**
1FW3150-1.P.2-....	105 (77.4)	17.5	0.90	0.12 (1.06)	87 (192)	gk230	30	**6SL312■-1TE23-0AA3**
1FW3152-1.P.2-....	210 (155)	33.5	0.93	0.16 (1.42)	108 (238)	gk230	45	**6SL312■-1TE24-5AA3**
1FW3154-1.P.2-....	315 (232)	49	0.93	0.20 (1.77)	129 (284)	gk230	60	**6SL312■-1TE26-0AA3**
1FW3155-1.P.2-....	420 (310)	67	0.94	0.24 (2.12)	150 (331)	gk420	85	**6SL312■-1TE28-5AA3**
1FW3156-1.P.2-....	525 (387)	80	0.94	0.28 (2.48)	171 (377)	gk420	85	**6SL312■-1TE28-5AA3**

Format:	
Booksize	**1**
Chassis	**3**
Cooling:	
Internal air cooling	**0**
External air cooling	**1**
Motor Module:	
Single Motor Module	**1**

1) Maximum permissible operating speed based on the induced voltage in the motor and the voltage strength of the converter (without protective circuit).
2) Maximum speed which must not be exceeded.
3) Optimum efficiency in continuous duty.
4) Compliance with the rated pulse frequencies is essential; the rated motor data is valid for 4 kHz or 2 kHz.
5) The rated output current of the Motor Module is lower than the rated motor current at 2 kHz.

1FW3 complete torque motors
Water cooling

Order No. supplement

Data position of the Order No.	1	2	3	4	5	6	7	-	8	9	10	11	12	-	13	14	15	16	-	Z
Shaft height 150	**1**	**F**	**W**	**3**	**1**	**5**	**.**	**–**	**1**	■	**.**	■	**2**	**–**	■	**A**	**A**	**0**	**–**	**Z**
Shaft height 200	**1**	**F**	**W**	**3**	**2**	**0**	**.**	**–**	**1**	■	**.**	■	**2**	**–**	■	**A**	**A**	**0**	**–**	**Z**
Shaft height 280	**1**	**F**	**W**	**3**	**2**	**8**	**.**	**–**	**.**	■	**.**	■	**3**	**–**	■	**A**	**A**	**0**	**–**	**Z**
Construction length[1]							**.**													
High Torque (1FW315/1FW320)									**1**											
High Torque (1FW328)									**2**											
High Speed (1FW328)									**3**											

Encoder systems for motors without DRIVE-CLiQ interface	**Mounting**							
Without encoder	Coaxial mounted	**W**		**6**				
Incremental encoder sin/cos 1 V_{pp} 2048 S/R with C and D tracks (encoder IC2048S/R)	Belt-mounted	**A**		**7**				
Absolute encoder 2048 S/R, 4096 revolutions, multi-turn (encoder AM2048S/R)	Coaxial mounted	**E**		**6**				
Absolute encoder 2048 S/R, 4096 revolutions, multi-turn (encoder AM2048S/R)	Belt-mounted	**E**		**7**				
Absolute encoder 2048 S/R (encoder AS2048S/R)	Coaxial mounted	**N**		**6**				
Resolver, multi-pole (number of pole pairs corresponds to number of pole pairs of the motor)	Belt-mounted	**S**		**7**				
Encoder systems for motors with DRIVE-CLiQ interface	**Mounting**							
Incremental encoder 22 bit (resolution 4194304, internal 2048 S/R) + commutating position 11 bit (encoder IC22DQ)	Belt-mounted	**D**		**7**				
Absolute encoder 22 bit (resolution 4194304, internal 2048 S/R) +12 bit multi-turn (traversing range 4096 revolutions) (encoder AM22DQ)	Coaxial mounted	**F**		**6**				
Absolute encoder 22 bit (resolution 4194304, internal 2048 S/R) +12 bit multi-turn (traversing range 4096 revolutions) (encoder AM22DQ)	Belt-mounted	**F**		**7**				
Absolute encoder, 22 bit (resolution 4194304, internal 2048 S/R) (encoder AS22DQ)	Coaxial mounted	**P**		**6**				
Resolver 15 bit (resolution 32768, internal, multi-pole) (resolver R15DQ)	Belt-mounted	**U**		**7**				

Rated speeds at 380 to 480 V 3 AC (winding design)								
140 rpm/150 rpm/160 rpm			**E**					
220 rpm/250 rpm/270 rpm			**G**					
270 rpm/300 rpm/330 rpm			**H**					
350 rpm/400 rpm/430 rpm			**J**					
450 rpm/500 rpm/550 rpm			**L**					
520 rpm/600 rpm/650 rpm			**M**					
670 rpm/750 rpm/810 rpm			**P**					
Type of construction								
IM B14 for 1FW315/1FW320				**2**				
IM B35 for 1FW328				**3**				

Power connection (view of DE)	**Cable outlet**							
Terminal box top	Transverse right				**5**			
Terminal box top	Transverse left				**6**			
Terminal box top	NDE				**7**			
Terminal box top	DE				**8**			
Special version (order codes are required for options)							**–**	**Z**

[1] Not selectable. Determined by the choice of rated power.

Options

Order code	Description
A11	Motor protection by PTC thermistor (3 × PTC)
K40	Regreasing system
T20	Shaft cover at NDE (not required with coaxial mounted encoder)
X01	Paint: Jet black, matte RAL 9005
X02	Paint: Cream white RAL 9001
X03	Paint: Reseda green RAL 6011
X04	Paint: Pebble gray RAL 7032
X05	Paint: Sky blue RAL 5015
X06	Paint: Light ivory RAL 1015

When ordering a motor with options, **-Z** should be added to the order number.

Example:
1FW3150-1AH72-5AA0-**Z**
A11+**X05**

Terminal box assignment, max. connectable cable cross-sections

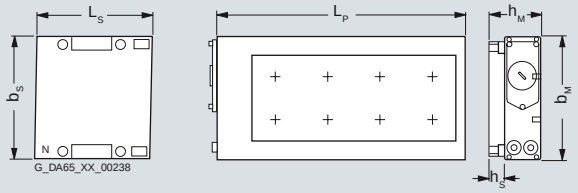
Terminal box	Cable entry		Outer cable diameter, max.[1]	Number of main terminals	Cross-section per terminal, max.	Rated current max.[2]
Type	Power	External signals	mm (in)		mm^2	A
gk230	2 × M32 × 1.5	1 × M16 × 1.5[3]	16 (0.63)	Phases: 3 × M5 Grounding: 1 × M4	2 × 16	50
gk420	2 × M40 × 1.5	1 × M16 × 1.5[3]	35 (1.38)	Phases: 3 × M10 Grounding: 1 × M6	2 × 35	105
gk630	2 × M50 × 1.5	1 × M16 × 1.5[3]	50 (1.97)	Phases: 3 × M10 Grounding: 1 × M10	2 × 50	260
1XB7700	3 × M75 × 1.5	2 × M16 × 1.5[3]	120 (4.72)	Phases: 3 × M12 Grounding: 1 × M12	3 × 120	450
1XB7712	4 × M75 × 1.5	4 × PG 13.5 1 × M20 × 1.5 1 × M25 × 1.5[3]	120 (4.72)	Phases: 3 × M16 Grounding: 1 × M16	4 × 120	800

[1] Dependent on the design of the metric gland.
[2] Current-carrying capacity based on EN 60204-1 and IEC 60364-5-52 for installation type C.
[3] Only in conjunction with option A11 or with W in 9th data position (without encoder).

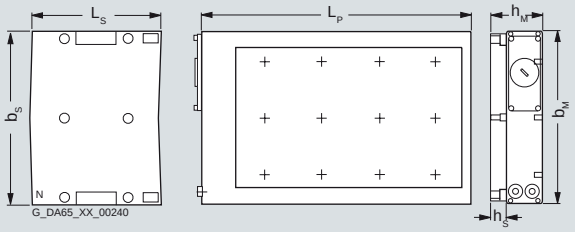
1FN3 linear motors
Version for peak load – water cooling

Dimensional drawings

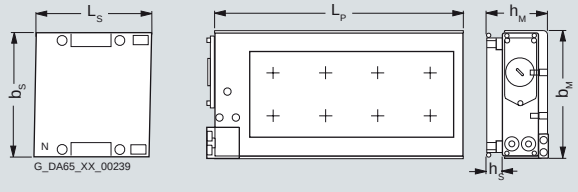
Primary section	Dimensions in mm (inches)					Secondary section	Dimensions in mm (inches)				
	Without precision cooling		With precision cooling		Primary section length		Without precision cooling		With precision cooling and cover		Secondary section length
Type	b_M	h_M	b_M	h_M	L_P	Type	b_S	h_S	b_S	h_S	L_S
1FN3, version for peak load – water cooling											
1FN3050-2W	67 (2.64)	48.5 (1.91)	76 (2.99)	63.4 (2.50)	255 (10.04)	1FN3050-4SA00-0AA0	58 (2.28)	11.8 (0.46)	75 (2.95)	14.8 (0.58)	120 (4.72)
1FN3100-1W	96 (3.78)	48.5 (1.91)	–	–	150 (5.91)	1FN3100-4SA00-0AA0	88 (3.46)	11.8 (0.46)	105 (4.13)	14.8 (0.58)	120 (4.72)
1FN3100-2W			105 (4.13)	63.4 (2.50)	255 (10.04)						
1FN3100-3W					360 (14.17)						
1FN3100-4W					465 (18.31)						
1FN3100-5W					570 (22.44)						
1FN3150-1W	126 (4.96)	50.5 (1.99)	–	–	150 (5.91)	1FN3150-4SA00-0AA0	118 (4.65)	13.8 (0.54)	135 (5.31)	16.8 (0.66)	120 (4.72)
1FN3150-2W			135 (5.31)	65.4 (2.57)	255 (10.04)						
1FN3150-3W					360 (14.17)						
1FN3150-4W					465 (18.31)						
1FN3150-5W					570 (22.44)						
1FN3300-1W	141 (5.55)	64.1 (2.52)	–	–	221 (8.70)	1FN3300-4SA00-0AA0	134 (5.28)	16.5 (0.65)	151 (5.94)	19.5 (0.77)	184 (7.24)
1FN3300-2W			150 (5.91)	79 (3.11)	382 (15.04)						
1FN3300-3W					543 (21.38)						
1FN3300-4W					704 (27.72)						
1FN3450-2W	188 (7.40)	66.1 (2.60)	197 (7.76)	81 (3.19)	382 (15.04)	1FN3450-4SA00-0AA0	180 (7.09)	18.5 (0.73)	197 (7.76)	21.5 (0.85)	184 (7.24)
1FN3450-3W					543 (21.38)						
1FN3450-4W					704 (27.72)						
1FN3600-2W	248 (9.76)	64.1 (2.52)	257 (10.12)	86 (3.39)	382 (15.04)	1FN3600-4SA00-0AA0	240 (9.45)	16.5 (0.65)	247 (9.72)	26.5 (1.04)	184 (7.24)
1FN3600-3W					543 (21.38)						
1FN3600-4W					704 (27.72)						
1FN3900-2W	342 (13.46)	66.1 (2.60)	351 (13.82)	88 (3.46)	382 (15.04)	1FN3900-4SA00-0AA0	334 (13.15)	18.5 (0.73)	341 (13.43)	28.5 (1.12)	184 (7.24)
1FN3900-3W					543 (21.38)						
1FN3900-4W					704 (27.72)						



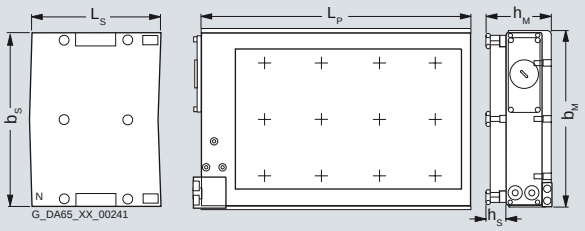
1FN3050 to 1FN3450 without precision cooling



1FN3600 to 1FN3900 without precision cooling
Note: 4-row drill pattern with 1FN3900 for fixing the primary section



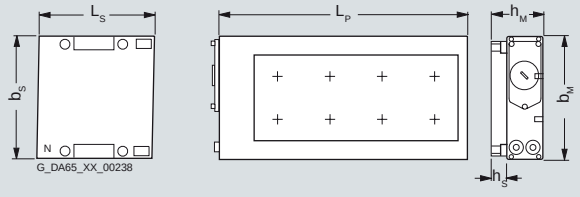
1FN3050 to 1FN3450 with precision cooling



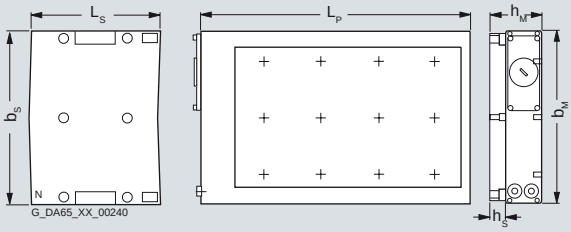
1FN3600 to 1FN3900 with precision cooling
Note: 4-row drill pattern with 1FN3900 for fixing the primary section

Dimensional drawings

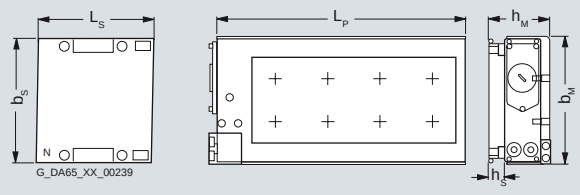
Primary section	Dimensions in mm (inches)					Secondary section	Dimensions in mm (inches)				
	Without precision cooling		With precision cooling		Primary section length		Without precision cooling		With precision cooling		Secondary section length
Type	b_M	h_M	b_M	h_M	L_P	Type	b_S	h_S	b_M	h_M	L_S
1FN3, version for continuous load – water cooling											
1FN3050-1ND	67 (2.64)	59.4 (2.34)	76 (2.99)	74.3 (2.93)	162 (6.38)	1FN3050-4SA00-0AA0	58 (2.28)	11.8 (0.46)	75 (2.95)	14.8 (0.58)	120 (4.72)
1FN3050-2NB					267 (10.51)						
1FN3100-1NC	96 (3.78)	59.4 (2.34)	105 (4.13)	74.3 (2.93)	162 (6.38)	1FN3100-4SA00-0AA0	88 (3.46)	11.8 (0.46)	105 (4.13)	14.8 (0.58)	120 (4.72)
1FN3100-2NC					267 (10.51)						
1FN3100-3NC					372 (14.65)						
1FN3100-4NC					477 (18.78)						
1FN3150-1NC	126 (4.96)	61.4 (2.42)	135 (5.31)	76.3 (3.00)	162 (6.38)	1FN3150-4SA00-0AA0	118 (4.65)	13.8 (0.54)	135 (5.31)	16.8 (0.66)	120 (4.72)
1FN3150-2NB					267 (10.51)						
1FN3150-3NC					372 (14.65)						
1FN3150-4NB					477 (18.78)						
1FN3300-1NC	141 (5.55)	78 (3.07)	150 (5.91)	92.9 (3.66)	238 (9.37)	1FN3300-4SA00-0AA0	134 (5.28)	16.5 (0.65)	151 (5.94)	19.5 (0.77)	184 (7.24)
1FN3300-2NC					399 (15.71)						
1FN3300-3NC					560 (22.05)						
1FN3300-4NB					721 (28.39)						
1FN3450-2NC	188 (7.40)	80 (3.15)	197 (7.76)	94.9 (3.74)	399 (15.71)	1FN3450-4SA00-0AA0	180 (7.09)	18.5 (0.73)	197 (7.76)	21.5 (0.85)	184 (7.24)
1FN3450-3NC					560 (22.05)						
1FN3450-4NB					721 (28.39)						
1FN3600-2NB	248 (9.76)	78 (3.07)	257 (10.12)	99.9 (3.93)	399 (15.71)	1FN3600-4SA00-0AA0	240 (9.45)	16.5 (0.65)	247 (9.72)	26.5 (1.04)	184 (7.24)
1FN3600-3NB					560 (22.05)						
1FN3600-4NB					721 (28.39)						
1FN3900-2NB	342 (13.46)	80 (3.15)	351 (13.82)	101.9 (4.01)	399 (15.71)	1FN3900-4SA00-0AA0	334 (13.15)	18.5 (0.73)	341 (13.43)	28.5 (1.12)	184 (7.24)
1FN3900-3NB					560 (22.05)						
1FN3900-4NB					721 (28.39)						



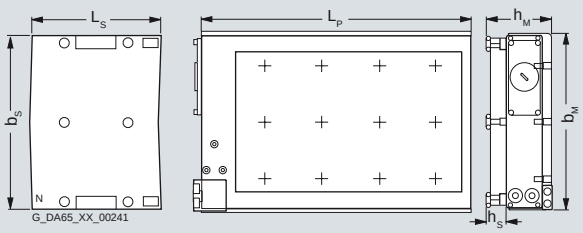
1FN3050 to 1FN3450 without precision cooling



1FN3600 to 1FN3900 without precision cooling
Note: 4-row drill pattern with 1FN3900 for fixing the primary section



1FN3050 to 1FN3450 with precision cooling

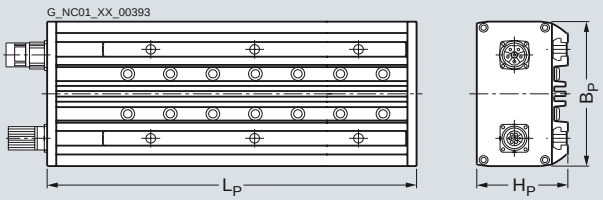


1FN3600 to 1FN3900 with precision cooling
Note: 4-row drill pattern with 1FN3900 for fixing the primary section

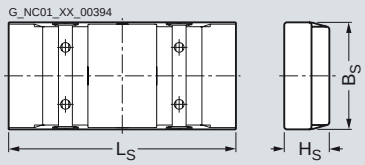
1FN6 linear motors
Natural cooling

Dimensional drawings

Primary section	Dimensions in mm (inches)			Secondary section	Dimensions in mm (inches)		
			Primary section length				Secondary section length
Type	B_P	H_P	L_P	Type	B_S	H_S	L_S
1FN6, natural cooling							
1FN6003-1LC	80 (3.15)	49.4 (1.94)	203 (7.99)	1FN6003-1SC00-0AA0 1FN6003-1SF00-0AA0	75 (2.95)	20 (0.79)	200 (7.87) 500 (19.69)
1FN6003-1LE			328 (12.91)				
1FN6003-1LG			453 (17.83)				
1FN6003-1LJ			578 (22.76)				
1FN6003-1LL			703 (27.68)				
1FN6003-1LN			828 (32.60)				
1FN6007-1LC	115 (4.53)	55.4 (2.18)	203 (7.99)	1FN6007-1SC00-0AA0 1FN6007-1SF00-0AA0	110 (4.33)	26 (1.02)	200 (7.87) 500 (19.69)
1FN6007-1LE			328 (12.91)				
1FN6007-1LG			453 (17.83)				
1FN6007-1LJ			578 (22.76)				
1FN6007-1LL			703 (27.68)				
1FN6007-1LN			828 (32.60)				
1FN6008-1LC	130 (5.12)	80.4 (3.17)	392 (15.43)	1FN6008-1SC00-0AA0	90 (3.54)	40 (1.57)	200 (7.87)
1FN6008-1LE			642 (25.28)				
1FN6008-1LG			892 (35.12)				
1FN6016-1LC	209 (8.23)	80.4 (3.17)	392 (15.43)	1FN6016-1SC00-0AA0	170 (6.69)	40 (1.57)	200 (7.87)
1FN6016-1LE			642 (25.28)				
1FN6016-1LG			892 (35.12)				
1FN6024-1LC	289 (11.38)	80.4 (3.17)	392 (15.43)	1FN6024-1SC00-0AA0	250 (9.84)	40 (1.57)	200 (7.87)
1FN6024-1LE			642 (25.28)				
1FN6024-1LG			892 (35.12)				



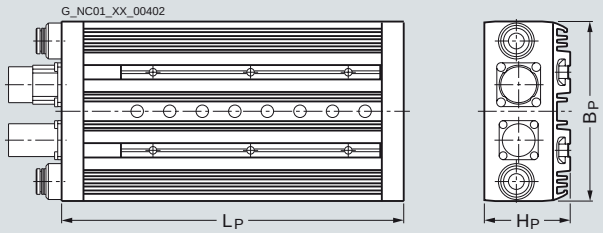
Primary section 1FN6



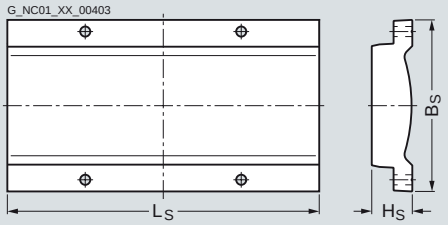
Secondary section 1FN6

Dimensional drawings

Primary section	Dimensions in mm (inches)			Secondary section	Dimensions in mm (inches)		
			Primary section length				Secondary section length
Type	B_P	H_P	L_P	Type	B_S	H_S	L_S
1FN6, water cooling							
1FN6003-1WC	80 (3.15)	49.4 (1.94)	219 (8.62)	1FN6003-1SC00-0AA0 1FN6003-1SF00-0AA0	75 (2.95)	20 (0.79)	200 (7.87) 500 (19.69)
1FN6003-1WE			344 (13.54)				
1FN6003-1WG			469 (18.46)				
1FN6003-1WJ			594 (23.39)				
1FN6003-1WL			719 (28.31)				
1FN6003-1WN			844 (33.23)				
1FN6007-1WC	115 (4.53)	55.4 (2.18)	219 (8.62)	1FN6007-1SC00-0AA0 1FN6007-1SF00-0AA0	110 (4.33)	26 (1.02)	200 (7.87) 500 (19.69)
1FN6007-1WE			344 (13.54)				
1FN6007-1WG			469 (18,46)				
1FN6007-1WJ			594 (23,39)				
1FN6007-1WL			719 (28,31)				
1FN6007-1WN			844 (33,23)				



Primary section 1FN6



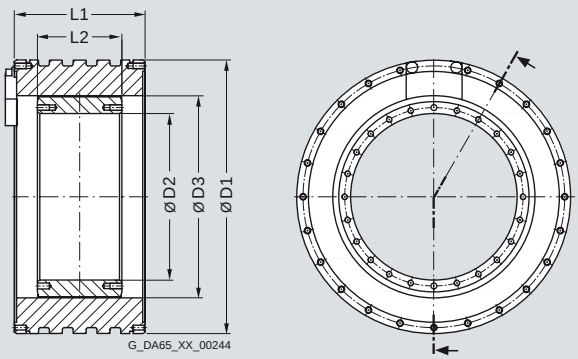
Secondary section 1FN6

1FW6 built-in torque motors
Water cooling

Dimensional drawings

For motor Type	Dimensions in mm (inches) D_1	D_2	D_3	L_1	L_2
1FW6, individual components, water cooling					
1FW6090-0.B05	230 (9.06)	140 (5.51)	170 (6.69)	90 (3.54)	51 (2.01)
1FW6090-0.B07				110 (4.33)	71 (2.80)
1FW6090-0.B10				140 (5.51)	101 (3.98)
1FW6090-0.B15				190 (7.48)	151 (5.94)
1FW6130-0.B05	310 (12.20)	220 (8.66)	254 (10.00)	90 (3.54)	51 (2.01)
1FW6130-0.B07				110 (4.33)	71 (2.80)
1FW6130-0.B10				140 (5.51)	101 (3.98)
1FW6130-0.B15				190 (7.48)	151 (5.94)
1FW6150-0.B05	385 (15.16)	265 (10.43)	300 (11.81)	110 (4.33)	51 (2.01)
1FW6150-0.B07				130 (5.12)	71 (2.80)
1FW6150-0.B10				160 (6.30)	101 (3.98)
1FW6150-0.B15				210 (8.27)	151 (5.94)

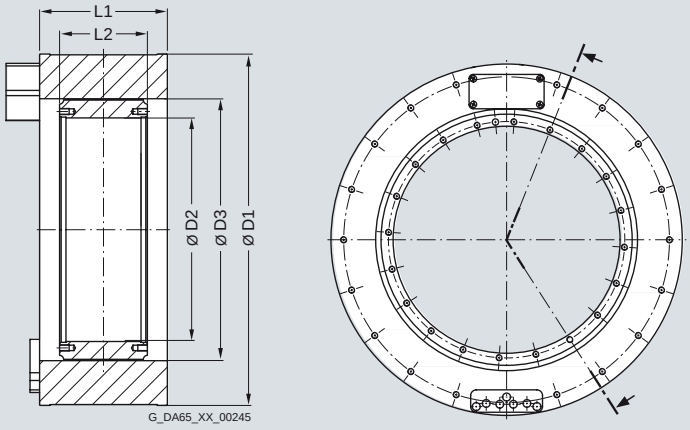
1FW6090
1FW6130
1FW6150



Dimensional drawings

For motor Type	Dimensions in mm (inches) D_1	D_2	D_3	L_1	L_2
1FW6, individual components, water cooling					
1FW6160-0.B05	440 (17.32)	280 (11.02)	328 (12.91)	110 (4.33)	60 (2.36)
1FW6160-0.B07				130 (5.12)	80 (3.15)
1FW6160-0.B10-.J.2/-5G.2/-8FB2				160 (6.30)	110 (4.33)
1FW6160-0.B10-2PB2				170 (6.69)	110 (4.33)
1FW6160-0.B15-2J.2/-5G.2/-8FB2				210 (8.27)	160 (6.30)
1FW6160-0.B15-2PB2/-0WB2				220 (8.66)	160 (6.30)
1FW6160-0.B20-5G.2/-8FB2				260 (10.24)	210 (8.27)
1FW6160-0.B20-2PB2/-0WB2				270 (10.63)	210 (8.27)
1FW6190-0.B05	502 (19.76)	342 (13.46)	389 (15.31)	110 (4.33)	60 (2.36)
1FW6190-0.B07				130 (5.12)	80 (3.15)
1FW6190-0.B10-.J.2/-5G.2/-8FB2				160 (6.30)	110 (4.33)
1FW6190-0.B10-2PB2				170 (6.69)	110 (4.33)
1FW6190-0.B15-2J.2/-5G.2/-8FB2				210 (8.27)	160 (6.30)
1FW6190-0.B15-2PB2/-0WB2				220 (8.66)	160 (6.30)
1FW6190-0.B20-5G.2/-8FB2				260 (10.24)	210 (8.27)
1FW6190-0.B20-2PB2/-0WB2				270 (10.63)	210 (8.27)
1FW6230-0.B05	576 (22.68)	416 (16.38)	463 (18.23)	110 (4.33)	60 (2.36)
1FW6230-0.B07				130 (5.12)	80 (3.15)
1FW6230-0.B10				160 (6.30)	110 (4.33)
1FW6230-0.B15-4C.2/-5G.2/-8FB2/-2PB2				210 (8.27)	160 (6.30)
1FW6230-0.B15-0WB2				220 (8.66)	160 (6.30)
1FW6230-0.B20-5G.2/-8FB2/-2PB2				260 (10.24)	210 (8.27)
1FW6230-0.B20-0WB2				270 (10.63)	210 (8.27)
1FW6290-0.B07-5G.2/-0LB2	730 (28.74)	520 (20.47)	580 (22.83)	140 (5.51)	90 (3.54)
1FW6290-0.B07-2PB2				160 (6.30)	90 (3.54)
1FW6290-0.B11-7A.2/-0LB2				180 (7.09)	130 (5.12)
1FW6290-0.B11-2PB2				200 (7.87)	130 (5.12)
1FW6290-0.B15-7A.2/-0LB2				220 (8.66)	170 (6.69)
1FW6290-0.B15-2PB2				240 (9.45)	170 (6.69)
1FW6290-0.B20-0LB2				260 (10.24)	210 (8.27)
1FW6290-0.B20-2PB2				280 (11.02)	210 (8.27)

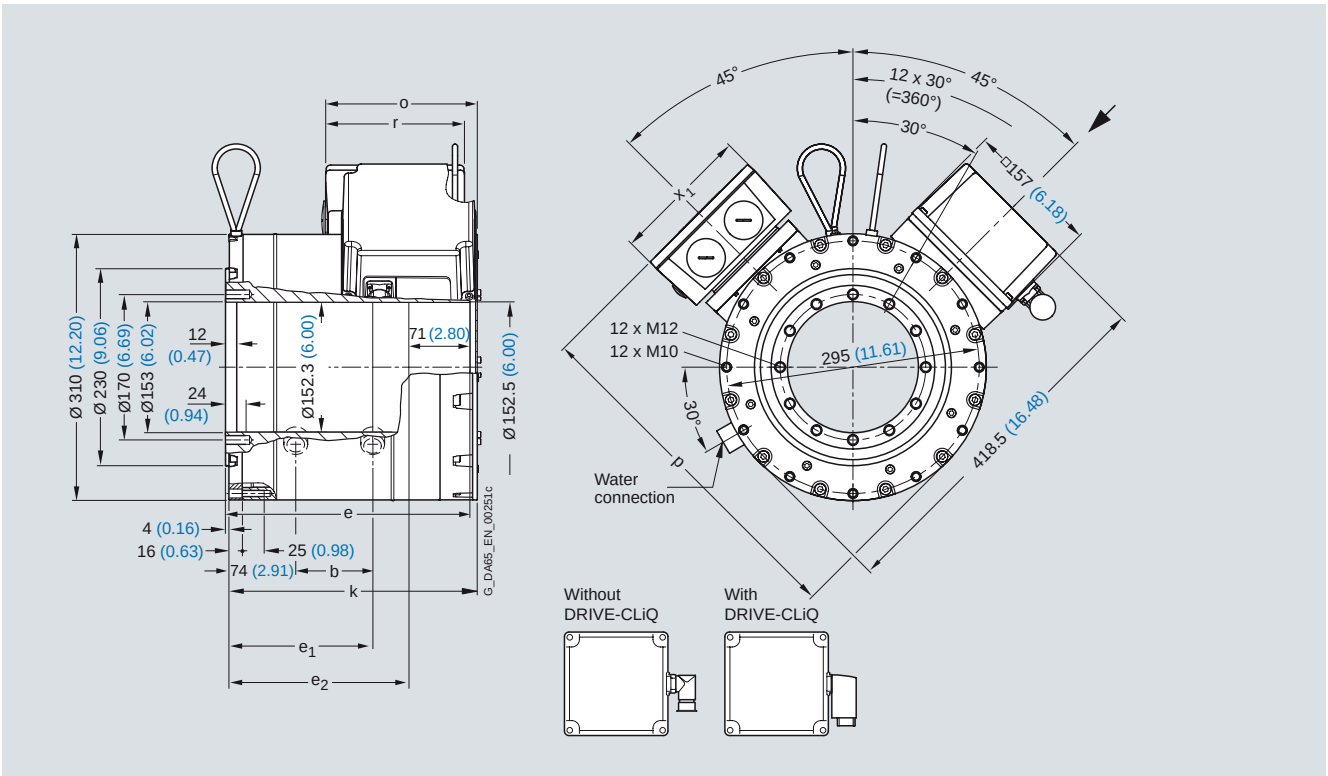
1FW6160
1FW6190
1FW6230
1FW6290



1FW3 complete torque motors with/without DRIVE-CLiQ – Water cooling

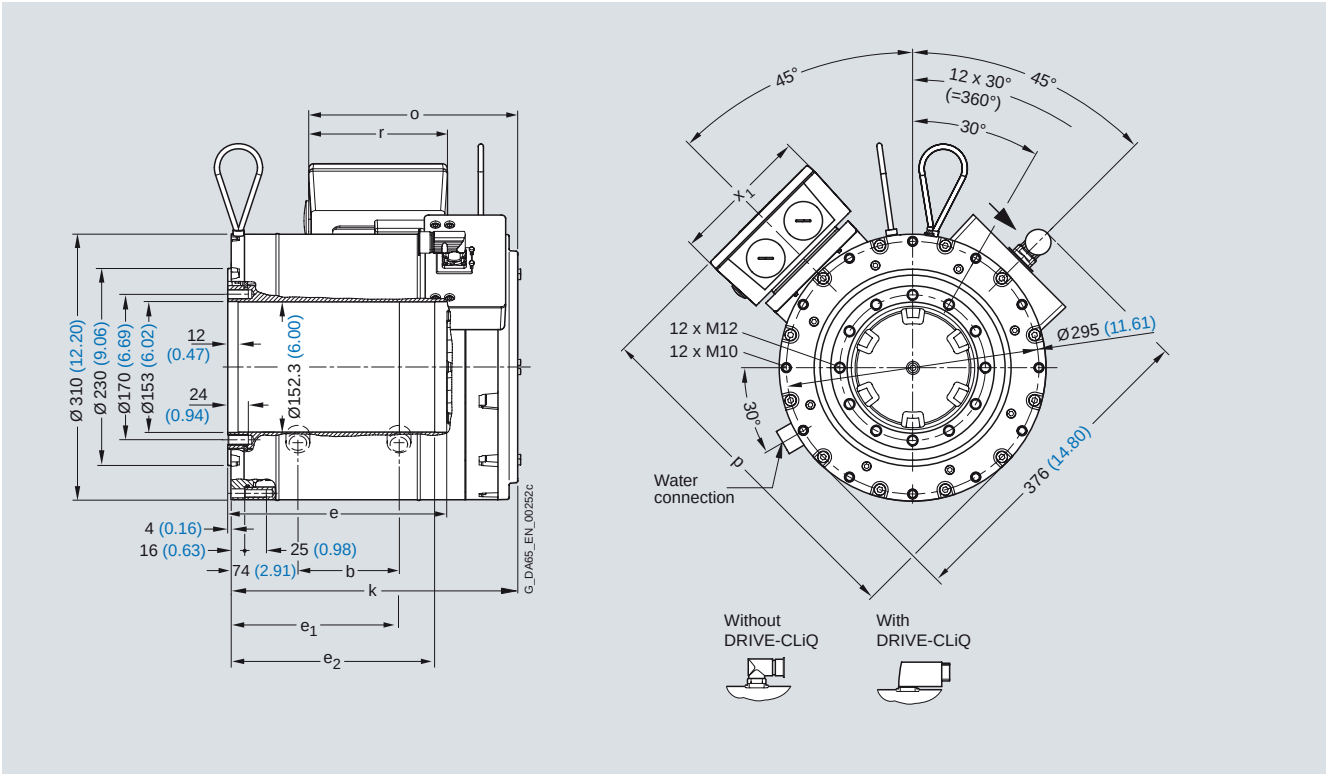
Dimensional drawings

For motor		Dimensions in mm (inches)																	
								Terminal box gk230				Terminal box gk420				Terminal box gk630			
Shaft height	Type	DIN IEC	b –	e –	e_1 –	e_2 –	k L	o –	p HD	r LL	x_1 AG	o –	p HD	r LL	x_1 AG	o –	p HD	r LL	x_1 AG
1FW3, type of construction IM B14, water cooling, with terminal box, belt-mounted encoder																			
150	1FW3150		68 (2.68)	256 (10.08)	141 (5.55)	185 (7.28)	263 (10.35)	162 (6.38)	393 (15.47)	122 (4.80)	117 (4.61)	179.5 (7.07)	410 (16.14)	162 (6.38)	162 (6.38)	228 (8.98)	427 (16.81)	210 (8.27)	210 (8.27)
	1FW3152		125 (4.92)	313 (12.32)	198 (7.80)	242 (9.53)	320 (12.60)												
	1FW3154		174 (6.85)	362 (14.25)	247 (9.72)	291 (11.46)	369 (14.53)												
	1FW3155		226 (8.90)	414 (16.30)	299 (11.77)	343 (13.50)	421 (16.57)												
	1FW3156		279 (10.98)	467 (18.39)	352 (13.86)	396 (15.59)	474 (18.66)												



Dimensional drawings

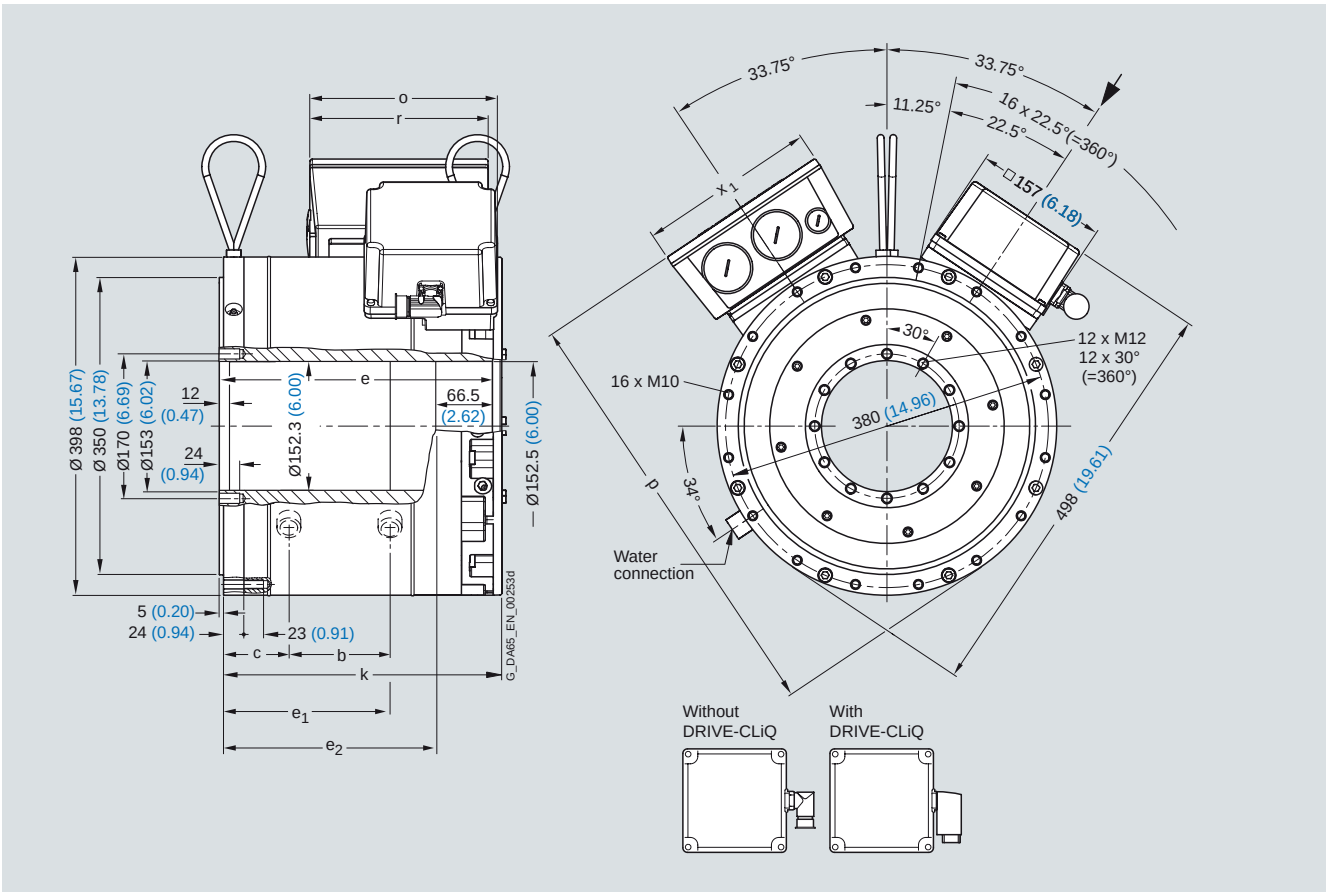
For motor		Dimensions in mm (inches)																	
							Terminal box gk230					Terminal box gk420				Terminal box gk630			
Shaft height	Type	DIN IEC	b –	e –	e_1 –	e_2 –	k L	o –	p HD	r LL	x_1 AG	o –	p HD	r LL	x_1 AG	o –	p HD	r LL	x_1 AG
1FW3, type of construction IM B14, water cooling, with terminal box, coaxial mounted encoder																			
150	1FW3150		68 (2.68)	199 (7.83)	141 (5.55)	185 (7.28)	277.5 (10.93)	177 (6.97)	393 (15.47)	122 (4.80)	117 (4.61)	194 (7.64)	410 (16.14)	162 (6.38)	162 (6.38)	243 (9.57)	427 (16.81)	210 (8.27)	210 (8.27)
	1FW3152		125 (4.92)	256 (10.08)	198 (7.80)	242 (9.53)	334.5 (13.17)												
	1FW3154		174 (6.85)	305 (12.01)	247 (9.72)	291 (11.46)	383.5 (15.10)												
	1FW3155		226 (8.90)	357 (14.06)	299 (11.77)	343 (13.50)	435.5 (17.15)												
	1FW3156		279 (10.98)	410 (16.14)	352 (13.86)	396 (15.59)	488.5 (19.23)												



1FW3 complete torque motors with/without DRIVE-CLiQ – Water cooling

Dimensional drawings

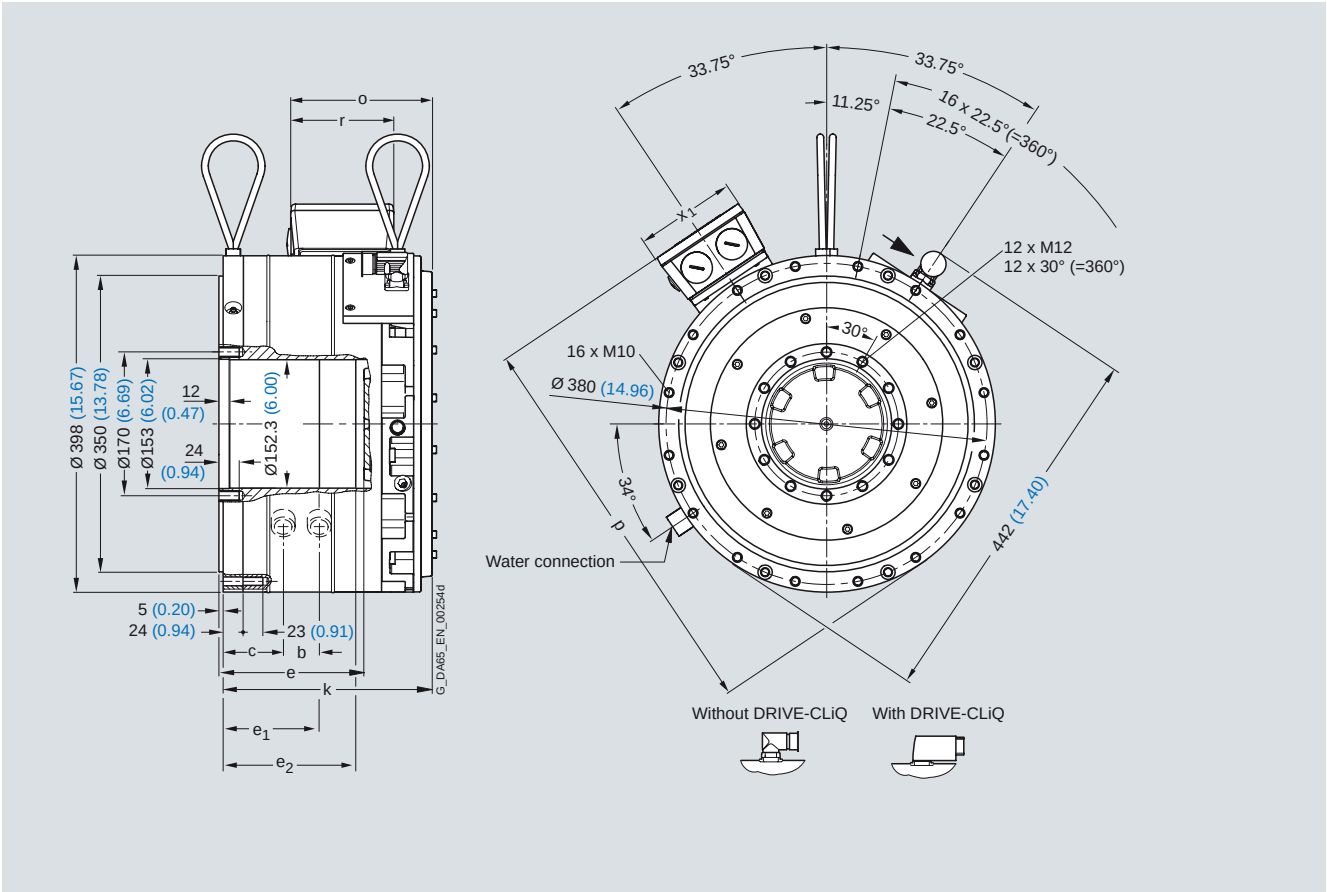
For motor		Dimensions in mm (inches)																		
								Terminal box gk230					Terminal box gk420				Terminal box gk630			
Shaft height	Type	DIN IEC	b –	c C	e –	e_1 –	e_2 –	k L	o –	p HD	r LL	x_1 AG	o –	p HD	r LL	x_1 AG	o –	p HD	r LL	x_1 AG
1FW3, type of construction IM B14, water cooling, with terminal box, belt-mounted encoder																				
200	1FW3201		48.5 (1.91)	67.5 (2.66)	229 (9.02)	120 (4.72)	162.5 (6.40)	235.5 (9.27)	158 (6.22)	474 (18.66)	122 (4.80)	117 (4.61)	175 (6.89)	490 (19.29)	162 (6.38)	162 (6.38)	226 (8.90)	508 (20.00)	210 (8.27)	210 (8.27)
	1FW3202		94.5 (3.72)	67.5 (2.66)	275 (10.83)	166 (6.54)	208.5 (8.21)	281.5 (11.08)												
	1FW3203		137 (5.39)	69.5 (2.74)	321.5 (12.66)	212 (8.35)	255 (10.04)	328 (12.91)												
	1FW3204		206 (8.11)	69.5 (2.74)	390.5 (15.37)	281 (11.06)	324 (12.76)	397 (15.63)												
	1FW3206		298.5 (11.75)	69.5 (2.74)	483 (19.02)	374 (14.72)	416.5 (16.40)	489.5 (19.27)												
	1FW3208		413.5 (16.28)	69.5 (2.74)	598 (23.54)	489 (19.25)	531.5 (20.93)	604.5 (23.80)												



Dimensional drawings

For motor — Dimensions in mm (inches)

Shaft height	Type	DIN IEC	b –	c C	e –	e_1 –	e_2 –	k L	Terminal box gk230 o –	p HD	r LL	x_1 AG	Terminal box gk420 o –	p HD	r LL	x_1 AG	Terminal box gk630 o –	p HD	r LL	x_1 AG
1FW3, type of construction IM B14, water cooling, with terminal box, coaxial mounted encoder																				
200	1FW3201		48.5 (1.91)	67.5 (2.66)	172 (6.77)	120 (4.72)	162.5 (6.40)	247.5 (9.74)	170.5 (6.71)	474 (18.66)	122 (4.80)	117 (4.61)	188 (7.40)	490 (19.29)	162 (6.38)	162 (6.38)	239 (9.41)	508 (20.00)	210 (8.27)	210 (8.27)
	1FW3202		94.5 (3.72)	67.5 (2.66)	218 (8.58)	166 (6.54)	208.5 (8.21)	293.5 (11.56)												
	1FW3203		137 (5.39)	69.5 (2.74)	264.5 (10.41)	212 (8.35)	255 (10.04)	340 (13.39)												
	1FW3204		206 (8.11)	69.5 (2.74)	333.5 (13.13)	281 (11.06)	324 (12.76)	409 (16.10)												
	1FW3206		298.5 (11.75)	69.5 (2.74)	426 (16.77)	374 (14.72)	416.5 (16.40)	501.5 (19.74)												
	1FW3208		413.5 (16.28)	69.5 (2.74)	541 (21.30)	489 (19.25)	531.5 (20.93)	616.5 (24.27)												

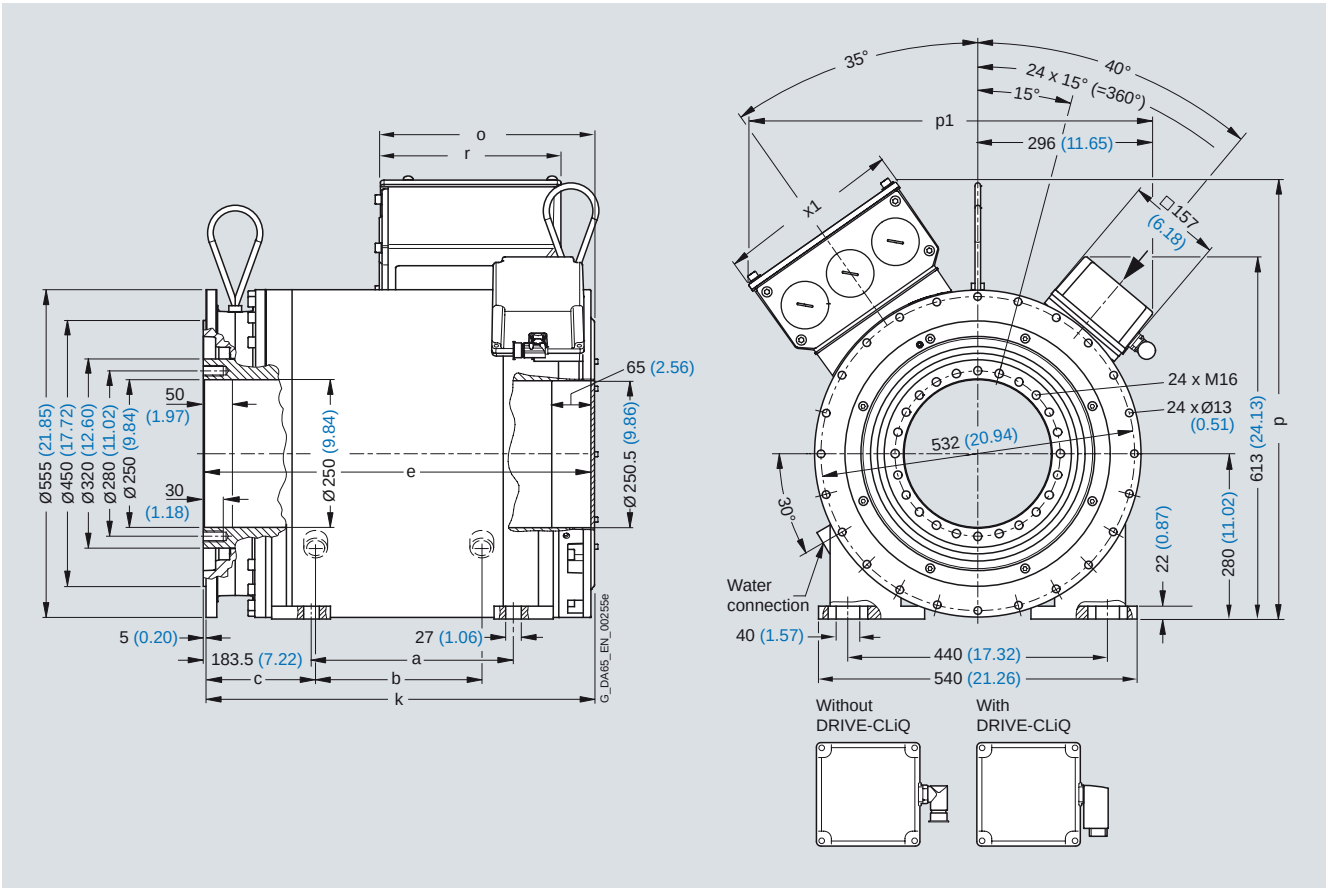


6

1FW3 complete torque motors with/without DRIVE-CLiQ – Water cooling

Dimensional drawings

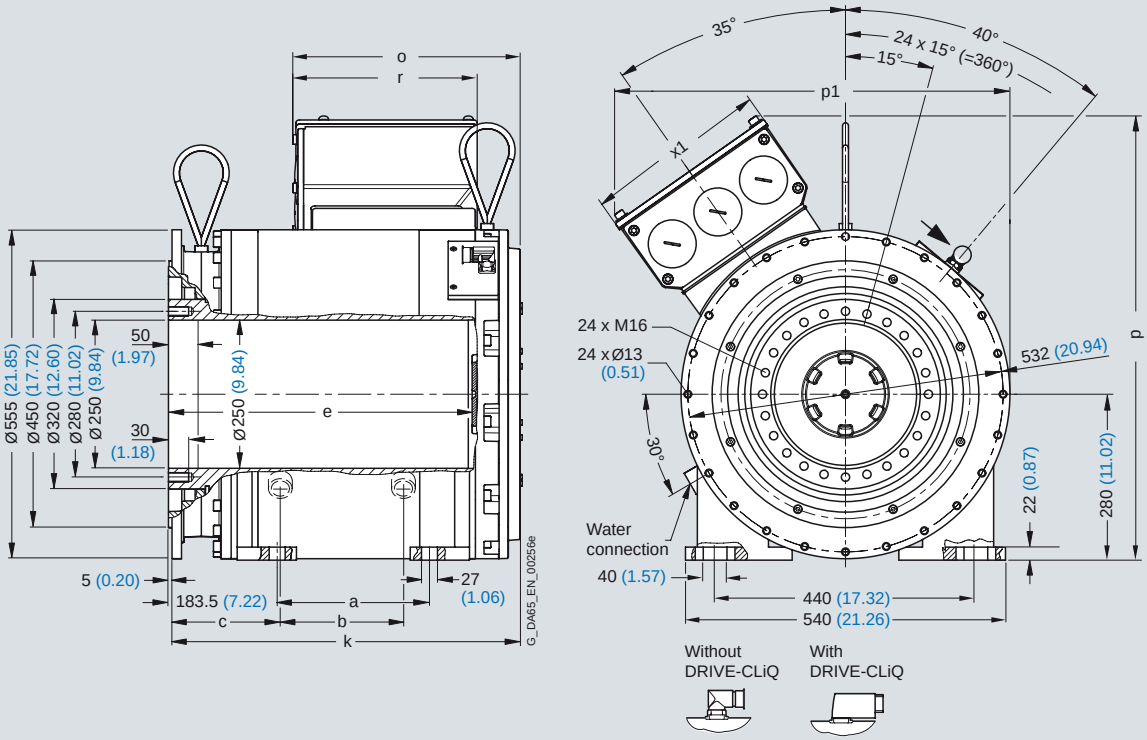
For motor		Dimensions in mm (inches)																
									Terminal box 1XB7700					Terminal box 1XB7712				
Shaft height	Type	DIN IEC	a B	b –	c C	e –	k L	o –	p HD	p_1 –	r LL	x_1 AG	o –	p HD	p_1 –	r LL	x_1 AG
1FW3, type of construction IM B35, water cooling, with terminal box, belt-mounted encoder																		
280	1FW3281		258 (10.16)	217 (8.54)	174 (6.85)	571 (22.48)	574 (22.60)	363 (14.29)	743 (29.25)	684 (26.93)	306 (12.05)	306 (12.05)	385 (15.16)	846 (33.31)	777 (30.59)	371 (14.61)	371 (14.61)
	1FW3283		342.5 (13.48)	301.5 (11.87)		655.5 (25.81)	658.5 (25.93)										
	1FW3285		468.5 (18.44)	427.5 (16.83)		781.5 (30.77)	784.5 (30.89)										
	1FW3287		637 (25.08)	596 (23.46)		950 (37.40)	953 (37.52)										



Dimensional drawings

For motor — Dimensions in mm (inches)

Shaft height	Type	DIN IEC	a B	b –	c C	e –	k L	Terminal box 1XB7700 o –	p HD	p_1 –	r LL	x_1 AG	Terminal box 1XB7712 o –	p HD	p_1 –	r LL	x_1 AG
1FW3, type of construction IM B35, water cooling, with terminal box, coaxial mounted encoder																	
280	1FW3281		258 (10.16)	217 (8.54)	174 (6.85)	514 (20.24)	599.5 (23.60)	389 (15.31)	743 (29.25)	665 (26.18)	306 (12.05)	306 (12.05)	411 (16.18)	846 (33.31)	758 (29.84)	371 (14.61)	371 (14.61)
	1FW3283		342.5 (13.48)	301.5 (11.87)		598.5 (23.56)	684 (26.93)										
	1FW3285		468.5 (18.44)	427.5 (16.83)		724.5 (28.52)	810 (31.89)										
	1FW3287		637 (25.08)	596 (23.46)		893 (35.16)	978.5 (38.52)										



Notes

Measuring systems

7/2 **Overview**

7/3 **Built-on optoelectronic rotary encoders**

7/3 Introduction

7/4 Incremental encoders
7/4 sin/cos 1 V_{pp} incremental encoder
7/4 RS 422 (TTL) incremental encoder
7/4 HTL incremental encoder
7/4 RS 422 (TTL) double-track incremental encoder

7/7 Absolute encoders
7/7 Absolute encoder with DRIVE-CLiQ
7/7 SSI absolute encoder
7/7 EnDat absolute encoder
7/9 PROFIBUS DP absolute encoder
7/9 PROFINET IO absolute encoder

7/12 Accessories

Overview

Encoder type	Interface	Safety Integrated[1]	Accuracy in angular seconds	Resolution	Degree of protection without/with shaft input	Page
Incremental encoders 	sin/cos 1 V_{pp}	Yes	± 18 mech. × 3600/ number of signals/revolution *z*	2500 S/R	IP67/IP64	**7/4**
	RS 422 (TTL)	[2]	± 18 mech. × 3600/ number of signals/revolution *z*	5000 S/R	IP67/IP64	**7/4**
	HTL	[2]	± 18 mech. × 3600/ number of signals/revolution *z*	2500 S/R	IP67/IP64	**7/4**
	RS 422 (TTL) double-track	[2]	Track 1: ± 63 Track 2: ± 12	Track 1: 1024 S/R Track 2: 9000 S/R	IP67/IP64	**7/4**
Absolute encoders 	DRIVE-CLiQ	[2]	± 36	Single-turn 22 bit Multi-turn 34 bit (22 bit Single-turn + 12 bit Multi-turn)	IP67/IP64	**7/7**
	SSI	[2]	± 79 (with 8192 steps)	Single-turn 13 bit (8192 steps) Multi-turn 25 bit (8192 steps × 4096 revolutions)	IP67/IP64	**7/7**
	EnDat	Yes	± 60 (incremental track)	Single-turn 13 bit (8192 steps) Multi-turn 25 bit (8192 steps × 4096 revolutions)	IP67/IP64	**7/7**
	PROFIBUS DP	[2]	± 79 (with 8192 steps)	Single-turn 13 bit (8192 steps) Multi-turn 27 bit (8192 steps × 16384 revolutions)	IP67/IP64	**7/9**
	PROFINET IO	[2]	± 79 (with 8192 steps)	Single-turn 13 bit (8192 steps) Multi-turn 27 bit (8192 steps × 16384 revolutions)	IP67/IP64	**7/9**

S/R = signals/revolution

[1] Built-on rotary encoders can be used for Safety Integrated.

[2] If you require information about the usability of built-on rotary encoders for Safety Integrated, please contact your local Siemens office.

Overview

Absolute encoders, incremental encoders and mounting accessories

The built-on optoelectronic rotary encoders measure paths, angles of rotation or speeds in machines. They can be used in conjunction with computerized numerical controls, programmable logic controllers, drives and position displays, e.g. for:

- SINUMERIK CNCs
- SIMOTION Motion Control Systems
- SIMATIC programmable logic controllers
- SINAMICS drive systems
- SIMODRIVE drive systems
- SIMOVERT MASTERDRIVES drive systems

Application

A distinction is made between incremental and absolute measuring procedures:

- In the case of incremental encoders, the machine must travel to a reference point after each power-off state, as the position is not usually stored in the controller, and movements of the machine while the power is off are not recorded.
- Absolute encoders, on the other hand, also record these movements while the power is off and return the actual position with power On. Travel to a reference point is not necessary.

Design

All encoders are available in Synchro flange and supported flange joint versions. Encoders with a Synchro flange can be attached to the machine with 3 clamp straps or mounted with axial screws. The encoder is driven by means of a plug-in coupling or a spring disk coupling. Alternatively, pulleys can also be used.

The encoder supply voltage is 5 V DC or alternatively 10 V to 30 V DC. The 10 V to 30 V DC version supports longer cable lengths. Most control systems apply the supply voltage directly on the measuring circuit connector. With SINAMICS, the power supply for the measuring systems is provided via the Sensor Modules.

For rotary encoders with cables, the cable length including the connector is 1 m (3.28 ft).

The following bending radii for the cables at the encoder must be complied with:

- One-time bending: ≥ 20 mm (0.79 in)
- Continuous bending: ≥ 75 mm (2.95 in)

Incremental encoders

Function

Incremental encoders deliver a defined number of electrical pulses per rotation, which represent the measurement of the traveled distance or angle.

Incremental encoders operate on the principle of optoelectronic scanning of dividing disks with the transmitted light principle. The light source is a light emitting diode (LED). The light-dark modulation generated as the encoder shaft rotates is picked up by photoelectronic elements. With an appropriate arrangement of the line pattern on the dividing disk connected to the shaft and the fixed aperture, the photoelectronic elements provide two trace signals A and B at 90° to one another, as well as a reference signal R. The encoder electronics amplify these signals and convert them into different output levels.

The following output levels are available:

- sin/cos 1 V_{pp} analog signals
  Better resolution can be achieved for encoders with sinusoidal signals by interpolating them in the higher-level controller.
- RS 422 difference signals (TTL)
  In the case of RS 422 incremental encoders (TTL), the resolution can be improved by a factor of four by means of edge evaluation.
- HTL (High Voltage Transistor Logic)
  Encoders with HTL interfaces are designed for applications with digital inputs with 24 V levels.

Incremental encoders (sin/cos 1 V_{pp}/RS 422/HTL) with cable and connector or Synchro flange

7

Technical specifications

	sin/cos 1 V_{pp} incremental encoder	RS 422 (TTL) incremental encoder	HTL incremental encoder	RS 422 (TTL) double-track incremental encoder
	6FX2001-3....	6FX2001-2....	6FX2001-4...0	6FX2001-2UK00
Operating voltage U_p on encoder	5 V DC ± 10 %	5 V DC ± 10 % or 10 ... 30 V DC	10 ... 30 V DC	5 V DC ± 5 %
Limit frequency, typical	≥ 180 kHz (-3 dB) ≥ 450 kHz (-6 dB)	–	–	–
Scanning frequency, max.	–	300 kHz	300 kHz	Track 1: 160 kHz Track 2: 1 MHz
No-load current consumption, max.	150 mA	150 mA	150 mA	150 mA per track
Signal level	Sinusoidal 1 V_{pp}	TTL (RS 422)	U_H ≥ 21 V at I_H = 20 mA at 24 V U_L ≤ 2.8 V at I_L = 20 mA at 24 V	TTL (RS 422)
Outputs protected against short-circuit to 0 V	Yes	Yes	Yes	Yes
Switching time (10 ... 90 %) (1 m (3.28 ft) cable and recommended input circuit)	–	Rise/fall time t_+/t_- ≤ 50 ns	Rise/fall time t_+/t_- ≤ 200 ns	Rise/fall time t_+/t_- ≤ 100 ns
Phase angle, signal A to B Edge spacing, min. at	90° ± 10°el.	90°	90°	90°
• 1 MHz	–	–	–	Track 2: ≥ 0.125 µs
• 300 kHz	–	≥ 0.45 µs	≥ 0.45 µs	–
• 160 kHz	–	–	–	Track 1: ≥ 0.8 µs

Technical specifications (continued)

	sin/cos 1 V_{pp} incremental encoder	RS 422 (TTL) incremental encoder	HTL incremental encoder	RS 422 (TTL) double-track incremental encoder
	6FX2001-3....	6FX2001-2....	6FX2001-4...0	6FX2001-2UK00
Cable length to downstream electronics, max. [1]	150 m (492 ft)	100 m (328 ft)	300 m (984 ft)	Up to 500 kHz: 100 m (328 ft) Up to 1 MHz: 50 m (164 ft)
LED failure monitoring	–	High-resistance driver	High-resistance driver	–
Resolution, max.	2500 S/R	5000 S/R	2500 S/R	Track 1: 1024 S/R Track 2: 9000 S/R
Accuracy (in angular seconds)	± 18 mech. × 3600/number of signals/revolution *z*	± 18 mech. × 3600/number of signals/revolution *z*	± 18 mech. × 3600/number of signals/revolution *z*	Track 1: ± 63 Track 2: ± 12
Speed, max.				
• Electrical	(27 × 10^6 rpm)/number of signals/revolution (at -6 dB)	(18 × 10^6 rpm)/number of signals/revolution	(18 × 10^6 rpm)/number of signals/revolution	Track 1: 9000 rpm Track 2: 6500 rpm
• Mechanical	12000 rpm	12000 rpm	12000 rpm	12000 rpm
Friction torque (at 20 °C) (68 °F)	≤ 0.01 Nm (0.09 lb_f-in)	≤ 0.01 Nm (0.09 lb_f-in)	≤ 0.01 Nm (0.09 lb_f-in)	≤ 0.01 Nm (0.09 lb_f-in)
Starting torque (at 20 °C) (68 °F)	≤ 0.01 Nm (0.09 lb_f-in)	≤ 0.01 Nm (0.09 lb_f-in)	≤ 0.01 Nm (0.09 lb_f-in)	≤ 0.01 Nm (0.09 lb_f-in)
Shaft loading capacity				
• n > 6000 rpm				
- Axial	10 N (2.25 lb_f)	10 N (2.25 lb_f)	10 N (2.25 lb_f)	–
- Radial at shaft extension	20 N (4.50 lb_f)	20 N (4.50 lb_f)	20 N (4.50 lb_f)	–
• n ≤ 6000 rpm				
- Axial	40 N (8.99 lb_f)	40 N (8.99 lb_f)	40 N (8.99 lb_f)	10 N (2.25 lb_f)
- Radial at shaft extension	60 N (13.5 lb_f)	60 N (13.5 lb_f)	60 N (13.5 lb_f)	20 N (4.50 lb_f)
Angular acceleration, max.	10^5 rad/s^2	10^5 rad/s^2	10^5 rad/s^2	10^5 rad/s^2
Moment of inertia of rotor	1.45 × 10^{-6} kgm^2 (12.8 × 10^{-6} lb_f-in-s^2)	1.45 × 10^{-6} kgm^2 (12.8 × 10^{-6} lb_f-in-s^2)	1.45 × 10^{-6} kgm^2 (12.8 × 10^{-6} lb_f-in-s^2)	20 × 10^{-6} kgm^2 (177 × 10^{-6} lb_f-in-s^2)
Vibration (55 ... 2000 Hz) to EN 60068-2-6	≤ 300 m/s^2 (984 ft/s^2)	≤ 300 m/s^2 (984 ft/s^2)	≤ 300 m/s^2 (984 ft/s^2)	≤ 100 m/s^2 (328 ft/s^2)
Shock to EN 60068-2-27				
• 2 ms	≤ 2000 m/s^2 (6562 ft/s^2)	≤ 2000 m/s^2 (6562 ft/s^2)	≤ 2000 m/s^2 (6562 ft/s^2)	–
• 6 ms	≤ 1000 m/s^2 (3281 ft/s^2)	≤ 1000 m/s^2 (3281 ft/s^2)	≤ 1000 m/s^2 (3281 ft/s^2)	≤ 1000 m/s^2 (3281 ft/s^2)
Degree of protection to EN 60529 (IEC 60529)				
• Without shaft input	IP67	IP67	IP67	IP67
• With shaft input	IP64	IP64	IP64	IP64
Ambient temperature				
Operation				
• Flange outlet or fixed cable				
- At U_p = 5 V ± 10 %	-40 ... +100 °C (-40 ... +212 °F)	-40 ... +100 °C (-40 ... +212 °F)	-40 ... +100 °C (-40 ... +212 °F)	-10 ... +70 °C (+14 ... +158 °F)
- At U_p = 10 … 30 V	–	-40 ... +70 °C (-40 ... +158 °F)	–	–
• Flexible cable				
- At U_p = 5 V ± 10 %	-10 ... +100 °C (+14 ... +212 °F)	-10 ... +100 °C (+14 ... +212 °F)	-10 ... +100 °C (+14 ... +212 °F)	-10 ... +70 °C (+14 ... +158 °F)
- At U_p = 10 … 30 V	–	-10 ... +70 °C (+14 ... +158 °F)	–	–
Weight, approx.	0.25 kg (0.55 lb)	0.25 kg (0.55 lb)	0.25 kg (0.55 lb)	0.7 kg (1.54 lb)
EMC	Tested in accordance with the guidelines for electromagnetic compatibility 89/336/EEC and the regulations of the EMC guidelines (applicable basic standards)			
Approvals, according to	CE, cULus	CE, cULus	CE, cULus	CE, cULus

S/R = signals/revolution

[1] With recommended cable and input circuitry of the downstream electronics, observe max. permissible cable length of module to be evaluated.

Selection and ordering data

Description	Order No.
sin/cos 1 V_{pp} incremental encoder	
Synchro flange and 5 V DC supply voltage	
Connection:	
• Axial flange outlet	**6FX2001-3G** ■■■
• Radial flange outlet	**6FX2001-3E** ■■■
• Cable 1 m (3.28 ft) with connector[1]	**6FX2001-3C** ■■■
Resolution	
1000 S/R	**B 0 0**
1024 S/R	**B 0 2**
2500 S/R	**C 5 0**
RS 422 (TTL) incremental encoder	
Synchro flange and 5 V DC supply voltage	
Connection:	
• Axial flange outlet	**6FX2001-2G** ■■■
• Radial flange outlet	**6FX2001-2E** ■■■
• Cable 1 m (3.28 ft) with connector[1]	**6FX2001-2C** ■■■
Synchro flange and 10 ... 30 V DC supply voltage	
Connection:	
• Axial flange outlet	**6FX2001-2H** ■■■
• Radial flange outlet	**6FX2001-2F** ■■■
• Cable 1 m (3.28 ft) with connector[1]	**6FX2001-2D** ■■■
Supported flange joint and 5 V DC supply voltage	
Connection:	
• Axial flange outlet	**6FX2001-2R** ■■■
• Radial flange outlet	**6FX2001-2P** ■■■
• Cable 1 m (3.28 ft) with connector[1]	**6FX2001-2M** ■■■
Supported flange joint and 10 ... 30 V DC supply voltage	
Connection:	
• Axial flange outlet	**6FX2001-2S** ■■■
• Radial flange outlet	**6FX2001-2Q** ■■■
• Cable 1 m (3.28 ft) with connector[1]	**6FX2001-2N** ■■■
Resolution	
500 S/R	**A 5 0**
1000 S/R	**B 0 0**
1024 S/R	**B 0 2**
1250 S/R	**B 2 5**
1500 S/R	**B 5 0**
2000 S/R	**C 0 0**
2048 S/R	**C 0 4**
2500 S/R	**C 5 0**
3600 S/R	**D 6 0**
5000 S/R	**F 0 0**

S/R = signals/revolution

Description	Order No.
HTL incremental encoder	
Synchro flange and 10 ... 30 V DC supply voltage	
Connection:	
• Axial flange outlet	**6FX2001-4H** ■■ **0**
• Radial flange outlet	**6FX2001-4F** ■■ **0**
• Cable 1 m (3.28 ft) with connector[1]	**6FX2001-4D** ■■ **0**
Supported flange joint and 10 ... 30 V DC supply voltage	
Connection:	
• Axial flange outlet	**6FX2001-4S** ■■ **0**
• Radial flange outlet	**6FX2001-4Q** ■■ **0**
• Cable 1 m (3.28 ft) with connector[1]	**6FX2001-4N** ■■ **0**
Resolution	
100 S/R	**A 1**
500 S/R	**A 5**
1000 S/R	**B 0**
2500 S/R	**C 5**
RS 422 (TTL) double-track incremental encoder	
Synchro flange and 5 V DC supply voltage	
Connection:	
• Cable 1 m (3.28 ft) with axial connector 2 types of resolution: 9000/1024 S/R	**6FX2001-2UK00**

[1] Universal integrated cable outlet for axial and radial outlet direction.

Function

Absolute encoders (absolute shaft encoders) are designed on the same scanning principle as incremental encoders, but have a greater number of tracks. For example, if there are 13 tracks, then 2^{13} = 8192 steps are coded in the case of single-turn encoders. The code used is a one-step code (gray code), which prevents any scanning errors from occurring.

After switching on the machine, the position value is transmitted immediately to the controller. There is no need to travel to a reference point.

DRIVE-CLiQ, SSI and EnDat absolute encoders are of advantage in time-critical applications.

In plants with a large number of encoders, PROFIBUS DP or PROFINET IO are more of an advantage due to the reduced wiring overhead. PROFIBUS DP encoders are programmable and support isochronous mode with slave-to-slave communication. PROFINET IO encoders are programmable as well, they have two additional ports and support RT and IRT operation.

Single-turn encoders

Single-turn encoders divide one rotation (360 degrees mechanical) into a specific number of steps, e.g. 8192. A unique code word is assigned to each position. After 360° the position values are repeated.

Multi-turn encoders

Multi-turn encoders also record the number of revolutions, in addition to the absolute position within one revolution. To do this, further code discs which are coupled via gear steps with the encoder shaft are scanned. When evaluating 12 additional tracks, this means that 2^{12} = 4096 revolutions can be coded.

SSI/EnDat and PROFIBUS DP absolute encoders, top, and DRIVE-CLiQ and PROFINET IO absolute encoders, bottom

Technical specifications

	Absolute encoder with DRIVE-CLiQ	**SSI absolute encoder**	**EnDat absolute encoder**
	6FX2001-5.D..-0AA0	6FX2001-5.S..	6FX2001-5.E..
Operating voltage U_p on encoder	24 V DC - 15 % + 20 %	10 ... 30 V DC	5 V DC ± 5 %
Power consumption, approx.			
• Single-turn	245 mA	160 mA	160 mA
• Multi-turn	325 mA	200 mA	200 mA
Interface	DRIVE-CLiQ	SSI	EnDat
Clock input	–	Differential cable receiver according to EIA standard RS 485	Differential cable receiver according to EIA standard RS 485
Data output	DRIVE-CLiQ	Differential cable driver according to EIA standard RS 485	Differential cable driver according to EIA standard RS 485
Short-circuit strength	Yes	Yes	Yes
Data transfer rate	100 Mbit	100 kHz ... 1 MHz	100 kHz ... 2 MHz
Speed, max.			
• Electrical	14000 rpm	–	–
- At ± 1 bit accuracy	–	5000 rpm	5000 rpm
- At ± 100 bit accuracy	–	10000 rpm	10000 rpm
• Mechanical			
- Single-turn	12000 rpm	12000 rpm	12000 rpm
- Multi-turn	10000 rpm	10000 rpm	10000 rpm
Cable length to downstream electronics, max. [1]	100 m (328 ft)	Up to 1-MHz-cycle: 50 m (164 ft) Up to 300-kHz-cycle: 100 m (328 ft) Up to 100-kHz-cycle: 400 m (1312 ft)	Up to 1-MHz-cycle: 50 m (164 ft) Up to 300-kHz-cycle: 150 m (492 ft)
Connection	DRIVE-CLiQ connector, radial	Flange outlet, axial/radial	Flange outlet, axial/radial

[1] Observe the maximum permissible cable length of the connected module.

Technical specifications (continued)

	Absolute encoder with DRIVE-CLiQ 6FX2001-5.D..-0AA0	SSI absolute encoder 6FX2001-5.S..	EnDat absolute encoder 6FX2001-5.E..
Resolution			
• Single-turn	22 bit	13 bit (8192 steps)	13 bit (8192 steps)
• Multi-turn	34 bit (22 bit single-turn + 12 bit multi-turn)	25 bit (8192 steps × 4096 revolutions)	25 bit (8192 steps × 4096 revolutions)
Message frame			
• Single-turn	–	13 bit, without parity	According to EnDat specification
• Multi-turn	–	25 bit, without parity	According to EnDat specification
Incremental track	2048 S/R, 1 V_{pp} (encoder-internal only)	–	512 S/R, 1 V_{pp}
Code type			
• Sampling	Gray	Gray	Gray
• Transfer	DRIVE-CLiQ	Gray, fir tree format	Binary
Parameterization capability			
• Preset	–	Set to zero	–
• Counting direction	Yes	Yes	–
Accuracy (in angular seconds)	± 36	± 79 (with 8192 steps)	± 60 (incremental track)
Friction torque (at 20 °C) (68 °F)	≤ 0.01 Nm (0.09 lb_f-in)	≤ 0.01 Nm (0.09 lb_f-in)	≤ 0.01 Nm (0.09 lb_f-in)
Starting torque (at 20 °C) (68 °F)	≤ 0.01 Nm (0.09 lb_f-in)	≤ 0.01 Nm (0.09 lb_f-in)	≤ 0.01 Nm (0.09 lb_f-in)
Shaft loading capacity			
• n > 6000 rpm			
- Axial	10 N (2.25 lb_f)	10 N (2.25 lb_f)	10 N (2.25 lb_f)
- Radial at shaft extension	20 N (4.50 lb_f)	20 N (4.50 lb_f)	20 N (4.50 lb_f)
• n ≤ 6000 rpm			
- Axial	40 N (8.99 lb_f)	40 N (8.99 lb_f)	40 N (8.99 lb_f)
- Radial at shaft extension	60 N (13.5 lb_f)	60 N (13.5 lb_f)	60 N (13.5 lb_f)
Angular acceleration, max.	10^5 rad/s^2	10^5 rad/s^2	10^5 rad/s^2
Moment of inertia of rotor			
• Solid shaft	1.90×10^{-6} kgm^2 (16.8×10^{-6} lb_f-in-s^2)	1.45×10^{-6} kgm^2 (12.8×10^{-6} lb_f-in-s^2)	1.45×10^{-6} kgm^2 (12.8×10^{-6} lb_f-in-s^2)
• Hollow shaft	2.80×10^{-6} kgm^2 (24.8×10^{-6} lb_f-in-s^2)	–	–
Vibration (55 … 2000 Hz) to EN 60068-2-6	≤ 100 m/s^2 (328 ft/s^2)	≤ 300 m/s^2 (984 ft/s^2)	≤ 300 m/s^2 (984 ft/s^2)
Shock to EN 60068-2-27			
• 2 ms	≤ 2000 m/s^2 (6562 ft/s^2)	≤ 2000 m/s^2 (6562 ft/s^2)	≤ 2000 m/s^2 (6562 ft/s^2)
• 6 ms	≤ 1000 m/s^2 (3281 ft/s^2)	≤ 1000 m/s^2 (3281 ft/s^2)	≤ 1000 m/s^2 (3281 ft/s^2)
Degree of protection to EN 60529 (IEC 60529)			
• Without shaft input	IP67	IP67	IP67
• With shaft input	IP64	IP64	IP64
Ambient temperature			
• Operation	-20 ... +100 °C (-4 ... +212 °F)	-40 ... +85 °C (-40 ... +185 °F)	-40 ... +100 °C (-40 ... +212 °F)
Weight, approx.			
• Single-turn	0.40 kg (0.88 lb)	0.35 kg (0.77 lb)	0.35 kg (0.77 lb)
• Multi-turn	0.44 kg (0.97 lb)	0.35 kg (0.77 lb)	0.35 kg (0.77 lb)
EMC	Tested in accordance with EN 50081 and EN 50082	Tested in accordance with EN 50081 and EN 50082	Tested in accordance with EN 50081 and EN 50082
Approvals, according to	CE, cULus	CE, cULus	CE, cULus

S/R = signals/revolution

Technical specifications (continued)

	PROFIBUS DP absolute encoder 6FX2001-5.P..	PROFINET IO absolute encoder 6FX2001-5.N..
Operating voltage U_p on encoder	10 ... 30 V DC	10 ... 30 V DC
Power consumption, approx.		
• Single-turn	300 ... 100 mA (2.5 W)	400 ... 130 mA (< 4 W)
• Multi-turn	300 ... 100 mA (2.5 W)	400 ... 130 mA (< 4 W)
Interface	PROFIBUS DP-V2	PROFINET IO with RT/IRT
Clock input	Differential cable receiver according to EIA standard RS 485	2 IRT ports
Data output	Differential cable driver according to EIA standard RS 485	2 IRT ports
Short-circuit strength	Yes	Yes
Data transfer rate	12 Mbit/s	100 Mbit/s
LED for diagnostics	Yes (green/red)	Yes (green/red/yellow)
Speed, max.		
• Electrical	–	
- At ± 1 bit accuracy	5800 rpm	5800 rpm
• Mechanical		
- Single-turn	12000 rpm	12000 rpm
- Multi-turn	6000 rpm	6000 rpm
Cable length to down-stream electronics, max. [1]	Up to 12 Mbit/s: 100 m (328 ft) Up to 1.5 Mbit/s: 200 m (656 ft) Up to 93.75 kbit/s: 1200 m (3937 ft)	85 m (279 ft)
Number of nodes	99	–
Connection	Terminal block with address selector switch and bus terminating resistor in removable cover with radial cable glands (3 units)	2 × 4-pin M12 connector for PROFINET ports 1 × 4-pin M12 connector for operating voltage
• Cable diameter	6.5 ... 9 mm (0.26 ... 0.35 in) Removal of cover possible without interrupting bus	
Resolution		
• Single-turn	13 bit (8192 steps)	13 bit (8192 steps)
• Multi-turn	27 bit (8192 steps × 16384 revolutions)	27 bit (8192 steps × 16384 revolutions)
Telegram	According to PNO encoder profile V4.1 Class 1, Class 2, Class 3 Standard telegram 81	According to PNO encoder profile V4.1 Class 1, Class 2, Class 3, Class 4 Standard telegrams 81/82/83/84 Siemens telegram 860
Code type		
• Sampling	Gray	Gray
• Transfer	Binary, PROFIBUS	Binary, PROFINET
Network load, approx.	20 µs per encoder at 12 Mbit/s	–
Cycle time	667 µs	1 ... 100 ms

[1] Observe the maximum permissible cable length of the connected module.

Technical specifications (continued)

	PROFIBUS DP absolute encoder 6FX2001-5.P..	PROFINET IO absolute encoder 6FX2001-5.P..
Parameterization capability		
• Resolution per revolution	Arbitrary 1 ... 8192	Arbitrary 1 ... 8192
• Total resolution	Arbitrary 1 ... 16384	Arbitrary 1 ... 16384
• Preset	Arbitrary	Arbitrary
• Counting direction	Yes	Yes
• Speed signal	Yes	Yes
• Limit switches	Yes, 2 units	No
• Isochronous mode	Yes	Yes
• Slave-to-slave communication	Yes	No
Online parameterization	Yes	Yes
PNO certificate	Yes	Yes
Supported profiles	PNO encoder profile V4.1	PNO encoder profile V4.1
Accuracy (in angular seconds)	± 79 with 8192 steps (± ½ LSB)	± 79 with 8192 steps (± ½ LSB)
Friction torque (at 20 °C) (68 °F)	≤ 0.01 Nm (0.09 lb_f-in)	≤ 0.01 Nm (0.09 lb_f-in)
Starting torque (at 20 °C) (68 °F)	≤ 0.01 Nm (0.09 lb_f-in)	≤ 0.01 Nm (0.09 lb_f-in)
Shaft loading capacity		
• n > 6000 rpm		
- Axial	10 N (2.25 lb_f)	10 N (2.25 lb_f)
- Radial at shaft extension	20 N (4.50 lb_f)	20 N (4.50 lb_f)
• n ≤ 6000 rpm		
- Axial	40 N (8.99 lb_f)	40 N (8.99 lb_f)
- Radial at shaft extension	110 N (24.7 lb_f)	110 N (24.7 lb_f)
Angular acceleration, max.	10^5 rad/s^2	10^5 rad/s^2
Moment of inertia of rotor		
• Solid shaft	1.90×10^{-6} kgm^2 (16.8×10^{-6} lb_f-in-s^2)	1.90×10^{-6} kgm^2 (16.8×10^{-6} lb_f-in-s^2)
• Hollow shaft	2.80×10^{-6} kgm^2 (24.8×10^{-6} lb_f-in-s^2)	2.80×10^{-6} kgm^2 (24.8×10^{-6} lb_f-in-s^2)
Vibration (55 … 2000 Hz) to EN 60068-2-6	≤ 100 m/s^2 (328 ft/s^2)	≤ 100 m/s^2 (328 ft/s^2)
Shock to EN 60068-2-27		
• 2 ms	≤ 2000 m/s^2 (6562 ft/s^2)	≤ 2000 m/s^2 (6562 ft/s^2)
• 6 ms	≤ 1000 m/s^2 (3281 ft/s^2)	≤ 1000 m/s^2 (3281 ft/s^2)
Degree of protection to EN 60529 (IEC 60529)		
• Without shaft input	IP67	IP67
• With shaft input	IP64	IP64
Ambient temperature		
• Operation	-40 ... +85 °C (-40 ... +185 °F)	-40 ... +85 °C (-40 ... +185 °F)
Weight, approx.		
• Single-turn	0.5 kg (1.10 lb)	0.5 kg (1.10 lb)
• Multi-turn	0.7 kg (1.54 lb)	0.7 kg (1.54 lb)
EMC	Tested in accordance with EN 50081 and EN 50082	Tested in accordance with EN 50081 and EN 50082
Approvals, according to	CE, cULus	CE, cULus

Selection and ordering data

Description	Order No.
Absolute encoder with DRIVE-CLiQ	
24 V DC supply voltage Radial connection	
• Synchro flange Solid shaft 6 mm (0.24 in)	**6FX2001-5FD ■■-0AA0**
• Supported flange joint Solid shaft 10 mm (0.39 in)	**6FX2001-5QD ■■-0AA0**
• Torque bracket Hollow shaft 10 mm (0.39 in)	**6FX2001-5VD ■■-0AA0**
• Torque bracket Hollow shaft 12 mm (0.47 in)	**6FX2001-5WD ■■-0AA0**
Resolution	
• Single-turn 22 bit	**13**
• Multi-turn 34 bit	**25**
SSI absolute encoder	
Synchro flange and 10 ... 30 V DC supply voltage	
Connection:	
• Axial flange outlet	**6FX2001-5HS ■■**
• Radial flange outlet	**6FX2001-5FS ■■**
Supported flange joint and 10 ... 30 V DC supply voltage	
Connection:	
• Axial flange outlet	**6FX2001-5SS ■■**
• Radial flange outlet	**6FX2001-5QS ■■**
Resolution	
• Single-turn 8192 steps/revolution (13 bit)	**12**
• Multi-turn 8192 steps/revolution, 4096 revolutions (25 bit)	**24**
EnDat absolute encoder	
Synchro flange and 5 V DC supply voltage	
Connection:	
• Axial flange outlet	**6FX2001-5HE ■■**
• Radial flange outlet	**6FX2001-5FE ■■**
Supported flange joint and 5 V DC supply voltage	
Connection:	
• Axial flange outlet	**6FX2001-5SE ■■**
• Radial flange outlet	**6FX2001-5QE ■■**
Resolution	
• Single-turn 8192 steps/revolution (13 bit)	**13**
• Multi-turn 8192 steps/revolution, 4096 revolutions (25 bit)	**25**

Description	Order No.
PROFIBUS DP absolute encoder	
10 ... 30 V DC supply voltage Radial connection	
• Synchro flange Solid shaft	**6FX2001-5FP ■■**
• Supported flange joint Solid shaft	**6FX2001-5QP ■■**
• Torque bracket Hollow shaft 8 mm/10 mm/12 mm/15 mm (0.31 in/0.39 in/0.47 in/0.59 in)	**6FX2001-5WP ■■**
Resolution	
• Single-turn 8192 steps/revolution (13 bit)	**12**
• Multi-turn 8192 steps/revolution, 16384 revolutions (27 bit)	**24**
PROFINET IO absolute encoder	
10 ... 30 V DC supply voltage Radial connection	
• Synchro flange Solid shaft	**6FX2001-5FN ■■**
• Supported flange joint Solid shaft	**6FX2001-5QN ■■**
• Torque bracket Hollow shaft 8 mm/10 mm/12 mm/15 mm (0.31 in/0.39 in/0.47 in/0.59 in)	**6FX2001-5WN ■■**
Resolution	
• Single-turn 8192 steps/revolution (13 bit)	**13**
• Multi-turn 8192 steps/revolution, 16384 revolutions (27 bit)	**25**

More information

Description	Order No.
Decentralizing with PROFIBUS DP	**ISBN 3-89578-074-X**

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Accessories

Overview

Couplings and clamp straps

Couplings/clamp straps

Couplings and clamp straps are available as mounting accessories for the built-on rotary encoders. The clamp straps are used to fix the encoders with Synchro flange.

Signal connector as mating connector

A signal connector is available as mating connector for encoders with flange outlet or with cable and connector. The connector with 12 contacts is suitable for all incremental encoders. The connector with 17 contacts is suitable for EnDat absolute encoders.

Signal connector

A signal connector is available as replacement for encoders with cable and connector.

Technical specifications

	Spring disk coupling 6FX2001-7KF10 6FX2001-7KF06	Plug-in coupling 6FX2001-7KS06 6FX2001-7KS10
Transmission torque, max.	0.8 Nm (2.88 oz_f)	0.7 Nm (2.52 oz_f)
Shaft diameter	6 mm (0.24 in) both ends or d_1 = 6 mm (0.24 in), d_2 = 5 mm (0.20 in)	6 mm (0.24 in) both ends or 10 mm (0.39 in) both ends
Center offset of shafts, max.	0.4 mm (0.02 in)	0.5 mm (0.02 in)
Axial offset	± 0.4 mm (0.02 in)	± 0.5 mm (0.02 in)
Angular displacement of shafts, max.	3°	1°
Torsional rigidity	150 Nm/rad (539.51 oz_f/rad)	31 Nm/rad (111.5 oz_f/rad)
Lateral spring stiffness	6 N/mm (1.35 lb_f)	10 N/mm (2.25 lb_f)
Moment of inertia	19 gcm^2 (168 × 10^{-7} lb_f-in-s^2)	20 gcm^2 (177 × 10^{-7} lb_f-in-s^2)
Speed, max.	12000 rpm	12000 rpm
Ambient temperature		
• Operation	-40 ... +150 °C (-40 ... +302 °F)	-40 ... +80 °C (-40 ... +176 °F)
Weight, approx.	16 g (0.56 oz)	20 g (0.71 oz)

Selection and ordering data

Description	Order No.
Spring disk coupling Shaft diameter:	
• 6 mm/6 mm (0.24 in/0.24 in)	**6FX2001-7KF10**
• 6 mm/5 mm (0.24 in/0.20 in)	**6FX2001-7KF06**
Plug-in coupling Shaft diameter:	
• 6 mm/6 mm (0.24 in/0.24 in)	**6FX2001-7KS06**
• 10 mm/10 mm (0.39 in/0.39 in)	**6FX2001-7KS10**
Clamp strap (1 unit) For double-track encoders and encoders with Synchro flange (3 units are required.)	**6FX2001-7KP01**
Signal connector with cap nut (1 unit) Mating connector for TTL, sin/cos 1 V_{pp}, HTL incremental encoders and SSI absolute encoders 12-pin, insulator with 12 socket contacts 0.08 ... 0.22 mm^2 and 0.20 ... 0.56 mm^2, 2 × cable clamping 6.5 ... 10 mm and 10.1 ... 13 mm	**6FX2003-0SU12**
Signal connector with cap nut (1 unit) Mating connector for EnDat absolute encoders 17-pin, insulator with 17 socket contacts 0.20 ... 0.56 mm^2, 2 × cable clamping 6.5 ... 10 mm and 10.1 ... 13 mm	**6FX2003-0SU17**
Signal connector with external thread for encoders with cable (1 unit) Replacement connector for RS 422, sin/cos 1 V_{pp} and HTL incremental encoders 12-pin, insulator with 12 contact pins 0.20 ... 0.56 mm^2, 2 × cable clamping 6.5 ... 10 mm and 10.1 ... 13 mm	**6FX2003-0SA12**
Power connecting cable Pre-assembled cable for power supply of PROFINET IO absolute encoders with M12 connector and M12 socket, A-coded, 4-pin	
• Length: 2 m (6.56 ft)	**6XV1801-5DH20**
• Length: 3 m (9.84 ft)	**6XV1801-5DH30**
• Length: 5 m (16.4 ft)	**6XV1801-5DH50**
• Length: 10 m (32.8 ft)	**6XV1801-5DN10**
• Length: 15 m (49.2 ft)	**6XV1801-5DN15**
IE connecting cable Pre-assembled signal cable for PROFINET IO absolute encoders with M12 and RJ45 connectors, D-coded, 4-pin	
• Length: 2 m (6.56 ft)	**6XV1871-5TH20**
• Length: 3 m (9.84 ft)	**6XV1871-5TH30**
• Length: 5 m (16.4 ft)	**6XV1871-5TH50**
• Length: 10 m (32.8 ft)	**6XV1871-5TN10**
• Length: 15 m (49.2 ft)	**6XV1871-5TN15**
IE FC RJ45 Plug 145 (1 unit) 2 × 2 RJ45 plug connector with rugged metal enclosure and FC connecting method, cable outlet 145°	**6GK1901-1BB30-0AA0**
IE FC M12 Plug PRO (1 unit) M12 plug connector with metal enclosure and FC connecting method, axial cable outlet, D-coded	**6GK1901-0DB20-6AA0**
IE FC TP Trailing Cable 2 × 2 (Type C) 4-wire, shielded, PROFINET compliant, TP installation cable for use in cable carriers Sold by the meter Max. consignment: 2000 m (6562 ft) Min. ordering quantity: 20 m (65.62 ft)	**6XV1840-3AH10**

Connection system MOTION-CONNECT

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8/2 **Overview**

8/4 **Introduction**
8/4 General information

8/6 **Power cables for SINAMICS S120**
8/8 Power cables for 1FT7/1FK7/1PH8 motors with SPEED-CONNECT connector
8/10 Power cables for 1FT7/1FK7/1PH8 motors with full-thread connector
8/13 Extensions for power cables with SPEED-CONNECT or full-thread connector
8/14 Power cables for 1PH8 motors with terminal box
8/15 Power cables for 1PH7 motors with terminal box
8/16 Power cables for 1FN3/1FN6 motors
8/17 Power cables for 1FW6/1FW3 motors

8/18 **Signal cables for SINAMICS S120/SIMOTION D**
8/21 DRIVE-CLiQ signal cables without 24 V DC cores
8/22 DRIVE-CLiQ MOTION-CONNECT signal cables with 24 V DC cores
8/23 Signal cables for motors with SPEED-CONNECT connector
8/23 Signal cables for motors with full-thread connector
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8/35 Power connector for SINAMICS Motor Modules
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8/36 Mounting flange
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8/37 DRIVE-CLiQ cabinet bushing
8/37 DRIVE-CLiQ coupler

8/38 **Length code**

Connection system MOTION-CONNECT

Overview

Cable	For motor	MOTION-CONNECT 500	MOTION-CONNECT 700	MOTION-CONNECT 800	Page
Dynamic requirements		Medium	Very high	High	
Environmental requirements		Medium	High	High	
UL/CSA		✔	✔	✔	
Halogen-free		–	✔	✔	
RoHS		✔	✔	✔	
Power cables with SPEED-CONNECT connector					
	1FT7	✔	–	✔	**8/8, 8/9**
	1PH808 1PH810	✔	–	✔	**8/8, 8/9**
	1FN6	–	–	✔	**8/16**
Power cables with full-thread connector					
	1FT7 (connector size 3)	✔	–	✔	**8/10 – 8/12**
	1FK7	✔	–	✔	**8/10 – 8/12**
	1PH808 1PH810 1PH813	✔	–	✔	**8/10 – 8/12**
	1FN3 (adapter cable)	–	✔	✔	**8/16**
	1FW6	✔	–	✔	**8/17**
Extensions for power cables with SPEED-CONNECT or full-thread connector					
	1FT7	✔	–	✔	**8/13**
	1FK7	✔	–	✔	**8/13**
	1PH808 1PH810 1PH813	✔	–	✔	**8/13**
	1FN3	–	–	✔	**8/16**
	1FN6	–	–	✔	**8/16**
	1FW6	–	–	✔	**8/17**
Power cables for motors with terminal box					
	1PH808 1PH810 1PH813	✔ From 35 mm^2	–	✔ Up to 16 mm^2	**8/14**
	1PH710 1PH713	✔	–	–	**8/15**
	1FW3[1)]	✔	–	✔	**8/17**

✔ = Possible
– = Not possible

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[1)] Sold by the meter only, without cable glands.

Cable	For motor	MOTION-CONNECT 500	MOTION-CONNECT 700	MOTION-CONNECT 800	Page
Dynamic requirements		Medium	Very high	High	
Environmental requirements		Medium	High	High	
UL/CSA		✔	✔	✔	
Halogen-free		–	✔	✔	
RoHS		✔	✔	✔	
MOTION-CONNECT DRIVE-CLiQ signal cables					
	1FT7	✔	–	✔	**8/22**
	1FK7	✔	–	✔	**8/22**
	1PH8	✔	–	✔	**8/22**
	1PH7	✔	–	✔	**8/22**
	1PL6	✔	–	✔	**8/22**
	1FN3	✔	–	✔	**8/22**
	1FN6	✔	–	✔	**8/22**
	1FW6	✔	–	✔	**8/22**
	1FW3	✔	–	✔	**8/22**
Signal cables with SPEED-CONNECT connector					
	1FT7	✔	–	✔	**8/23**
	1PH808 1PH810 1PH813	✔	–	✔	**8/23**
Extensions for signal cables with SPEED-CONNECT connector					
	1FT7	✔	–	✔	**8/23**
	1PH808 1PH810 1PH813	✔	–	✔	**8/23**
Signal cables with full-thread connector					
	1FT7	✔	–	✔	**8/23**
	1FK7	✔	–	✔	**8/23, 8/24**
	1PH8	✔	–	✔	**8/23, 8/24**
	1PH7	✔	–	✔	**8/23, 8/24**
	1PL6	✔	–	✔	**8/23, 8/24**
	1FN3	–	✔	–	**8/23, 8/24**
	1FN6	–	✔	–	**8/23, 8/24**
	1FW6	–	✔	–	**8/23, 8/24**
	1FW3	✔	–	✔	**8/23**
Extensions for signal cables with full-thread connector					
	1FT7	✔	–	✔	**8/24**
	1FK7	✔	–	✔	**8/23, 8/24**
	1PH8	✔	–	✔	**8/23, 8/24**
	1PH7	✔	–	✔	**8/23, 8/24**
	1PL6	✔	–	✔	**8/23, 8/24**
	1FN3	–	✔	–	**8/23**
	1FW3	✔	–	✔	**8/23**

✔ = Possible
– = Not possible

8

General information

Overview

MOTION-CONNECT cables are suitable for use with many different types of machine tool and production machine.

The power cables and signal cables can be ordered by the meter or pre-assembled.

The following MOTION-CONNECT cable designs are available:

- **MOTION-CONNECT 500** is the option for mainly fixed installation.
- **MOTION-CONNECT 700** is the ideal complement to linear motors and machines with high demands in dynamic response. The cables are resistant to cutting oils.
- **MOTION-CONNECT 800** meets all high mechanical requirements for use in cable carriers for machine tools and production machines. The cables are resistant to cutting oils.

Benefits

SPEED-CONNECT

The new pre-assembled cables with SPEED-CONNECT connectors support a fast, stable and reliable connection. With a short rotation as far as the stop, the lock nut of the connector secures the connection.

The cables with SPEED-CONNECT connectors supplement the previously offered MOTION-CONNECT cables with full-thread connectors.

The use of pre-assembled MOTION-CONNECT cables will ensure high quality and system-tested, problem-free operation.

Application

Degree of protection of pre-assembled power and signal cables and their extensions is IP67 when closed and connected.

When cable lengths (basic cables and extensions) are determined for the systems and applications described in this catalog, the technically permissible maximum cable lengths (e.g. 25 m (82 ft)) specified in the catalog must be observed. Malfunctions can occur if longer cables are used.

Siemens AG assumes no liability for correct transmission of signals or power in this case.

When the power cables with brake cores and signal cables include more than one additional intermediate connection, the maximum permissible cable length is reduced by 2 m (6.56 ft) for each interruption point.

The pre-assembled cables can be ordered in length units of 10 cm (3.94 in) and can be extended, if necessary.

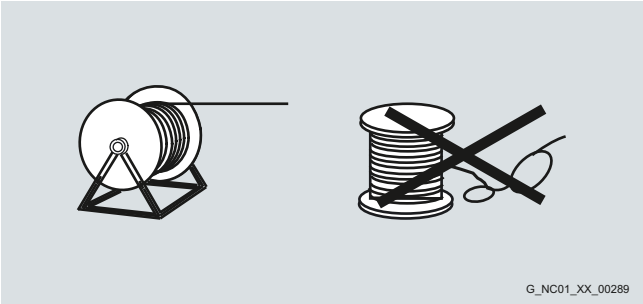
MOTION-CONNECT cables are not suitable for outdoor use.

MOTION-CONNECT cables are approved for a maximum horizontal travel distance of 5 m (16.41 ft).

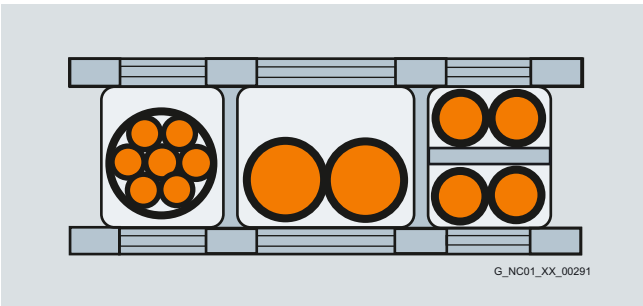
Compatibility between connectors with SPEED-CONNECT and full-thread:

Connector on motor with external thread	Connector with lock nut on the cable	Compatibility
SPEED-CONNECT	SPEED-CONNECT	✔
SPEED-CONNECT	Full-thread	✔
Full-thread	SPEED-CONNECT	–

Function



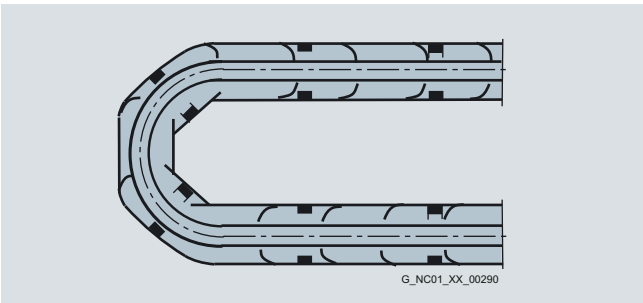
The cables must be removed from the drum without twisting, i.e. the cables must be unwound and must never be lifted over the drum flange in loops.



To maximize the service life of the cable carrier and cables, cables in the carrier made from different materials must be separated in the cable carrier by means of spacers. The spacers must be filled evenly to ensure that the position of the cables does not change during operation. The cables should be distributed as symmetrically as possible according to their weights and dimensions. Cables with very different outer diameters should be separated by spacers as well.

When inserting pre-assembled cables into the cable carrier, do **not** pull at the connector, as this may damage the strain relief or cable clamping.

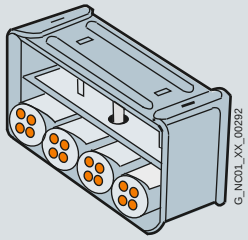
The cables must not be fixed in the cable carrier. They must be freely movable.



The cables must be able to be moved without applying force in particular in the bending radii of the carrier. The specified minimum bending radii must be adhered to.

The cable fixings must be attached at both ends at an appropriate distance away from the end points of the moving parts in a dead zone.

Function (continued)



MOTION-CONNECT cables are tested in a cable carrier. The cables are attached to the moving ends of the cable carrier with strain relief. Strain relief is applied over a wide area of the cable jacket surface without crimping the cable.

Cables must be installed in accordance with the instructions supplied by the cable carrier manufacturer.

Notes:

If, for example, pre-assembled cables are installed in a cable carrier in such a way that the connector would inhibit assembly, pre-assembled cables without assembled connectors can also be supplied (power and signal cables[1]). In this case, the contacts of the cables are crimped and the connector enclosure is supplied separately. After installing the cables, the customer assembles the connector enclosure.

In case of vibration load and with horizontal or vertical cable entries, we recommend that the cable is additionally fixed if between the cable strain relief on the cable carrier and the terminal at the motor part of the cable is hanging loose or is not routed. To prevent machine vibrations being transmitted to the connectors, the cable should be fixed at the moving part where the motor is mounted.

Representation in connection overviews

Symbol	Explanation
	Connector with pin contacts
	Connector with socket contacts
	Exposed core ends
	The cable is not included in the scope of supply. It must be provided by the customer.

More information

Current carrying capacity for power and signal cables

The current carrying capacity of PVC-/PUR-insulated copper cables is specified in the table for installation types B1, B2, C and E under continuous operating conditions with reference to an ambient air temperature of 40 °C (104 °F). For other ambient temperatures, the values must be corrected by the derating factors from the table.

Cross-section	Current carrying capacity rms AC 50/60 Hz or DC in amps for installation type			
	B1 Single-core cables in protection tubes or installation ducts	**B2** Multi-core cables in protection tubes or installation ducts	**C** Multi-core cables, vertically or horizontally on walls / open, without protection tubes and installation ducts / with contact	**E** Multi-core cables, horizontally or vertically on perforated cable racks / open, without protection tubes and installation ducts / with contact
mm²				
Electronics[2]				
0.20	–	4.3	4.4	4.4
0.30	–	7.5	7.5	7.8
0.75	–	9	9.5	10
Power[3]				
0.75	8.6	8.5	9.8	10.4
1.00	10.3	10.1	11.7	12.4
1.50	13.5	13.1	15.2	16.1
2.50	18.3	17.4	21	22
4	24	23	28	30
6	31	30	36	37
10	44	40	50	52
16	59	54	66	70
25	77	70	84	88
35	96	86	104	110
50	117	103	125	133
70	149	130	160	171
95	180	165	194	207
120	208	179	225	240
150[4]	239	206	259	276
185[4]	274	235	296	315
> 185	The values must be taken from the IEC 60364-5-52 standard			

Derating factors for power and signal cables

Ambient air temperature °C (°F)	**Derating factor** according to EN 60204-1, Table D.1
30 (86)	1.15
35 (95)	1.08
40 (104)	1.00
45 (113)	0.91
50 (122)	0.82
55 (131)	0.71
60 (140)	0.58

[1] Not for DRIVE-CLiQ signal cables.
[2] One control circuit pair.
[3] One symmetrically loaded AC cable.
[4] Current-carrying capacity extrapolated according to EN 60204-1, IEC 60364-5-52 and VDE 0298 Part 4.

Overview

Power cable for connecting a 1PH8 motor with terminal box to a SINAMICS S120 Motor Module

Power cable with connector supplied for connecting a 1FT7/1FK7/1PH8 motor to a SINAMICS S120 Motor Module

The synchronous and asynchronous motors are connected to the Motor Modules or Power Modules by means of MOTION-CONNECT power cables.

The pre-assembled MOTION-CONNECT power cables are of high quality and offer safety with problem-free functioning.

Depending on the design, the MOTION-CONNECT power cables are either pre-assembled at one end or at both ends.

Notes:

On request, all 6FX.002-5....-.... power cables are also available with crimped contacts and with the connector enclosure **for the module end** supplied separately.

In this case, the 6th position of the Order No. must be changed from 0 to 1: 6FX.0**1**2-5....-....

Once the contacts have latched into the insulator, they can no longer be removed.

Type of delivery of pre-assembled power cables

Pre-assembled power cables can be ordered in units of 10 cm (3.94 in) up to a maximum length of 299.8 m (984 ft).

Cables up to 30 kg (66.2 lb) or 100 m (328 ft) are supplied as coils; above this, they are supplied on drums. This applies to both pre-assembled power cables and to those sold by the meter.

Type of delivery of power cables sold by the meter

Fixed lengths

Cross-section	MOTION-CONNECT 500	MOTION-CONNECT 700	MOTION-CONNECT 800
1.5 mm^2	50 m (164 ft), 100 m (328 ft), 200 m (656 ft), 500 m (1641 ft)	100 m (328 ft), 200 m (656 ft)	50 m (164 ft), 100 m (328 ft), 200 m (656 ft), 500 m (1641 ft)
2.5 mm^2	50 m (164 ft), 100 m (328 ft), 200 m (656 ft), 500 m (1641 ft)	100 m (328 ft), 200 m (656 ft)	50 m (164 ft), 100 m (328 ft), 200 m (656 ft), 500 m (1641 ft)

Variable length, sold by the meter

Cross-section	MOTION-CONNECT 500	MOTION-CONNECT 700	MOTION-CONNECT 800
1.5 mm^2	–	≤ 50 m (164 ft)	–
2.5 mm^2	–	≤ 50 m (164 ft)	–
4 mm^2	≤ 500 m (1641 ft)	≤ 200 m (656 ft)	≤ 500 m (1641 ft)
6 mm^2	≤ 500 m (1641 ft)	≤ 200 m (656 ft)	≤ 500 m (1641 ft)
10 mm^2	≤ 500 m (1641 ft)	≤ 200 m (656 ft)	≤ 100 m (328 ft)[1] ≤ 500 m (1641 ft)[2]
16 mm^2	≤ 200 m (656 ft)	≤ 200 m (656 ft)	≤ 200 m (656 ft)
25 mm^2	≤ 200 m (656 ft)	≤ 200 m (656 ft)	≤ 200 m (656 ft)[1]
35 mm^2	≤ 200 m (656 ft)	≤ 200 m (656 ft)	≤ 200 m (656 ft)[1]
50 mm^2	≤ 200 m (656 ft)	≤ 200 m (656 ft)	≤ 200 m (656 ft)[1]
70 mm^2	≤ 100 m (328 ft)[2]	–	≤ 100 m (328 ft)[2]
95 mm^2	≤ 100 m (328 ft)[2]	–	≤ 100 m (328 ft)[2]
120 mm^2	≤ 100 m (328 ft)[2]	–	≤ 100 m (328 ft)[2]
150 mm^2	≤ 100 m (328 ft)[2]	–	≤ 100 m (328 ft)[2]
185 mm^2	≤ 100 m (328 ft)[2]	–	≤ 100 m (328 ft)[2]

[1] Power cables with brake cores.

[2] Power cables without brake cores.

Technical specifications

Power cables	MOTION-CONNECT 500	MOTION-CONNECT 700	MOTION-CONNECT 800
	6FX500.-.....-....	6FX700.-.....-....	6FX800.-.....-....
Approvals, according to			
• VDE[1]	Yes	Yes	Yes
• cURus or UR/CSA	UL758-CSA-C22.2-N.210.2-M90	UL758-CSA-C22.2-N.210.2-M90	UL758-CSA-C22.2-N.210.2-M90
• UR-CSA File No.[2]	Yes	Yes	Yes
• RoHS conformity	Yes	Yes	Yes
Rated voltage U_0/U in accordance with EN 50395			
• Power conductors	600 V/1000 V	600 V/1000 V	600 V/1000 V
• Signal conductors	24 V (EN) 1000 V (UL/CSA)	24 V (EN) 1000 V (UL/CSA)	24 V (EN) 1000 V (UL/CSA)
Test voltage, rms			
• Power conductors	4 kV	4 kV	4 kV
• Signal conductors	2 kV	2 kV	2 kV
Operating temperature on the surface			
• Fixed installation	-20 … +80 °C (-4… +176 °F)	-50 … +80 °C (-58… +176 °F)	-50 … +80 °C (-58… +176 °F)
• Flexible installation	0 … 60 °C (32 ... 140 °F)	-20 … +60 °C (-4 ... +140 °F)	-20 … +60 °C (-4 ... +140 °F)
Tensile stress, max.			
• Fixed installation	50 N/mm^2 (7252 lb$_f$/in^2)	50 N/mm^2 (7252 lb$_f$/in^2)	50 N/mm^2 (7252 lb$_f$/in^2)
• Flexible installation	20 N/mm^2 (2901 lb$_f$/in^2)	20 N/mm^2 (2901 lb$_f$/in^2)	20 N/mm^2 (2901 lb$_f$/in^2)
Smallest bending radius			
• Fixed installation	5 × D_{max}	4 × D_{max}	6 × D_{max}
• Flexible installation	See power cables	See power cables	See power cables
Torsional stress	Absolute 30°/m	Absolute 30°/m	Absolute 30°/m
Bending	100000	10 million from 16 mm^2: 3 million	10 million from 10 mm^2: 3 million
Traversing velocity	30 m/min (98.4 ft/min)	200 m/min (656 ft/min) from 16 mm^2: 150 m/min (492 ft/min)	180 m/min (591 ft/min) from 10 mm^2: 100 m/min (328 ft/min)
Acceleration	2 m/s^2 (6.56 ft/s^2)	30 m/s^2 (98.4 ft/s^2)	5 m/s^2 (16.41 ft/s^2) (5 m (16.41 ft)); 10 m/s^2 (32.81 ft/s^2) (2.5 m (8.20 ft))
Insulation material, incl. jacket	CFC/silicone-free	CFC/halogen/silicone-free IEC 60754-1/ DIN VDE 0472-815	CFC/halogen/silicone-free IEC 60754-1/ DIN VDE 0472-815
Oil resistance	EN 60811-2-1 (mineral oil only)	EN 60811-2-1	EN 60811-2-1
Outer jacket	PVC DESINA color orange RAL 2003	PUR, HD22.10 S2 (VDE 0282, Part 10) DESINA color orange RAL 2003	PUR, HD22.10 S2 (VDE 0282, Part 10) DESINA color orange RAL 2003
Flame-retardant	EN 60332-1-1 to 1-3	EN 60332-1-1 to 1-3	EN 60332-1-1 to 1-3

[1] The respective registration number is printed on the cable jacket (only applies to power cables).
[2] The file number is printed on the cable jacket.

Power cables for 1FT7/1FK7/1PH8 motors with SPEED-CONNECT connector

Selection and ordering data

For 1FT7 motors without brake/1PH808/1PH810 with SPEED-CONNECT connector on SINAMICS S120 Motor Modules in booksize format

Connection method, Motor Module end	No. of cores × cross-section	Connector size, motor end	**Pre-assembled cable without brake cores**	D_{max}		**Cable sold by the meter[1] without brake cores**	Weight (without connector)		Smallest perm. bending radius[2]	
				6FX5	**6FX8**		**6FX5**	**6FX8**	**6FX5**	**6FX8**
	mm²		Order No.	mm (in)	mm (in)	Order No.	kg/m (lb/ft)	kg/m (lb/ft)	mm (in)	mm (in)
Connector[3]	4 × 1.5	1	**6FX■002-5CN01-....**	8.4 (0.33)	10.4 (0.41)	**6FX■008-1BB11-....**	0.12 (0.08)	0.16 (0.11)	155 (6.10)	100 (3.94)
		1.5	**6FX■002-5CN21-....**							
	4 × 2.5	1	**6FX■002-5CN11-....**	10.0 (0.39)	12.1 (0.48)	**6FX■008-1BB21-....**	0.21 (0.14)	0.23 (0.16)	180 (7.09)	120 (4.72)
		1.5	**6FX■002-5CN31-....**							
	4 × 4	1.5	**6FX■002-5CN41-....**	11.4 (0.45)	13.2 (0.52)	**6FX■008-1BB31-....**	0.27 (0.18)	0.31 (0.21)	210 (8.27)	130 (5.12)
	4 × 6	1.5	**6FX■002-5CN51-....**	13.6 (0.54)	16.0 (0.63)	**6FX■008-1BB41-....**	0.37 (0.25)	0.42 (0.28)	245 (9.65)	170 (6.69)
	4 × 10	1.5	**6FX■002-5CN61-....**	20.0 (0.79)	19.4 (0.76)	**6FX■008-1BB51-....**	0.73 (0.49)	0.63 (0.42)	360 (14.17)	210 (8.27)
Ring cable lugs[4]	4 × 6	1.5	**6FX■002-5CN54-....**	13.6 (0.54)	16.0 (0.63)	**6FX■008-1BB41-....**	0.37 (0.25)	0.42 (0.28)	245 (9.65)	170 (6.69)
	4 × 10	1.5	**6FX■002-5CN64-....**	20.0 (0.79)	19.4 (0.76)	**6FX■008-1BB51-....**	0.73 (0.49)	0.63 (0.42)	360 (14.17)	210 (8.27)
Sold by the meter	4 × 25	–	–	28.0 (1.10)	–	**6FX 5 008-1BB25-....**	1.62 (1.09)	–	505 (19.88)	–
	4 × 35	–	–	31.5 (1.24)	–	**6FX 5 008-1BB35-....**	1.93 (1.30)	–	570 (22.44)	–
	4 × 50	–	–	38.0 (1.50)	–	**6FX 5 008-1BB50-....**	3.04 (2.04)	–	685 (26.97)	–
	4 × 70	–	–	42.6 (1.68)	–	**6FX 5 008-1BB70-....**	3.96 (2.66)	–	770 (30.31)	–
	4 × 95	–	–	51.7 (2.04)	–	**6FX 5 008-1BB05-....**	5.55 (3.73)	–	935 (36.81)	–
	4 × 120	–	–	56.0 (2.20)	–	**6FX 5 008-1BB12-....**	6.69 (4.50)	–	1010 (39.76)	–
	4 × 150	–	–	63.0 (2.48)	–	**6FX 5 008-1BB15-....**	8.21 (5.52)	–	1135 (44.68)	–
	4 × 185	–	–	66.2 (2.61)	–	**6FX 5 008-1BB18-....**	9.82 (6.60)	–	1195 (47.05)	–
MOTION-CONNECT 500			**5**			**5**				
MOTION-CONNECT 800			**8**			**8**				
Length code			**....**			**....**				

For 1FT7 motors with brake, with SPEED-CONNECT connector on SINAMICS S120 Motor Modules in booksize format

Connection method, Motor Module end	No. of cores × cross-section	Connector size, motor end	**Pre-assembled cable with brake cores**	D_{max}		**Cable sold by the meter[1] with brake cores**	Weight (without connector)		Smallest perm. bending radius[2]	
				6FX5	**6FX8**		**6FX5**	**6FX8**	**6FX5**	**6FX8**
	mm²		Order No.	mm (in)	mm (in)	Order No.	kg/m (lb/ft)	kg/m (lb/ft)	mm (in)	mm (in)
Connector[3]	4 × 1.5+2 × 1.5	1	**6FX■002-5DN01-....**	10.8 (0.43)	12.9 (0.51)	**6FX■008-1BA11-....**	0.22 (0.15)	0.25 (0.17)	195 (7.68)	125 (4.92)
		1.5	**6FX■002-5DN21-....**							
	4 × 2.5+2 × 1.5	1	**6FX■002-5DN11-....**	12.4 (0.49)	14.2 (0.56)	**6FX■008-1BA21-....**	0.25 (0.17)	0.31 (0.21)	225 (8.86)	140 (5.51)
		1.5	**6FX■002-5DN31-....**							
	4 × 4+2 × 1.5	1.5	**6FX■002-5DN41-....**	14.0 (0.55)	15.3 (0.60)	**6FX■008-1BA31-....**	0.35 (0.34)	0.40 (0.27)	255 (10.04)	150 (5.91)
	4 × 6+2 × 1.5	1.5	**6FX■002-5DN51-....**	16.1 (0.63)	17.8 (0.70)	**6FX■008-1BA41-....**	0.49 (0.33)	0.53 (0.36)	290 (11.42)	195 (7.68)
	4 × 10+2 × 1.5	1.5	**6FX■002-5DN61-....**	21.7 (0.85)	20.8 (0.82)	**6FX■008-1BA51-....**	0.81 (0.54)	0.78 (0.52)	395 (15.55)	230 (9.06)
Ring cable lugs[4]	4 × 6+2 × 1.5	1.5	**6FX■002-5DN54-....**	16.1 (0.63)	17.8 (0.70)	**6FX■008-1BA41-....**	0.49 (0.33)	0.53 (0.36)	290 (11.42)	195 (7.68)
	4 × 10+2 × 1.5	1.5	**6FX■002-5DN64-....**	21.7 (0.85)	20.8 (0.82)	**6FX■008-1BA51-....**	0.81 (0.54)	0.78 (0.52)	395 (15.55)	230 (9.06)
MOTION-CONNECT 500			**5**			**5**				
MOTION-CONNECT 800			**8**			**8**				
Length code			**....**			**....**				

[1] Note type of delivery.
[2] Valid for installation in a cable carrier.
[3] For SINAMICS S120 Motor Modules 3 A to 30 A in booksize format.
[4] For SINAMICS S120 Motor Modules 45 A and 60 A in booksize format.

Selection and ordering data (continued)

For 1FT7 motors without brake/1PH808/1PH810 with SPEED-CONNECT connector on SINAMICS S120 Motor Modules in booksize compact format and Power Modules

Connection method, Power Module end	No. of cores × cross-section	Connector size, motor end	Pre-assembled cable without brake cores	D_{max}		Cable sold by the meter[1] without brake cores	Weight (without connector)		Smallest perm. bending radius[2]	
				6FX5	6FX8		6FX5	6FX8	6FX5	6FX8
	mm²		Order No.	mm (in)	mm (in)	Order No.	kg/m (lb/ft)	kg/m (lb/ft)	mm (in)	mm (in)
Exposed core ends	4 × 1.5	1	6FX■002-5CG10-....	8.4 (0.33)	10.4 (0.41)	6FX■008-1BB11-....	0.12 (0.08)	0.16 (0.11)	155 (6.10)	100 (3.94)
		1.5	6FX■002-5CG22-....							
	4 × 2.5	1	6FX■002-5CG12-....	10.0 (0.39)	12.1 (0.48)	6FX■008-1BB21-....	0.21 (0.14)	0.23 (0.16)	180 (7.09)	120 (4.72)
		1.5	6FX■002-5CG32-....							
	4 × 4	1.5	6FX■002-5CG42-....	11.4 (0.45)	13.2 (0.52)	6FX■008-1BB31-....	0.27 (0.18)	0.31 (0.21)	210 (8.27)	130 (5.12)
	4 × 6	1.5	6FX■002-5CG52-....	13.6 (0.54)	16.0 (0.63)	6FX■008-1BB41-....	0.37 (0.25)	0.42 (0.28)	245 (9.65)	170 (6.69)
	4 × 10	1.5	6FX■002-5CG62-....	20.0 (0.79)	19.4 (0.76)	6FX■008-1BB51-....	0.73 (0.49)	0.63 (0.42)	360 (14.17)	210 (8.27)
MOTION-CONNECT 500			**5**			**5**				
MOTION-CONNECT 800			**8**			**8**				
Length code			....			....				

For 1FT7 motors with brake, with SPEED-CONNECT connector on SINAMICS S120 Motor Modules in booksize compact format and Power Modules

Connection method, Power Module end	No. of cores × cross-section	Connector size, motor end	Pre-assembled cable with brake cores	D_{max}		Cable sold by the meter[1] with brake cores	Weight (without connector)		Smallest perm. bending radius[2]	
				6FX5	6FX8		6FX5	6FX8	6FX5	6FX8
	mm²		Order No.	mm (in)	mm (in)	Order No.	kg/m (lb/ft)	kg/m (lb/ft)	mm (in)	mm (in)
Exposed core ends	4 × 1.5+2 × 1.5	1	6FX■002-5DG10-....	10.8 (0.43)	12.9 (0.51)	6FX■008-1BA11-....	0.22 (0.15)	0.25 (0.17)	195 (7.68)	125 (4.92)
		1.5	6FX■002-5DG22-....							
	4 × 2.5+2 × 1.5	1	6FX■002-5DG12-....	12.4 (0.49)	14.2 (0.56)	6FX■008-1BA21-....	0.25 (0.17)	0.31 (0.21)	225 (8.86)	140 (5.51)
		1.5	6FX■002-5DG32-....							
	4 × 4+2 × 1.5	1.5	6FX■002-5DG42-....	14.0 (0.55)	15.3 (0.60)	6FX■008-1BA31-....	0.35 (0.34)	0.40 (0.27)	255 (10.04)	150 (5.91)
	4 × 6+2 × 1.5	1.5	6FX■002-5DG52-....	16.1 (0.63)	17.8 (0.70)	6FX■008-1BA41-....	0.49 (0.33)	0.53 (0.36)	290 (11.42)	195 (7.68)
	4 × 10+2 × 1.5	1.5	6FX■002-5DG62-....	21.7 (0.85)	20.8 (0.82)	6FX■008-1BA51-....	0.81 (0.54)	0.78 (0.52)	395 (15.55)	230 (9.06)
MOTION-CONNECT 500			**5**			**5**				
MOTION-CONNECT 800			**8**			**8**				
Length code			....			....				

[1] Note type of delivery.

[2] Valid for installation in a cable carrier.

Power cables for 1FT7/1FK7/1PH8 motors with full-thread connector

Selection and ordering data (continued)

For 1FT7 motors without brake/1FK7 without brake /1PH808/1PH810/1PH813 with full-thread connector on SINAMICS S120 Motor Modules in booksize format

Connection method, Motor Module end	No. of cores × cross-section	Connector size, motor end	Pre-assembled cable without brake cores	D_{max}		Cable sold by the meter[1] without brake cores	Weight (without connector)		Smallest perm. bending radius[2]	
				6FX5	6FX8		6FX5	6FX8	6FX5	6FX8
	mm²		Order No.	mm (in)	mm (in)	Order No.	kg/m (lb/ft)	kg/m (lb/ft)	mm (in)	mm (in)
Connector[3]	4 × 1.5	1	6FX■002-5CS01-....	8.4 (0.33)	10.4 (0.41)	6FX■008-1BB11-....	0.12 (0.08)	0.16 (0.11)	155 (6.10)	100 (3.94)
		1.5	6FX■002-5CS21-....							
		e. c.[4]	6FX 5 002-5CS02-....							
	4 × 2.5	1	6FX■002-5CS11-....	10.0 (0.39)	12.1 (0.48)	6FX■008-1BB21-....	0.21 (0.14)	0.23 (0.16)	180 (7.09)	120 (4.72)
		1.5	6FX■002-5CS31-....							
		e. c.[4]	6FX 5 002-5CS12-....							
	4 × 4	1.5	6FX■002-5CS41-....	11.4 (0.45)	13.2 (0.52)	6FX■008-1BB31-....	0.27 (0.18)	0.31 (0.21)	210 (8.27)	130 (5.12)
		e. c.[4]	6FX 5 002-5CS42-....							
	4 × 6	1.5	6FX■002-5CS51-....	13.6 (0.54)	16.0 (0.63)	6FX■008-1BB41-....	0.37 (0.25)	0.42 (0.28)	245 (9.65)	170 (6.69)
		e. c.[4]	6FX 5 002-5CS52-....							
	4 × 10	1.5	6FX■002-5CS61-....	20.0 (0.79)	19.4 (0.76)	6FX■008-1BB51-....	0.73 (0.49)	0.63 (0.42)	360 (14.17)	210 (8.27)
		3	6FX■002-5CS13-....							
		e. c.[4]	6FX 5 002-5CS62-....							
Ring cable lugs[5]	4 × 6	1.5	6FX■002-5CS54-....	13.6 (0.54)	16.0 (0.63)	6FX■008-1BB41-....	0.37 (0.25)	0.42 (0.28)	245 (9.65)	170 (6.69)
	4 × 10	1.5	6FX■002-5CS64-....	20.0 (0.79)	19.4 (0.76)	6FX■008-1BB51-....	0.73 (0.49)	0.63 (0.42)	360 (14.17)	210 (8.27)
		3	6FX■002-5CS14-....							
	4 × 16	1.5	6FX 8 002-5CS24-....	24.2 (0.95)	23.6 (0.93)	6FX■008-1BB61-....	1.10 (0.74)	0.95 (0.64)	440 (17.32)	260 (10.24)
		3	6FX■002-5CS23-....							
Sold by the meter	4 × 25	–	–	28.0 (1.10)	–	6FX 5 008-1BB25-....	1.62 (1.09)	–	505 (19.88)	–
	4 × 35	–	–	31.5 (1.24)	–	6FX 5 008-1BB35-....	1.93 (1.30)	–	570 (22.44)	–
	4 × 50	–	–	38.0 (1.50)	–	6FX 5 008-1BB50-....	3.04 (2.04)	–	685 (26.97)	–
	4 × 70	–	–	42.6 (1.68)	–	6FX 5 008-1BB70-....	3.96 (2.66)	–	770 (30.31)	–
	4 × 95	–	–	51.7 (2.04)	–	6FX 5 008-1BB05-....	5.55 (3.73)	–	935 (36.81)	–
	4 × 120	–	–	56.0 (2.20)	–	6FX 5 008-1BB12-....	6.69 (4.50)	–	1010 (39.76)	–
	4 × 150	–	–	63.0 (2.48)	–	6FX 5 008-1BB15-....	8.21 (5.52)	–	1135 (44.68)	–
	4 × 185	–	–	66.2 (2.61)	–	6FX 5 008-1BB18-....	9.82 (6.60)	–	1195 (47.05)	–

MOTION-CONNECT 500	**5**			**5**	
MOTION-CONNECT 800	**8**			**8**	
Length code		....			....

[1] Note type of delivery.
[2] Valid for installation in a cable carrier.
[3] For SINAMICS S120 Motor Modules 3 A to 30 A in booksize format.
[4] e. c. = exposed core ends; suitable for motors with terminal box.
[5] For SINAMICS S120 Motor Modules 45 A and 60 A in booksize format.

Selection and ordering data (continued)

For 1FT7 motors with brake/1FK7 with brake, with full-thread connector on SINAMICS S120 Motor Modules in booksize format

Connection method, Motor Module end	No. of cores × cross-section	Connector size, motor end	Pre-assembled cable with brake cores	D_{max}		Cable sold by the meter[1] with brake cores	Weight (without connector)		Smallest perm. bending radius[2]	
				6FX5	6FX8		6FX5	6FX8	6FX5	6FX8
	mm²		Order No.	mm (in)	mm (in)	Order No.	kg/m (lb/ft)	kg/m (lb/ft)	mm (in)	mm (in)
Connector[3]	4 × 1.5+2 × 1.5	0.5	6FX 5 002-5DA20-....	10.8 (0.43)	12.9 (0.51)	6FX5008-1BA11-....	0.22 (0.15)	0.25 (0.17)	195 (7.68)	125 (4.92)
		1	6FX■002-5DS01-....			6FX■008-1BA11-....				
		1.5	6FX■002-5DS21-....							
	4 × 2.5+2 × 1.5	1	6FX■002-5DS11-....	12.4 (0.49)	14.2 (0.56)	6FX■008-1BA21-....	0.25 (0.17)	0.31 (0.21)	225 (8.86)	140 (5.51)
		1.5	6FX■002-5DS31-....							
	4 × 4+2 × 1.5	1.5	6FX■002-5DS41-....	14.0 (0.55)	15.3 (0.60)	6FX■008-1BA31-....	0.35 (0.34)	0.40 (0.27)	255 (10.04)	150 (5.91)
	4 × 6+2 × 1.5	1.5	6FX■002-5DS51-....	16.1 (0.63)	17.8 (0.70)	6FX■008-1BA41-....	0.49 (0.33)	0.53 (0.36)	290 (11.42)	195 (7.68)
	4 × 10+2 × 1.5	1.5	6FX■002-5DS61-....	21.7 (0.85)	20.8 (0.82)	6FX■008-1BA51-....	0.81 (0.54)	0.78 (0.52)	395 (15.55)	230 (9.06)
		3	6FX■002-5DS13-....							
Ring cable lugs[4]	4 × 6+2 × 1.5	1.5	6FX■002-5DS54-....	16.1 (0.63)	17.8 (0.70)	6FX■008-1BA41-....	0.49 (0.33)	0.53 (0.36)	290 (11.42)	195 (7.68)
	4 × 10+2 × 1.5	1.5	6FX■002-5DS64-....	21.7 (0.85)	20.8 (0.82)	6FX■008-1BA51-....	0.81 (0.54)	0.78 (0.52)	395 (15.55)	230 (9.06)
		3	6FX■002-5DS14-....							
	4 × 16+2 × 1.5	3	6FX■002-5DS23-....	25.0 (0.98)	24.7 (0.97)	6FX■008-1BA61-....	1.12 (0.75)	1.05 (0.71)	450 (17.72)	275 (10.83)
Exposed core ends[5]	4 × 16+2 × 1.5	3	6FX■002-5DG23-....	25.0 (0.98)	24.7 (0.97)	6FX■008-1BA61-....	1.12 (0.75)	1.05 (0.71)	450 (17.72)	275 (10.83)
	4 × 25+2 × 1.5	3	6FX■002-5DG33-....	29.4 (1.16)	27.9 (1.10)	6FX■008-1BA25-....	1.62 (1.09)	1.51 (1.01)	530 (20.87)	325 (12.80)
	4 × 35+2 × 1.5	3	6FX■002-5DG43-....	32.6 (1.28)	32.0 (1.26)	6FX■008-1BA35-....	2.06 (1.38)	2.00 (1.34)	590 (23.23)	380 (14.96)
	4 × 50+2 × 1.5	3	6FX■002-5DG53-....	38.0 (1.50)	35.8 (1.41)	6FX■008-1BA50-....	3.04 (2.04)	2.66 (1.79)	685 (26.97)	420 (16.54)

MOTION-CONNECT 500	**5**			**5**	
MOTION-CONNECT 800	**8**			**8**	
Length code		**....**			**....**

[1] Note type of delivery.
[2] Valid for installation in a cable carrier.
[3] For SINAMICS S120 Motor Modules 3 A to 30 A in booksize format.
[4] For SINAMICS S120 Motor Modules 45 A and 60 A in booksize format.
[5] Length of core ends: 300 mm (11.81 in). 4 M8 cable lugs, 1 M6 cable lug and 1 spring-loaded terminal are also included in the scope of supply of the cables.

Power cables for 1FT7/1FK7/1PH8 motors with full-thread connector

Selection and ordering data (continued)

For 1FT7 motors without brake/1FK7 without brake /1PH808/1PH810/1PH813 with full-thread connector on SINAMICS S120 Motor Modules in booksize compact format and Power Modules

Connection method, Power Module end	No. of cores × cross-section	Connector size, motor end	Pre-assembled cable without brake cores	D_{max}		Cable sold by the meter[1] without brake cores	Weight (without connector)		Smallest perm. bending radius[2]	
				6FX5	6FX8		6FX5	6FX8	6FX5	6FX8
	mm²		Order No.	mm (in)	mm (in)	Order No.	kg/m (lb/ft)	kg/m (lb/ft)	mm (in)	mm (in)
Exposed core ends	4 × 1.5	1	6FX■002-5CG01-....	8.4 (0.33)	10.4 (0.41)	6FX■008-1BB11-....	0.12 (0.08)	0.16 (0.11)	155 (6.10)	100 (3.94)
		1.5	6FX■002-5CG21-....							
	4 × 2.5	1	6FX■002-5CG11-....	10.0 (0.39)	12.1 (0.48)	6FX■008-1BB21-....	0.21 (0.14)	0.23 (0.16)	180 (7.09)	120 (4.72)
		1.5	6FX■002-5CG31-....							
	4 × 4	1.5	6FX■002-5CG41-....	11.4 (0.45)	13.2 (0.52)	6FX■008-1BB31-....	0.27 (0.18)	0.31 (0.21)	210 (8.27)	130 (5.12)
	4 × 6	1.5	6FX■002-5CG51-....	13.6 (0.54)	16.0 (0.63)	6FX■008-1BB41-....	0.37 (0.25)	0.42 (0.28)	245 (9.65)	170 (6.69)
	4 × 10	1.5	6FX■002-5CG61-....	20.0 (0.79)	19.4 (0.76)	6FX■008-1BB51-....	0.73 (0.49)	0.63 (0.42)	360 (14.17)	210 (8.27)
		3	6FX■002-5CG13-....							
	4 × 16	3	6FX■002-5CG23-....	24.2 (0.95)	23.6 (0.93)	6FX5008-1BB61-....	1.10 (0.74)	0.95 (0.64)	440 (17.32)	260 (10.24)
MOTION-CONNECT 500			**5**			**5**				
MOTION-CONNECT 800			**8**			**8**				
Length code			....			....				

For 1FT7 motors with brake/1FK7 with brake, with full-thread connector on SINAMICS S120 Motor Modules in booksize compact format and Power Modules

Connection method, Power Module end	No. of cores × cross-section	Connector size, motor end	Pre-assembled cable with brake cores	D_{max}		Cable sold by the meter[1] with brake cores	Weight (without connector)		Smallest perm. bending radius[2]	
				6FX5	6FX8		6FX5	6FX8	6FX5	6FX8
	mm²		Order No.	mm (in)	mm (in)	Order No.	kg/m (lb/ft)	kg/m (lb/ft)	mm (in)	mm (in)
Exposed core ends	4 × 1.5+2 × 1.5	0.5	6FX 5 002-5DA30-....	10.8 (0.43)	–	6FX 5 008-1BA11-....	0.22 (0.15)	–	195	–
		1	6FX■002-5DG01-....	10.8 (0.43)	12.9 (0.51)	6FX■008-1BA11-....	0.22 (0.15)	0.25 (0.17)	195 (7.68)	125 (4.92)
		1.5	6FX■002-5DG21-....							
	4 × 2.5+2 × 1.5	1	6FX■002-5DG11-....	12.4 (0.49)	14.2 (0.56)	6FX■008-1BA21-....	0.25 (0.17)	0.31 (0.21)	225 (8.86)	140 (5.51)
		1.5	6FX■002-5DG31-....							
	4 × 4+2 × 1.5	1.5	6FX■002-5DG41-....	14.0 (0.55)	15.3 (0.60)	6FX■008-1BA31-....	0.35 (0.24)	0.40 (0.27)	255 (10.04)	150 (5.91)
	4 × 6+2 × 1.5	1.5	6FX■002-5DG51-....	16.1 (0.63)	17.8 (0.70)	6FX■008-1BA41-....	0.49 (0.33)	0.53 (0.36)	290 (11.42)	195 (7.68)
	4 × 10+2 × 1.5	1.5	6FX■002-5DG61-....	21.7 (0.85)	20.8 (0.82)	6FX■008-1BA51-....	0.81 (0.54)	0.78 (0.52)	395 (15.55)	230 (9.06)
		3	6FX■002-5DG13-....							
	4 × 16+2 × 1.5	3	6FX■002-5DG23-....	25.0 (0.98)	24.7 (0.97)	6FX■008-1BA61-....	1.12 (0.75)	1.05 (0.71)	450 (17.72)	275 (10.83)
	4 × 25+2 × 1.5	3	6FX■002-5DG33-....	29.4 (1.16)	27.9 (1.10)	6FX■008-1BA25-....	1.62 (1.09)	1.51 (1.01)	530 (20.87)	325 (12.80)
	4 × 35+2 × 1.5	3	6FX■002-5DG43-....	32.6 (1.28)	32.0 (1.26)	6FX■008-1BA35-....	2.06 (1.38)	2.00 (1.34)	590 (23.23)	380 (14.96)
	4 × 50+2 × 1.5	3	6FX■002-5DG53-....	38.0 (1.50)	35.8 (1.41)	6FX■008-1BA50-....	3.04 (2.04)	2.66 (1.79)	685 (26.97)	420 (16.54)
MOTION-CONNECT 500			**5**			**5**				
MOTION-CONNECT 800			**8**			**8**				
Length code			....			....				

[1] Note type of delivery.
[2] Valid for installation in a cable carrier.

Accessories

Extensions for power cables with SPEED-CONNECT or full-thread connector

No. of cores × cross-section		Connector size, motor end	Basic cable for motors on SINAMICS S120		Extension
Without brake cores	With brake cores		Motor Modules	Power Modules	
mm^2	mm^2		Type	Type	Order No.
–	4 × 1.5+2 × 1.5	0.5	6FX5002-5DA20-....	6FX5002-5DA30-....	**6FX 5 002-5ME05-....**
		0.5/1[2]	6FX . 002-5DS01-....	6FX . 002-5DG10-....	**6FX 5 002-5DA88-....**
4 × 1.5	4 × 1.5+2 × 1.5	1	6FX . 002-5 . S01-....	6FX . 002-5 . G01-....	**6FX■002-5■A05-....**
			6FX . 002-5 . N01-....	6FX . 002-5 . G10-....	**6FX■002-5■N05-....**
		1.5	6FX . 002-5 . S21-....	6FX . 002-5 . G21-....	**6FX■002-5■A28-....**
			6FX . 002-5 . N21-....	6FX . 002-5 . G22-....	**6FX■002-5■Q28-....**
4 × 2.5	4 × 2.5+2 × 1.5	1	6FX . 002-5 . S11-....	6FX . 002-5 . G11-....	**6FX■002-5■A15-....**
			6FX . 002-5 . N11-....	6FX . 002-5 . G12-....	**6FX■002-5■Q15-....**
		1.5	6FX . 002-5 . S31-....	6FX . 002-5 . G31-....	**6FX■002-5■A38-....**
			6FX . 002-5 . N31-....	6FX . 002-5 . G32-....	**6FX■002-5■Q38-....**
4 × 4	4 × 4+2 × 1.5	1.5	6FX . 002-5 . S41-....	6FX . 002-5 . G41-....	**6FX■002-5■A48-....**
			6FX . 002-5 . N41-....	6FX . 002-5 . G42-....	**6FX■002-5■Q48-....**
4 × 6	4 × 6+2 × 1.5	1.5	6FX . 002-5 . S51-....	6FX . 002-5 . G51-....	**6FX■002-5■A58-....**
			6FX . 002-5 . S54-....	–	**6FX■002-5■A58-....**
			6FX . 002-5 . N51-....	6FX . 002-5 . G52-....	**6FX■002-5■Q58-....**
			6FX . 002-5 . N54-....	–	**6FX■002-5■Q58-....**
4 × 10	4 × 10+2 × 1.5	1.5	6FX . 002-5 . S61-....	6FX . 002-5 . G61-....	**6FX■002-5■A68-....**
			6FX . 002-5 . S64-....	–	**6FX■002-5■A68-....**
			6FX . 002-5 . N61-....	6FX . 002-5 . G62-....	**6FX■002-5■Q68-....**
			6FX . 002-5 . N64-....	–	**6FX■002-5■Q68-....**
		3[1]	6FX . 002-5 . S13-....	6FX . 002-5 . G13-....	**6FX■002-5■X18-....**
			6FX . 002-5 . S14-....	–	**6FX■002-5■X18-....**
4 × 16	4 × 16+2 × 1.5	3[1]	6FX . 002-5 . S23-....	6FX . 002-5 . G23-....	**6FX■002-5■X28-....**
			6FX . 002-5CS24-....	–	**6FX■002-5■X28-....**
			6FX . 002-5 . G23-....	–	**6FX■002-5■X28-....**
–	4 × 25+2 × 1.5	3[1]	6FX . 002-5DG33-....	6FX . 002-5DG33-....	**6FX■002-5DX38-....**
–	4 × 35+2 × 1.5	3[1]	6FX . 002-5DG43-....	6FX . 002-5DG43-....	**6FX■002-5DX48-....**
–	4 × 50+2 × 1.5	3[1]	6FX . 002-5DG53-....	6FX . 002-5DG53-....	**6FX■002-5DX58-....**

MOTION-CONNECT 500	**5**
MOTION-CONNECT 800	**8**
Without brake cores	**C**
With brake cores	**D**
Length code	**....**

The maximum specified cable length (basic cable and extensions) must not be exceeded. For power cables with brake cores, the total maximum length is reduced by 2 m (6.56 ft) for each interruption point.

[1] Connector at motor end with full-thread only.
[2] Adapter cable for using a 6FX8002 trailable basic cable, also for 1FK701 motors.

Power cables for 1PH8 motors with terminal box

Selection and ordering data

For 1PH8 motors with terminal boxes on SINAMICS S120 Motor Modules

Motor Type	Thread	No. of cores × cross-section mm²	Connection method Motor Module end	**Pre-assembled cable** Order No.	D_{max} mm (in)	**Cable sold by the meter**[1] Order No.	Weight (without cable gland) kg/m (lb/ft)	Smallest perm. bending radius[2] mm (in)
1PH808	M25	4 × 2.5	Connector[3]	**6FX8002-5CP10-....**	12.1 (0.48)	**6FX8008-1BB21-....**	0.23 (0.16)	120 (4.72)
		4 × 4		**6FX8002-5CP20-....**	13.2 (0.52)	**6FX8008-1BB31-....**	0.31 (0.21)	130 (5.12)
1PH810	M32	4 × 2.5	Connector[3]	**6FX8002-5CP11-....**	12.1 (0.48)	**6FX8008-1BB21-....**	0.23 (0.16)	120 (4.72)
		4 × 4		**6FX8002-5CP21-....**	13.2 (0.52)	**6FX8008-1BB31-....**	0.31 (0.21)	130 (5.12)
		4 × 10		**6FX8002-5CP41-....**	19.4 (0.76)	**6FX8008-1BB51-....**	0.63 (0.42)	210 (8.27)
		4 × 10	Exposed core ends[4]	**6FX8002-5CR41-....**				
1PH813	M40	4 × 10	Connector[3]	**6FX8002-5CP42-....**	19.4 (0.76)	**6FX8008-1BB51-....**	0.63 (0.42)	210 (8.27)
			Exposed core ends[4]	**6FX8002-5CR42-....**				
	M50	4 × 10	Connector[3]	**6FX8002-5CP43-....**				
			Exposed core ends[4]	**6FX8002-5CR43-....**				
	M40	4 × 16	Exposed core ends[4]	**6FX8002-5CR52-....**	23.6 (0.93)	**6FX8008-1BB61-....**	0.95 (0.64)	260 (10.24)
	M50	4 × 16		**6FX8002-5CR53-....**				
		4 × 35		**6FX5002-5CR73-....**	31.5 (1.24)	**6FX5008-1BB35-....**	1.93 (1.30)	570 (22.44)
		4 × 50		**6FX5002-5CR83-....**	38.0 (1.50)	**6FX5008-1BB50-....**	3.04 (2.04)	685 (26.97)
Length code				**....**		**....**		

For 1PH8 motors with terminal boxes on SINAMICS S120 Power Modules

Motor Type	Thread	No. of cores × cross-section mm²	Connection method Power Module end	**Pre-assembled cable** Order No.	D_{max} mm (in)	**Cable sold by the meter**[1] Order No.	Weight (without cable gland) kg/m (lb/ft)	Smallest perm. bending radius[2] mm (in)
1PH808	M25	4 × 2.5	Exposed core ends[4]	**6FX8002-5CR10-....**	12.1 (0.48)	**6FX8008-1BB21-....**	0.23 (0.16)	120 (4.72)
		4 × 4		**6FX8002-5CR20-....**	13.2 (0.52)	**6FX8008-1BB31-....**	0.31 (0.21)	130 (5.12)
1PH810	M32	4 × 2.5	Exposed core ends[4]	**6FX8002-5CR11-....**	12.1 (0.48)	**6FX8008-1BB21-....**	0.23 (0.16)	120 (4.72)
		4 × 4		**6FX8002-5CR21-....**	13.2 (0.52)	**6FX8008-1BB31-....**	0.31 (0.21)	130 (5.12)
		4 × 10		**6FX8002-5CR41-....**	19.4 (0.76)	**6FX8008-1BB51-....**	0.63 (0.42)	210 (8.27)
1PH813	M40	4 × 10	Exposed core ends[4]	**6FX8002-5CR42-....**	19.4 (0.76)	**6FX8008-1BB51-....**	0.63 (0.42)	210 (8.27)
	M50			**6FX8002-5CR43-....**				
	M40	4 × 16		**6FX8002-5CR52-....**	23.6 (0.93)	**6FX8008-1BB61-....**	0.95 (0.64)	260 (10.24)
	M50			**6FX8002-5CR53-....**				
	M40	4 × 35		**6FX5002-5CR72-....**	31.5 (1.24)	**6FX5008-1BB35-....**	1.93 (1.30)	570 (22.44)
	M50			**6FX5002-5CR73-....**				
	M50	4 × 50		**6FX5002-5CR83-....**	38.0 (1.50)	**6FX5008-1BB50-....**	3.04 (2.04)	685 (26.97)
Length code				**....**		**....**		

[1] Note type of delivery.
[2] Valid for installation in a cable carrier.
[3] For SINAMICS S120 Motor Modules 3 A to 30 A in booksize format.
[4] Length of core ends: 300 mm (11.81 in.) 4 M8 cable lugs and 4 M6 cable lugs are also included in the scope of supply of the cables.

Selection and ordering data

For 1PH7 motors with terminal boxes on SINAMICS S120 Motor Modules

Motor	Armour thread	No. of cores × cross-section	**Pre-assembled cable**	Weight by the meter	Smallest perm. bending radius[1)]
Type		mm^2	Order No.	kg/m (lb/ft)	mm (in)
1PH710	PG29	4 × 16	**6FX5002-5CH16-....**	1.10 (0.74)	440 (17.3)
1PH713	PG36	4 × 16	**6FX5002-5CJ16-....**	1.10 (0.74)	440 (17.3)
1PH716	PG42	4 × 25	**6FX5002-5CK25-....**	1.56 (1.05)	530 (20.87)
Length code			**....**		

For 1PH7 motors with a holding brake, there are no pre-assembled power cables. If a holding brake is used, it must be supplied through a separate cable via the terminal box. For 1PH7 motors with a metric cable entry in the terminal box, the adapter must be removed.

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[1)] Valid for installation in a cable carrier.

Power cables for 1FN3/1FN6 motors

Selection and ordering data

For 1FN3 linear motors, peak/continuous load version, connection to SINAMICS S120 through adapter cable with full-thread connector

No. of cores × cross-section	Thread	**Pre-assembled adapter cable**	Connector size Interface	**Pre-assembled basic cable to the drive system**	D_{max}	**Cable sold by meter**[1] **for pre-assembled adapter cable**	Weight (without connector)	Smallest perm. bending radius[2]
mm^2		Order No.		Order No.	mm (in)	Order No.	kg/m (lb/ft)	mm (in)
4 × 2.5	M20	**6FX7002-5LM42-....**	1	**6FX8002-5CS11-....**	12.1 (0.48)	**6FX7008-1BB21-....**	0.23 (0.16)	90 (3.54)
4 × 2.5	M20	**6FX7002-5LM62-....***)	1	**6FX8002-5CS11-....**	12.1 (0.48)	**6FX7008-1BB21-....**	0.23 (0.16)	90 (3.54)
4 × 4	M32	**6FX7002-5LM72-....**	1.5	**6FX8002-5CS41-....****)	13.2 (0.52)	**6FX7008-1BB31-....**	0.29 (0.20)	100 (3.94)
4 × 6	M32	**6FX7002-5LM82-....**	1.5	**6FX8002-5CS54-....**	15.9 (0.63)	**6FX7008-1BB41-....**	0.37 (0.25)	120 (4.72)
4 × 10	M32	**6FX7002-5LM32-....**	1.5	**6FX8002-5CS64-....**	19.2 (0.76)	**6FX7008-1BB51-....**	0.57 (0.38)	140 (5.51)
4 × 16	M32	**6FX7002-5LM02-....**	1.5	**6FX8002-5CS24-....**	22.5 (0.89)	**6FX7008-1BB61-....**	0.93 (0.63)	165 (6.50)
Length code		**....**		**....**		**....**		

For 1FN6 linear motors with SPEED-CONNECT connector on SINAMICS S120

No. of cores × cross-section	Connector size, motor end	**Pre-assembled cable to the drive system**	D_{max}	**Cable sold by the meter**[1]	Weight (without connector)	Smallest perm. bending radius[2]
mm^2		Order No.	mm (in)	Order No.	kg/m (lb/ft)	mm (in)
4 × 1.5	1	**6FX8002-5CN01-....**	10.4 (0.41)	**6FX8008-1BB11-....**	0.16 (0.11)	100 (3.94)
4 × 2.5	1	**6FX8002-5CN11-....**	12.1 (0.48)	**6FX8008-1BB21-....**	0.23 (0.16)	120 (4.72)
4 × 4	1.5	**6FX8002-5CN41-....**	13.2 (0.52)	**6FX8008-1BB31-....**	0.31 (0.21)	130 (5.12)
4 × 10	1.5	**6FX8002-5CN64-....*****)	19.4 (0.76)	**6FX8008-1BB51-....**	0.63 (0.42)	210 (8.27)
Length code		**....**		**....**		

Accessories

Power cable extensions for 1FN3 linear motors, peak/continuous load version with full-thread connector

No. of cores × cross-section	Connector size	Pre-assembled basic cable to the drive system	**Extension**
mm^2		Type	Order No.
4 × 2.5	1	6FX8002-5CS11-....	**6FX8002-5CA15-....**
4 × 4	1.5	6FX8002-5CS41-....**)	**6FX8002-5CA48-....**
4 × 6	1.5	6FX8002-5CS54-....	**6FX8002-5CA58-....**
4 × 10	1.5	6FX8002-5CS64-....	**6FX8002-5CA68-....**
4 × 16	1.5	6FX8002-5CS24-....	**6FX8002-5YW12-....**
Length code			**....**

Power cable extensions for 1FN6 linear motors with SPEED-CONNECT connector

No. of cores × cross-section	Connector size, motor end	Pre-assembled cable to the drive system	**Extension**
mm^2		Type	Order No.
4 × 1.5	1	6FX8002-5CN01-....	**6FX8002-5CN05-....**
4 × 2.5	1	6FX8002-5CN11-....	**6FX8002-5CQ15-....**
4 × 4	1.5	6FX8002-5CN41-....	**6FX8002-5DQ48-....**
4 × 10	1.5	6FX8002-5CN64-....***)	**6FX8002-5DQ68-....**
Length code			**....**

The combinations of power cable extensions shown are only provided by way of example.

[1] Note type of delivery.
[2] Valid for installation in a cable carrier.
*) Only for 1FN3300 motors upwards.
**) For 1FN3 linear motors in the peak load version, the pre-assembled basic cable 6FX8002-5CS54-.... (4 × 6 mm^2) to the SINAMICS S120 drive system must be used.
***) Module end with ring cable lugs.

Selection and ordering data

For 1FW6 built-in torque motors connected via adapter cable with full-thread connector

No. of cores × cross-section	Connector size, motor end	**Pre-assembled cable to the drive system**	D_{max}	**Cablesold by the meter**[1]	Weight (without connector)	Smallest perm. bending radius[2]
mm^2		Order No.	mm (in)	Order No.	kg/m (lb/ft)	mm (in)
4 × 2.5	1	**6FX8002-5CS11-....**	12.1 (0.48)	**6FX8008-1BB21-....**	0.23 (0.16)	120 (4.72)
4 × 4	1.5	**6FX8002-5CS41-....**	13.2 (0.52)	**6FX8008-1BB31-....**	0.31 (0.21)	130 (5.12)
4 × 6	1.5	**6FX8002-5CS54-....**	16.0 (0.63)	**6FX8008-1BB41-....**	0.46 (0.31)	170 (6.69)
4 × 10	1.5	**6FX8002-5CS64-....**	19.4 (0.76)	**6FX8008-1BB51-....**	0.63 (0.42)	210 (8.27)
4 × 16	1.5	**6FX8002-5CS24-....**	23.6 (0.93)	**6FX8008-1BB61-....**	0.95 (0.64)	260 (10.24)
Length code		**....**		**....**		

For 1FW3 complete torque motors with terminal box

No. of cores × cross-section	D_{max}		**Cablesold by the meter**[1]	Weight (without connector)		Smallest perm. bending radius[2]	
	6FX5	**6FX8**		**6FX5**	**6FX8**	**6FX5**	**6FX8**
mm^2	mm (in)	mm (in)	Order No.	kg/m (lb/ft)	kg/m (lb/ft)	mm (in)	mm (in)
4 × 1.5	8.4 (0.33)	10.4 (0.41)	**6FX■008-1BB11-....**	0.12 (0.08)	0.16 (0.11)	155 (6.10)	100 (3.94)
4 × 2.5	10.0 (0.39)	12.1 (0.48)	**6FX■008-1BB21-....**	0.21 (0.14)	0.23 (0.16)	180 (7.09)	120 (4.72)
4 × 4	11.4 (0.45)	13.2 (0.52)	**6FX■008-1BB31-....**	0.27 (0.18)	0.31 (0.21)	210 (8.27)	130 (5.12)
4 × 6	13.6 (0.54)	16.0 (0.63)	**6FX■008-1BB41-....**	0.37 (0.25)	0.42 (0.28)	245 (9.65)	170 (6.69)
4 × 10	20.0 (0.79)	19.4 (0.76)	**6FX■008-1BB51-....**	0.73 (0.49)	0.63 (0.42)	360 (14.17)	210 (8.27)
4 × 16	24.2 (0.95)	23.6 (0.93)	**6FX■008-1BB61-....**	1.10 (0.74)	0.95 (0.64)	440 (17.32)	260 (10.24)
4 × 25	28.0 (1.10)	–	**6FX5008-1BB25-....**	1.62 (1.09)	–	505 (19.88)	–
4 × 35	31.5 (1.24)	–	**6FX5008-1BB35-....**	1.93 (1.30)	–	570 (22.44)	–
4 × 50	38.0 (1.50)	–	**6FX5008-1BB50-....**	3.04 (2.04)	–	685 (26.97)	–
4 × 70	42.6 (1.68)	–	**6FX5008-1BB70-....**	3.96 (2.66)	–	770 (30.31)	–
4 × 95	51.7 (2.04)	–	**6FX5008-1BB05-....**	5.55 (3.73)	–	935 (36.81)	–
4 × 120	56.0 (2.20)	–	**6FX5008-1BB12-....**	6.69 (4.50)	–	1010 (39.76)	–
MOTION-CONNECT 500			**5**				
MOTION-CONNECT 800			**8**				
Length code			**....**				

Accessories

Power cable extensions for 1FW6 built-in torque motors with full-thread connector

No. of cores × cross-section	Connector size	Pre-assembled cable to the drive system	**Extension**
mm^2		Type	Order No.
4 × 2.5	1	6FX8002-5CS11-....	**6FX8002-5CA15-....**
4 × 4	1.5	6FX8002-5CS41-....	**6FX8002-5CA48-....**
4 × 6	1.5	6FX8002-5CS54-....	**6FX8002-5CA58-....**
4 × 10	1.5	6FX8002-5CS64-....	**6FX8002-5CA68-....**
4 × 16	1.5	6FX8002-5CS24-....	**6FX8002-5YW12-....**
Length code			**....**

The combinations of power cable extensions shown are only provided by way of example.

[1] Note type of delivery.
[2] Valid for installation in a cable carrier.

Overview

MOTION-CONNECT DRIVE-CLiQ signal cable with IP20/IP67 connector

Signal cables are pre-assembled and are sold by the meter for the connection of a variety of components.

The following different types of cable are available:

- DRIVE-CLiQ signal cables
- MOTION-CONNECT DRIVE-CLiQ signal cables
- Pre-assembled MOTION-CONNECT signal cables

Type of delivery of pre-assembled signal cables

Pre-assembled signal cables can be ordered in units of 10 cm (3.94 in).
Cables up to 30 kg (66.2 lb) or 100 m (328 ft) are supplied as coils; above this, they are supplied on drums.

Application

DRIVE-CLiQ signal cables

are used to connect components with DRIVE-CLiQ connections which have a separate or external 24 V DC power supply.

MOTION-CONNECT DRIVE-CLiQ signal cables

are used whenever components with DRIVE-CLiQ connections must meet high requirements such as mechanical stress and oil resistance, e.g. in the event of a connection outside the cabinet between

- Motor Modules and Sensor Modules
- Motor Modules and motors with DRIVE-CLiQ interface

MOTION-CONNECT DRIVE-CLiQ signal cables have 24 V DC cores.

Pre-assembled MOTION-CONNECT signal cables

are used whenever motor encoders on motors without DRIVE-CLiQ interface are connected to Sensor Modules.

Notes:

All 6FX.002-2C...-.... signal cables are also available with crimped contacts and with the connector enclosure supplied separately (not in the case of DRIVE-CLiQ signal cables).

Signal cables with enclosed connector enclosure **for the motor end**. In this case, the 6th position of the Order No. must be changed from 0 to 4:
6FX.0**4**2-2C...-....

Signal cables with enclosed connector enclosure **for the module end**. In this case, the 6th position of the Order No. must be changed from 0 to 1:
6FX.0**1**2-2C...-....

Once the contacts have latched into the insulator, they can no longer be removed.

Technical specifications

DRIVE-CLiQ signal cables	DRIVE-CLiQ	DRIVE-CLiQ MOTION-CONNECT 500	DRIVE-CLiQ MOTION-CONNECT 800
	6FX2...-1DC..-....	6FX5...-.DC..-....	6FX8...-.DC..-....
Approvals, according to			
• VDE	Yes	Yes	Yes
• cURus or UR/CSA	UL STYLE 2502/CSA-N.210.2-M90	UL STYLE 2502/CSA-N.210.2-M90	UL STYLE 2502/CSA-N.210.2-M90
• UR-CSA File No.[1)]	Yes	Yes	Yes
• RoHS conformity	Yes	Yes	Yes
Rated voltage according to EN 50395	30 V	30 V	30 V
Test voltage, rms	500 V	500 V	500 V
Operating temperature on the surface			
• Fixed installation	-20 … +80 °C (-4 ... +176 °F)	-20 … +80 °C (-4 ... +176 °F)	-20 … +80 °C (-4 ... +176 °F)
• Flexible installation	–	0 … 60 °C (32 ... 140 °F)	-20 … +60 °C (-4 ... +140 °F)
Tensile stress, max.			
• Fixed installation	45 N/mm^2 (6526 lb$_f$/in^2)	80 N/mm^2 (11603 lb$_f$/in^2)	50 N/mm^2 (7252 lb$_f$/in^2)
• Flexible installation	–	30 N/mm^2 (4351 lb$_f$/in^2)	20 N/mm^2 (2901 lb$_f$/in^2)
Smallest bending radius			
• Fixed installation	50 mm (1.97 in)	35 mm (1.38 in)	35 mm (1.38 in)
• Flexible installation	–	125 mm (4.92 in)	75 mm (2.95 in)
Torsional stress	–	Absolute 30°/m	Absolute 30°/m
Bending	–	100000	10 million
Traversing velocity	–	30 m/min (98.4 ft/min)	180 m/min (591 ft/min)
Acceleration	–	2 m/s^2 (6.56 ft/s^2)	5 m/s^2 (16.41 ft/s^2) (5 m (16.41 ft)); 10 m/s^2 (32.81 ft/s^2) (2.5 m (8.20 ft))
Insulation material, incl. jacket	CFC/silicone-free	CFC/silicone-free	CFC/halogen/silicone-free IEC 60754-1/DIN VDE 0472-815
Oil resistance	EN 60811-2-1	EN 60811-2-1 (mineral oil only)	EN 60811-2-1
Outer jacket	PVC Gray RAL 7032	PVC DESINA color green RAL 6018	PUR, HD22.10 S2 (VDE 0282, Part 10) DESINA color green RAL 6018
Flame-retardant	EN 60332-1-1 to 1-3	EN 60332-1-1 to 1-3	EN 60332-1-1 to 1-3

[1)] The file number is printed on the cable jacket.

Technical specifications (continued)

Signal cables	MOTION-CONNECT 500	MOTION-CONNECT 700	MOTION-CONNECT 800
	6FX500.-.....-....	6FX700.-.....-....	6FX800.-.....-....
Approvals, according to			
• VDE	Yes	Yes	Yes
• cURus or UR/CSA	UL758-CSA-C22.2-N.210.2-M90	UL758-CSA-C22.2-N.210.2-M90	UL758-CSA-C22.2-N.210.2-M90
• UR-CSA File No.[1)]	Yes	Yes	Yes
• RoHS conformity	Yes	Yes	Yes
Rated voltage according to EN 50395	30 V	30 V	30 V
Test voltage, rms	500 V	500 V	500 V
Operating temperature on the surface			
• Fixed installation	-20 … +80 °C (-4 ... +176 °F)	-50 … +80 °C (-58 ... +176 °F)	-50 … +80 °C (-58 ... +176 °F)
• Flexible installation	0 … 60 °C (32 ... 140 °F)	-20 … +60 °C (-4 ... +140 °F)	-20 … +60 °C (-4 ... +140 °F)
Tensile stress, max.			
• Fixed installation	50 N/mm^2 (7252 lb$_f$/in^2)	50 N/mm^2 (7252 lb$_f$/in^2)	50 N/mm^2 (7252 lb$_f$/in^2)
• Flexible installation	20 N/mm^2 (2901 lb$_f$/in^2)	20 N/mm^2 (2901 lb$_f$/in^2)	20 N/mm^2 (2901 lb$_f$/in^2)
Smallest bending radius			
• Fixed installation	60 mm (2.36 in)	60 mm (2.36 in)	60 mm (2.36 in)
• Flexible installation	100 mm (3.94 in)	95 mm (3.74 in)	100 mm (3.94 in)
Torsional stress	Absolute 30°/m	Absolute 30°/m	Absolute 30°/m
Bending	2 million	10 million	10 million
Traversing velocity	180 m/min (591 ft/min)	200 m/min (656 ft/min)	180 m/min (591 ft/min)
Acceleration	5 m/s^2 (16.41 ft/s^2)	30 m/s^2 (98.43 ft/s^2)	5 m/s^2 (16.41 ft/s^2) (5 m (16.41 ft)); 10 m/s^2 (32.81 ft/s^2) (2.5 m (8.20 ft))
Insulation material, incl. jacket	CFC/silicone-free	CFC/halogen/silicone-free IEC 60754-1	CFC/halogen/silicone-free IEC 60754-1/DIN VDE 0472-815
Oil resistance	EN 60811-2-1 (mineral oil only)	EN 60811-2-1	EN 60811-2-1
Outer jacket	PVC DESINA color green RAL 6018	PUR, HD22.10 S2 (VDE 0282, Part 10) DESINA color green RAL 6018	PUR, HD22.10 S2 (VDE 0282, Part 10) DESINA color green RAL 6018
Flame-retardant	EN 60332-1-1 to 1-3	EN 60332-1-1 to 1-3	EN 60332-1-1 to 1-3

[1)] The file number is printed on the cable jacket.

Selection and ordering data

Pre-assembled DRIVE-CLiQ signal cables without 24 V DC cores

Type	Length	D_{max}	Degree of protection Connector	DRIVE-CLiQ signal cable without 24 V DC cores
	m (ft)	mm (in)		Order No.
Fixed lengths 	0.11 (0.36)		IP20/IP20	**6SL3060-4AB00-0AA0**
	0.16 (0.52)			**6SL3060-4AD00-0AA0**
	0.21 (0.69)			**6SL3060-4AF00-0AA0**
	0.26 (0.85)			**6SL3060-4AH00-0AA0**
	0.31 (1.02)			**6SL3060-4AK00-0AA0**
	0.36 (1.18)			**6SL3060-4AM00-0AA0**
	0.41 (1.35)			**6SL3060-4AP00-0AA0**
	0.60 (1.97)			**6SL3060-4AU00-0AA0**
	0.95 (3.12)			**6SL3060-4AA10-0AA0**
	1.20 (3.94)			**6SL3060-4AW00-0AA0**
	1.45 (4.76)			**6SL3060-4AF10-0AA0**
	2.80 (9.19)			**6SL3060-4AJ20-0AA0**
	5.00 (16.4)			**6SL3060-4AA50-0AA0**
To the meter 	max. 70 (230)	7.0 (0.28)	IP20/IP20	**6FX2002-1DC00-....**
To the meter 	max. 70 (230)	7.0 (0.28)	IP67/IP67	**6FX2002-1DC20-....**
Length code				**....**

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DRIVE-CLiQ MOTION-CONNECT signal cables with 24 V DC cores

Selection and ordering data (continued)

Pre-assembled DRIVE-CLiQ MOTION-CONNECT signal cables with 24 V DC cores

Type	Application	Length, max.	D_{max}	Degree of protection Connector	DRIVE-CLiQ MOTION-CONNECT signal cable with 24 V DC cores Order No.
		m (ft)	mm (in)		
To the meter 	For components with DRIVE-CLiQ interface in the control cabinet, e.g. SINAMICS S120 Motor Modules	50 (164)	7.1 (0.28)	IP20/IP20	**6FX8002-2DC00-....**
		100 (328)	7.1 (0.28)	IP20/IP20	**6FX5002-2DC00-....**
To the meter 	For encoder systems with DRIVE-CLiQ, built into or onto 1FT7/1FK7/1PH8/ 1PH7/1PL6/1FN3/ 1FN6/1FW6/1FW3 motors For connecting the motors to SINAMICS S120 Motor Modules	50 (164)	7.1 (0.28)	IP20/IP67	**6FX8002-2DC10-....**
		100 (328)	7.1 (0.28)	IP20/IP67	**6FX5002-2DC10-....**
To the meter 	For encoder systems with DRIVE-CLiQ, built into or onto 1FT7/1FK7/1PH8/ 1PH7/1PL6/1FN3/ 1FN6/1FW6/1FW3 motors For connecting the motors to Sensor Modules External, DRIVE-CLiQ coupler or DRIVE-CLiQ cabinet bushing	50 (164)	7.1 (0.28)	IP67/IP67	**6FX8002-2DC20-....**
		100 (328)	7.1 (0.28)	IP67/IP67	**6FX5002-2DC20-....**
MOTION-CONNECT 500					**5**
MOTION-CONNECT 800					**8**
Length code					**....**

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Selection and ordering data (continued)

Pre-assembled signal cables for motors with SPEED-CONNECT connector

Encoder system	Motor type	Connection via	Length, max.	D_{max}	Degree of protection Connector	Basic cable	Extension
			m (ft)	mm (in)		Order No.	Order No.
Incremental encoder sin/cos 1 V_{pp} 2048 S/R							
• With C and D tracks	1FT7/1PH8[1]	SMC20	100 (328)	9.8 (0.39)	IP20/IP67	**6FX■002-2CQ31-....**	**6FX■002-2CQ34-....**
• Without C and D tracks	1PH8[1]	SMC20	50 (164)	9.2 (0.36)	IP20/IP67	**6FX8002-2CQ80-....**	**6FX■002-2CQ34-....**
Absolute encoder with EnDat	1FT7/1PH8[1]	SMC20	100 (328)	9.8 (0.39)	IP20/IP67	**6FX■002-2EQ31-....**	**6FX■002-2EQ34-....**
MOTION-CONNECT 500						**5**	**5**
MOTION-CONNECT 800						**8**	**8**
Length code						**....**	**....**

Pre-assembled signal cables for motors with full-thread connector

Encoder system	Motor type	Connection via	Length, max.	D_{max}	Degree of protection Connector	Basic cable	Extension
			m (ft)	mm (in)		Order No.	Order No.
Absolute encoder with SSI 6FX2001-5.S.. Clock-pulse rate 100 ... 250 kHz		SMC30	100 (328)	9.3 (0.37)	IP20/IP67	**6FX■002-2CC11-....**	**6FX■002-2CB54-....**
Absolute encoder with SSI 5 V DC		SME25	3 (9.84)	9.2 (0.36)	IP67/IP67	**6FX■002-2AD04-....**	–
Absolute encoder with EnDat	1FK7[2]/1PH8/ 1PH7/1PL6/ 1FW3	SMC20	100 (328)	9.8 (0.39)	IP20/IP67	**6FX■002-2EQ10-....**	**6FX■002-2EQ14-....**
Absolute encoder with EnDat	1FK701	SMC20	50 (164)	9.8 (0.39)	IP20/IP67	**6FX■002-2EQ20-....**	**6FX5002-2EQ24-....**
Absolute encoder with EnDat 6FX2001-5.E..		SMC20	100 (328)	9.2 (0.36)	IP20/IP67	**6FX■002-2CH00-....**	**6FX■002-2AD04-....**
Absolute encoder with EnDat 5 V DC		SME25	3 (9.84)	9.2 (0.36)	IP67/IP67	**6FX■002-2AD04-....**	–
Direct absolute encoder with EnDat	1FN3/1FN6/ 1FW6	SME125	3 (9.84)	9.2 (0.36)	IP67/IP67	**6FX7002-2AD04-....**	–
Resolver							
• Multi-pole	1FT/1FK[2]/ 1FW3	SMC10	50 (164)	9.2 (0.36)	IP20/IP67	**6FX■002-2CF02-....**	**6FX■002-2CF04-....**
• 2-pole	1FT/1FK[2]/ 1PH7/1PL6	SMC10	130 (426)	9.2 (0.36)	IP20/IP67	**6FX■002-2CF02-....**	**6FX■002-2CF04-....**
Resolver	1FK701	SMC10	50 (164)	9.2 (0.36)	IP20/IP67	**6FX■002-2CF20-....**	**6FX5002-2CF24-....**
Temperature sensor	1FN3100_... 1FN3150[3]	SME120/ SME125	10 (32.8)	11.9 (0.47)	IP67/IP67	**6FX7002-2SL01-....**	**6FX7002-2SL10-....**
Temperature sensor	1FN3300_... 1FN3900[3]	SME120/ SME125	10 (32.8)	11.9 (0.47)	IP67/IP67	**6FX7002-2SL02-....**	**6FX7002-2SL10-....**
Temperature sensor	1FN6/1FW6	SME120/ SME125	10 (32.8)	11.9 (0.47)	IP67/IP67	**6FX7002-2SL10-....**	–
MOTION-CONNECT 500						**5**	**5**
MOTION-CONNECT 700 (not selectable)						**7**	**7**
MOTION-CONNECT 800						**8**	**8**
Length code						**....**	**....**

The combinations of signal cable extensions shown are only provided by way of example.

The maximum specified cable length (basic cable and extensions) must not be exceeded. The total maximum length is reduced by 2 m (6.56 ft) for each interruption point.

[1] Possible with 1PH808/1PH810/1PH813 motors.
[2] Not for 1FK701.
[3] Continuous load version.

Selection and ordering data (continued)

Pre-assembled signal cables for motors with full-thread connector

Encoder system	Motor type	Connection via	Length, max.	D_{max}	Degree of protection Connector	Basic cable	Extension
			m (ft)	mm (in)		Order No.	Order No.
Incremental encoder sin/cos 1 V_{pp} 2048 S/R							
• With C and D tracks	1FK7[1]/1PH8/ 1PH7/1PL6	SMC20	100 (328)	9.8 (0.39)	IP20/IP67	**6FX■002-2CA31-....**	**6FX■002-2CA34-....**
• Without C and D tracks	1PH8/1PH7/ 1PL6	SMC20	50 (164)	9.2 (0.36)	IP20/IP67	**6FX8002-2CA80-....**	**6FX■002-2CA34-....**
Incremental encoder sin/cos 1 V_{pp} 2048 S/R	1FK701	SMC20	50 (164)	9.8 (0.39)	IP20/IP67	**6FX■002-2CA20-....**	**6FX5002-2CA24-....**
HTL incremental encoder	1PH8/1PH7/ 1PL6	SMC30	100 (328) 300 (984)[2]	9.3 (0.37)	IP20/IP67	**6FX■002-2AH00-....**	**6FX■002-2AH04-....**
HTL incremental encoder	1PH8/1PH7/ 1PL6	CU310 DP	100 (328)	9.3 (0.37)	IP20/IP67	**6FX■002-2AH11-....**	–
HTL incremental encoder 24 V DC 6FX2001-4		SMC30	100 (328)	9.3 (0.37)	–/IP67	**6FX5002-2CA12-....**	–
TTL incremental encoder RS 422 6FX2001-2							
• 5 V DC		SMC30	100 (328)	9.3 (0.37)	IP20/IP67	**6FX■002-2CR00-....**	**6FX■002-2CB54-....**
• 24 V DC		SMC30	100 (328)	9.3 (0.37)	IP20/IP67	**6FX■002-2CD24-....**	**6FX■002-2CB54-....**
HTL incremental encoder 5 V DC	1LA[3]	CU310 DP	300 (984)	8.0 (0.31)	IP20/IP67	**6SX7002-0AN30-....**	–
HTL incremental encoder type 1XP8001-1	1LA[3]						
• Signals A, B		SMC30	100 (328)	6.3 (0.25)	IP20/IP67	**6SX7002-0AL00-....**	–
• Signals A*, A, B*, B, R*, R		SMC30	300 (984)[2]	8.0 (0.31)	IP20/IP67	**6SX7002-0AN00-....**	–
• Signals A*, A, B*, B, R*, R with right-angled connector		SMC30	300 (984)[2]	8.0 (0.31)	IP20/IP67	**6SX7002-0AN10-....**	–
Incremental encoder sin/cos 1 V_{pp} 6FX2001-3		SMC20	50 (164)	9.3 (0.37)	IP20/IP67	**6FX■002-2CG00-....**	**6FX■002-2CB54-....**
Incremental encoder sin/cos 1 V_{pp} 5 V DC with C and D track		SME20	3 (9.84)[4]	9.3 (0.37)	IP67/IP67	**6FX■002-2CB54-....**	–
Direct incremental encoder sin/cos 1 V_{pp}	1FN3/1FN6/ 1FW6	SME120	3 (9.84)[4]	9.3 (0.37)	IP67/IP67	**6FX7002-2CB54-....**	–
MOTION-CONNECT 500						**5**	**5**
MOTION-CONNECT 700 (not selectable)						**7**	
MOTION-CONNECT 800						**8**	**8**
Length code						**....**	**....**

The combinations of signal cable extensions shown are only provided by way of example.

The maximum specified cable length (basic cable and extensions) must not be exceeded. The total maximum length is reduced by 2 m (6.56 ft) for each interruption point.

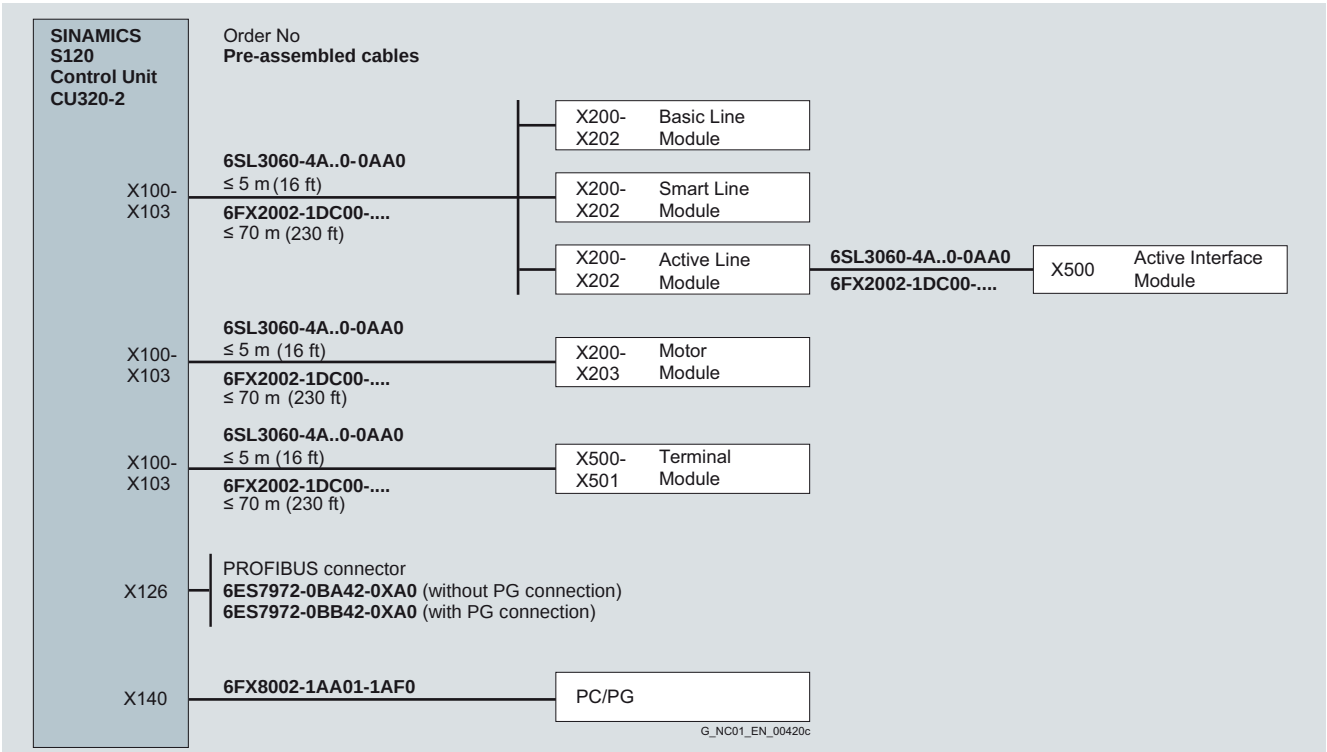
[1] Not for 1FK701.
[2] With evaluation of difference signals A*, A, B*, B.
[3] Not for 2KG geared motor.
[4] Up to 10 m (32.8 ft) possible, depending on the encoder current consumption.

Integration

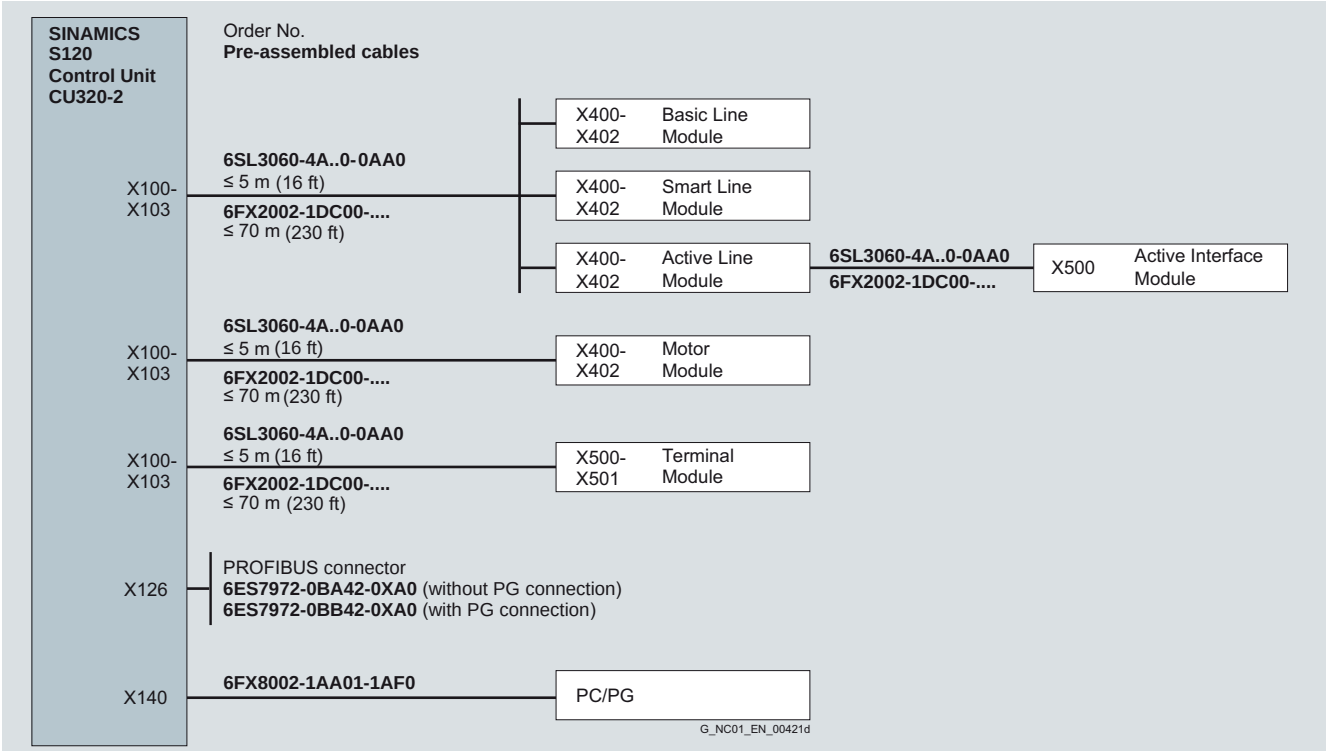
The DRIVE-CLiQ signal cables of type 6SL3060-4A..0-0AA0 required for the standard configuration are part of the scope of supply of the Line Modules and Motor Modules. In this case, the modules must be mounted directly adjacent to one another in a row.

The same components can be connected to the DRIVE-CLiQ interfaces X100-X103 (SIMOTION D425, SIMOTION D435, SIMOTION CX32) or X100-X105 (SIMOTION D445-1) as can be connected to the DRIVE-CLiQ interfaces X100-X103 of a CU320-2.

Connection overview of CU320-2 Control Unit in booksize compact format and booksize format



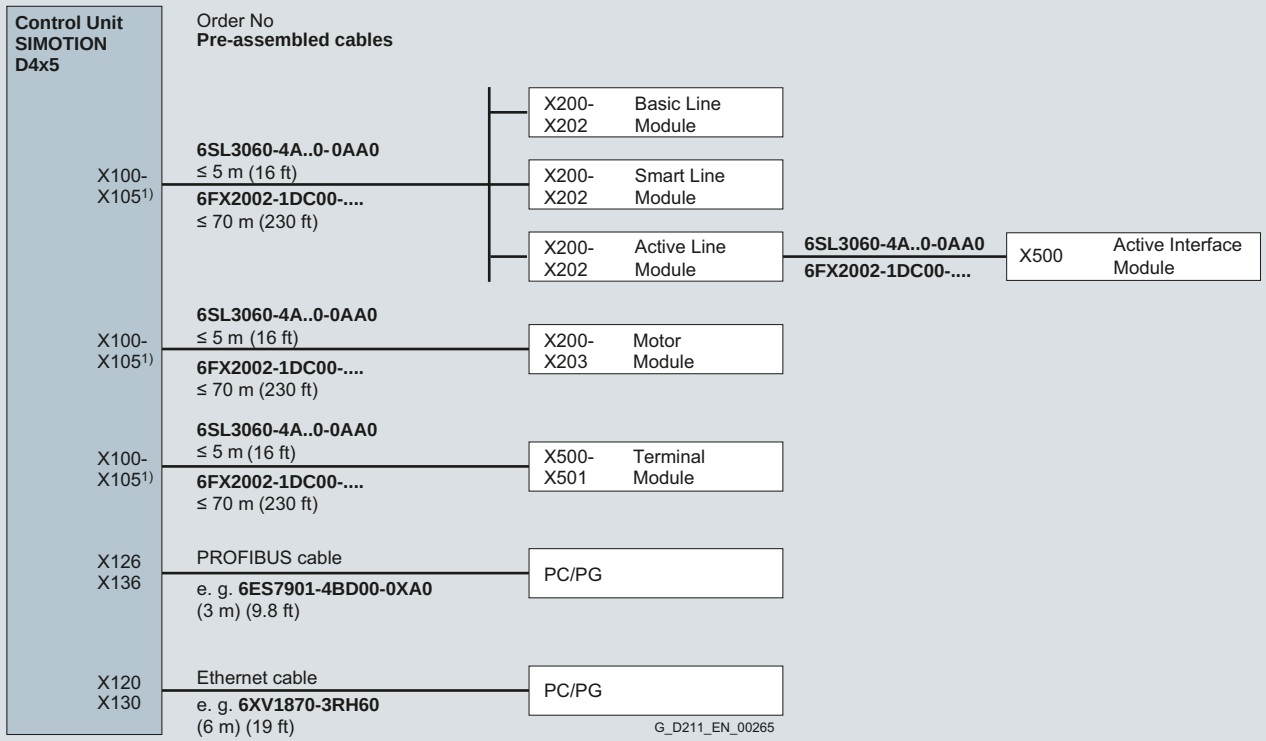
Connection overview of CU320-2 Control Unit in chassis format



Connection overviews

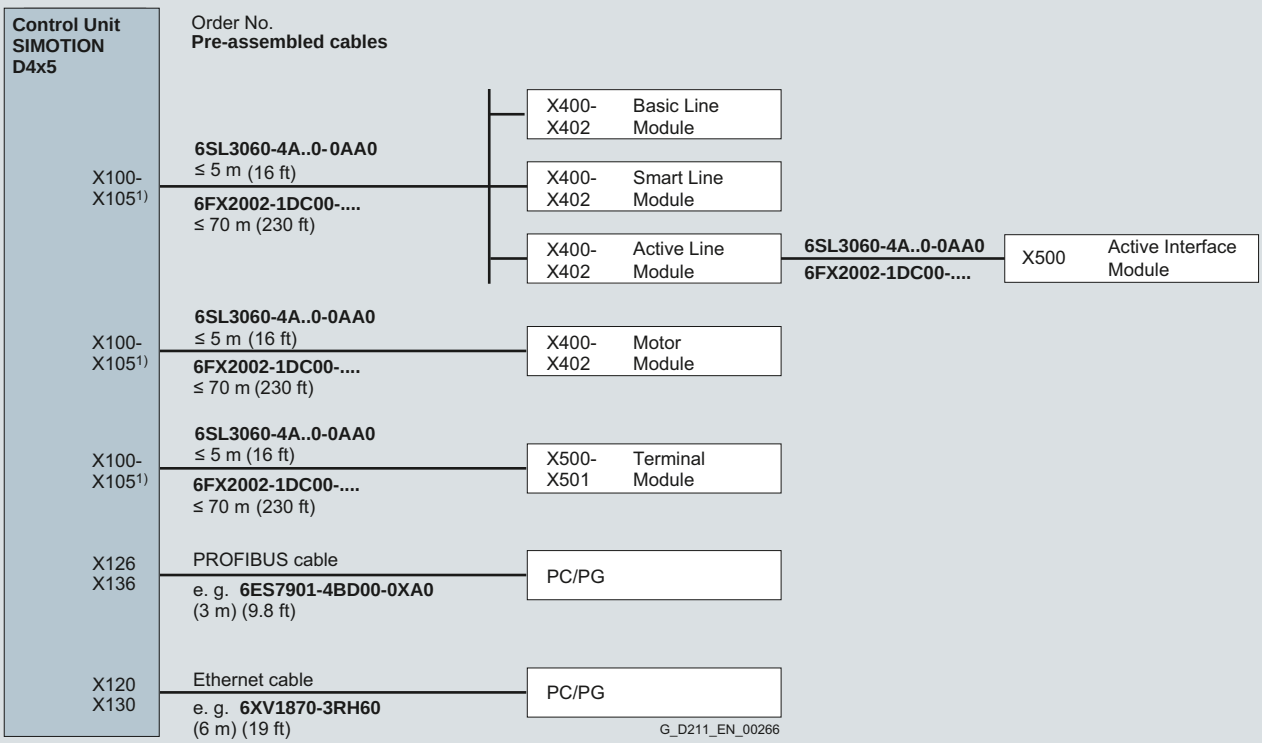
Integration (continued)

Connection overview of SIMOTION D4x5 Control Unit with SINAMICS S120 in booksize format



1) For SIMOTION D425/SIMOTION D435: X100-X103.
For SIMOTION D445-1: X100-X105.

Connection overview of SIMOTION D4x5 Control Unit with SINAMICS S120 in chassis format

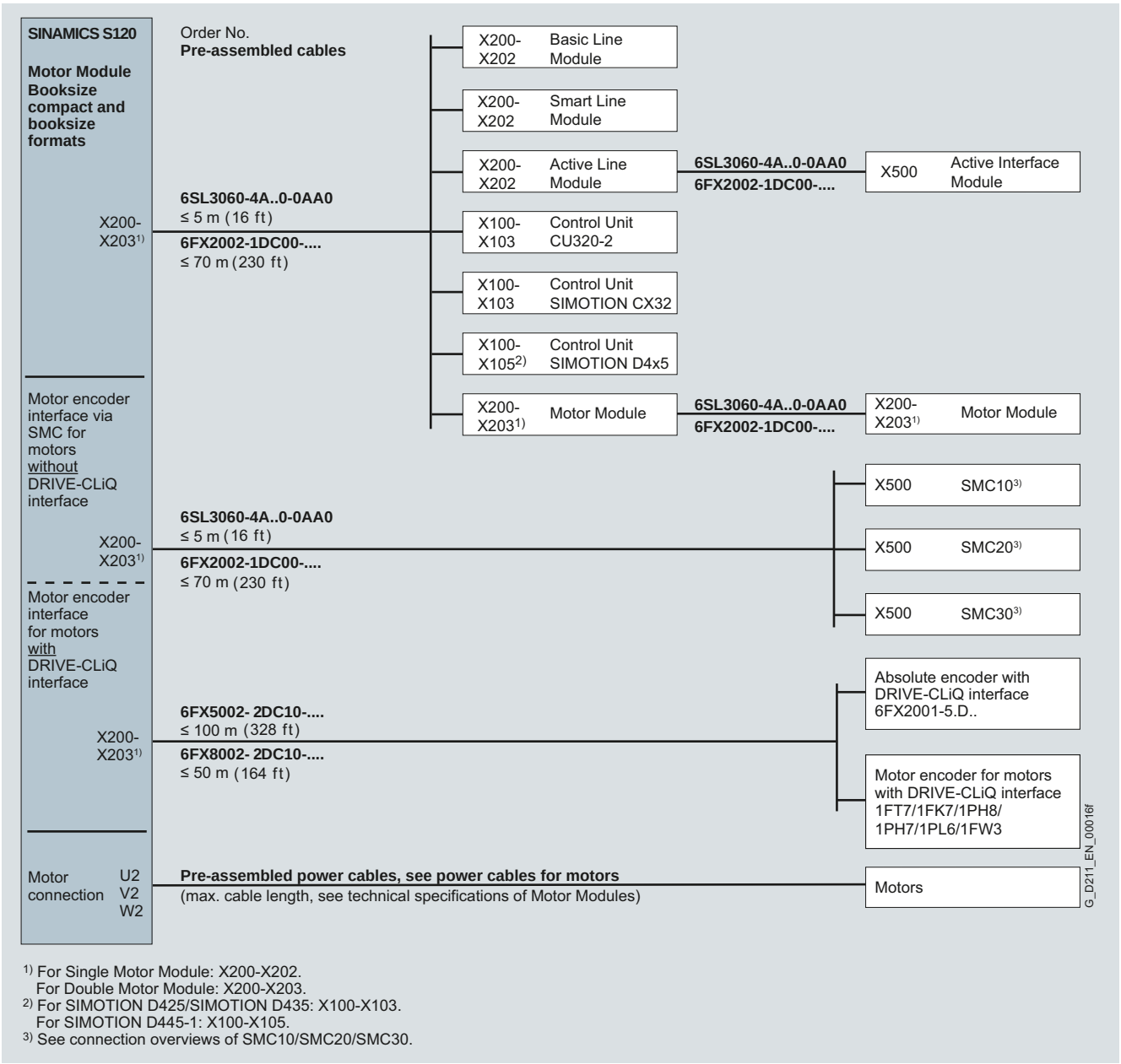


1) For SIMOTION D425/SIMOTION D435: X100-X103.
For SIMOTION D445-1: X100-X105.

Integration (continued)

Connection overview of SINAMICS S120 Motor Modules in booksize compact and booksize format for motors with DRIVE-CLiQ interface

The DRIVE-CLiQ signal cables of type 6SL3060-4A..0-0AA0 required for the standard configuration are part of the scope of supply of the Line Modules and Motor Modules. In this case, the modules must be mounted directly adjacent to one another in a row.

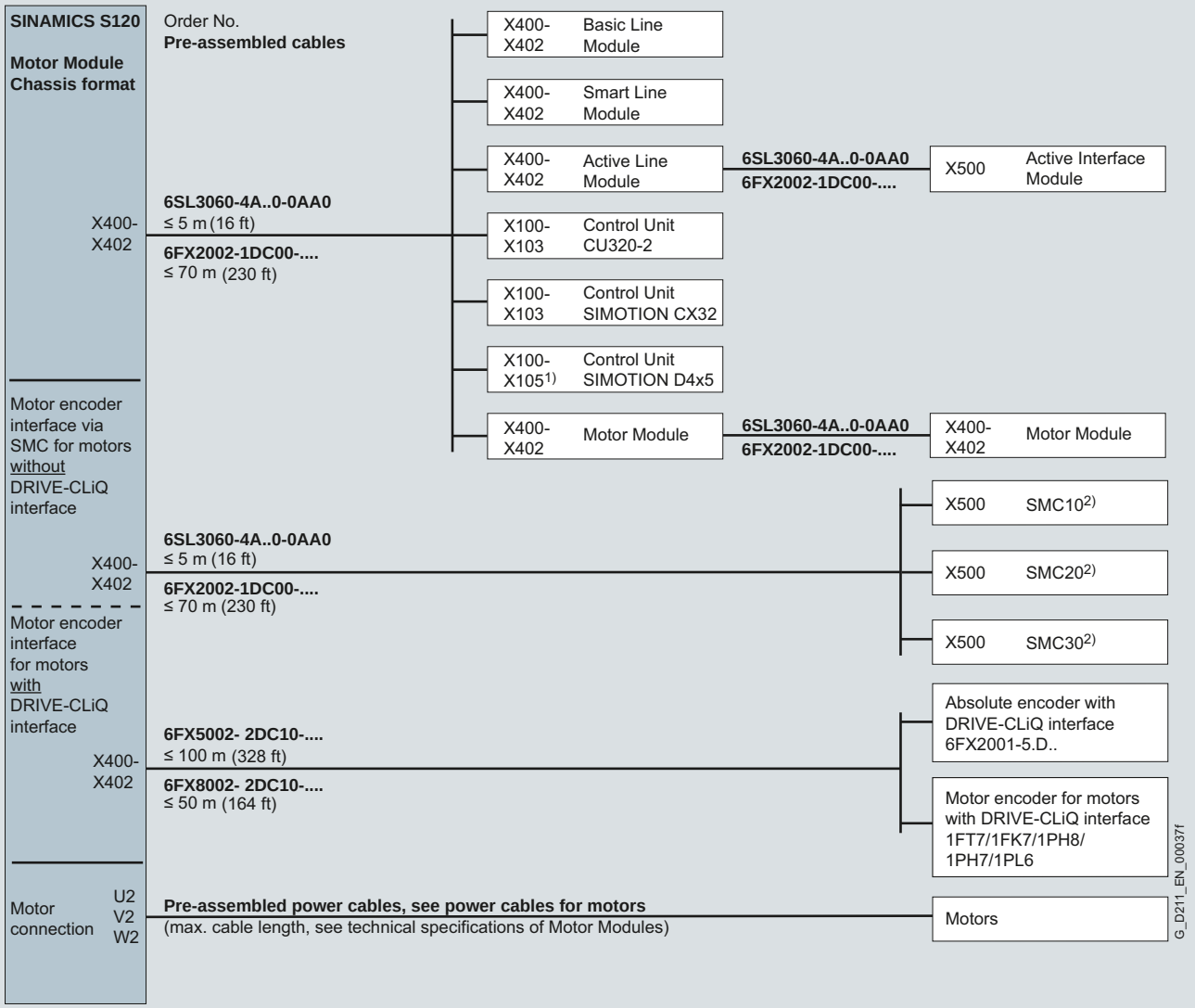


[1)] For Single Motor Module: X200-X202.
For Double Motor Module: X200-X203.
[2)] For SIMOTION D425/SIMOTION D435: X100-X103.
For SIMOTION D445-1: X100-X105.
[3)] See connection overviews of SMC10/SMC20/SMC30.

Connection overviews

Integration (continued)

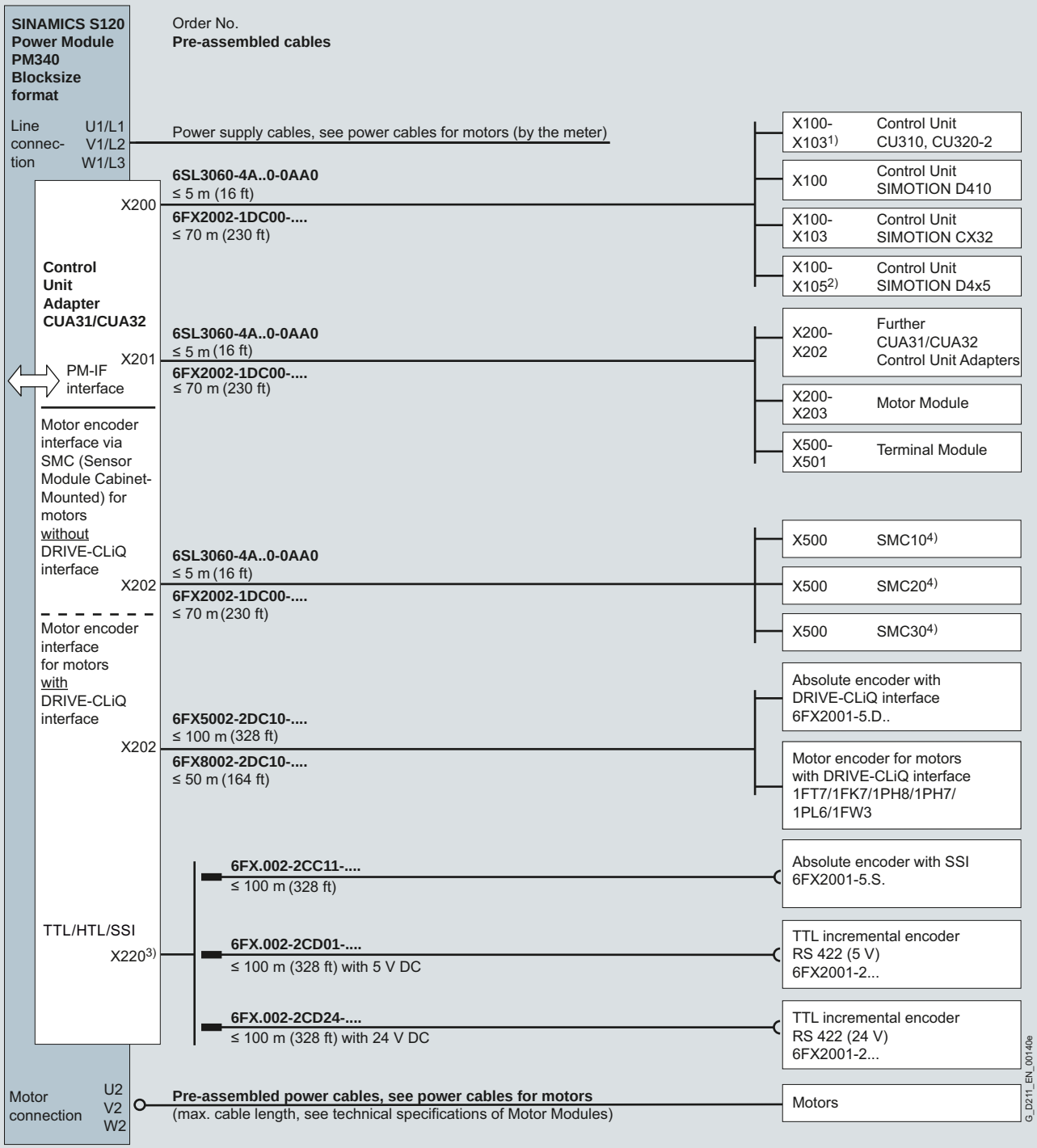
Connection overview of SINAMICS S120 Line Modules and Motor Modules in chassis format for motors with DRIVE-CLiQ interface



1) For SIMOTION D425/SIMOTION D435: X100-X103.
For SIMOTION D445-1: X100-X105.
2) See connection overviews of SMC10/SMC20/SMC30.

Integration (continued)

Connection overview of SINAMICS S120 Power Modules in blocksize format with CUA31/CUA32 Control Unit Adapter for motors with DRIVE-CLiQ interface

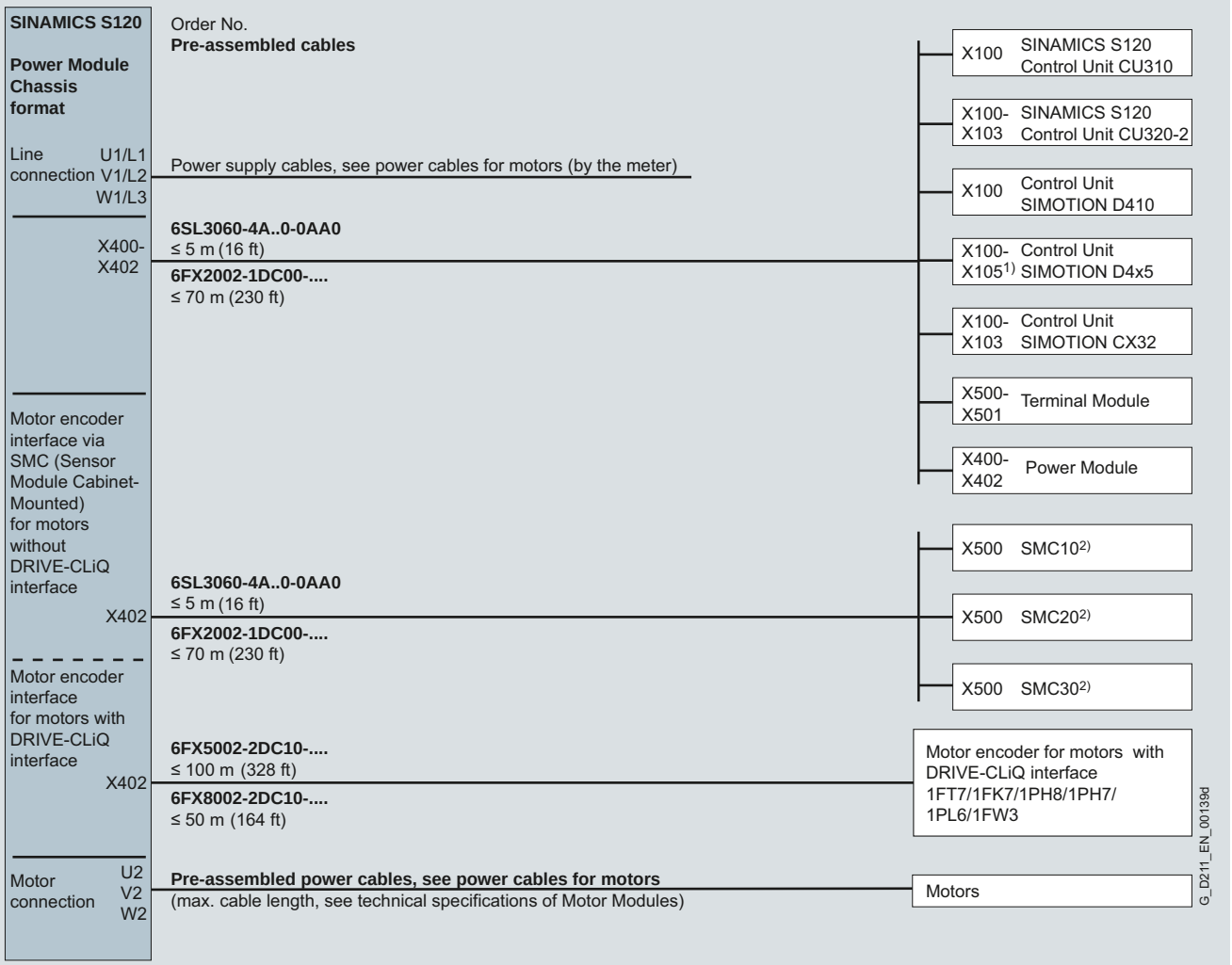


1) For Control Unit CU310: X100.
For Control Unit CU320-2: X100-X103.
2) For SIMOTION D425/SIMOTION D435-1: X100-X103.
For SIMOTION D445-1: X100-X105.
3) Only for CUA32 Control Unit Adapter.
4) See connection overviews of SMC10/SMC20/SMC30.

Integration (continued)

Connection overview for SINAMICS S120 Power Modules in chassis format

A DRIVE-CLiQ signal cable of type 6SL3060-4A..0-0AA0 for connection to the chassis-mounted CU310 Control Unit/SIMOTION D410 Control Unit is already included in the scope of supply.

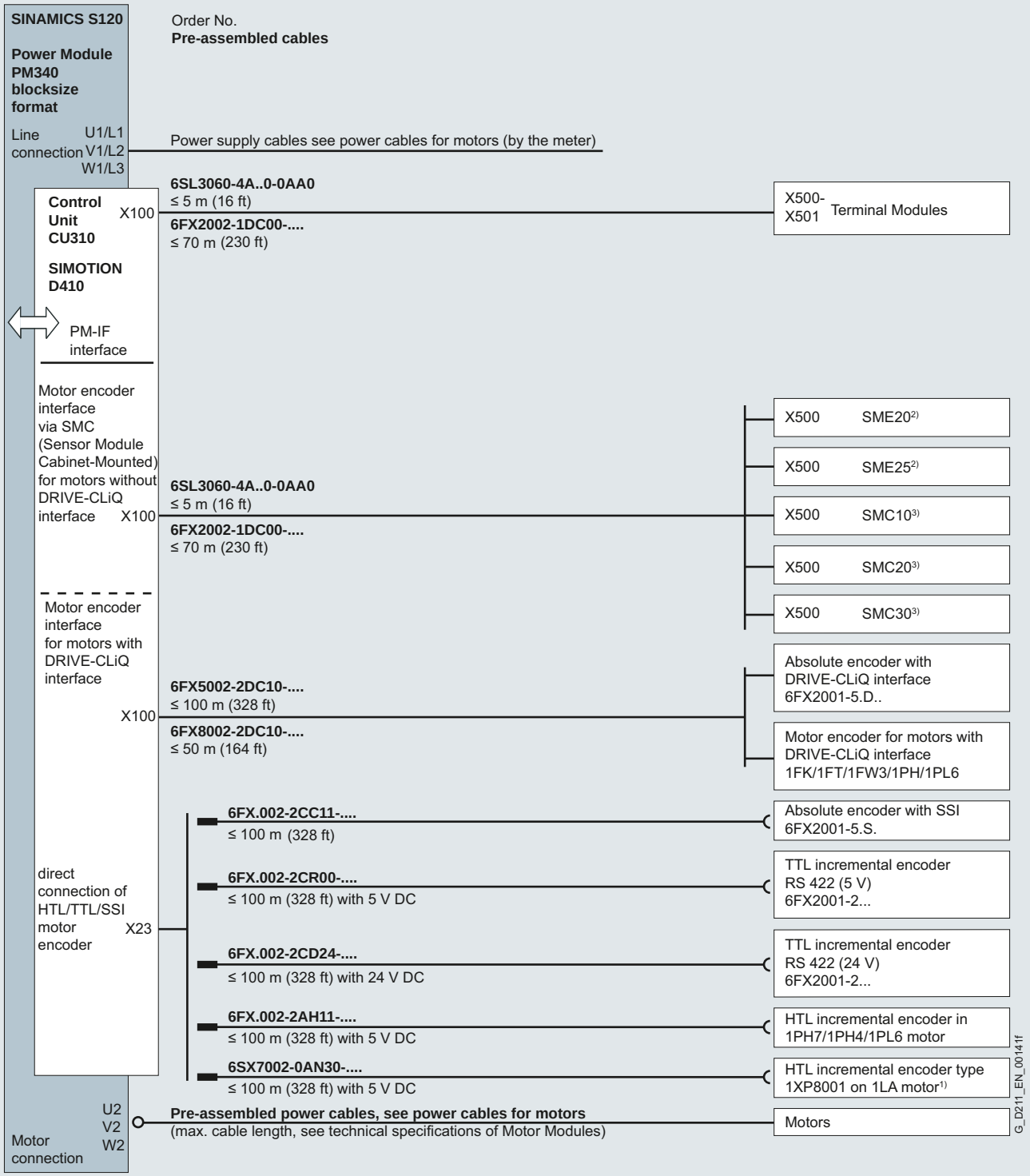


1) For SIMOTION D425/SIMOTION D435: X100-X103.
For SIMOTION D445-1: X100-X105.

2) See connection overviews of SMC10/SMC20/SMC30.

Integration (continued)

Connection overview of SINAMICS S120 Power Modules in blocksize format with CU310/SIMOTION D410 Control Unit for motors with DRIVE-CLiQ interface



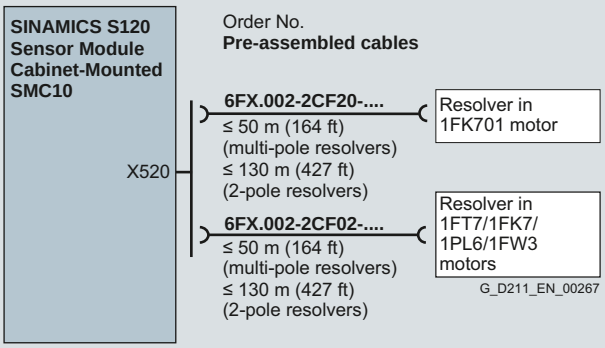
1) Not for 2KG geared motor.
2) See connection overview for connection of a machine encoder.
3) See connection overviews of SMC10/SMC20/SMC30.

8

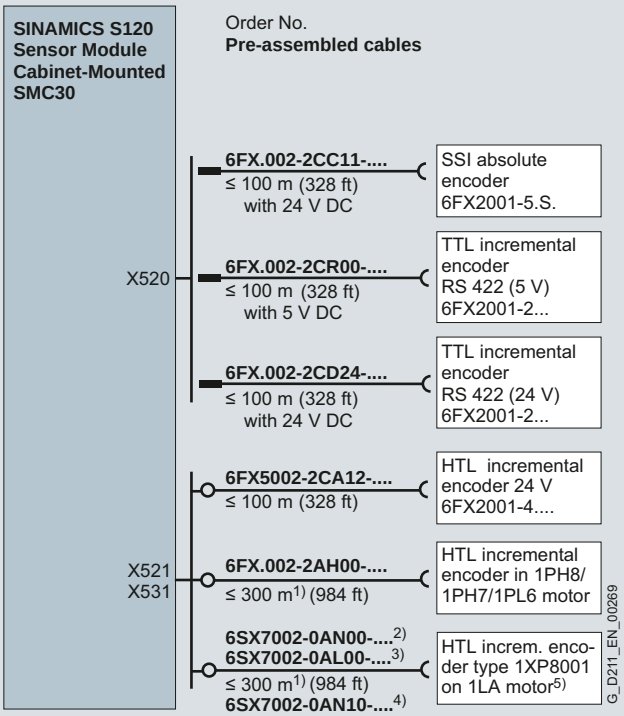
Connection overviews

Integration (continued)

Connection overview for SINAMICS S120 Sensor Module Cabinet-Mounted SMC10

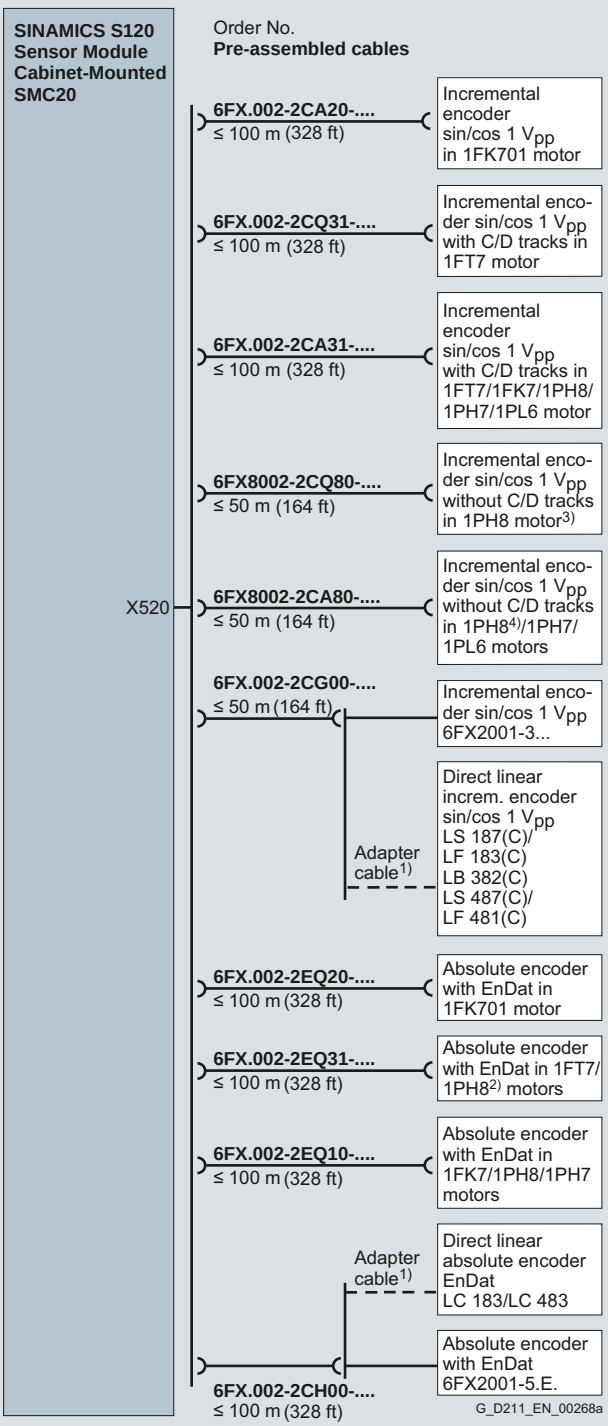


Connection overview for SINAMICS S120 Sensor Module Cabinet-Mounted SMC30



1) With evaluation of difference signals A*, A and B*, B, otherwise ≤ 100 m (328 ft).
2) Signals A*, A, B*, B, R*, R.
3) Signals A, B.
4) With right-angled connector.
5) Not for 2KG geared motor.

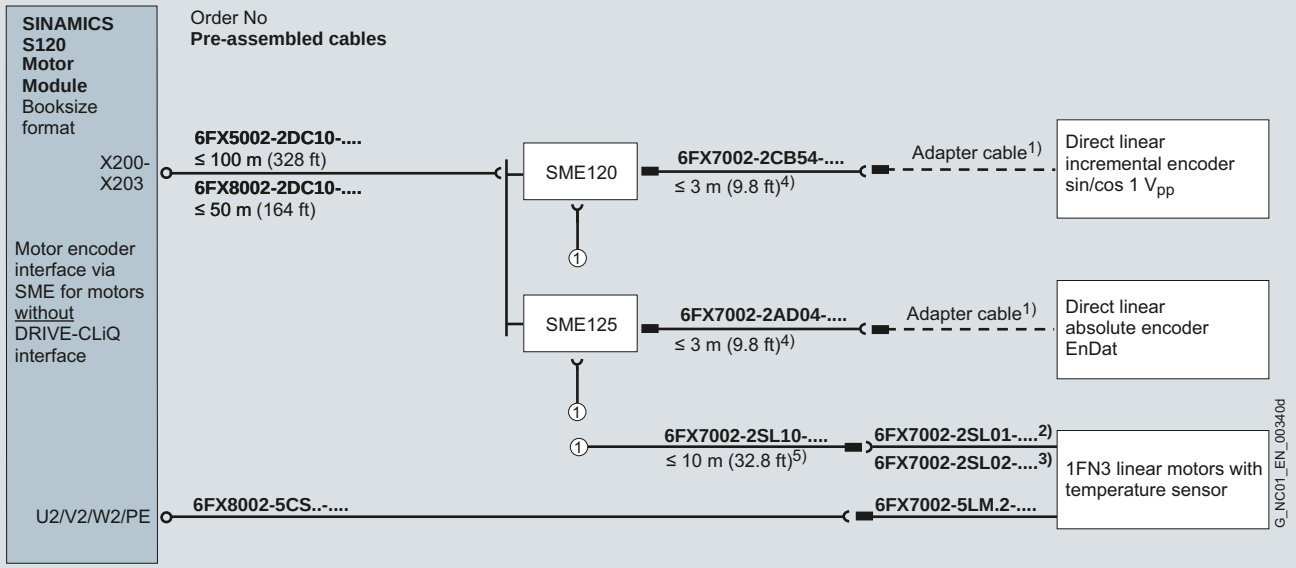
Connection overview for SINAMICS S120 Sensor Module Cabinet-Mounted SMC20



1) Adapter cable available from measuring system manufacturer.
2) Possible for 1PH808/1PH810/1PH813/1PH816 motors.
3) Possible for 1PH808/1PH810/1PH813/1PH816 motors for encoders with 512 S/R and 256 S/R.
4) Possible for 1PH8 motors for encoders with 512 S/R and 256 S/R.

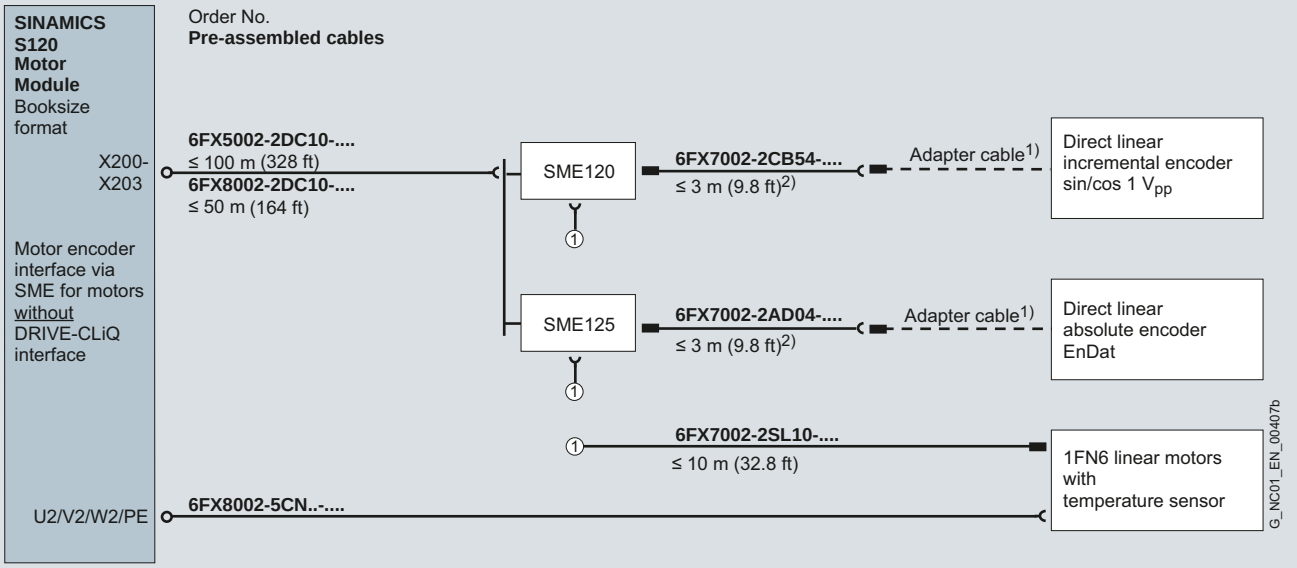
Integration (continued)

Connection overview for SINAMICS S120 Motor Modules in booksize format and 1FN3 linear motors



1) Adapter cable available from measuring system manufacturer.
2) For motors 1FN3100/1FN3150.
3) For motors 1FN3300 to 1FN3900.
4) Up to 10 m (32.8 ft) possible, depending on encoder current consumption.
5) The total cable length between SME125 and 1FN3 must not exceed 10 m (32.8 ft).

Connection overview for SINAMICS S120 Motor Modules in booksize format and 1FN6 linear motors



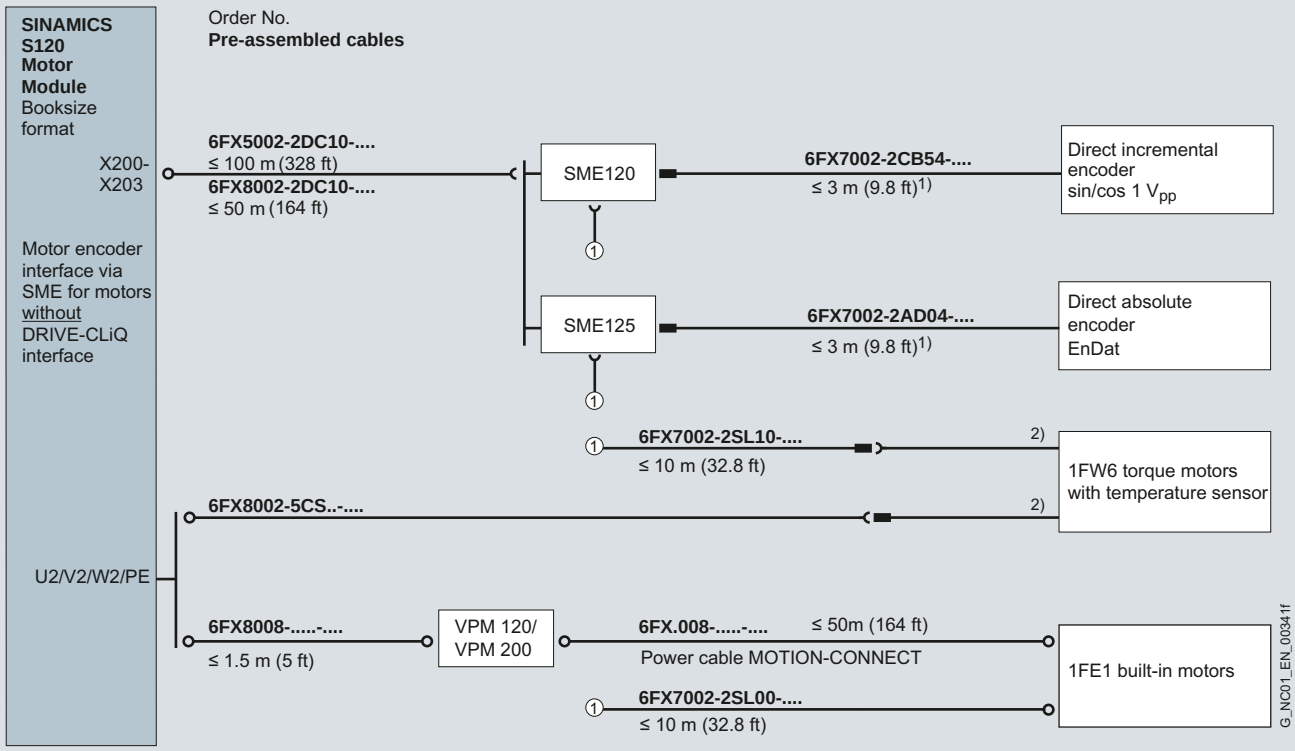
1) Adapter cable available from measuring system manufacturer.
2) Up to 10 m (32.8 ft) possible, depending on encoder current consumption.

8

Connection overviews

Integration (continued)

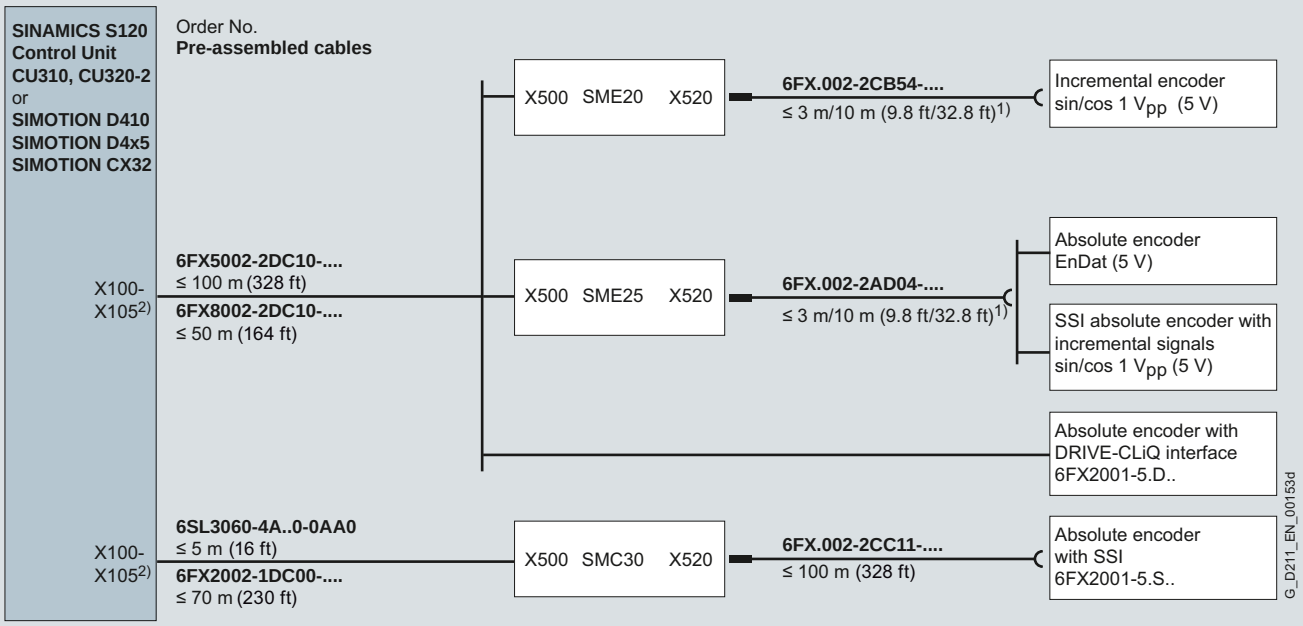
Connection overview for SINAMICS S120 Motor Modules in booksize format with SME12. and 1FW6 motors



1) Up to 10 m (32.8 ft) possible, depending on encoder current consumption.

2) For type of connection with exposed core ends, power and signal connectors are not included in the scope of delivery of the motor, they must be ordered separately (see Accessories for power and signal cables).

Connection of a machine encoder (direct measuring system)



1) Depending on encoder current consumption.

2) For Control Unit CU310/SIMOTION D410: X100.
For Control Unit CU320-2/SIMOTION D425/SIMOTION D435/SIMOTION CX32: X100-X103.
For SIMOTION D445-1: X100-X105.

Power connector for SINAMICS Motor Modules

Overview

Power connector with screw-type connection

3 A to 30 A Motor Modules in booksize format are shipped without power connector, as this is already connected to the MOTION-CONNECT power cables.

Power connectors can also be ordered separately, e.g. for applications where installation of the motor cable would be difficult if a power connector were attached.

Selection and ordering data

Description	Order No.
Power connector For Motor Modules 3 ... 30 A booksize format with screw-type connection (enclosure, insulator, 4 coding pins and 1 interlock bolt, screw-type connections motor: 1.5 ... 10 mm^2, brake: 1.5 mm^2)	**6SL3162-2MA00-0AA0**

Power and signal connectors for 1FW6 built-in torque motors

Overview

Power and signal connectors for 1FW6 torque motors

6FX2003 power and signal connectors ensure that the 1FW6 built-in torque motors are optimally connected to the drive system.

Selection and ordering data

Description	Order No.
Power connector for 1FW6 built-in torque motors	
• Size 1 for 4 × 2.5 mm^2 connector with male contacts and external full thread	**6FX2003-0LA00**
• Size 1.5 for 4 × 4 mm^2/4 × 6 mm^2/ 4 × 10 mm^2/4 × 16 mm^2 connector with male contacts and external full thread	**6FX2003-0LA10**
Signal connector for 1FW6 built-in torque motors	
• M17 for 5 × 0.5 mm^2 + 1 × 1.0 mm^2 connector with female contacts and full-thread lock nut	**6FX2003-0SU07**

More information

A special tool is required for crimping the contacts. For more information, go to:
www.intercontec.biz

Mounting flange

Overview

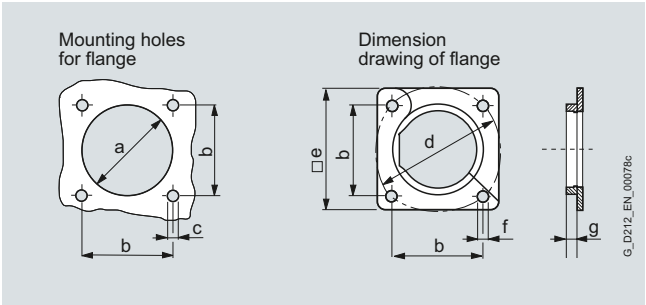
Mounting flange for power connectors

Mounting flanges are used to route or fix connectors in IP67 degree of protection, for example, in control cabinets. With the exception of angled connectors, a mounting flange can be retro-mounted on connectors with a union nut or with external thread.

Selection and ordering data

Description	Order No.
Mounting flange for	
• Power connector size 0.5 and signal connector M17	**6FX2003-7HX00**
• Power connector, size 1	**6FX2003-7BX00**
• Power connector size 1.5	**6FX2003-7CX00**
• Power connector, size 3	**6FX2003-7AX00**
• Signal connector M23	**6FX2003-7DX00**

Dimensional drawings



Dimensions	Power connector				Signal connector	
	Connector size 0.5	Connector size 1	Connector size 1.5	Connector size 3	M17	M23
	mm (in)	mm (in)	mm (in)	mm (in)	mm (in)	mm (in)
a	∅ 23 (0.91)	∅ 28.6 (1.13)	∅ 47 (1.85)	∅ 66 (2.6)	∅ 23 (0.91)	∅ 27.6 (1.09)
b	22.6 (0.89)	28.3 (1.11)	42.4 (1.67)	75 (2.95)	22.6 (0.89)	28.3 (1.11)
c	4 × M2.5	4 × M3	4 × M4	4 × M4	4 × M2.5	4 × M3
d	∅ 32 (1.26)	∅ 40 (1.57)	∅ 60 (2.36)	∅ 63 (2.48)	∅ 32 (1.26)	∅ 40 (1.57)
e	32 (1.26)	36.8 (1.45)	55 (2.17)	84.9 (3.34)	32 (1.26)	36.8 (1.45)
f	M3	M4	M5	M6	M3	M4
g	6.5 (0.26)	6.5 (0.26)	7 (0.28)	10 (0.39)	6.5 (0.26)	6.5 (0.26)

HF (high-frequency) clamp

Overview

HF (high-frequency) clamp for power connectors

To ensure correct grounding at the cable duct or cabinet wall, a ground clamp is optionally available together with the flanges for large-area discharging of high-frequency interferences. An HF (high frequency) clamp is not required for power connectors, size 3.

Selection and ordering data

Description	Order No.
HF (high-frequency) clamp for	
• Power connector size 0.5 and signal connector M17	**6FX2003-7FA00**
• Power connector size 1 and signal connector M23	**6FX2003-7FX00**
• Power connector size 1.5	**6FX2003-7GX00**

DRIVE-CLiQ cabinet bushing

Overview

DRIVE-CLiQ cabinet bushing for signal cables

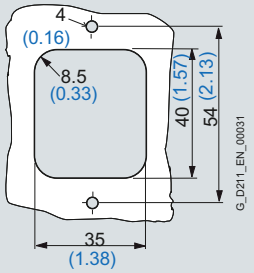
The DRIVE-CLiQ cabinet bushing provides the high IP67 degree of protection for DRIVE-CLiQ MOTION-CONNECT signal cables routed through openings in control cabinets. The DRIVE-CLiQ cabinet bushing features IP54 degree of protection on the outside and IP20 on the inside of the control cabinet.

Selection and ordering data

Description	Order No.
DRIVE-CLiQ cabinet bushing For DRIVE-CLiQ MOTION-CONNECT signal cables	**6SL3066-2DA00-0AA0**

Dimensional drawings

Cabinet cut-out for DRIVE-CLiQ cabinet bushing



Dimensions in mm

DRIVE-CLiQ coupler

Overview

DRIVE-CLiQ coupler for signal cables

The DRIVE-CLiQ coupler makes it possible to join two DRIVE-CLiQ MOTION-CONNECT signal cables with degree of protection IP67.

Selection and ordering data

Description	Order No.
DRIVE-CLiQ coupler For DRIVE-CLiQ MOTION-CONNECT signal cables	**6SL3066-2DA00-0AB0**

8

Length code

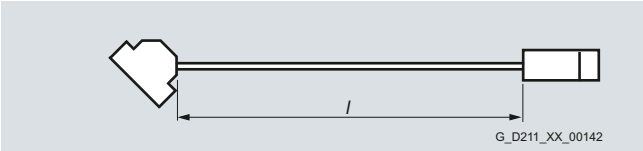
Overview

Description	Order No. supplement				
Length code for pre-assembled cables					
	6FX....-.....-	■	■	■	■
	6SX....-.....-	■	■	■	**0**
0 m (0 ft)		**1**			
100 m (328 ft)		**2**			
200 m (656 ft)		**3**			
0 m (0 ft)			**A**		
10 m (32.8 ft)			**B**		
20 m (65.6 ft)			**C**		
30 m (98.4 ft)			**D**		
40 m (131 ft)			**E**		
50 m (164 ft)			**F**		
60 m (197 ft)			**G**		
70 m (230 ft)			**H**		
80 m (262 ft)			**J**		
90 m (295 ft)			**K**		
0 m (0 ft)				**A**	
1 m (3.28 ft)				**B**	
2 m (6.56 ft)				**C**	
3 m (9.84 ft)				**D**	
4 m (13.1 ft)				**E**	
5 m (16.4 ft)				**F**	
6 m (19.7 ft)				**G**	
7 m (22.9 ft)				**H**	
8 m (26.3 ft)				**J**	
9 m (29.5 ft)				**K**	
0 m (0 ft)					**0**
0.1 m (3.94 in)					**1**
0.2 m (7.87 in)					**2**
0.3 m (11.81 in)					**3**
0.4 m (15.75 in)					**4**
0.5 m (19.96 in)					**5**
0.6 m (23.62 in)					**6**
0.7 m (27.56 in)					**7**
0.8 m (31.5 in)					**8**
Examples:	1.0 m (3.28 ft):	1	A	B	0
	2.2 m (7.22 ft):	1	A	C	2
	8.0 m (26.3 ft):	1	A	J	0
	299.0 m (981 ft):	3	K	K	0

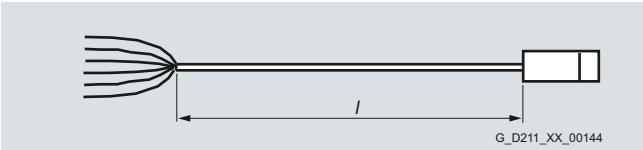
Description	Order No. supplement				
Length code for power and signal cables, sold by the meter[1)]					
	6FX.008-.....-	■	■	**A**	**0**
50 m (164 ft)		**1**	**F**		
100 m (328 ft)		**2**	**A**		
200 m (656 ft)		**3**	**A**		
500 m (1641 ft)		**6**	**A**		

More information

Definition of lengths for pre-assembled cables



Signal cables



Power cables 6FX.002-5LM..-.... for linear/torque motors

Tolerances:

- Cable lengths up to 10 m (32.8 ft): ± 2 %
- Cable lengths of 10 m (32.8 ft) and longer: ± 1 %

1) Note type of delivery.

SIMOTION
Motion Control System

9

9/2	**Overview**
9/4	**SIMOTION C – Controller-based**
9/7	SIMOTION C240/C240 PN Motion Controller
9/12	**SIMOTION P – PC-based**
9/17	SIMOTION P320-3 Motion Controller
9/20	SIMOTION P350-3 Motion Controller
9/23	Panel fronts for SIMOTION P
9/24	Supplementary components
9/24	SIMATIC Panel PC Remote Kit
9/25	KBPC CG US standard PC keyboard
9/26	MCI-PN Communication Board
9/27	**SIMOTION D – Drive-based**
9/32	SIMOTION D410 Control Units
9/37	SIMOTION D4x5 Control Units
9/43	Supplementary components
9/43	CBE30 Communication Board
9/44	SIMOTION CX32 Controller Extension
9/46	**SIMOTION software**
9/47	**SIMOTION runtime software**
9/50	Runtime software licensing
9/50	Overview of the licensing concept
9/52	Ordering of licenses for runtime software
9/54	SIMOTION Kernel
9/56	SIMOTION technology packages
9/63	SIMOTION PLCopen blocks
9/64	OPC server
9/66	SIMOTION IT
9/69	**SIMOTION engineering software**
9/69	SIMOTION SCOUT software package
9/80	**Overview of SIMOTION functions**
Part 3	**Engineering software** STARTER commissioning tool Drive Control Chart (DCC) Drive ES engineering software
Part 13	**SIZER configuration tool**
Part 14	**CAD CREATOR** Dimension drawing and 2D/3D CAD generator www.siemens.com/cadcreator

	Designation	Description	Page
SIMOTION C – Controller-based			**9/4**
	SIMOTION C240/C240PN Motion Controller	Motion Controller for analog, stepper, PROFIBUS and PROFINET drives	**9/7**
SIMOTION P – PC-based			**9/12**
	SIMOTION P320-3 Motion Controller	Motion Controller for embedded PC solutions	**9/17**
	SIMOTION P350-3 Motion Controller	Motion Controller for high-performance applications with Windows XP	**9/20**
	Panel fronts for SIMOTION P	Panel fronts for SIMOTION P with touch or key operation	**9/23**
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	SIMATIC Panel PC Remote Kit	The Panel PC Remote Kit allows the Motion Controller and control unit to be installed at a distance from one another	**9/24**
	Standard PC keyboard	PC keyboard with palm rest for ergonomic working	**9/25**
	MCI-PN Communication Board	Option module for PROFINET	**9/26**
SIMOTION D – Drive-based			**9/27**
	SIMOTION D410 Control Units	Compact Control Units for single-axis applications	**9/32**
	SIMOTION D4x5 Control Units	Scalable Control Units for multi-axis applications	**9/37**
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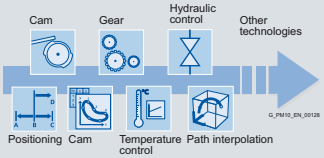
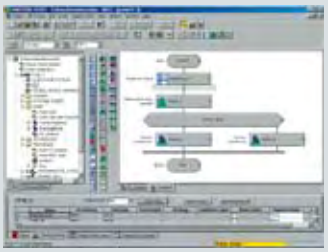
SIMOTION software		Software for runtime, engineering and commissioning	**9/46**
SIMOTION runtime software			**9/47**
	Runtime software licensing	Overview of the licensing system	**9/50**
		Ordering of licenses for runtime software	**9/52**
	SIMOTION Kernel	Structure and functions of the SIMOTION Kernel	**9/54**
	SIMOTION technology packages	Functions of the technology packages	**9/56**
	SIMOTION PLCopen blocks	PLCopen blocks for SIMOTION	**9/63**
	OPC server	SIMATIC NET OPC server for SIMOTION P350-3	**9/64**
	SIMOTION IT	Service and diagnostic functions for SIMOTION	**9/66**

	Designation	Description	Page
SIMOTION engineering software			**9/69**
	SIMOTION SCOUT software package	The engineering system for SIMOTION	**9/69**
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Overview of SIMOTION functions			**9/80**
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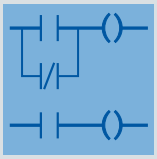
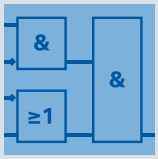
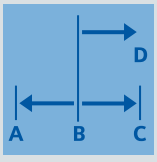
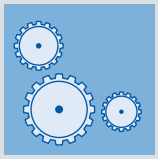
	Encoders on SIMOTION	Which encoders can be directly connected to SIMOTION? Are there other connection options?	**9/84**
	Measuring inputs	How many measuring inputs are provided on the SIMOTION platforms? Are there further options for implementing measuring inputs?	**9/85**
	Output cams	How many onboard output cams are provided on the SIMOTION platforms? Are there further options for implementing output cams?	**9/85**
	Integrated I/O interfaces	How many onboard I/O interfaces are provided? (digital, analog, relay outputs, etc.)	**9/86**
	SIMOTION C centralized I/O modules	How many centralized I/O modules can be added to SIMOTION C?	**9/86**
	Connectable distributed I/O modules	Which distributed I/O modules can be connected over PROFIBUS or PROFINET? Which SINAMICS drive I/Os can be connected to SIMOTION?	**9/87**
	SIMOTION HMI devices	Which HMI devices can be connected to SIMOTION?	**9/88**
	HMI software for SIMOTION	Which HMI software can be employed for SIMOTION applications?	**9/88**
	Software for extended communication with SIMOTION	Communication according to the standards OPC and OPC XML-DA, SIMOTION Multipurpose Information Interface	**9/88**
	Communication	How many communication interfaces are provided on the SIMOTION platforms?	**9/89**
	SIMOTION Kernel	Performance features of the SIMOTION Kernel and PLC command set	**9/92**
	Motion Control technology package	Features of the Motion Control technology package	**9/93**
	Other technology packages	SIMOTION technology packages for special areas of application	**9/94**
	SIMOTION IT	Software options for extending the service and diagnostic functions of SIMOTION	**9/94**
	SIMOTION SCOUT engineering system	SCOUT basic functionality and optional packages	**9/95**
	Testing and diagnostics with SIMOTION SCOUT	Program test functions, trace, comparison function for projects, etc.	**9/96**
	Engineering drives	Drive engineering tools for SIMOTION	**9/97**

Overview

SIMOTION C is the controller variant of the SIMOTION family with the proven design of the SIMATIC S7-300. Flexible modular expansion of SIMOTION C is possible thanks to use of the SIMATIC S7 module spectrum. The SIMOTION C240 and C240 PN designs represent two powerful Motion Controllers for advanced control and motion control tasks.

Depending on the SIMOTION C platform, HMI devices can be operated directly on the onboard PROFIBUS, Ethernet or PROFINET interfaces for operator control and monitoring. Functions such as remote maintenance, diagnostics and teleservice can also be used via these interfaces.

Benefits

- Flexible application thanks to use of the SIMATIC S7-300 module spectrum and thus optimal adaptation to the automation task
- For universal use with digital and analog coupling to servo/vector, stepper and hydraulic drives (depending on the variant)
- User-friendly mounting and simple design with no moving parts
- Versatile networking through onboard PROFIBUS DP, Industrial Ethernet and PROFINET IO interfaces
- Powerful thanks to a range of integrated functions
- Easy engineering for open-loop control and motion control applications in the same program

Application

SIMOTION C can be used wherever:

- Motion Control, technology and PLC functionalities are to be programmed, configured and executed in a single unit,
- a modularly expandable device is to be placed near or in the machine,
- communication with other programmable controllers is necessary.

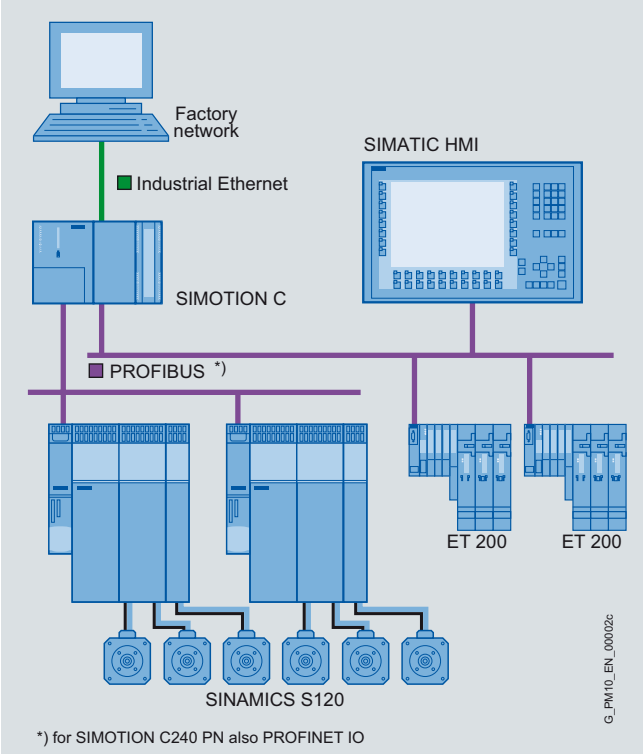
SIMOTION C is universally applicable and meets the highest standards with respect to suitability for industrial use, thanks to high EMC compatibility and resistance against shock and vibration loads.

Important applications include:

- Packaging machines
- Plastic and rubber processing machines
- Presses, wire-drawing machines
- Textile machines
- Printing machines
- Wood, glass, ceramics and stone working machines
- Retrofit

Due to the increasing use of servo drives, these machines require a high degree of integration of PLC, Motion Control and technology functions.

Design



SIMOTION C with central and distributed I/O

The SIMOTION C motion control system is designed with modular principles in mind. It consists of a comprehensive and individually combinable hardware spectrum that uses components of the SIMATIC S7-300 series and Siemens drive technology.

Design (continued)

Components and interfaces of the SIMOTION C Motion Controller:

- Analog drive interfaces (for C240)
  - For setpoint outputs to servo/vector drives
  - For setpoint outputs to the actuating valves of hydraulic drives
  - As analog outputs for optional use
- Pulse outputs for controlling stepper drives (for C240)
- Interfaces for incremental/absolute encoders for cyclic acquisition of an actual position value or as freely assignable up/down counter (for C240)
- Onboard I/O for high-speed I/O signals
- SIMOTION Micro Memory Card (MMC) for storing:
  - SIMOTION Kernel
  - User programs
  - User variables
- Integrated communications interfaces for linking:
  - Distributed I/Os
  - HMI systems
  - PG/PC
  - Other Motion Control and automation systems
  - Drives with digital setpoint interface
- Various status/error displays and mode selectors

The following components make up a SIMOTION C system:

- Motion Controller and Micro Memory Card (MMC)
- Other system components (depending on requirements) such as:
  - Load power supplies (PS) for connecting SIMOTION C to a power supply of 120 V/230 V AC
  - Central (not onboard) and distributed I/O components
  - Servo/vector drives with analog or digital setpoint interface or stepper drives

Mounting and connection technology

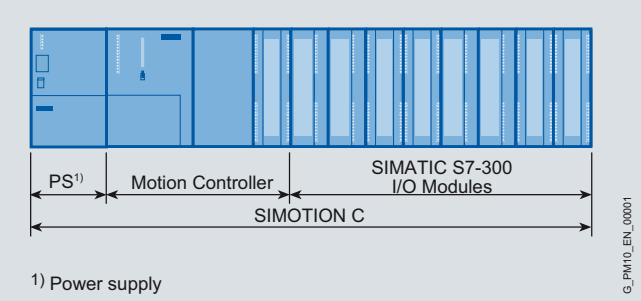
The simple design makes SIMOTION C flexible and easy to maintain:

- Rail mounting
  Simply attach the module to the standard mounting rail, swing it in and screw it tight.
- Integrated backplane bus
  The backplane bus is integrated in the Motion Controller. The Motion Controller is connected to the I/O modules via bus connectors which are plugged into the rear of the housing.
- The front connector design prevents front connectors from being plugged into the wrong module type.
- Screw-type terminals, spring-loaded terminals or Fast Connect system for I/O modules
- TOP connect
  This connection method provides pre-assembled wiring with 1 to 3-wire connection systems with screw-type or spring-loaded terminal as an alternative to wiring directly on the I/O module.
- This system uses a standard mounting depth since all connections and connectors are recessed in the module and are protected and covered by doors on the front.
- No slot rules.

Expansion with central I/O modules

Up to 8 slots can be used to the right of the Motion Controller for SIMATIC S7-300 I/O modules.

The IM 365 can be used to connect an expansion rack (two-tier design) to increase the number of slots available for I/O modules from 8 to 16. Multi-tier configuration with IM 360/IM 361 is not supported by SIMOTION C.



SIMOTION C can be mounted horizontally or vertically.

If additional I/O modules are required, the distributed SIMATIC ET 200 I/O can be connected to a SIMOTION C via PROFIBUS DP or PROFINET IO (for C240 PN).

The number of pluggable I/O modules is also limited by the power required from the backplane bus. The power consumption of all modules which are connected to the same backplane bus must not exceed 1.2 A.

Expansion using distributed I/Os

Distributed I/Os can be assembled with intelligent I/O system components:

- SIMATIC ET 200S
- SIMATIC ET 200M
- SIMATIC ET 200pro
- SIMATIC ET 200eco
- SIMATIC ET 200eco PN (for C240 PN)

Function

Basic functionality

SIMOTION C provides the following basic functionality for a wide variety of automation requirements:

- SIMOTION runtime system
  - User-programmable with several languages conforming to IEC 61131
  - Various methods of program execution (cyclic, sequential, event-driven)
  - PLC and arithmetic functionality
  - Communication and management functions
  - Motion Control functions (Motion Control Basic)
- Testing and diagnostic tools

This basic functionality can be expanded with loadable technology packages, if required.

SIMOTION technology packages

A special feature of SIMOTION is that the operating system functionality can be expanded by loading technology packages, such as:

- Motion Control with the functions:
  - POS – Positioning
  - GEAR – Synchronous operation/electronic gear
  - CAM – Cam
  - PATH - Path interpolation
- TControl – Temperature controller
- DPM – Direct Product Motion
- MIIF – Multipurpose Information Interface

Since the technology functions have modular licenses, you only pay for what you use.

Configuring/parameterizing/programming

SIMOTION SCOUT is a powerful and user-friendly engineering tool. It is an integrated system for all engineering steps, from configuring and parameterization, through programming, to testing and diagnostics. Graphical operator prompting, using dialog boxes and wizards, as well as text-based and graphical languages for programming, considerably reduce the familiarization and training periods.

Operator control and monitoring (HMI)

Communication utilities which support user-friendly data exchange with HMI devices are integrated in the basic functionality of the SIMOTION C Controller. Operator control and monitoring can be implemented using SIMATIC HMI devices, such as TPs (Touch Panels), OPs (Operator Panels) or MPs (Multi Panels).

These devices can be connected to a SIMOTION C via Industrial Ethernet, PROFIBUS or PROFINET (for C240 PN). They are configured using ProTool/Pro or WinCC flexible.

With the SIMATIC NET communication software, the open, standardized OPC interface is available for accessing SIMOTION from other Windows-based HMI systems.

Function (continued)

SIMOTION IT provides SIMOTION C with an integrated Web server on which, for example, user-specific Web pages can be stored. Read and write access can be made to the Motion Controller variables. Java scripts or applets also allow the implementation of active operation and display functions in the Web pages that can be executed on a client PC with an Internet browser.

Process and data communication

Thanks to its integrated interfaces, SIMOTION C supports both process and data communication. The SCOUT engineering system is provided for user-friendly communication configuration and diagnostics.

More information

More information

- about power supplies and I/O modules can be found in chapter SIMOTION I/O components.
- about TOP connect can be found in Catalog KT 10.2 and in the Industry Mall under Automation technology/ Automation and Control Systems/System cabling/ control cabinets/SIMATIC TOP connect system cabling.
- about the functionality of SIMOTION platforms can be found in section Overview of SIMOTION functions.
- about runtime software and engineering software can be found in section SIMOTION software.
- about the communication functions of the Motion Controllers can be found in section SIMOTION runtime software.
- about operator control and monitoring can be found in chapter SIMOTION HMI devices.
- about SIMATIC NET communication software can be found in section SIMOTION runtime software.

Overview

SIMOTION C is a Motion Controller in S7-300 design. In addition to the already integrated interfaces, the controller can be expanded using I/O modules from the SIMATIC S7-300 range.

The Motion Controller is available in two versions: SIMOTION C240 and SIMOTION C240 PN. Although the two C240 and C240 PN versions have the same PLC and motion control performance, they differ in their interfaces.

Design

Interfaces

Operation, display and diagnostics

- 1 mode selector
- 1 LED strip for fault and status indicators

Integrated I/Os

- 18 digital inputs
  (C240: of which 2 for local measuring inputs and 4 for global measuring inputs/zero marks, C240 PN: of which four for global measuring inputs)
- 8 digital outputs

Drive interfaces (C240)

- 1 setpoint output interface for up to 4 axes (optionally for analog, stepper or hydraulic drives; also as freely assignable analog outputs)
- 4 encoder inputs for incremental or absolute encoders (can also be used as freely assignable up/down counters)

Communication

- 1 interface for Industrial Ethernet
- 2 interfaces for PROFIBUS DP
  (of which one interface is for MPI)
- 3 ports for PROFINET IO (C240 PN)

Data backup

- 1 slot for SIMOTION Micro Memory Card (MMC)

Additional interfaces

- Power supply terminals

Design (continued)

Data storage/data backup

SIMOTION C Motion Controllers have an integrated non-volatile data memory for storing process variables.

The data is backed up on a SIMOTION Micro Memory Card (MMC).

Expansion with central I/O modules

The central I/O is plugged directly into the SIMOTION C Motion Controller. The I/O configuration for centralized I/O can comprise of two tiers (second tier using IM 365 interface) with up to 8 I/O modules each and a total of 4 analog modules. I/O modules from the SIMATIC S7-300 spectrum can be used here.

Expansion using distributed I/Os

The following can be used as distributed I/O components:

PROFIBUS DP:

- All certified PROFIBUS standard slaves
  (DP-V0, DP-V1, DP-V2)
- SIMATIC ET 200S/M/eco/pro distributed I/O systems
- Servo converters of the MASTERDRIVES, SIMODRIVE and SINAMICS series over PROFIBUS DP interface with PROFIdrive
- MICROMASTER and COMBIMASTER frequency inverters
- Stepper drives over PROFIBUS DP interface with PROFIdrive

PROFINET IO (C240 PN):

- Distributed I/O systems SIMATIC ET 200S/M/pro/eco PN
- SINAMICS S120 servo converters over PROFINET IO with IRT (PROFIdrive)

SIMOTION C240/C240 PN Motion Controller

Function

The control and motion control functionality runs centrally on the SIMOTION C controller.

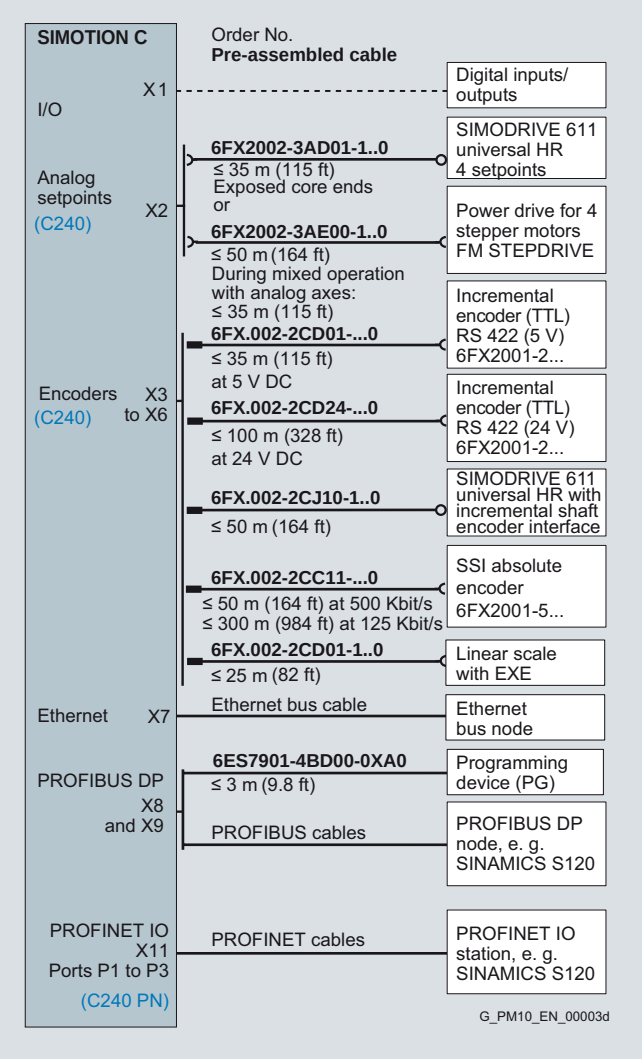
The functionality ranges from simple positioning to complex motion control tasks over cams and interpolation.

Position-controlled motion control

Setpoint output/actual value acquisition

- Position control with analog setpoint output
  For each axis, the SIMOTION C240 Motion Controller provides one analog output for the speed setpoint and one encoder input for cyclic detection of the actual position value. In the case of hydraulic drives, the setpoint for the positioning valve is specified via the analog output.
- Position control with pulse direction output for stepper drives
  For each axis, the SIMOTION C240 Motion Controller provides one pulse output for the position setpoint. Stepper drives can either be operated without an encoder or be position-controlled with an encoder.
- Position control with digital setpoint output
  The PROFIBUS DP interface with PROFIdrive or the PROFINET interface for the C240 PN is available for this purpose. The actual position value is fetched over PROFIBUS DP or PROFINET and the speed setpoint is output.
- Position control with mixed setpoint output
  Analog, stepper and PROFIBUS drives can be used in a mixed configuration on the SIMOTION C240 Motion Controller. The channels of the 4 onboard interfaces can be used for analog, stepper or hydraulic drives. PROFIBUS and PROFINET drives can be operated as mixed configuration for the C240 PN.
- Incremental position sensing (C240)
  Incremental encoders supply counter pulses for the traversed distance according to their resolution.
  It is usually necessary to search for homing references.
  The following can be used:
  - Rotary encoders
  - Linear encoders (length dimensions)
- Absolute position sensing (C240)
  Absolute encoders with serial interface can be used (SSI absolute encoders).
  It is not necessary to search for homing references.
- Position control/position sensing over ADI 4 or IM 174
  The ADI 4 (Analog Drive Interface for 4 Axes) or IM 174 (Interface Module for 4 Axes) module can be used to connect drives with analog setpoint interfaces.
  The IM 174 also supports the connection of stepper drives with a pulse direction interface.
  Both modules are connected over PROFIBUS DP.
  The following can be connected to an ADI 4 or IM 174 module:
  - 4 drives
  - 4 encoders
  - Digital inputs and outputs
- Isochronous PROFIBUS encoder

Integration



Overview of connections for SIMOTION C

The maximum permissible cable lengths should be taken into account when planning the cable layout.

Functional faults can occur when using longer cables.

The permissible length of PROFIBUS DP cables depends on the configuration.

Technical specifications

PLC and Motion Control performance	
Maximum number of axes	32
Minimum PROFIBUS cycle	1 ms
Minimum PROFINET send cycle (C240 PN only)	0.5 ms
Minimum servo/interpolator clock cycle	0.5 ms
Memory	
RAM (Random Access Memory)	35 MB
RAM disk (load memory)	23 MB
Retentive memory	107 KB
Persistent memory (user data on MMC)	52 MB
Communication	
Ethernet interfaces	1
PROFIBUS interfaces	2
PROFINET interfaces (C240 PN only)	• 1 interface with 3 ports • Supports PROFINET IO with IRT and RT • Can be configured as PROFINET IO controller and/or device
General technical specifications	
Supply voltage	
• Rated value	24 V DC
• Permissible range	20.4 ... 28.8 V
Current consumption, typ.	1.2 A
Starting current, typ.	8.0 A
Power loss	15 W
Permissible ambient temperature	
• Storage and transport	-40 ... +70 °C (-40 ... +158 °F)
• Operation	0 ... 55 °C (32 ... 131 °F)
Permissible relative humidity (without condensation)	5 ... 95 %
Atmospheric pressure	700 ... 1060 hPa
Degree of protection according to EN 60529 (IEC 60529)	IP20
Dimensions (W × H × D)	200 × 125 × 118 mm (7.87 × 4.92 × 4.65 in)
Weight	
• SIMOTION C2xx	1150 g (2.54 lb)
• Memory card	16 g (0.56 oz)
Relay outputs	**5 (C240)** **1 (C240 PN)**
of which for	
• Controller enable (C240 only)	4
• READY	1
Electrical data	
• Operational voltage, max.	50 V DC
• Switching current, max.	1 A
• Switching capacity, max.	30 W
Operating cycles	
• at 24 V, 1 A	3×10^6

Drive interfaces (C240 only)	**4**
Can be optionally used for analog, stepper or hydraulic drives, alternatively also as standard analog outputs	
When used as an analog output	
• Voltage range	± 10.5 V
• Resolution	16 bit, including sign
• Galvanic isolation	No
• Load impedance	>3 kW
• Cable length, max.	35 m (115 ft)
When used as a pulse output for stepper drives	
• Output voltage for "1" signal, I_O = -20 mA	3.7 V
• Output voltage for "0" signal, I_O = 20 mA, max.	1 V
• Load resistance, min.	55 Ω
• Cable length, max.	50 m (164 ft)
• Pulse frequency, max.	750 kHz
Integrated digital inputs	**18**
of which with special functions for:	
• Measuring input (C240 only)	2
• BERO connection (can also be used as measuring input for C240, can only be used as measuring input for C240 PN)	4
(All inputs can be used as standard inputs.)	
Input voltage	
• Rated value	24 V DC
• For signal "1"	11 ... 30 V
• For signal "0"	-3 ... +5 V
Galvanic isolation	
• Inputs in groups of	18
Input current	
• For signal "1", min. / typ.	6 mA/8 mA
Input delay (at rated value of input voltage)	
• 0 → 1, typ./max.	6 µs/15 µs
• 1 → 0, typ./max.	40 µs/150 µs
Connection of 2-wire BERO	Yes
• Permitted quiescent current	2 mA
Integrated digital outputs	**8**
• of which for fast output cam, max.	8
Rated load voltage	24 V DC
• Permissible range	20.4 ... 28.8 V
Output voltage	
• For signal "1", max.	L+
Galvanic isolation in groups of	8

Technical specifications (continued)

Output current	
• For signal "1", minimum current per channel	5 mA
• For signal "0", max.	0.5 mA
Residual current, max.	2 mA
Derated loading	
• at 40 °C (104 °F)	4 A
• at 55 °C (131 °F)	2 A
Switching frequency of the outputs	
• With resistive load	100 Hz
• With inductive load	2 Hz
Lamp load	5 W
Purge energy/channel	400 mJ (not simultaneous)
Output delay, typ.	150 µs
Short-circuit protection	Yes
Encoder inputs, max. (C240 only)	**4**
Optionally for incremental or absolute encoder Can be used alternatively as up/down counter	
Incremental encoder inputs	
• Interface type (RS 422)	5 V
• Encoder supply	5 V/0.3 A
• Galvanic isolation	No
• Encoder frequency, max.	1 MHz
Cable length, max.	
• at 1 MHz	10 m (32.81 ft)
• at 500 kHz and 300 mA	25 m (82.03 ft)
• at 500 kHz and 210 mA	35 m (114 ft)
Inputs, SSI absolute encoder	
• Interface type (RS 422)	5 V synchronous serial, single-turn or multi-turn
• Encoder supply	24 V/0.3 A
• Galvanic isolation	No
• Transfer rate	187.5/375/750/1500 kbit/s
• Message length, max.	25 bit
Cable length, max.	
• at 187.5 kbit/s	250 m (820 ft)
• at 1500 kbit/s	10 m (32.81 ft)
Monitoring	
• Short-circuit of the sensor supply	Yes
• Wire break	Yes
Additional technical specifications	
Real-time clock buffering	
• Buffer time, typ.	4 weeks
• Charging time, typ.	1 h
Approvals, according to	cULus

Selection and ordering data

Description	Order No.
SIMOTION C240 **Motion Controller** (SIMOTION V4.0 HF2 is required)	**6AU1240-1AA00-0AA0**
MultiAxes Bundle **SIMOTION C240** Consists of 1 item each • SIMOTION C240 Motion Controller • Micro Memory Card (MMC) 64 MB with MultiAxes Package license for SIMOTION C	**6AU1240-1AA00-0CA0**
SIMOTION C240 PN **Motion Controller** (SIMOTION V4.1 SP2 HF 3/4 is required)	**6AU1240-1AB00-0AA0**
MultiAxes Bundle **SIMOTION C240 PN** Consists of 1 item each • SIMOTION C240 PN Motion Controller • Micro Memory Card (MMC) 64 MB with MultiAxes Package license for SIMOTION C	**6AU1240-1AB00-0CA0**
Micro Memory Card (MMC) 64 MB for SIMOTION C240/C240 PN Pre-installed license can be obtained using additional order codes [1]	**6AU1720-1KA00-0AA0**
Micro Memory Card (MMC) 64 MB for SIMOTION C240/C240 PN with MultiAxes Package license for SIMOTION C	**6AU1720-1KA00-0AA0-Z M24**

[1] See Ordering of licenses for runtime software on page 9/52.

Accessories

Description	Order No.
Accessories for SIMOTION C240/C240 PN	
Front connector, 40-pin for connection of onboard I/Os	
• With screw contacts	**6ES7392-1AM00-0AA0**
• With spring-loaded contacts	**6ES7392-1BM01-0AA0**
• with Fast Connect fast connection method	**6ES7392-1CM00-0AA0**
Connecting comb PS – C2xx for PS307 power supply	**6ES7390-7BA00-0AA0**
IM 365 Interface Module for expanding the Motion Controller with max. 1 expansion unit, 2 modules with permanent connecting cable (1 m (3.28 ft))	
• Standard temperature range	**6ES7365-0BA01-0AA0**
SIMATIC S7-300 mounting rail	
• L = 160 mm (6.30 in)	**6ES7390-1AB60-0AA0**
• L = 480 mm (18.90 in)	**6ES7390-1AE80-0AA0**
• L = 530 mm (20.87 in)	**6ES7390-1AF30-0AA0**
• L = 830 mm (32.68 in)	**6ES7390-1AJ30-0AA0**
• L = 2000 mm (78.74 in)	**6ES7390-1BC00-0AA0**
Accessories for PROFINET	
RJ45 FastConnect plug connector for Industrial Ethernet/PROFINET	
• 145° cable outlet	
- 1 pack = 1 unit	**6GK1901-1BB30-0AA0**
- 1 pack = 10 units	**6GK1901-1BB30-0AB0**
FastConnect cables for Industrial Ethernet/PROFINET [1]	
• IE FC Standard Cable GP 2x2	**6XV1840-2AH10**
• IE FC Flexible Cable GP 2x2	**6XV1870-2B**
• IE FC Trailing Cable GP 2x2	**6XV1870-2D**
• IE FC Trailing Cable 2x2	**6XV1840-3AH10**
• IE FC Marine Cable 2x2	**6XV1840-4AH10**
Stripping tool for Industrial Ethernet/PROFINET FastConnect cables	
• IE FC stripping tool	**6GK1901-1GA00**

[1] Sold by the meter; max. length 1000 m (3281 ft); minimum order 20 m (65.62 ft).

More information

For more information about PROFIBUS DP, Industrial Ethernet and PROFINET, please refer to Catalog IK PI and the Industry Mall under Automation technology/Industrial Communication.

SIZER configuration tool

With the SIZER configuration tool, you can easily configure the SINAMICS S120 drive family including SIMOTION. It provides you with support for selecting and dimensioning the components for a Motion Control task. You can also determine the possible number of axes and the resulting load with SIZER in accordance with your performance requirements.

For more information about SIZER, refer to chapter System description – Dimensioning.

Overview

SIMOTION P – the PC-based variant

SIMOTION P is a PC-based, open Motion Control System which is available in two variants:

- SIMOTION P320-3 for **embedded** PC solutions operating on Windows Embedded Standard 2009
- SIMOTION P350-3 for high-performance applications operating on Windows XP.

PLC, Motion Control, and HMI functions are executed together with standard PC applications on one platform. Benefits to the user: Using the PC platform and the Microsoft Windows operating system, with a real-time expansion for SIMOTION – the advantages of both worlds are combined in SIMOTION P:

Openness thanks to the Windows operating system

With SIMOTION P, you can enhance your machine's performance using technology normally associated with the office environment:

- Flexible networking
- High storage capacity for data
- Data backup concepts
- Integrated communication

Complex data evaluation, visualization tasks and even engineering can be easily implemented with SIMOTION P directly on the PC. When HMI software from other engineering systems is needed, the standardized OPC server interface can be used.

Functions such as remote maintenance, diagnostics and teleservice can also be used via the integrated Ethernet interface. The standard applications of the PC world are also available for your motion applications for example:

- Hardware, such as a printer, keyboard, mouse
- Software, such as visualization software or Microsoft Office programs.

Real-time capability thanks to the SIMOTION operating system

The fully independent SIMOTION operating system runs parallel with Windows on SIMOTION P. This real-time expansion makes it possible to implement complex motion control applications with high performance requirements on platforms of the SIMOTION P range. A Windows "bluescreen" does not interrupt the motion control application, as the real-time operating system of SIMOTION P can continue running despite this type of error condition.

Overview (continued)

Powerful PC technology

- The latest PC processor technology ensures optimum performance.
- Fast instruction execution opens up completely new application possibilities in the mid-performance to high-performance range.

Benefits

- Open-loop control, motion control, technology, visualization and standard Microsoft applications on the same platform – ready to use without the need for time-consuming installation
- Performance gains due to the latest, powerful PC processor architecture
- Easy configuration of HMI functions using WinCC flexible
- Openness to standard applications on the basis of the Windows operating system
- Standard PC communication mechanisms can be used over Industrial Ethernet
- Easy software updates
- User-friendly operation
- Flexible networking over the communication interfaces provided. For example, PROFIBUS DP, PROFINET and Industrial Ethernet available.
- Powerful thanks to a range of integrated functions
- Easy engineering for open-loop control and motion control applications in the same program

Application

SIMOTION P320-3 is ideal for applications for which

- the available mounting space is minimal
- rugged hardware is extremely important, without rotating parts such as fan or hard disk
- no display is needed in normal operation (headless mode). Connections are available for operation of a monitor or display.
- Windows Embedded Standard is required as the operating system.

SIMOTION P350-3 is ideal for high-performance applications for which

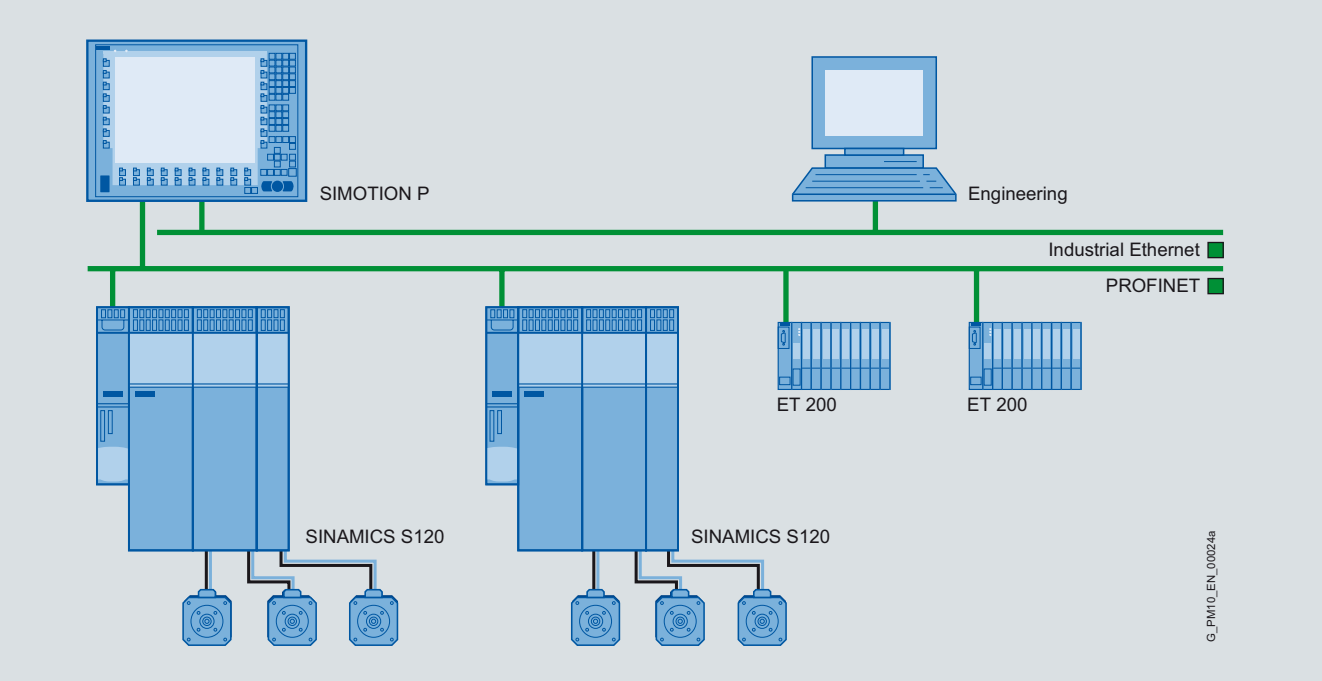
- complex data management and data evaluation are required
- motion control, open-loop control and HMI functions need to be implemented on one platform to save space
- highly dynamic position and pressure control loops are needed for hydraulic applications
- the openness provided by the Windows operating system can be optimally utilized (software, drivers, etc.)

Important applications include:

- Packaging machines
- Plastic and rubber processing machines
- Presses, wire-drawing machines
- Textile machines
- Printing machines
- Wood, glass, ceramics and stone working machines
- Production lines in the renewable energy sector, e.g. solar technology, wind power installations.

Due to the increasing use of servo drives, these machines require a high degree of integration of PLC, motion control and technology functions.

Design



Typical design of an automation solution using SIMOTION P

Equipment provided on SIMOTION P basic units

The SIMOTION P320-3 and P350-3 Motion Controllers are ready-to-run PC systems comprising:

- SIMOTION P320-3 or P350-3 hardware platform
- Windows operating system and real-time expansion for SIMOTION P
- SIMOTION Kernel
- Communication interfaces for flexible networking, e.g. PROFIBUS DP, PROFINET IO and Industrial Ethernet available.

Power supplies for SIMOTION P

SIMOTION P systems require a 24 V operating voltage. We recommend that you use an uninterruptible power supply (UPS). For the connection to a 120/230/400 V voltage source, you will require one of the following power supplies, for example:

- SIMATIC PS 307 or
- SITOP power and DC-UPS module.

Operator control and monitoring

Displays and monitors can be directly connected to SIMOTION P320-3 and SIMOTION P350-3 Motion Controllers by means of the graphics interfaces featured on both types of controller. With the Panel PC Remote Kit, it is possible to operate SIMOTION P panel fronts at a distance of up to 30 m (98.4 ft) from Motion Controllers.

Engineering

Engineering is performed either using a separate programming device or, in the case of SIMOTION P350-3, directly on the SIMOTION P system.

Communication interfaces on SIMOTION P320-3

With its integrated PROFINET Communication Board with 3 ports, SIMOTION P320-3 can be connected to a PROFINET IO network. The PROFINET board supports PROFINET IO with IRT and RT. Standard Ethernet communication (TCP/IP) is also possible over this interface.

Communication interfaces on SIMOTION P350-3

PROFIBUS version

The connection to a PROFIBUS network is made via the integrated IsoPROFIBUS board. This is a PCI card with two ports for PROFIBUS DP (max. 12 Mbit/s). Users can parameterize the clock-pulse rate on the bus. Optionally, one of the two PROFIBUS DP interfaces can also be defined as programming interface (MPI protocol).

If required, PROFINET can also be retrofitted to the PROFIBUS version which will then support PROFIBUS and PROFINET communication in the same device.

PROFINET version

The connection to a PROFINET network is made via the integrated MCI-PN board. This comprises of a PCI card with four Ethernet ports and integrated switch functionality. The PROFINET board supports PROFINET IO with IRT and RT. Standard Ethernet communication (TCP/IP) is also possible over this interface.

Integration in Local Area Networks

With the onboard Industrial Ethernet interface, the SIMOTION P systems are prepared for integration in LANs (Local Area Networks). An external operator station or an engineering system can also be connected (e.g. for remote maintenance).

Design (continued)

Expansion using distributed I/Os

SIMOTION P320-3 and P350-3 Motion Controllers can control (depending on device and device variant) drives and distributed I/O modules over PROFIBUS DP or PROFINET. Suitable I/O systems include, for example:

- SIMATIC ET 200S
- SIMATIC ET 200M
- SIMATIC ET 200pro
- SIMATIC ET 200eco, ET 200eco PN

The high-performance I/O systems transfer the required process signals digitally and free of interference to the SIMOTION P system.

High-speed I/Os for time-critical applications

Cycle times of 250 µs can be achieved with SIMOTION P, PROFINET and the ET 200S distributed I/O system with interface module IM 151-3 PN High Speed . This is particularly necessary for applications with fast response times (e.g. hydraulic axes).

Function

System concept

The control and motion control software execute on the SIMOTION Kernel basic system.

The internal PC communication provides high-performance data exchange between the SIMOTION Kernel and the Microsoft Windows operating system. Further processing of this data, e.g. using OPC server, is possible in any Microsoft programs.

SIMOTION basic functionality

The SIMOTION P systems provide the following basic functionality for a wide variety of automation requirements:

- SIMOTION runtime system
  - User-programmable with several languages conforming to IEC 61131
  - Various methods of program execution (cyclic, sequential, event-driven)
  - PLC and arithmetic functionality
  - Communication and management functions
  - Technology functions for Motion Control Basic
- Testing and diagnostic tools

This basic functionality can be expanded with loadable technology packages, if required.

SIMOTION technology packages

A special feature of SIMOTION is that the operating system functionality can be expanded by loading technology packages, such as:

- Motion Control with the functions
  - POS – Positioning
  - GEAR – Synchronous operation/electronic gear
  - CAM – Cam
  - PATH - Path interpolation
- TControl – Temperature controller
- DPM – Direct Product Motion
- MIIF – Multipurpose Information Interface

Since the technology functions have modular licenses, you only pay for what you will actually use: "pay only for what you need"

Function (continued)

Configuring/parameterizing/programming

SIMOTION SCOUT is a powerful and user-friendly engineering tool. It is an integrated system for all engineering steps, from configuring and parameterization, through programming, to testing and diagnostics. Graphical operator prompting, using dialog boxes and wizards, as well as text-based and graphical languages for programming, considerably reduce the familiarization and training periods.

Operator control and monitoring (HMI)

Operator control and monitoring can be performed

- separately on an HMI panel or
- directly on the SIMOTION P panel.

Communication utilities which support user-friendly data exchange with HMI systems are integrated in the basic functionality of SIMOTION P. Both PROFIBUS/PROFINET and Industrial Ethernet can be used for communication. The SIMOTION Kernel processes the data exchange independently.

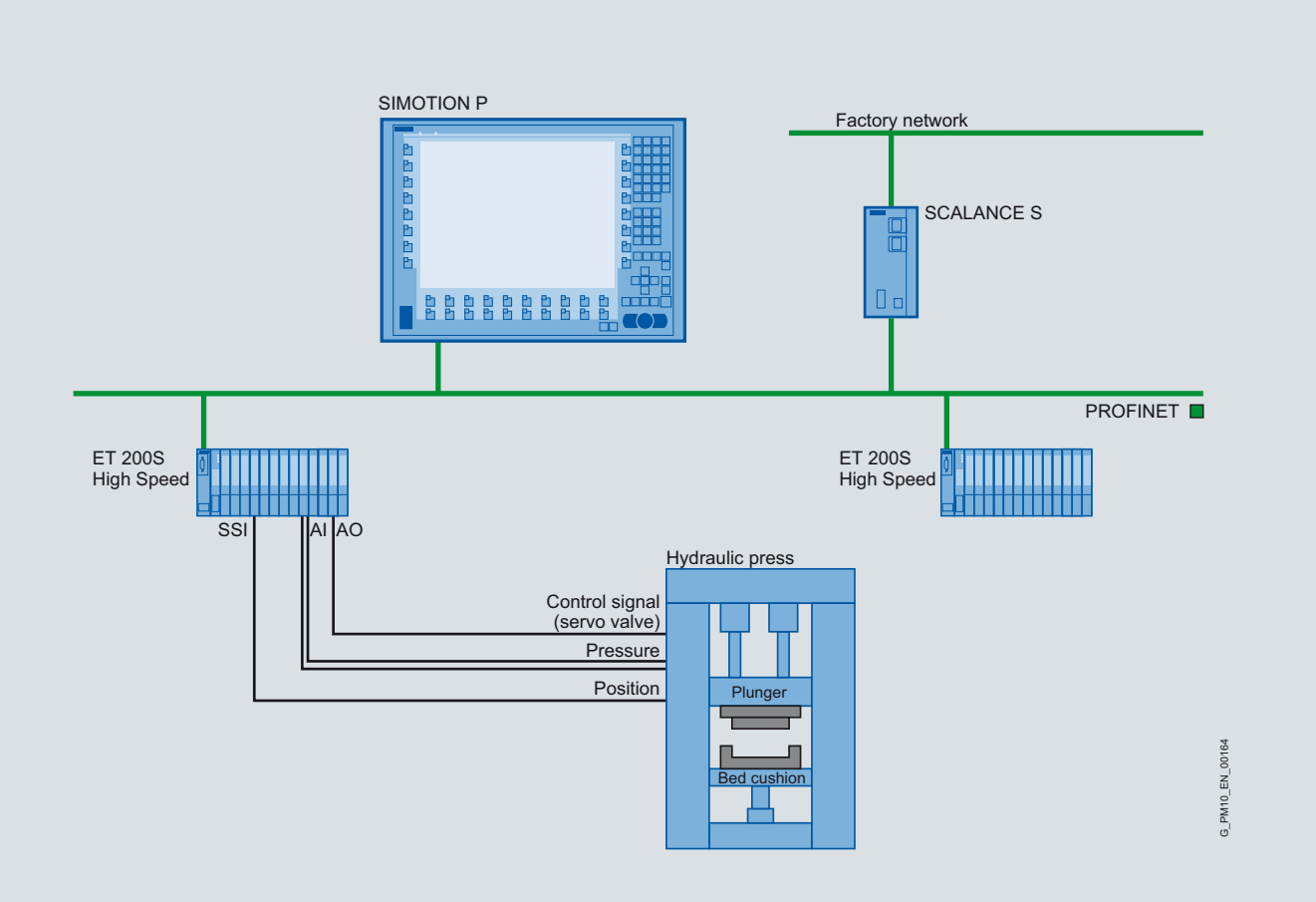
SIMATIC WinCC flexible is the standard HMI system for SIMOTION P. This HMI system can directly configure the data from a SIMOTION project. SIMOTION panel fronts can be used for operation and visualization. SIMOTION P panel fronts are connected directly via the LVDS interface in the case of SIMOTION P350-3 and by means of the Panel PC Remote Kit in the case of SIMOTION P320-3.

With the SIMATIC NET communication software, an open, standardized OPC interface is available for accessing SIMOTION from other Windows-based HMI systems.

Process and data communication

Thanks to its integrated interfaces, SIMOTION P supports both process and data communication. The SCOUT engineering system is provided for user-friendly communication configuration and diagnostics.

Function (continued)



Example: Closed-loop control of a hydraulic press with SIMOTION P350-3

Position-controlled motion control for servo drives

Drives with digital setpoint interface

SIMOTION P Motion Controllers enable position-controlled motion control for drives with digital setpoint interfaces via PROFIBUS DP (P350) or PROFINET IO with PROFIdrive.

Drives with analog setpoint interface (for retrofitting)

The ADI 4 (Analog Drive Interface for 4 Axes) or IM 174 (Interface Module for 4 Axes) module can be used to connect drives with analog ± 10 V setpoint interface in the case of SIMOTION P350-3.
The IM 174 Interface Module also supports the connection of stepper drives with a pulse direction interface.
Both modules are connected over PROFIBUS DP.
The following can be connected to an ADI 4 or IM 174 module:

- 4 drives
- 4 encoders
- Digital inputs and outputs.

Position control and pressure control for hydraulic drives

With SIMOTION P and the new SIMATIC ET 200S High Speed I/O, cycle times down to 250 µs can be achieved over PROFINET with IRT (Isochronous Real Time).

Highly dynamic control loops can therefore be achieved for hydraulic applications with position and pressure control.

The necessary sensors and actuators, such as

- position encoders connected through the SSI interface,
- pressure sensors connected through analog inputs (AI),
- servo valves connected through analog outputs (AO) and
- digital I/O for tool safety and cam signal output

are connected over the SIMATIC ET 200S distributed I/O system, which was equipped with the necessary high-speed I/O modules beforehand to suit the application.

On the basis of PROFINET, it is therefore possible to synchronize hydraulic drives as well as electrical drives. In conveyor systems and press lines in the automotive industry, plant-wide automation solutions can be implemented in which both electrical drives (winders, cross cutters, roller feeds) and hydraulic drives (e.g. deep-drawing presses) are implemented.

Function (continued)

Indication and diagnostics of operating status

A SIMOTION P system does not have any pushbuttons or switches for changing operating modes (RUN/STOP). This task is performed (when a monitor/display is connected) by a software monitor (SIMOTION P State), which is operated using the keyboard or mouse.

SIMOTION P State

This monitor shows the operating states during start-up and operation. Other functions are, for example, loading (Restore) and saving (Save) user programs or starting (Restart) or shutting down (Terminate) the Motion Controller. During shutdown, important data (retain data) are stored on the IsoPROFIBUS board or MCI-PN PROFINET board (internally on SIMOTION P320-3) while the device's power supply is shutting down so that the most up-to-date data is ready for use as soon as the device is restarted.

The SIMOTION P intelligent diagnostic system constantly controls the functionality of the system and registers errors or specific system events (e.g., timing errors, module or network failures). In addition, PC-specific functions, such as fan speeds or temperatures, are continuously controlled and alarms generated in the case of failure on SIMOTION P350-3.

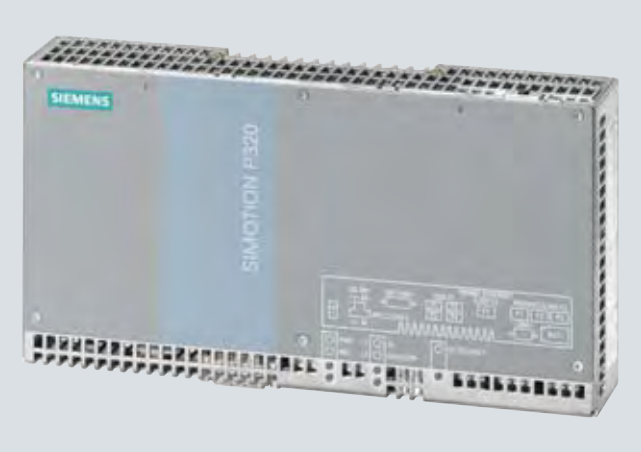
The stability of the SIMOTION Kernel is **independent** of the Windows operating system. Even in the event of a Windows operating system crash (Windows bluescreen), SIMOTION P continues to run and the machine can be shut down safely according to user specifications.

More information

More information

- about suitable I/O modules for SIMOTION can be found in chapter SIMOTION I/O components.
- about the functionality of SIMOTION platforms can be found in section Overview of SIMOTION functions.
- about engineering and the SIMOTION runtime system can be found in section SIMOTION software.
- about operator control and monitoring can be found in chapter SIMOTION HMI devices.
- about SIMATIC NET communication software can be found in section SIMOTION runtime software.
- about the SIMATIC Panel PC Remote Kit can be found in section Supplementary components.

Overview



The SIMOTION P320-3 Motion Controller is a high-performance, ultra compact and maintenance-free embedded industrial PC. This product expands the PC-based hardware platform of the SIMOTION range by an Embedded PC for motion control tasks.

The SIMOTION P320-3 hardware is based on the latest generation of the SIMATIC Microbox PC and therefore offers the following benefits:

- High performance: Thanks to state-of-the-art Intel processor technology
- Rugged: No rotating parts (no fan, no hard disk)
- Compact: With very small mounting dimensions
- Flexible in use: Thanks to a variety of installation methods.

In addition to the Windows Embedded Standard 2009 operating system, the proven successful real-time expansion for SIMOTION is also installed.

Flexible application in operation

SIMOTION P320-3 can be operated in a variety of different modes:

- Headless mode:
  SIMOTION P320-3 can be operated in so-called "headless" mode: In other words, it can be operated without display, monitor or panel front.
- Operation with display or monitor:
  Standard SIMATIC displays or monitors can be connected at a distance of up to 5 m (16.4 ft) via the integrated DVI interface.
- Operation with SIMOTION P panel fronts:
  The SIMATIC Panel PC Remote Kit can be used to connect SIMOTION P320-3 to the panel fronts for SIMOTION P. The panel fronts can be installed at a distance of up to 30 m (98.4 ft) from SIMOTION P320-3.

PC-based CompactFlash card replaces hard disk

In order to enhance the rugged design of the system, SIMOTION P320-3 contains no rotating parts at all. A PC-based CompactFlash card is used instead of a hard disk. No tools are needed to insert or remove this card.

Enhanced Write Filter (EWF) reduces write cycles

When a computer with Windows operating system is running, large volumes of information are buffered on the hard disk or, alternatively, on a CompactFlash memory. However, frequent write cycles reduce the service life of the hard disk or CompactFlash memory.

Using the Enhanced Write Filter avoids this problem. The data is initially written to RAM. This ensures, for example, that changes made at the commissioning stage do not take effect until they are stored by command on the PC-based CompactFlash card.

Changes made by mistake are not permanent. When the PC is switched on again, it boots to the previous state until changes have been stored on the CompactFlash card. The PC is always restarted from the data stored on the PC-based CompactFlash card.

The Enhanced Write Filter (EWF) is deactivated in the delivery state.

High system availability

The following features of the SIMOTION P320-3 Motion Controller afford an especially high degree of system availability:

- Integrated monitoring functions for battery, temperature and program execution
- LEDs on front panel for efficient diagnosis
- Integrated power supply with bridging of supply failures

PC technology

- Processor: Intel Core 2 Solo, 1.2 GHz
- Operating system: Windows Embedded Standard 2009
- Memory: 2 GB DDR3 SDRAM
- 4 GB CompactFlash card
- Data backup/restore using the SIMATIC IPC Image & Partition Creator data backup software (optional)

Series commissioning with optional USB Flash Drive

For the purpose of commissioning several Motion Controllers at once, it is possible to copy a pregenerated data image to the CompactFlash drive using SIMATIC IPC Image & Partition Creator (own software).

The SIMATIC IPC Image & Partition Creator must either be ordered separately, or is pre-installed on the SIMATIC IPC USB Flash Drive (USB stick) (see selection and ordering data).

Design

Interfaces

Display and diagnostics

With SIMOTION P320-3, the display and diagnostics functions for the operating states are performed by a software monitor, which takes the form of an application window on a connected screen. This software monitor can be operated using your keyboard, mouse or touch panel.

Integrated interfaces

- 1 × COM 1 (V.24)
- 1 × DVI
- 4 × USB 2.0
- 1 × Industrial Ethernet (10/100/1000 Mbit/s)
- 1 × PROFINET IO (1 interface with 3 ports)

Operator control and monitoring

- SIMOTION P320-3 can be operated without display, monitor or panel front ("headless" mode).
- Monitors and displays can be connected by means of the integrated DVI interface.
- SIMOTION P panel fronts can be connected to SIMOTION P320-3 by means of the SIMATIC Panel PC Remote Kit.

Panel fronts for SIMOTION P

The following SIMOTION P panel fronts are available:

- 12" with membrane-type keys
- 12" for touch screen operation, and
- 15" for touch screen operation.

Communication via PROFINET

SIMOTION P320-3 can be linked to a PROFINET IO network by means of the integrated PROFINET interface with 3 ports. This means that in terms of PROFINET, SIMOTION P320-3 is a PROFINET IO controller that offers the following functions:

- Communication as PROFINET-IO controller, I-Device (controller and device simultaneously)
- 100 Mbit/s full duplex
- Supports real-time classes of PROFINET IO:
  - RT (real-time)
  - IRT (Isochronous Real Time)
- Integration of distributed I/O as PROFINET IO devices
- Integration of drives as PROFINET IO devices through PROFIdrive according to the V4 specification
- Support for standard Ethernet communication, e.g.
  - for interfacing with SIMOTION SCOUT
  - for the connection of HMI systems
  - for communication with any other devices over TCP/IP or UDP communication
- Integrated 3-port switch with 3 RJ45 sockets based on the PROFINET ASIC ERTEC400. The optimum topology (line, star, tree) can therefore be configured without additional external switches.

SIMOTION IT service and diagnostic functions

SIMOTION IT provides SIMOTION P with an integrated Web server on which, for example, user-specific Web pages can be stored.

Read and write access can be made to the Control Unit variables. Java scripts or applets also allow the implementation of active operation and display functions in the Web pages that can be executed on a client PC with standard Internet browser.

Expansion with distributed I/O by means of PROFINET

The following distributed I/O can be added to the SIMOTION P320-3 system by means of PROFINET:

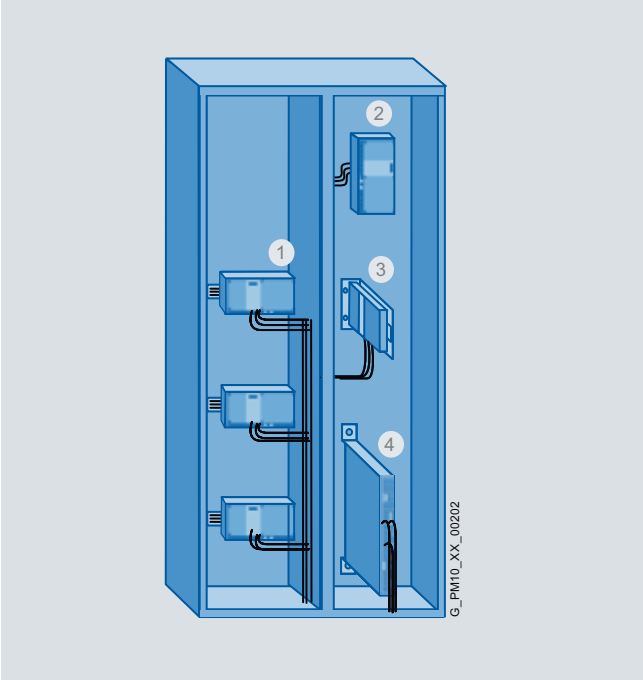
- Distributed drives (e.g. SINAMICS S120 Motor Modules with CU320/CU320-2 Control Unit and CBE20 Communication Board plus SINAMICS S120 Power Modules with CU310 PN Control Unit)
- Distributed I/O (SIMATIC ET 200S/M/pro/eco PN)
- Engineering systems (PG/PC) or
- HMI devices (e.g., MP, TP, OP)

High-speed I/Os for time-critical applications

Cycle times of 250 µs can be achieved with SIMOTION P, PROFINET and the ET 200S distributed I/O system with interface module IM 151-3 PN High Speed . This is particularly necessary for applications with fast response times (e.g. hydraulic axes).

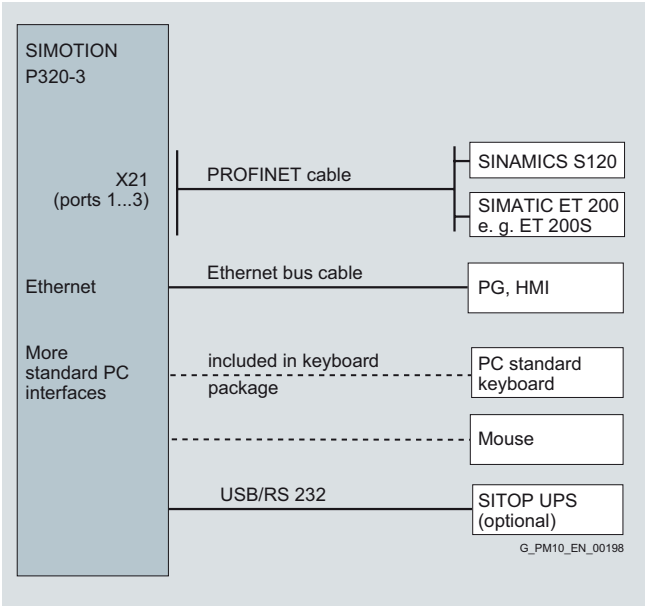
Flexible mounting in the control cabinet

SIMOTION P320-3 can be mounted in a variety of positions in the control cabinet, e.g. on a standard rail, cabinet wall or by portrait assembly kit. This means that valuable space inside the cabinet can be saved for other purposes.



Flexible mounting in the control cabinet: (1) Standard rail mounting, (2) Wall mounting, (3) Portrait assembly, (4) Front portrait assembly

Integration



Overview of the SIMOTION P320-3 connections

Selection and ordering data

Description	Order No.
SIMOTION P320-3 Motion Controller [1] with Intel Core 2 Solo, 1.2 GHz, Windows Embedded Standard 2009, 2 GB DDR3 SDRAM, 24 V DC, incl. 4 GB CompactFlash card, front portrait assembly and wall mounting kit, with current runtime version (earlier software versions are stored on the recovery CD)	**6AU1320-7AB55-3AF0**

Accessories

Description	Order No.
SIMATIC IPC portrait assembly kit	**6ES7648-1AA20-0YB0**
SIMATIC IPC Image & Partition Creator V3.0	**6ES7648-6AA03-0YA0**
SIMATIC IPC USB Flash Drive 2 GB, USB 2.0 SIMATIC IPC Image & Partition Creator software pre-installed	**6AV7672-8JD00-0AA0**
Touch pen (for use with a touch-operated panel front)	**6AV7672-1JB00-0AA0**

Technical specifications

PLC and Motion Control performance	
Maximum number of axes	64
Minimum PROFINET transmission cycle	250 µs
Minimum servo/interpolator clock cycle	250 µs
Memory	
RAM (Random Access Memory)	2 GB DDR3 SDRAM
Retentive memory	15 KB (256 KB with UPS)
CompactFlash card	4 GB
Persistent memory (user data on CF)	64 MB
Communication	
USB interfaces	4 × USB 2.0
Ethernet interfaces	1
PROFINET interfaces	• 1 interface with 3 ports • Supports PROFINET IO with IRT and RT • Can be configured as PROFINET IO controller and/or device
General technical specifications	
Input voltage	24 V DC
Power consumption, max.	72 W
Mains buffering, max.	5 ms
Degree of protection according to EN 60529 (IEC 60529)	IP20
Temperature change, max.	10 K/h
Relative humidity limit values in accordance with EN 60068-2-78, EN 60068-2-30	
• Storage and transport	5 ... 95 % at 25 °C (77 °F)
• Operation	5 ... 80 % at 25 °C (77 °F)
Permissible ambient temperature	
• Storage and transport	-20 ... +60 °C (-4 ... +140 °F)
• Operation	
- Portrait assembly, front and wall mounting	0 ... 45 °C (32 ... 113 °F)
- Standard rail mounting	0 ... 55 °C (32 ... 131 °F)
Weight, approx.	2 kg (4.41 lb)
Dimensions (W × H × D)	262 × 142 × 47 mm (103.15 × 55.91 × 18.50 in)
Approvals, according to	UL/CSA

More information

SIZER configuration tool

With the SIZER configuration tool, you can easily configure the SINAMICS S120 drive family including SIMOTION. It provides you with support for selecting and dimensioning the components for a Motion Control task. You can also determine the possible number of axes and the resulting load with SIZER in accordance with your performance requirements.

For more information about SIZER, refer to chapter System description – Dimensioning.

[1] Note about licenses for runtime software:
Licenses for runtime software for SIMOTION P320-3 can be ordered individually or by means of order code (Z option).
See Ordering of licenses for runtime software on page 9/52.

SIMOTION P350-3 Motion Controller

Overview

The SIMOTION P350-3 Motion Controller is a PC-based, open Motion Control System. The use of an industrial PC platform facilitates the running of the SIMOTION machine application (comprising of PLC, motion control and HMI functions) alongside standard PC applications in one platform. This is particularly useful in the case of applications that involve complex PC-based data management and sophisticated analysis systems.

The operating system is Windows XP Professional, with a real-time expansion for SIMOTION.

To facilitate the connection of distributed components, SIMOTION P350-3 is available in both PROFINET and PROFIBUS versions. A PROFINET Communication Board can be retrofitted to the PROFIBUS version for applications which require both PROFIBUS and PROFINET.

9

Design

Interfaces

Display and diagnostics

With SIMOTION P, the display and diagnostics functions for the operating states are performed by a software monitor, which takes the form of an on-screen application window. This software monitor can be operated using your keyboard, mouse or touch panel.

Integrated interfaces

- 1 × COM 1 (V.24), VGA (via DVI adapter)
- 4 × USB 2.0
- 2 × Industrial Ethernet 10/100 Mbits (integrated)
- PROFIBUS version:
  2 × PROFIBUS DP (not isochronous, isolated), one of the interfaces can be used as an MPI interface
- PROFINET version:
  1 × PROFINET interface with 4 ports, supports PROFINET IO with IRT and RT

Expansion slots

- 1 × PCI slot 265 mm
  - PROFIBUS version: occupied by IsoPROFIBUS board
  - PROFINET version: occupied by MCI-PN Communication Board
- 1 × PCI/ISA slot 170 mm (free)
  e.g., for the purpose of retrofitting an additional Communication Board (simultaneous communication via PROFIBUS and PROFINET)

Design (continued)

Communication via PROFIBUS

The PROFIBUS version features an integrated IsoPROFIBUS board, which offers two PROFIBUS DP interfaces with PROFIdrive.

The free PCI slot can be used for the purpose of retrofitting an optional MCI PN Communication Board. This means that the PROFIBUS version can support both PROFIBUS and PROFINET on the same PC.

Communication via PROFINET

The MCI-PN Communication Board that has been integrated in the PROFINET version enables the SIMOTION P350-3 to be connected to a PROFINET IO network. From a PROFINET perspective, the SIMOTION P350-3 thus assumes the role of a PROFINET IO controller.

To enable it to communicate with other PROFINET controllers, the SIMOTION P350-3 can be configured as both a PROFINET controller and a PROFINET device at the same time (I-Device).

Operator control and monitoring

SIMOTION P350-3 can be operated in a variety of different modes:

- Headless mode:
  It can be operated without display, monitor or panel front.
- Operation with display or monitor:
  Standard SIMATIC displays or monitors can be connected at a distance of up to 5 m (16.4 ft) via the integrated DVI or VGA interface.
- Operation with SIMOTION P panel fronts:
  SIMOTION P350-3 can be directly connected to the panel fronts for SIMOTION P via the internal LVDS interface. In this case, SIMOTION P350-3 and the panel front are operated as a single unit. The SIMATIC Panel PC Remote Kit allows SIMOTION P350-3 and the panel front to be operated at separate locations. The kit is capable of bridging a distance of up to 30 m (98.4 ft).

SIMOTION IT service and diagnostic functions

SIMOTION IT provides SIMOTION P with an integrated Web server on which, for example, user-specific Web pages can be stored.

Read and write access can be made to the Control Unit variables. Java scripts or applets also allow the implementation of active operation and display functions in the Web pages that can be executed on a client PC with standard Internet browser.

Panel fronts for SIMOTION P

Various panel fronts are available for the SIMOTION P Motion Controller:

- 12" with membrane-type keys
- 12" for touch screen operation, and
- 15" for touch screen operation

Design (continued)

Expansion using distributed I/Os

PROFINET version

- Distributed I/Os (SIMATIC ET 200S/M/pro/eco PN)
- Distributed drives (e.g. SINAMICS S120 Motor Modules with CU320 Control Unit and CBE20 Communication Board plus SINAMICS S120 Power Modules and CU310 PN Control Unit)
- Engineering systems (PG/PC) or
- HMI devices (e.g., MP, TP, OP)

PROFIBUS version

- Certified PROFIBUS standard slaves (DP-V0, DP-V1, DP-V2)
- Distributed I/Os (SIMATIC ET 200S/M/eco/pro)
- Distributed drives (e.g. SINAMICS S120 Motor Modules with CU320 Control Unit plus SINAMICS S120 Power Modules and CU310 DP Control Unit)
- Engineering systems (PG/PC) or
- HMI devices (e.g., MP, TP, OP)

High-speed I/Os for time-critical applications

Cycle times of 250 µs can be achieved with SIMOTION P, PROFINET and the ET 200S distributed I/O system with interface module IM 151-3 PN High Speed . This is particularly necessary for applications with fast response times (e.g. hydraulic axes).

PC technology

- Processor: Intel Pentium M 2 GHz
- Operating system: Windows XP Professional, English
- Memory: 512 MB SDRAM, upgradable to 2 GB
- Hard disk with shock damping, approx. 40 GB
- DVD-ROM drive (optional)
- Data backup/restore using the Symantec Ghost data backup software (pre-installed)

More information

More information

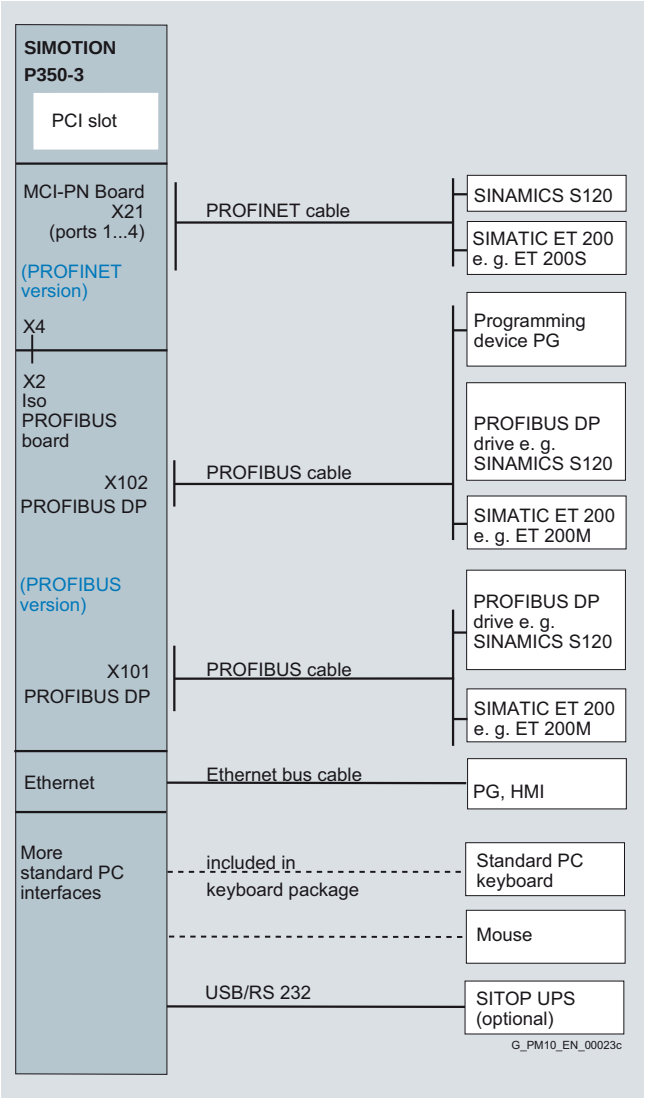
- about connectable I/O modules for SIMOTION can be found in chapter SIMOTION I/O components and section Overview of SIMOTION functions.
- about the connection of panel fronts for SIMOTION P can be found in section Panel fronts for SIMOTION P.

SIZER configuration tool

With the SIZER configuration tool, you can easily configure the SINAMICS S120 drive family including SIMOTION. It provides you with support for selecting and dimensioning the components for a Motion Control task. You can also determine the possible number of axes and the resulting load with SIZER in accordance with your performance requirements.

For more information about SIZER, refer to chapter System description – Dimensioning.

Integration



Overview of the SIMOTION P350-3 connections

SIMOTION P350-3 Motion Controller

Technical specifications

PLC and Motion Control performance	
Number of axes	Up to 64 depending on the set clock-pulse rate
Minimum PROFIBUS cycle	1 ms (PROFIBUS version)
Minimum PROFINET transmission cycle	0.25 ms (PROFINET version)
Minimum servo/interpolator clock cycle	0.25 ms
Memory	
RAM (Random Access Memory)	512 MB SDRAM, upgradable to 2 GB
Retentive memory	15 KB
Persistent memory	64 MB/256 MB when a UPS is used
Communication	
USB interfaces	4 × USB 2.0
Ethernet interfaces	2 × 10/100 Mbit/s
PROFIBUS interfaces	PROFIBUS version: • 2 interfaces, of which one can be used as an MPI interface • Not isochronous, isolated
PROFINET interfaces	PROFINET version: • 1 interface with 4 ports • Supports PROFINET IO with IRT and RT • Can be configured as PROFINET IO controller and/or device
General technical specifications	
Input voltage	24 V DC
Power consumption, max.	190 W
Mains buffering, max.	20 ms
Degree of protection according to EN 60529 (IEC 60529)	IP20
Temperature change, max.	10 K/h
Relative humidity limit values in accordance with IEC 68-2-3, IEC 68-2-30, IEC 68-2-56	
• Storage and transport	5 ... 95 % at 25 °C (77 °F)
• Operation	5 ... 80 % at 25 °C (77 °F)
Humidity rating based on EN 60721-3-3	Class 3K5 Condensation and icing excluded Low air temperature 0 °C (32 °F)
Permissible ambient temperature	
• Storage and transport	-20 ... +60 °C (-4 ... +140 °F)
• Operation	5 ... 45 °C (41 ... 113 °F)
Weight, approx.	6 kg (13.2 lb)
Dimensions (W × H × D)	297 × 267 × 85 mm (11.69 × 10.51 × 3.35 in) (excluding DVD drive) 297 × 267 × 106 mm (11.69 × 10.51 × 4.17 in) (including DVD drive)
Approvals, according to	cULus

Selection and ordering data

Description	Order No.
SIMOTION P350-3, PROFIBUS version with Intel Pentium M, 2 GHz, Windows XP Professional, English, 512 MB SDRAM, 24 V DC, **with IsoPROFIBUS board**	
• Without DVD drive	**6AU1350-3AK41-1BE2-Z** [1]
• With DVD drive	**6AU1350-3AK43-1BE2-Z** [1]
SIMOTION P350-3, PROFINET version with Intel Pentium M, 2 GHz, Windows XP Professional, English, 512 MB SDRAM, 24 V DC, **with MCI-PN board**	
• Without DVD drive	**6AU1350-3AK41-2BE2-Z** [1]
• With DVD drive	**6AU1350-3AK43-2BE2-Z** [1]

HMI Bundle	Order code
SIMOTION P350-3 can be ordered together with the HMI software WinCC flexible for a bundle price. The following is also included in the scope of supply: WinCC flexible 2008 Runtime, 2048 Powertags WinCC flexible Runtime, 2048 Powertags, WinCC flexible/Archives + Recipes **Example for ordering** SIMOTION P350-3, PROFIBUS version, without DVD drive, with HMI Bundle: 6AU1350-3AK41-1BE2-Z V41 W05 **A03**	**A03**

Accessories

Description	Order No.
Memory expansion	
• 512 MB DDR2 533 SODIMM	**6ES7648-2AG30-0GA0**
• 1 GB DDR2 533 SODIMM	**6ES7648-2AG40-0GA0**
MCI PN Communication Board (for PROFINET upgrade)	**6AU1390-0BA00-0AA0**
Spare parts	
• Motherboard battery	**6FC5247-0AA18-0AA0**

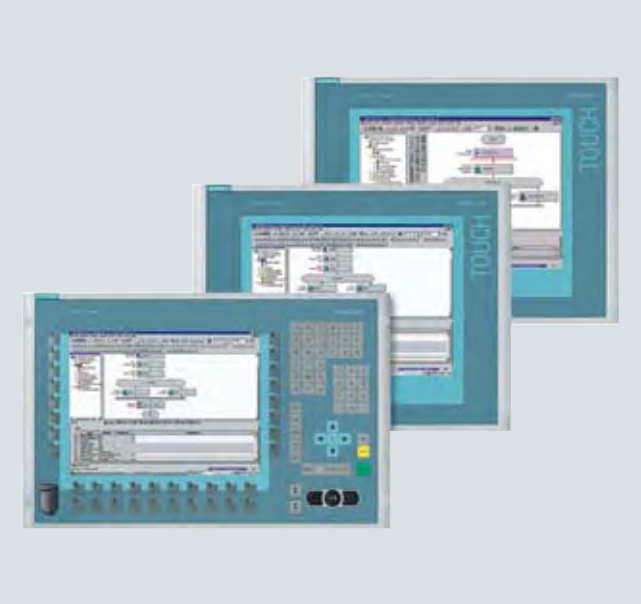
[1] Note about runtime software:
When ordering SIMOTION P350-3, the pre-installed runtime version must be specified. The software version is ordered with the order code (Z option) "V" and the service pack with the order code "W". It is essential to specify the two order codes.

Example:
When 6AU1350-3AK41-1BE2-Z V41 W05 is specified, SIMOTION P350-3 with the above order number and runtime version V4.1 SP5 is supplied.

"W00" must be specified to order earlier runtime versions without service pack (V4.0).

Other licenses for runtime software can be ordered individually or by means of order code (Z option).
See Ordering of licenses for runtime software.

Overview



Three different panel fronts with TFT color display are available for the SIMOTION P Motion Controller:

- 12" with membrane-type keys, resolution: 800 × 600 pixels
- 12" for touch screen operation, resolution: 800 × 600 pixels, and
- 15" for touch screen operation, resolution: 1024 × 768 pixels

The panel fronts are suitable for installation in consoles, control cabinets and support arm systems.

Connection to SIMOTION P320-3

SIMOTION P320-3 is connected to the panel fronts for SIMOTION P by means of the SIMATIC Panel PC Remote Kit. The panel front can be installed at a distance of up to 30 m (98.4 ft) from the Motion Controller.

Connection to SIMOTION P350-3

SIMOTION P350-3 can be directly connected to the panel fronts for SIMOTION P via the internal LVDS interface. The standard method of installing the Motion Controller is to mount it directly behind the panel front. Four knurled-head screws are used to form a mechanical interlock between the SIMOTION P350-3 and the panel front. No special tool is needed for this.

The Panel PC Remote Kit also allows SIMOTION P350-3 and the panel front to be operated at separate locations. In this case as well, the panel fronts can be installed at a distance of up to 30 m (98.4 ft) from the Motion Controller.

Technical specifications

Panel fronts for SIMOTION P	
Degree of protection at the front according to EN 60529 (IEC 60529)	IP65
Relative humidity limit values in accordance with IEC 68-2-3, IEC 68-2-30, IEC 68-2-56	
• Storage and transport	5 ... 95 % at 25 °C (77 °F)
• Operation	5 ... 80 % at 25 °C (77 °F)
Condensation	Not permissible
Permissible ambient temperature	
• Storage and transport	-20 ... +60 °C (-4 ... +140 °F)
• Operation	5 ... 45 °C (41 ... 113 °F)
Weight	
• 12" P012K panel front, membrane keys	6 kg (13.2 lb)
• 12" P012T panel front, touch screen operation	6 kg (13.2 lb)
• 15" P015T panel front, touch screen operation	6 kg (13.2 lb)
Dimensions (W × H × D)	
• 12" P012K panel front, membrane keys	483 × 310 × 100 mm (19.02 × 12.2 × 3.94 in)
• 12" P012T panel front, touch screen operation	400 × 310 × 125 mm (15.75 × 12.2 × 4.92 in)
• 15" P015T panel front, touch screen operation	483 × 310 × 130 mm (19.02 × 12.2 × 5.12 in)
Approvals, according to	cULus

Selection and ordering data

Description	Order No.
12" P012K panel front, membrane keys	**6AU1300-0DB00-0AA0**
12" P012T panel front, touch screen operation	**6AU1300-0CB00-0AA0**
15" P015T panel front, touch screen operation	**6AU1300-0EB00-0AA0**

Accessories

Description	Order No.
Key labeling strips For labeling softkeys and function keys, blank, plastic, supplied in sets of 3	**6AV7671-3CA00-0AA0**

Supplementary components
SIMATIC Panel PC Remote Kit

Overview

The SIMATIC Panel PC Remote Kit allows the computer and operating unit to be installed at a distance from one another. It is designed for use with SIMOTION P320-3 and SIMOTION P350-3 Motion Controllers. It can bridge a distance of up to 30 m (98.4 ft) between the computer/Motion Controller and the operating unit.

The Remote Kit must always be operated with the cables supplied with the unit.

Benefits

- Operating unit can be located up to 30 m (98.4 ft) from the computer
- Suitable for retrospective conversion/upgrade
- Allows the use of ultra compact operating units
- Pure hardware solution and therefore operating-system-neutral
- Remotely installed front with AC or DC power supply
- 2 additional USB interfaces, on the rear, USB 2.0: High speed up to 5 m (16.4 ft), full speed up to 30 m (98.4 ft)

Technical specifications

SIMATIC Panel PC Remote Kit	
Supported operating units	• All panel fronts for SIMOTION P
Front functionality	Same as for central mounting, but with following limits with respect to USB functions: • Distance > 5 m (16.4 ft): USB 1.1, and only one external 1.1 hub
External interfaces	2 additional USB interfaces on the remote module on the rear of the remote operating unit
Power supply	24 V DC or 110 to 240 V AC, 50/60 Hz
Certifications and approvals	CE, cULus (UL 508)
Scope of supply	Remote module, cable set, assembly materials, Europe power cable (for the AC option)

Design

The Remote Kit consists of the following components:

- Remote module (mounted on the rear of the operating unit)
- Video connecting cable (industrial-grade DVI-D cable)
- USB connecting cable (standard USB cable for a distance up to 5 m (16.4 ft), the USB signal is externally amplified and transferred via a CAT6 cable for distances over 5 m (16.4 ft))
- Mechanical assembly kit (for mounting the computer unit in the control cabinet, console or machine)

Selection and ordering data

Description	Order No.
SIMATIC Panel PC Remote Kits	
• With cable set 5 m (16.4 ft), 24 V DC	**6AV7671-1EA00-5AA1**
• With cable set 10 m (32.8 ft), 24 V DC	**6AV7671-1EA01-0AA1**
• With cable set 15 m (49.2 ft), 24 V DC	**6AV7671-1EA01-5AA1**
• With cable set 20 m (65.6 ft), 24 V DC	**6AV7671-1EA02-0AA1**
• With cable set 30 m (98.4 ft), 24 V DC	**6AV7671-1EA03-0AA1**
• With cable set 5 m (16.4 ft), 100/240 V AC	**6AV7671-1EA10-5AA1**
• With cable set 10 m (32.8 ft), 100/240 V AC	**6AV7671-1EA11-0AA1**
• With cable set 15 m (49.2 ft), 100/240 V AC	**6AV7671-1EA11-5AA1**
• With cable set 20 m (65.6 ft), 100/240 V AC	**6AV7671-1EA12-0AA1**
• With cable set 30 m (98.4 ft), 100/240 V AC	**6AV7671-1EA13-0AA1**

Accessories

Description	Order No.
Power cable	
• Europe: D/F/NL/E/B/A/S/FIN [1]	**6ES7900-1AA00-0XA0**
• United Kingdom	**6ES7900-1BA00-0XA0**
• Switzerland	**6ES7900-1CA00-0XA0**
• USA	**6ES7900-1DA00-0XA0**
• Italy	**6ES7900-1EA00-0XA0**
• China	**6ES7900-1FA00-0XA0**
Components of the Remote Kit (available individually only as spare part)	
• Remote module 24 V DC with mounting material	**6AV7671-1EX01-0AD0**
• Remote module 110 to 240 V AC with mounting material	**6AV7671-1EX01-0BD0**
• USB amplifier/CAT6 converter	**6AV7671-1EX02-0AB0**
• Cable set 5 m (16.4 ft) (DVI, USB standard cable)	**6AV7671-1EX10-5AA0**
• Cable set 10 m (32.8 ft) (DVI, Cat6 cable)	**6AV7671-1EX11-0AA0**
• Cable set 15 m (49.2 ft) (DVI, Cat6 cable)	**6AV7671-1EX11-5AA0**
• Cable set 20 m (65.6 ft) (DVI, Cat6 cable)	**6AV7671-1EX12-0AA0**
• Cable set 30 m (98.4 ft) (DVI, Cat6 cable)	**6AV7671-1EX13-0AA0**

[1] A Europe power cable is included in the scope of supply for AC variants (100 to 240 V) of the Remote Kit.

Overview

Programs and texts can be edited easily with the compact KBPC CG US standard PC keyboard.

The standard PC keyboard is not suitable for industrial use (EMC) and should not be used as a permanent installation. It may be used only for servicing and commissioning.

Integration

The KBPC CG US standard PC keyboard can be used for SIMOTION P350.

The standard PC keyboard cannot be used in conjunction with the full CNC keyboard.

Technical specifications

KBPC CG US standard PC keyboard	
Input voltage	5.25 V DC
Power consumption, max.	0.1 W
Degree of protection according to EN 60529 (IEC 60529)	IP20
Humidity rating based on EN 60721-3-3	Class 3K5 condensation and icing excluded. Low air temperature 0 °C (32 °F).
Ambient temperature	
• Storage	-20 … +60 °C (-4 … +140 °F)
• Transport	-20 … +60 °C (-4 … +140 °F)
• Operation	0 … 50 °C (32 … 122 °F)
Dimensions	
• Width	405 mm (15.95 in)
• Height	44 mm (1.73 in)
• Depth	180 mm (7.09 in)
Weight, approx.	1.3 kg (2.87 lb)
Approvals, according to	FCC, GS, CE, c-tick, cURus

Selection and ordering data

Description	Order No.
KBPC CG US standard PC keyboard MF-II compatible, 104 key layout, connection: USB, incl. connecting cable Length: 1.7 m (5.58 ft)	**6FC5203-0AC01-3AA0**

Supplementary components
MCI-PN Communication Board

Overview

The MCI PN Communication Board for SIMOTION P350-3 enables connection to a PROFINET IO network. This means that in terms of PROFINET, SIMOTION P350-3 is a PROFINET IO controller that offers the following functions:

- Communication as: PROFINET IO Controller, I-Device (controller and device simultaneously)
- 100 Mbit/s full duplex
- Supports real-time classes of PROFINET IO:
  - RT (Real Time)
  - IRT (Isochronous Real Time)
- Integration of distributed I/O as PROFINET IO devices
- Integration of drives as PROFINET IO devices through PROFIdrive according to the V4 specification
- Support for standard Ethernet communication, e.g.
  - for interfacing with SIMOTION SCOUT
  - for the connection of HMI systems
  - for communication with any other devices over TCP/IP or UDP communication
- Integrated 4-port switch with 4 RJ45 sockets based on the PROFINET ASIC, ERTEC400. The optimal topology (line, star, tree or ring) can therefore be constructed without the need for additional external switches.

Integration

The MCI-PN Communication Board is inserted in the free PCI slot of the SIMOTION P350-3 Motion Controller.

Technical specifications

MCI-PN Communication Board	
Current consumption	900 mA at 5 V
Permissible ambient temperature	
• Storage and transport	-20 ... +60 °C (-4 ... +140 °F)
• Operation	5 ... 55 °C (41 ... 131 °F)
Weight, approx.	110 g (0.24 lb)
Dimensions (W X H)	107 × 167 mm (4.21 × 6.57 in)
Approvals, according to	cULus

Selection and ordering data

Description	Order No.
MCI-PN Communication Board	**6AU1390-0BA00-0AA0**

Accessories

Description	Order No.
RJ45 FastConnect plug connector for Industrial Ethernet/PROFINET	
• 145° cable outlet	
- 1 pack = 1 unit	**6GK1901-1BB30-0AA0**
- 1 pack = 10 units	**6GK1901-1BB30-0AB0**
• 180° cable outlet	
- 1 pack = 1 unit	**6GK1901-1BB10-2AA0**
- 1 pack = 10 units	**6GK1901-1BB10-2AB0**
FastConnect cables for Industrial Ethernet/PROFINET [1]	
• IE FC Standard Cable GP 2x2	**6XV1840-2AH10**
• IE FC Flexible Cable GP 2x2	**6XV1870-2B**
• IE FC Trailing Cable GP 2x2	**6XV1870-2D**
• IE FC Trailing Cable 2x2	**6XV1840-3AH10**
• IE FC Marine Cable 2x2	**6XV1840-4AH10**
Stripping tool for Industrial Ethernet/PROFINET FastConnect cables	
• IE FC stripping tool	**6GK1901-1GA00**

More information

More information about cables for Ethernet/PROFINET can be found in Catalog IK PI (Industrial Communication) and the Industry Mall under Automation technology/ Industrial Communication/PROFINET/Network components.

[1] Sold by the meter; max. length 1000 m (3281 ft); minimum order 20 m (65.62 ft).

Overview

Left: SIMOTION D410 Control Unit for single-axis applications
Right: SIMOTION D425/D435/D445-1 Control Units for multi-axis applications

SIMOTION D is a compact, drive-based version of SIMOTION based on the SINAMICS S120 drives family.

Two versions are available:

- SIMOTION D410 is a compact Control Unit for single-axis applications and is snapped on to the SINAMICS S120 PM340 Power Module in blocksize format.
- SIMOTION D4x5 is a Control Unit for multi-axis applications in SINAMICS S120 booksize format and is offered in several performance variants:
  - SIMOTION D425 Control Unit (BASIC performance) for up to 16 axes
  - SIMOTION D435 (STANDARD performance) Control Unit for up to 32 axes
  - SIMOTION D445-1 (HIGH performance) Control Unit for up to 64 axes

SIMOTION D4x5 with its three performance variants offers maximum scalability and flexibility for multi-axis applications.

With SIMOTION D, the SIMOTION PLC and motion control functionalities as well as the SINAMICS S120 drive software run on a shared control hardware. The IEC 61131-3-compliant PLC integrated in SIMOTION D means that the system is not just capable of controlling sequences of motions, but the entire machine as well.

Depending on the SIMOTION D platform, HMI devices can be operated on the onboard PROFIBUS, Ethernet or PROFINET interface for operator control and monitoring. Functions such as remote maintenance, diagnostics and teleservice can also be used via these interfaces.

Benefits

- Cost-effective thanks to integrated motion control, technology and PLC functionality direct in the drive
- Employs the innovative SINAMICS S120 design
- Compact form-factor reduces control cabinet size
- Ideally suited to modular and distributed machine concepts
- User-friendly operation
- Flexible networking through integrated interfaces:
  - D410: PROFIBUS DP or PROFINET IO
  - D4x5: PROFIBUS DP, Industrial Ethernet and optional PROFINET IO
- Powerful thanks to a range of technology functions
- Very simple engineering, from drive commissioning to open-loop control and Motion Control applications
- Easy to service thanks to the CompactFlash card, which can be easily replaced and contains all data (programs, data, drive parameters, and licenses)
- Very dynamic because the interfaces between PLC and Motion Control are no longer required

Application

SIMOTION D can be used optimally wherever

- the SINAMICS S120 drive family is used
- the motion control and PLC functionality are directly executed in the drive (SINAMICS S120)
- compact, space-saving construction is required
- high performance is required for motion control and high-speed I/O
- high electromagnetic compatibility and a high resistance to shock and vibration are required due to harsh ambient conditions
- modular machine concepts with high-speed isochronous coupling is required

The flexible solution for modular machine concepts

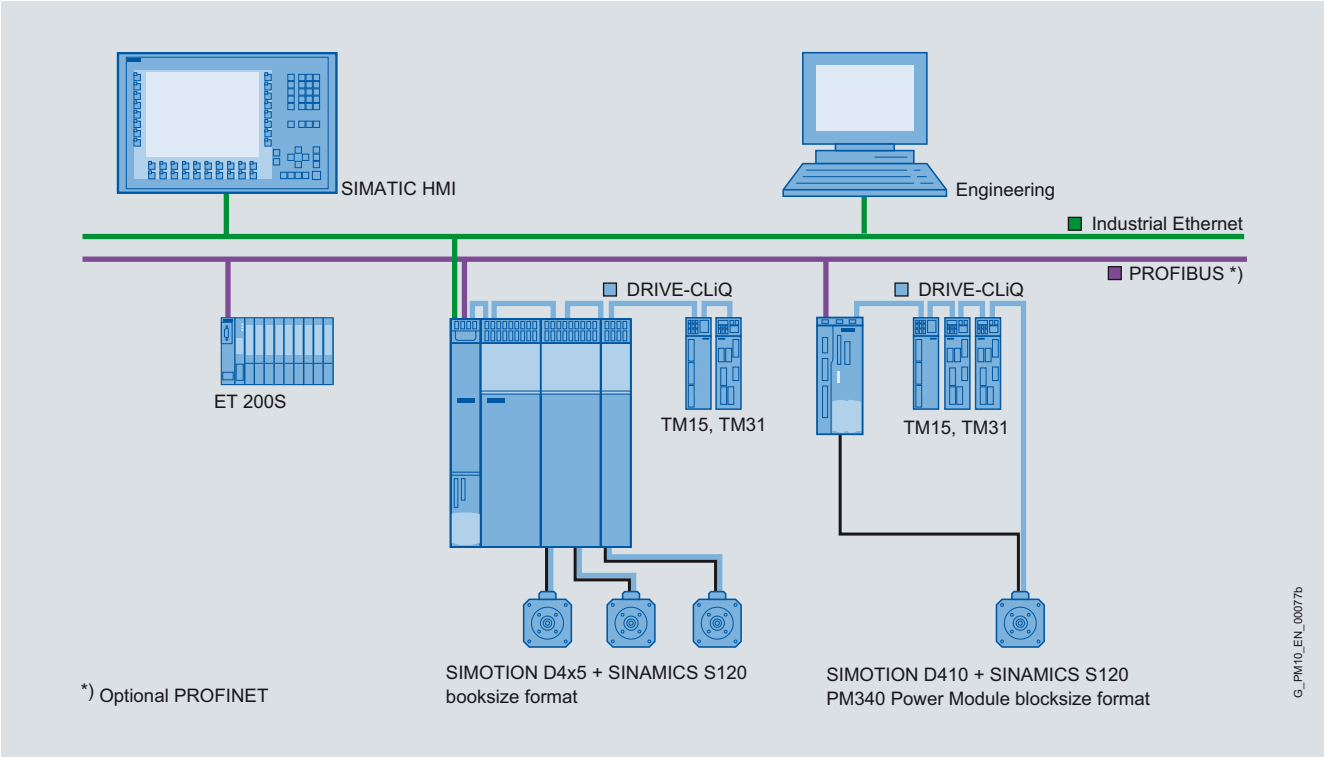
SIMOTION D optimally supports the implementation of modular machine concepts in which high-performance multi-axis and single-axis drives have to be combined: SIMOTION D4x5 undertakes open and closed-loop control of the multi-axis groups, SIMOTION D410 is the cost-effective solution for the compact design of single drive applications.

Important applications include:

- Packaging machines
- Plastic and rubber processing machines
- Presses, wire-drawing machines
- Textile machines
- Printing machines
- Wood, glass, ceramics and stone working machines
- Converting

Due to the increasing use of servo or vector drives, these machines require a high degree of integration of PLC, motion control and technology functions.

Design



Typical design of an automation solution using SIMOTION D

SIMOTION D components and interfaces

- Various status/error displays
- Onboard digital inputs and outputs
- Option slot (D4x5 only) for operating
  - an interface for PROFINET IO
  - terminal expansion (additional I/Os)
- Integrated communications interfaces for linking:
  - SINAMICS S120 drive modules
  - Distributed I/Os
  - HMI systems
  - PG/PC
  - Other motion control and automation systems
  - Other SINAMICS S110/S120 drives with digital setpoint interface
- Slot for CompactFlash card for data backup

Construction of an axis line-up with SIMOTION D4x5

The following components make up a SIMOTION D4x5 axis system:

- A SIMOTION D4x5 Control Unit, designed for open and closed-loop control of a multiple axis line-up
- A SINAMICS S120 Line Module (infeed module)
- One or more SINAMICS S120 Motor Modules (power modules)
- Other drive components, such as
  - Power supply
  - Filter
  - Choke, etc.
- DRIVE-CLiQ provides the link between SIMOTION D4x5 and the SINAMICS S120 drive modules.

Note:
SINAMICS S120 PM340 Power Modules in blocksize format can also be operated on a SIMOTION D4x5 with the Control Unit Adapters CUA31/CUA32.

Construction of a single axis with SIMOTION D410

The following components make up a SIMOTION D410 single axis system:

- A SIMOTION D410 Control Unit, designed for open and closed-loop control of a single axis
- A SINAMICS S120 PM340 Power Module, blocksize format (combined infeed and power module)
- Other drive components, such as
  - Power supply
  - Filter
  - Choke, etc.
- The connection between SIMOTION D410 and the SINAMICS S120 PM340 Power Module is made with the integrated PM-IF interface or, with the CUA31/CUA32 Control Unit Adapters, over DRIVE-CLiQ.

Expansion using I/O

SIMOTION D can be expanded with the following I/O:

- Distributed I/O systems (e.g. SIMATIC ET 200S)
- Drive-based control cabinet I/O (e.g. TM15, TM31 Terminal Modules, ...)

Function

Basic functionality

The SIMOTION D410 and D4x5 basic functionality is supplied with the CompactFlash card (CF) and is loaded when the power is switched on. The basic functionality includes:

- SINAMICS S120 drive control
  - SIMOTION D4x5: Current/speed control (based on CU320, firmware version 2.x) for up to 6 servo axes, 4 vector axes or 8 *V/f* axes, closed-loop control for infeed (Active Line Module)
  - SIMOTION D410: Current/speed control (based on CU310, firmware version 2.x) for 1 servo axis, 1 vector axis or 1 *V/f* axis
- SIMOTION runtime system
  - User-programmable with several languages conforming to IEC 61131
  - Various methods of program execution (cyclic, sequential, event-driven)
  - PLC and arithmetic functionality
  - Communication and management functions
  - Motion Control functions (Motion Control Basic)
- Testing and diagnostic tools

This basic functionality can be expanded with loadable technology packages, if required.

Position-controlled motion control for drives

- Integrated drives (D4x5, D410):
  The power units are connected over DRIVE-CLiQ or over the integrated PM-IF interface (D410 only)
- Drives with digital setpoint interfaces (D4x5 only):
  SIMOTION D enables position-controlled motion control for drives with a digital setpoint interface via PROFIBUS DP/ PROFINET IO with PROFIdrive.
- Drives with analog setpoint interface
  (D4x5 only, e.g. for retrofit or hydraulic applications):
  The ADI 4 (Analog Drive Interface for 4 Axes) or IM 174 (Interface Module for 4 Axes) module can be used to connect drives with analog ± 10 V setpoint interfaces. The IM 174 also makes it possible to connect stepper drives with a pulse direction interface.
  Both modules are connected over PROFIBUS DP. The following can be connected to one ADI 4 or IM 174 module:
  - 4 drives
  - 4 encoders
  - Digital inputs and outputs

SIMOTION technology packages

A special feature of SIMOTION is that the basic functionality can be expanded by loading technology packages, such as:

- Motion Control with the technology functions:
  - POS – Positioning
  - GEAR – Synchronous operation/electronic gear
  - CAM – Cam
  - PATH - Path interpolation
- TControl – Temperature controller
- DPM – Direct Product Motion (D435 and D445-1 only)
- MIIF – Multipurpose Information Interface (D4x5 only)

Since the technology functions have modular licenses, you only pay for what you will actually use.

With SIMOTION D410, the Motion Control technology functions (POS/GEAR/CAM) are already included for exactly one real axis, therefore an additional license is not required for this purpose.

Performance

Hardware-supported floating-point arithmetic enables complex arithmetic functions to be used effectively.

Fast instruction execution opens up completely new application possibilities in the mid-performance to high-performance range.

Configuring/parameterizing/programming

SIMOTION SCOUT is a powerful and user-friendly engineering tool. It is an integrated system for all engineering steps, from configuring and parameterization, through programming, to testing and diagnostics. Graphical operator prompting, using dialog boxes and wizards, as well as text-based and graphical languages for programming, considerably reduce the familiarization and training periods.

Operator control and monitoring (HMI)

Communication services which support user-friendly data exchange with HMI devices are integrated in the basic functionality of SIMOTION D.

Operator control and monitoring can be implemented using SIMATIC HMI devices, such as TPs (Touch Panels), OPs (Operator Panels) or MPs (Multi Panels).

These devices can be connected to SIMOTION D over PROFIBUS, Industrial Ethernet (D4x5 only) or PROFINET and they are configured using WinCC flexible.

With the SIMATIC NET communication software, an open, standardized OPC interface is available for accessing SIMOTION from other Windows-based HMI systems.

SIMOTION IT service and diagnostic functions

SIMOTION IT provides SIMOTION D with an integrated Web server on which user-specific Web pages can be stored.

Read and write access can be made to the Control Unit variables. Java scripts or applets also allow the implementation of active operation and display functions in the Web pages that can be executed on a client PC with an Internet browser.

Process and data communication

Thanks to its integrated interfaces, SIMOTION D supports both process and data communication. The SCOUT engineering system is provided for user-friendly communication configuration and diagnostics.

Function (continued)

Safety Integrated functions

Highly effective protection of personnel and machinery can be implemented with SIMOTION D thanks to the integrated safety functions of SINAMICS S120 (based on CU310/CU320 Control Unit, firmware version 2.x).

The following Safety Integrated functions are currently available for the integrated SINAMICS S120 drive system:
(Terms in accordance with IEC 61800-5-2)

- Safe Torque Off (STO)
- Safe Brake Control (SBC)
- Safe Stop1 (SS1)
- Safe Stop2 (SS2)
- Safe Operating Stop (SOS)
- Safely Limited Speed (SLS)
- Safe Speed Monitor (SSM)

More information about Safety Integrated functions can be found in chapter Safety Integrated.

Activation of Safety Integrated functions

Safety Integrated functions can be activated by the following methods:

- Via terminals on the Control Unit and on the power unit (STO, SBC, SS1 only)
- Over terminals on the TM54F Terminal Module
- Over PROFIBUS with PROFIsafe

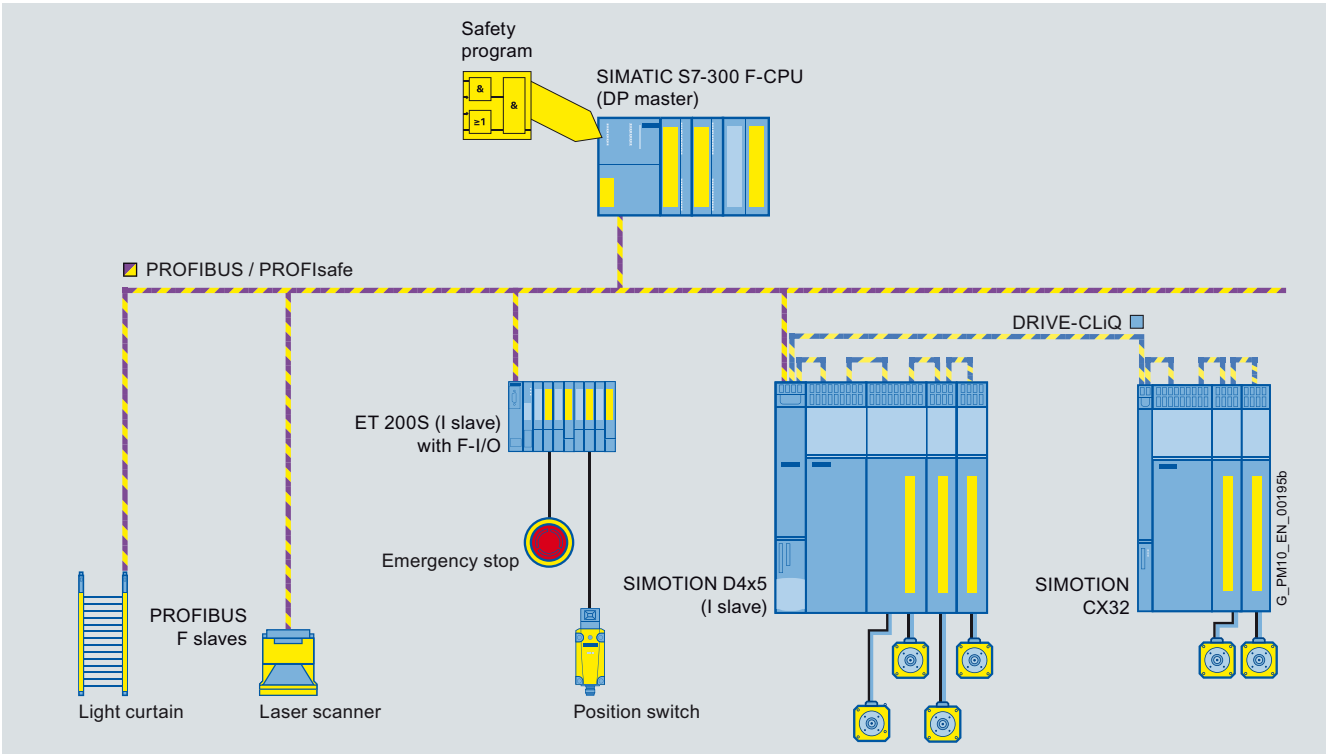
The Safety Integrated functions are implemented electronically and therefore offer short response times in comparison to solutions with externally implemented monitoring functions.

Safety Integrated functions over PROFIBUS with PROFIsafe

Safety Integrated functions are activated via "PROFIsafe on PROFIBUS" safe communication. The control (F logic) is implemented using an F-CPU connected via PROFIBUS with PROFIsafe, for example, a SIMATIC S7-300 F-CPU.

Safety Integrated functions are routed through from the SIMOTION D4x5 Control Units to the following drives:

- Integrated SINAMICS S120 drives on SIMOTION D4x5
- Drives on the SIMOTION CX32 Controller Extension
- Drives on SINAMICS Control Units connected via PROFIBUS to SIMOTION D.



Safety Integrated solution with SIMOTION D4x5: Control of the safety functions via PROFIBUS with PROFIsafe

For SIMOTION D410, the Safety Integrated functions are routed to just one drive (single-axis application with the PM340 Power Module).

Note
For more information about possible topologies and suitable SINAMICS Control Units, please contact your local Siemens sales office.

More information

More information

- about I/O modules for SIMOTION D can be found in chapter SIMOTION I/O components.
- about the functionality of SIMOTION platforms can be found in section Overview of SIMOTION functions.
- about the SIMOTION runtime system can be found in section SIMOTION runtime software.
- about operator control and monitoring can be found in chapter SIMOTION HMI devices.
- about SIMATIC NET communication software can be found in section SIMOTION runtime software.
- about SINAMICS S120 Motor Modules, Power Modules can be found in chapter SINAMICS S120 drive system.
- about SINAMICS S120 performance features and control characteristics can be found in chapter System description – Dimensioning.

SIMOTION D410 Control Units

Overview

Left: SIMOTION D410 Control Unit attached to mounting plate
On right: SIMOTION D410 Control Unit, snapped onto PM340 Power Module

SIMOTION D410 is the SIMOTION D platform for single-axis applications. It supplements the SIMOTION D4x5 controller family, which is the solution of choice for multi-axis applications. It is available in both PROFIBUS (D410 DP) and PROFINET (D410 PN) versions.

The SIMOTION D410 Control Unit is specially designed for use with the SINAMICS S120 PM340 Power Modules in blocksize format and can be directly connected to the Power Modules of this series. The SIMOTION D410 can also be installed on a separate mounting plate if required (to be ordered separately).

SIMOTION D410 Control Unit and mounting plate

The SIMOTION D410 handles the motion control, technology and PLC functions associated with a single axis and is also responsible for the drive control of that axis. The integrated inputs/outputs support up to 4 high-speed output cams or 3 measuring inputs.

The drive control supports servo control (for a highly dynamic response), vector control (for maximum torque accuracy) and *V/f* control.

SIMOTION D410 can be used in synchronized groups:

- For PROFINET: with controller – controller or controller – device relationship
- For PROFIBUS: with master – slave relationship

Application

SIMOTION D410 is the ideal solution when PLC functionality and motion control for one axis are required in a compact format.

Examples of SIMOTION D410 applications include:

- Autonomous control of single axes
- Cross cutters
- Winder applications
- Feeder devices/roller infeed/press feeders
- Synchronized machining equipment
- Compact machine modules, e.g.
  - Feeders in post press applications
  - Shrink wrapping machines.

Apart from positioning functions, SIMOTION D410 also provides all the synchronizing and cam functions; the second axis required for synchronous operation and camming can be a virtual axis, a position encoder or the axis of another SIMOTION controller. SIMOTION D410 can be easily integrated into synchronized groups.

This is an advantage in modular machine concepts that make up

- a basic machine, e.g. SIMOTION D4x5 as the PROFINET IRT controller with leading axis function
- several machine modules connected over PROFINET based on the SIMOTION D410.

Design

Interfaces

Display and diagnostics

- LEDs to display operating states and errors
- 3 measuring sockets

Integrated I/Os

- 4 digital inputs
- 4 digital inputs/outputs (max. 4 as output cams or 3 measuring inputs)

Communication

- 1 × DRIVE-CLiQ
- 2 × PROFINET ports (D410 PN only)
- 1 × PROFIBUS DP (D410 DP only)

Data backup

- 1 slot for SIMOTION CompactFlash card

Additional interfaces

- Terminals for 24 V electronics power supply
- 1 encoder input for
  - HTL/TTL incremental encoder
  - SSI absolute encoder (without incremental signals)
- 1 temperature sensor input (KTY84-130 or PTC)
- PM IF interface (Power Module interface) on rear for direct operation with a SINAMICS S120 PM340 Power Module in blocksize format

Design (continued)

Assembly/Installation

SIMOTION D410 can be directly plugged in to the SINAMICS S120 PM340 Power Module in blocksize format.

Alternatively, the SIMOTION D410 can be mounted on a separate mounting plate (to be ordered separately) and connected to the PM340 Power Module via DRIVE-CLiQ. In this case, the CUA31/CUA32 Control Unit Adapter has to be connected to the PM340 Power Module. No more than one Control Unit Adapter can be connected to a SIMOTION D410.

Power Modules in AC/AC chassis format are connected to the SIMOTION D410 over the DRIVE-CLiQ interface. Motor Modules in booksize format cannot be connected to SIMOTION D410.

A SIMOTION D410 inserted on the mounting plate can also be operated without PM340 (e.g. for hydraulic applications using a TM31 for the analog inputs and outputs).

Data storage/data backup

SIMOTION D410 has a 9 KB memory for retentive storage of process variables. The runtime software, user data and user programs are backed up on the SIMOTION CompactFlash card. In the event that the SIMOTION D410 needs to be replaced, the process variables can also be backed up on the SIMOTION CompactFlash card (CF) by means of system commands.

Connectable I/Os

PROFINET IO: (D410 PN only)

- Certified PROFINET devices
- Distributed I/Os SIMATIC ET 200S/M/eco PN/pro
- HMI

PROFIBUS DP: (D410 DP only)

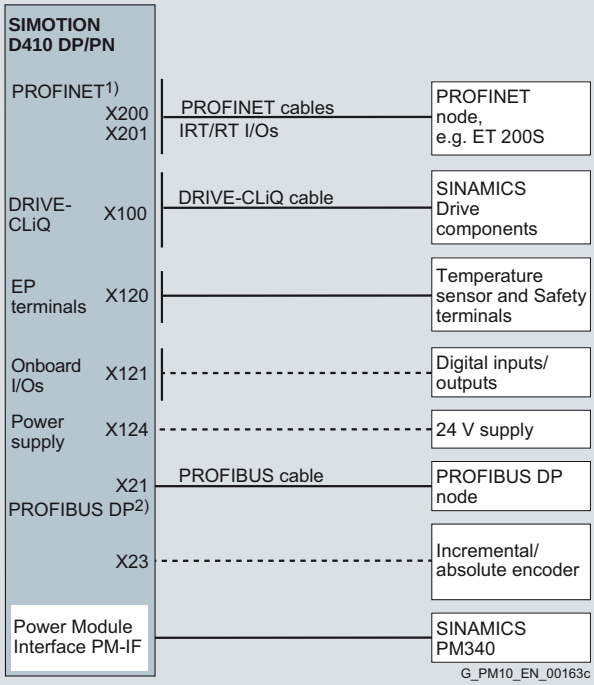
- Certified PROFIBUS standard slaves (DP-V0, DP-V1, DP-V2)
- SIMATIC ET 200S/M/eco/pro distributed I/O systems
- HMI

DRIVE-CLiQ:

Modules from the SINAMICS range:

- Terminal Modules TM15, TM17 High Feature, TM31, ... (max. 3)
- TM54F (max. 1)
- SMC/SME Sensor Modules (max. 2)
- DMC20 DRIVE-CLiQ Hub Module (max. 1)
- Motors with DRIVE-CLiQ interface

Integration



1) SIMOTION D410 PN only
2) SIMOTION D410 DP only

SIMOTION D410 overview of connections

When dimensioning cables, you must always observe the maximum permissible cable lengths.

If these maximum lengths are exceeded, malfunctions can occur.

The permissible length of PROFIBUS DP cables depends on the configuration.

The DRIVE-CLiQ and encoder cables used for the SINAMICS S120 CU310 Control Unit can also be used for SIMOTION D410.

For more information about signal cables, refer to chapter Connection system MOTION-CONNECT.

Technical specifications

PLC and Motion Control performance	
Maximum number of axes	1 (real axis)
Minimum PROFIBUS cycle	2 ms (D410 DP)
Minimum PROFINET transmission cycle	0.5 ms (D410 PN)
Minimum servo/interpolator clock cycle	2.0 ms
Integrated drive control	
Max. number of axes for integrated drive control (servo / vector / *V/f*)	1 / 1 / 1 (alternative) Drive control based on CU310, firmware version 2.x
Memory	
RAM (Random Access Memory)	26 MB + 20 MB for Java applications
RAM disk (load memory)	17 MB
Retentive memory	9 KB
Persistent memory (user data on CF)	300 MB
Communication	
DRIVE-CLiQ interfaces	1
PROFIBUS interfaces	1 (D410 DP only) • Equidistant and isochronous • Can be configured as master or slave
PROFINET interfaces	1 interface with 2 ports (D410 PN only) • Supports PROFINET IO with IRT and RT • Can be configured as PROFINET IO controller and/or device
General technical specifications	
Fan	Integrated
Supply voltage	
• Rated value	24 V DC
• Permissible range	20.4 ... 28.8 V
Current consumption, typ. (excluding digital outputs and DRIVE-CLiQ supply)	800 mA
Starting current, typ.	3.0 A
Power loss, typ.	20 W
Permissible ambient temperature	
• Storage and transport	-40 … +70 °C (-40 ... +158 °F)
• Operation	0 ... 55 °C (32 ... 131 °F); maximum installation altitude 2000 m (6562 ft) above sea level. Above an altitude of 2000 m (6562 ft), the max. ambient temperature decreases by 7 °C (44.6 °F) every 1000 m (3281 ft); max. 5000 m (16405 ft) above sea level.
Permissible relative humidity (without condensation)	5 ... 95 %
Atmospheric pressure	700 … 1060 hPa
Degree of protection according to EN 60529 (IEC 60529)	IP20
Dimensions (W × H × D)	73 × 183.2 × 89.6 mm (2.87 × 7.21 × 3.53 in)
Weight	
• SIMOTION D410	990 g (2.18 lb)
• CompactFlash card	10 g (0.35 oz)

Digital inputs	**4**
• Input voltage	
- Rated value	24 V DC
- For "1" signal	15 ... 30 V
- For "0" signal	-3 ... +5 V
• Galvanic isolation	Yes, in groups of 4
• Current consumption typ. at 1-signal level	10 mA at 24 V
• Input delay, typ. (hardware)	L → H: 50 µs H → L: 150 µs
Digital inputs/outputs (parameterizable)	**4 (max. 3 as high-speed measuring inputs, max. 4 as high-speed output cams)**
If used as an input	
• Input voltage	
- Rated value	24 V DC
- For "1" signal	15 ... 30 V
- For "0" signal	-3 ... +5 V
• Galvanic isolation	No
• Current consumption typ. at 1-signal level	10 mA at 24 V
• Input delay, typ. (hardware)	
- 3 inputs (can also be used as measuring inputs)	L → H: 5 µs H → L: 50 µs
- 1 input	L → H: 50 µs H → L: 100 µs
• Measuring input, accuracy (reproducibility)	5 µs
If used as an output	
• Rated load voltage	24 V DC
• Permissible range	20.4 ... 28.8 V
• Galvanic isolation	No
• Current load, max.	500 mA per output
• Residual current, max.	2 mA
• Output delay time, typ./max. (hardware, with 48 Ω load)	L → H: 150 µs/400 µs H → L: 75 µs/100 µs
• Output cam accuracy (reproducibility)	200 µs
• Short-circuit protection	Yes

Technical specifications (continued)

Onboard encoder interface	
• Encoder interface	• TTL or HTL incremental encoders (with adjustable parameters) • SSI absolute encoder (without incremental signals)
• Encoder supply	24 V DC/0.35 A or 5 V DC/0.35 A
• Limit frequency, max.	500 kHz
• SSI baud rate	100 ... 250 kBaud
• Resolution absolute position SSI	30 bit
Cable length, max.	
• For TTL incremental encoder (only bipolar signals permitted)	100 m (328 ft) [1]
• For HTL incremental encoder	
- For unipolar signals	100 m (328 ft)
- For bipolar signals	300 m (984 ft) [1]
• For SSI absolute encoder	100 m (328 ft)
Additional technical specifications	
Input for temperature sensing	
• Temperature sensor	KTY84-130 or PTC
Non-volatile data backup	
• Backup time, min.	• Non-volatile data: unlimited • Real-time clock: 5 days, minimum (maintenance-free backup)
Approvals, according to	cULus

Selection and ordering data

Description	Order No.
SIMOTION D410 DP Control Unit (SIMOTION V4.1 SP1 or higher)	**6AU1410-0AA00-0AA0**
SIMOTION D410 PN Control Unit (SIMOTION V4.1 SP1 or higher)	**6AU1410-0AB00-0AA0**
SIMOTION CompactFlash card (CF) 1 GB with the current SIMOTION Kernel and SINAMICS S120 drive software V2.x *Pre-installed license can be obtained using additional order codes* [2]	**6AU1400-2PA01-0AA0**

Accessories

Description	Order No.
Accessories for SIMOTION D410	
Rear panel mounting plate For installing the SIMOTION D410 in a different location if you do not wish to connect it to the Power Module.	**6AU1400-7AA05-0AA0**
Accessories for PROFIBUS	
PROFIBUS RS485 bus connector with angular cable outlet (35°) and screw-type terminals Max. transmission rate 12 Mbit/s	
• Without PG interface	**6ES7972-0BA42-0XA0**
• With PG interface	**6ES7972-0BB42-0XA0**
PROFIBUS Fast Connect RS485 bus connector with angular cable outlet (35°) and insulation displacement terminals Max. transmission rate 12 Mbit/s	
• Without PG interface	**6ES7972-0BA60-0XA0**
• With PG interface	**6ES7972-0BB60-0XA0**
Accessories for PROFINET	
RJ45 FastConnect plug connector for Industrial Ethernet/PROFINET 180° cable outlet	
• 1 pack = 1 unit	**6GK1901-1BB10-2AA0**
• 1 pack = 10 units	**6GK1901-1BB10-2AB0**
FastConnect cables for Industrial Ethernet/PROFINET [3]	
• IE FC Standard Cable GP 2x2	**6XV1840-2AH10**
• IE FC Flexible Cable GP 2x2	**6XV1870-2B**
• IE FC Trailing Cable GP 2x2	**6XV1870-2D**
• IE FC Trailing Cable 2x2	**6XV1840-3AH10**
• IE FC Marine Cable 2x2	**6XV1840-4AH10**
Stripping tool for Industrial Ethernet/PROFINET FastConnect cables	
• IE FC stripping tool	**6GK1901-1GA00**
Accessories for DRIVE-CLiQ	
Dust-proof blanking plugs (50 units) for sealing unused DRIVE-CLiQ ports	**6SL3066-4CA00-0AA0**

[1] Twisted pair and shielded signal cables

[2] Note about licenses for runtime software:
Runtime software licenses can either be pre-installed on a CompactFlash card (CF) or ordered separately.
See Ordering of licenses for runtime software on page 9/52.

[3] Sold by the meter; max. length 1000 m (3281 ft); minimum order 20 m (65.62 ft)

More information

More information

- about PROFIBUS DP/MPI cables and MOTION-CONNECT can be found in chapter Connection system MOTION-CONNECT.
- about PROFIBUS DP, Industrial Ethernet and PROFINET can be found in Catalog IK PI and the Industry Mall under Automation technology/Industrial Communication.
- about the ordering data for SINAMICS drive components such as Power Modules, DRIVE-CLiQ cables, etc. can be found in chapter SINAMICS S120 drive system and the Industry Mall under Drive technology/Converters/....

Integrated drive control

The drive control functions integrated in SIMOTION D410 are based on the drive control of a CU310 (firmware version 2.x), although there is a slight difference in functionality. For example, SIMOTION D410 does not have a basic positioner function (EPos), as this is already covered by SIMOTION technology functions.

For more information, refer to chapter System description – Dimensioning and the documentation for SIMOTION and SINAMICS.

Licensing notes

SIMOTION D410 is the SIMOTION D variant for single-axis applications and already contains the Motion Control technology functions for one real axis (speed control, positioning, synchronous operation, cam). A license is therefore not needed for this purpose. It is not possible to increase the number of axes using licenses. Apart from one real axis, additional virtual axes can be configured.

Licensed runtime functions such as SIMOTION IT DIAG require licenses which can be ordered pre-installed on a CompactFlash card (CF) or individually.

For more information, refer to section Ordering of licenses for runtime software.

SIZER configuration tool

With the SIZER configuration tool, you can easily configure the SINAMICS S120 drive family including SIMOTION. It provides you with support for selecting and dimensioning the components for a Motion Control task. You can also determine the possible number of axes and the resulting load with SIZER in accordance with your performance requirements.

For more information about SIZER, refer to chapter System description – Dimensioning.

Overview

SIMOTION D4x5 is the drive-based Control Unit for multi-axis systems. The individual versions SIMOTION D425 (BASIC performance), SIMOTION D435 (STANDARD performance) and SIMOTION D445-1 (HIGH performance) differ in their PLC performance and motion control performance. The main distinguishing features are:

	SIMOTION D425	SIMOTION D435	SIMOTION D445-1
Maximum number of axes	16	32	64
Minimum servo/ interpolator clock cycle	2.0 ms	1.0 ms	0.5 ms
DRIVE-CLiQ interfaces	4	4	6

SIMOTION D4x5 features PLC and motion control performance (open-loop control and motion control) for up to 16, 32 or 64 axes, as required.

The drive control functions integrated into the drive allow the D4x5 Control Unit to operate up to 6 servo, 4 vector or 8 *V/f* axes.

The drive control is based on a CU320 (firmware version 2.x) and supports servo control (for a highly dynamic response), vector control (for maximum torque accuracy) and *V/f* control.

Extension of the drive computing performance

The motion control performance of a SIMOTION D4x5 can be utilized in full by expanding the computing performance at the drive in two different ways:

- Over PROFIBUS or PROFINET, SINAMICS S120 Control Units complete with further SINAMICS S120 drive modules can be connected.
- With SIMOTION D435 and D445-1, the CX32 Controller Extension can be connected over DRIVE-CLiQ. This module is extremely compact and can control up to 6 servo, 4 vector or 8 *V/f* axes.

Application

SIMOTION D4x5 is ideally suited for applications with many coordinated axes with high clock-pulse rates. With SIMOTION D425, D435 and D445-1, three performance variants are available which offer maximum scalability and flexibility.

Typical applications include:

- Compact multiple-axis machines
- High-performance applications with short machine cycles
- Compact machines
  - Including the complete machine control in the drive
  - With extensive connection possibilities for communication, HMI and I/O
- Distributed drive concepts
  - Applications with many axes
  - Synchronization of several SIMOTION D Control Units using distributed synchronous operation

Design

Interfaces

Display and diagnostics

- LEDs to display operating states and errors
- 3 measuring sockets

Integrated I/Os

- 8 digital inputs
- 8 digital inputs/outputs (max. 8 as high-speed output cams, max. 6 as high-speed measuring inputs)

Communication

- 4 × DRIVE-CLiQ (6 × DRIVE-CLiQ for D445-1)
- 2 × Industrial Ethernet
- 2 × PROFIBUS DP
- 2 × USB

Data backup

- 1 slot for SIMOTION CompactFlash card

Additional interfaces

- Terminals for 24 V electronics power supply

Option modules

The following option modules are available for SIMOTION D4x5 Control Units:

- CBE30 Communication Board for the connection to PROFINET IO
- TB30 Terminal Board for the expansion with 4 digital inputs, 4 digital outputs, 2 analog inputs and 2 analog outputs

Assembly/Installation

SIMOTION D4x5 can be mounted in the control cabinet in one of three ways:

- Hooking it in to the Line Module on the left-hand side (not with D445-1)
- Screwing it directly to the control cabinet, if it is required/desired that SIMOTION D is separate from the Line Module
- Using spacers if it is not possible to mount SIMOTION D on to the side of the Line Module (e.g. if no Line Module is installed) so the difference between the mounting depth of SIMOTION D4x5 and the Motor Modules will be compensated for. SIMOTION D4x5 comes with pre-installed spacers. With SIMOTION D425, D435 and D445-1, these can be removed if necessary.

Design (continued)

Data storage/data backup

The SIMOTION D4x5 modules have 364 KB of non-volatile and battery-backed SRAM for process variables. This backup is stored for at least 5 days. There are two options for storing retentive data for a longer period:

- System commands for storing retentive data on the CompactFlash card (CF) of the SIMOTION D4x5
- Use of a battery module (combined fan/battery module already included in the scope of delivery of a SIMOTION D445-1, optional for SIMOTION D425/D435)

The runtime software, user data and user programs are saved retentively using a CompactFlash card (CF).

Connectable I/Os

PROFINET IO: (optionally via CBE30)

- Certified PROFINET devices
- Distributed I/Os SIMATIC ET 200S/M/eco PN/pro
- Distributed drives with CU320/CU320-2 Control Unit with PROFINET interface as well as SINAMICS S120 PM340 Power Modules with CU310 PN Control Unit

PROFIBUS DP:

- Certified PROFIBUS standard slaves (DP-V0, DP-V1, DP-V2)
- SIMATIC ET 200S/M/eco/pro distributed I/O systems
- Distributed drives with CU320/CU320-2 Control Unit and SINAMICS S120 PM340 Power Modules with CU310 DP/CU305 DP Control Unit

DRIVE-CLiQ:

Modules from the SINAMICS range:

- Terminal Modules TM15, TM17 High Feature, TM31, ...
- SMC/SME Sensor Modules
- DMC20 DRIVE-CLiQ Hub Module

USB:

The integrated USB interface allows, for example, a USB memory stick to be connected to upgrade the SIMOTION D4x5.

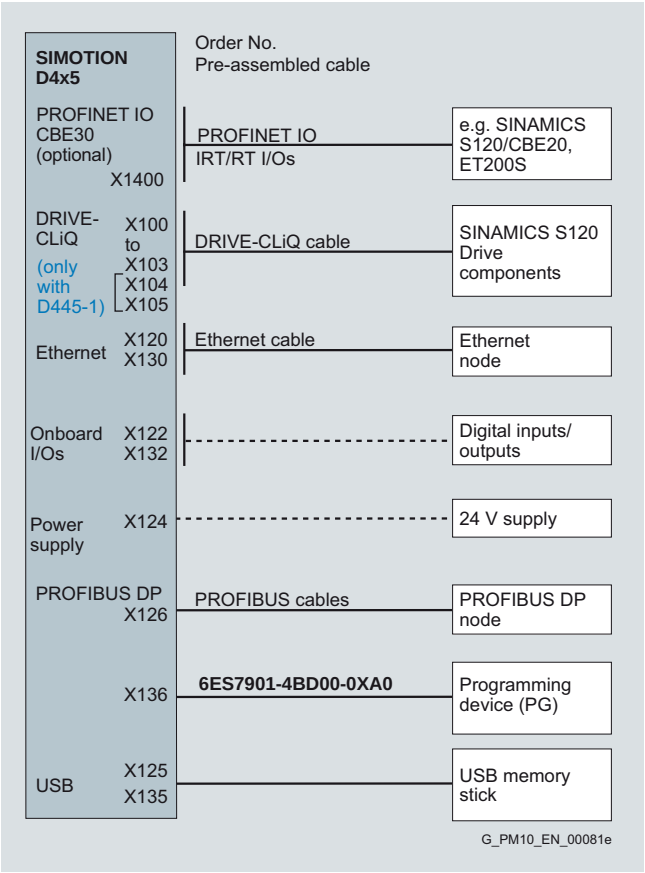
Expansion with SINAMICS S120 drive modules

SINAMICS S120 drive modules in booksize format (Line Modules, Motor Modules, etc.) are connected to SIMOTION D4x5 over DRIVE-CLiQ.

Furthermore, SINAMICS S120 PM340 Power Modules in blocksize format can also be operated on a SIMOTION D4x5 with the Control Unit Adapters CUA31/CUA32.

Note:
DRIVE-CLiQ cables, which are required to connect Line/Motor Modules to SIMOTION D, are supplied in a standard length with the Line/Motor Modules.

Integration



SIMOTION D4x5 connection overview

When dimensioning cables, you must always observe the maximum permissible cable lengths.

If these maximum lengths are exceeded, malfunctions can occur.

The permissible length of PROFIBUS DP cables depends on the configuration.

The DRIVE-CLiQ cables used for the SINAMICS S120 CU320/CU320-2 Control Unit can also be used for SIMOTION D4x5.

For more information about signal cables, refer to chapter Connection system MOTION-CONNECT.

Technical specifications

	SIMOTION D425 BASIC Performance	SIMOTION D435 STANDARD Performance	SIMOTION D445-1 HIGH performance
PLC and Motion Control performance			
Maximum number of axes	16	32	64
Minimum PROFIBUS cycle	2 ms	1 ms	1 ms
Minimum PROFINET transmission cycle	0.5 ms	0.5 ms	0.5 ms
Minimum servo/interpolator clock cycle	2.0 ms	1.0 ms	0.5 ms
Integrated drive control			
Max. number of axes for integrated drive control (servo / vector / *V/f*)	6 / 4 / 8 (alternative) (Drive control based on CU320, firmware version 2.x)	6 / 4 / 8 (alternative) (Drive control based on CU320, firmware version 2.x)	6 / 4 / 8 (alternative) (Drive control based on CU320, firmware version 2.x)
Memory			
RAM (Random Access Memory) (+ 20 MB for Java applications)	35 MB	35 MB	70 MB
RAM disk (load memory)	23 MB	23 MB	47 MB
Retentive memory	364 KB	364 KB	364 KB
Persistent memory (user data on CF)	300 MB	300 MB	300 MB
Communication			
DRIVE-CLiQ interfaces	4	4	6
USB interfaces	2	2	2
Ethernet interfaces	2	2	2
PROFIBUS interfaces	2 • Equidistant and isochronous • Can be configured as master or slave	2 • Equidistant and isochronous • Can be configured as master or slave	2 • Equidistant and isochronous • Can be configured as master or slave
PROFINET interfaces	Optionally over CBE30: • 1 interface with 4 ports • Supports PROFINET IO with IRT and RT • Can be configured as PROFINET IO controller and/or device	Optionally over CBE30: • 1 interface with 4 ports • Supports PROFINET IO with IRT and RT • Can be configured as PROFINET IO controller and/or device	Optionally over CBE30: • 1 interface with 4 ports • Supports PROFINET IO with IRT and RT • Can be configured as PROFINET IO controller and/or device
General technical specifications			
Fan	Optional fan/battery module (single fan)	Optional fan/battery module (single fan)	Double fan/battery module included in scope of delivery
Supply voltage			
• Rated value	24 V DC	24 V DC	24 V DC
• Permissible range	20.4 ... 28.8 V	20.4 ... 28.8 V	20.4 ... 28.8 V
Current consumption, typ. (excluding digital outputs and DRIVE-CLiQ supply)	600 mA	600 mA	1 A
Starting current, typ.	6 A	6 A	5 A
Power loss, typ.	15 W	15 W	24 W
Permissible ambient temperature			
• Storage and transport	-40 ... +70 °C (-40 ... +158 °F)	-40 ... +70 °C (-40 ... +158 °F)	-40 ... +70 °C (-40 ... +158 °F)
• Operation	0 ... 55 °C (32 ... 131 °F) Maximum installation altitude 2000 m (6562 ft) above sea level. Above an altitude of 2000 m (6562 ft), the max. ambient temperature decreases by 7 °C (44.6 °F) every 1000 m (3281 ft); maximum 5000 m (16405 ft) above sea level.	0 ... 55 °C (32 ... 131 °F) Maximum installation altitude 2000 m (6562 ft) above sea level. Above an altitude of 2000 m (6562 ft), the max. ambient temperature decreases by 7 °C (44.6 °F) every 1000 m (3281 ft); maximum 5000 m (16405 ft) above sea level.	0 ... 55 °C (32 ... 131 °F) Maximum installation altitude 2000 m (6562 ft) above sea level. Above an altitude of 2000 m (6562 ft), the max. ambient temperature decreases by 7 °C (44.6 °F) every 1000 m (3281 ft); maximum 5000 m (16405 ft) above sea level.
Permissible relative humidity (without condensation)	5 ... 95 %	5 ... 95 %	5 ... 95 %
Atmospheric pressure	700 ... 1060 hPa	700 ... 1060 hPa	700 ... 1060 hPa
Degree of protection according to EN 60529 (IEC 60529)	IP20	IP20	IP20
Dimensions (W × H × D)	50 × 380 × 230 mm (1.97 × 14.96 × 9.06 in)	50 × 380 × 230 mm (1.97 × 14.96 × 9.06 in)	50 × 380 × 230 mm (1.97 × 14.96 × 9.06 in)

Technical specifications (continued)

	SIMOTION D425 BASIC Performance	SIMOTION D435 STANDARD Performance	SIMOTION D445-1 HIGH performance
Weight			
• SIMOTION D	2600 g (5.73 lb)	2600 g (5.73 lb)	3100 g (6.84 lb)
• CompactFlash card	10 g (0.35 oz)	10 g (0.35 oz)	10 g (0.35 oz)
Digital inputs	**8**	**8**	**8**
• Input voltage			
- Rated value	24 V DC	24 V DC	24 V DC
- For "1" signal	15 ... 30 V	15 ... 30 V	15 ... 30 V
- For "0" signal	-3 ... +5 V	-3 ... +5 V	-3 ... +5 V
• Galvanic isolation	Yes, in groups of 4	Yes, in groups of 4	Yes, in groups of 4
• Current consumption typ. at 1-signal level	10 mA at 24 V	10 mA at 24 V	10 mA at 24 V
• Input delay, typ. (hardware)	L → H: 50 µs H → L: 150 µs	L → H: 50 µs H → L: 150 µs	L → H: 50 µs H → L: 150 µs
Digital inputs/outputs (parameterizable)	**8 (max. 6 as high-speed measuring inputs, max. 8 as high-speed output cams)**	**8 (max. 6 as high-speed measuring inputs, max. 8 as high-speed output cams)**	**8 (max. 6 as high-speed measuring inputs, max. 8 as high-speed output cams)**
If used as an input			
• Input voltage			
- Rated value	24 V DC	24 V DC	24 V DC
- For "1" signal	15 ... 30 V	15 ... 30 V	15 ... 30 V
- For "0" signal	-3 ... +5 V	-3 ... +5 V	-3 ... +5 V
• Galvanic isolation	No	No	No
• Current consumption typ. at 1-signal level	10 mA at 24 V	10 mA at 24 V	10 mA at 24 V
• Input delay, typ. (hardware)	L → H: 5 µs H → L: 50 µs	L → H: 5 µs H → L: 50 µs	L → H: 5 µs H → L: 50 µs
• Measuring input, accuracy (reproducibility)	5 µs	5 µs	5 µs
If used as an output			
• Rated load voltage	24 V DC	24 V DC	24 V DC
- Permissible range	20.4 ... 28.8 V	20.4 ... 28.8 V	20.4 ... 28.8 V
• Galvanic isolation	No	No	No
• Current load, max.	500 mA per output	500 mA per output	500 mA per output
• Residual current, max.	2 mA	2 mA	2 mA
• Output delay time, typ./max. (hardware, with 48 Ω load)	L → H: 150 µs/400 µs H → L: 75 µs/100 µs	L → H: 150 µs/400 µs H → L: 75 µs/100 µs	L → H: 150 µs/400 µs H → L: 75 µs/100 µs
• Output cam accuracy (reproducibility)	125 µs	125 µs	125 µs
• Switching frequency of the outputs, max.			
- With resistive load	100 Hz	100 Hz	100 Hz
- With inductive load	2 Hz	2 Hz	2 Hz
- With lamp load	11 Hz	11 Hz	11 Hz
• Short-circuit protection	Yes	Yes	Yes
Additional technical specifications			
Non-volatile data backup [1]			
• Backup time, min.	5 days (real-time clock/SRAM backup)	5 days (real-time clock/SRAM backup)	5 days (real-time clock/SRAM backup)
• Charging time, typ.	A few minutes	A few minutes	A few minutes
Approvals, according to	cULus	cULus	cULus

[1] Alternative: Longer buffer duration using fan/battery module or permanent buffering on a CompactFlash card with system command.

Selection and ordering data

Description	Order No.
SIMOTION D425 Control Unit	**6AU1425-0AA00-0AA0**
MultiAxes Bundle SIMOTION D425 Consists of 1 item each • SIMOTION D425 Control Unit • CompactFlash card 1 GB with MultiAxes Package license for the D425 platform	**6AU1425-0AA00-0CA0**
SIMOTION D435 Control Unit	**6AU1435-0AA00-0AA1**
MultiAxes Bundle SIMOTION D435 Consists of 1 item each • SIMOTION D435 Control Unit • CompactFlash card 1 GB with MultiAxes Package license for the D435 platform	**6AU1435-0AA00-0CA1**
SIMOTION D445-1 Control Unit incl. double fan/battery module and battery (V4.1 SP2 HF3 and higher)	**6AU1445-0AA00-0AA1**
MultiAxes Bundle SIMOTION D445-1 Consists of 1 item each • SIMOTION D445-1 Control Unit • CompactFlash card 1 GB with MultiAxes Package license for the D445/D445-1 platform [1]	**6AU1445-0AA00-0CA1**
SIMOTION CompactFlash card (CF) 1 GB with the current SIMOTION Kernel and SINAMICS S120 drive software V2.x *Pre-installed license using additional order codes* [2]	**6AU1400-2PA01-0AA0**

Accessories

Description	Order No.
Accessories for SIMOTION D4x5	
Fan/battery module Incl. battery • for D425/D435 as option • as spare part for D445 [1] • can be used for D445-1	**6FC5348-0AA01-0AA0**
Note: A fan/battery module is required only for D425/D435 • for backing up non-volatile data for longer than 5 days • when the free convection for heat dissipation does not suffice and the air supply temperature thus increases above 55° C (131 °F).	
Double fan/battery module Incl. battery Spare part, can only be used for D445-1	**6FC5348-0AA02-0AA0**
Battery Spare part for fan/battery module	**6FC5247-0AA18-0AA0**
Accessories for PROFIBUS	
PROFIBUS RS485 bus connector with angular cable outlet (35°) With screw-type terminals, max. transmission rate 12 Mbit/s	
• Without PG interface	**6ES7972-0BA42-0XA0**
• With PG interface	**6ES7972-0BB42-0XA0**
PROFIBUS Fast Connect RS485 bus connector with angular cable outlet (35°) With insulation displacement terminals, max. transmission rate 12 Mbit/s	
• Without PG interface	**6ES7972-0BA60-0XA0**
• With PG interface	**6ES7972-0BB60-0XA0**
Accessories for DRIVE-CLiQ	
Dust-proof blanking plugs (50 units) for sealing unused DRIVE-CLiQ ports	**6SL3066-4CA00-0AA0**

[1] SIMOTION D445 (6AU1445-0AA00-0AA0) is the predecessor to the more powerful SIMOTION D445-1 (6AU1445-0AA00-0AA1).

[2] Note about licenses for runtime software:
Runtime software licenses can either be pre-installed on a CompactFlash card (CF) or ordered separately.
See Ordering of licenses for runtime software on page 9/52.

More information

More information

- about PROFIBUS DP/MPI cables and MOTION-CONNECT can be found in chapter Connection system MOTION-CONNECT.
- about PROFIBUS DP, Industrial Ethernet and PROFINET can be found in Catalog IK PI and the Industry Mall under Automation technology/Industrial Communication and in chapter Communication.
- about the ordering data for other SINAMICS drive components such as Line Modules, Motor Modules, DRIVE-CLiQ cables, etc. can be found in chapter SINAMICS S120 drive system and the Industry Mall under Drive technology/Converters/....

Integrated drive control

The drive control functions integrated in SIMOTION D4x5 are based on the drive control of a CU320 (firmware version 2.x), although there is a slight difference in functionality. For example, SIMOTION D4x5 does not have a basic positioner function (EPos), as this is already covered by SIMOTION technology functions.

For more information, refer to chapter System description – Dimensioning and the documentation for SIMOTION and SINAMICS.

SIZER configuration tool

With the SIZER configuration tool, you can easily configure the SINAMICS S120 drive family including SIMOTION. It provides you with support for selecting and dimensioning the components for a Motion Control task. You can also determine the possible number of axes and the resulting load with SIZER in accordance with your performance requirements.

For more information about SIZER, refer to chapter System description – Dimensioning.

Overview

The CBE30 Communication Board allows SIMOTION D4x5 to be connected to a PROFINET IO network. The SIMOTION D4x5 then assumes the function of a PROFINET IO controller and can perform the following functions:

- PROFINET IO controller, I-Device
  (also controller and device simultaneously)
- 100 Mbit/s full-duplex/autocrossing
- Supports real-time classes of PROFINET IO:
  - RT (Real Time)
  - IRT (Isochronous Real Time)
- Integration of distributed I/O as PROFINET IO devices
- Integration of drives as PROFINET IO devices through PROFIdrive according to the V4 specification
- Support for standard Ethernet communication, e.g.
  - for interfacing with SIMOTION SCOUT
  - for the connection of HMI systems
  - for communication with any other devices over TCP/IP or UDP communication
- Integrated 4-port switch with four RJ45 sockets based on the PROFINET ASIC ERTEC400. The optimum topology (line, star, tree) can therefore be configured without additional external switches.

Integration

The CBE30 Communication Board is plugged into the option slot on the SIMOTION D4x5.

Technical specifications

CBE30 Communication Board	
Current requirement at 24 V DC	0.25 A
Permissible ambient temperature	
• Storage and transport	-40 … +70 °C (-40 ... +158 °F)
• Operation	0 … 55°C (32 ... 131 °F)
Dimensions (W × H × D)	25 × 95 × 143 mm (0.98 × 3.74 × 5.63 in)
Weight, approx.	100 g (0.22 lb)
Approvals, according to	cULus

Selection and ordering data

Description	Order No.
CBE30 Communication Board	**6FC5312-0FA00-0AA0**

Accessories

Description	Order No.
RJ45 FastConnect plug connector for Industrial Ethernet/PROFINET	
• 145°cable outlet [1]	
- 1 pack = 1 unit	**6GK1901-1BB30-0AA0**
- 1 pack = 10 units	**6GK1901-1BB30-0AB0**
• 180° cable outlet	
- 1 pack = 1 unit	**6GK1901-1BB10-2AA0**
- 1 pack = 10 units	**6GK1901-1BB10-2AB0**
FastConnect cables for Industrial Ethernet/PROFINET [2]	
• IE FC Standard Cable GP 2x2	**6XV1840-2AH10**
• IE FC Flexible Cable GP 2x2	**6XV1870-2B**
• IE FC Trailing Cable GP 2x2	**6XV1870-2D**
• IE FC Trailing Cable 2x2	**6XV1840-3AH10**
• IE FC Marine Cable 2x2	**6XV1840-4AH10**
Stripping tool for Industrial Ethernet/PROFINET FastConnect cables	
• IE FC stripping tool	**6GK1901-1GA00**

More information

More information about FastConnect cables can be found in Catalog IK PI (Industrial Communication) and the Industry Mall under Automation technology/Industrial Communication/ Industrial Ethernet/Cabling technology/...

[1] Preferred type if front cover must be closed.

[2] Sold by the meter; max. length 1000 m (3281 ft); minimum order 20 m (65.62 ft).

Supplementary components
SIMOTION CX32 Controller Extension

Overview

The SIMOTION CX32 Controller Extension is a component in SINAMICS S120 booksize format and supports scaling of the drive-end computing performance of the SIMOTION D435 and D445-1 Control Units. Each CX32 can operate up to 6 additional servo, 4 vector or 8 *V/f* axes.

If required, several CX32 components can be operated on a SIMOTION D435/D445-1 to increase the number of axes:

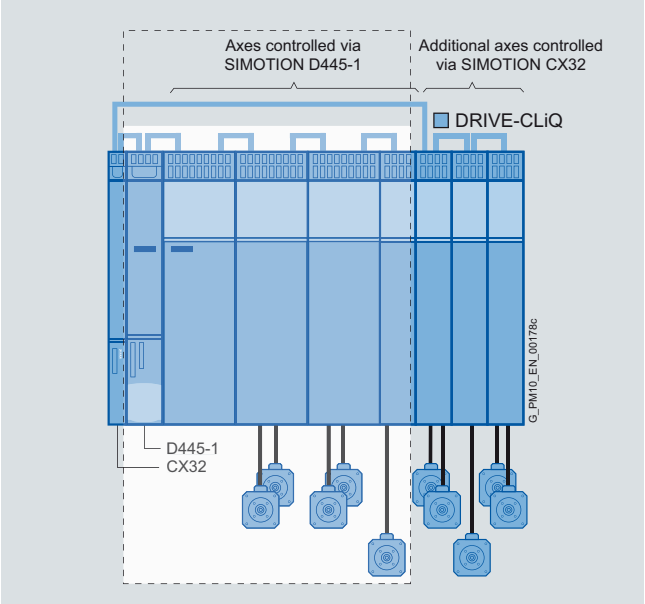
- max. 2 CX32 on one SIMOTION D435
- max. 4 CX32 on one SIMOTION D445-1.

The CX32 Controller Extension and SIMOTION D435/D445-1 can be used to implement automation solutions with a large number of axes.

Benefits

- With a width of 25 mm (0.98 in), the CX32 Controller Extension requires very little space and is therefore well-suited for use in compact machines.
- The CX32 Controller Extension is connected to SIMOTION D435/D445-1 over DRIVE-CLiQ, so high-performance, isochronous closed-loop control of the drives is possible without the need for additional modules. The communication interfaces on the SIMOTION D435/D445-1 remain available for other connections.
- The data for the CX32 is stored exclusively on the SIMOTION D435/D445-1, which means no action has be taken when the module is replaced.

Design



Example: Group of 10 axes with SIMOTION D445-1 and SIMOTION CX32 Controller Extension

SIMOTION D435/D445-1 features PLC and motion control functions for up to 32/64 axes and the drive control functions for 6 servo, 4 vector or 8 *V/f* axes are already integrated.

The CX32 Controller Extension is connected to SIMOTION D435/D445-1 over DRIVE-CLiQ and extends the processing power of the drive by a further 6 servo, 4 vector or 8 *V/f* axes.

With SIMOTION D435/D445-1 and CX32, an axis line-up comprising 10 axes can therefore be achieved.

Alternatively, additional drive controls can be implemented over PROFIBUS or PROFINET using the SINAMICS S110/S120 Control Units.

Technical specifications

Integrated drive control	
Max. number of axes for integrated drive control (servo / vector / *V/f*)	6 / 4 / 8 (alternative) Drive control based on CU320, firmware version 2.x
Communication	
DRIVE-CLiQ interfaces	4
General technical specifications	
Supply voltage	
• Rated value	24 V DC
• Permissible range	20.4 ... 28.8 V
Current consumption, typ. (excluding digital outputs and DRIVE-CLiQ supply)	800 mA
Starting current, typ.	1.6 A
Power loss, typ.	20 W
Permissible ambient temperature	
• Storage and transport	-40 ... +70 °C (-40 ... +158 °F)
• Operation	0 ... 55 °C (32 ... 131 °F) Maximum installation altitude 2000 m (6562 ft) above sea level. Above an altitude of 2000 m (6562 ft), the max. ambient temperature decreases by 7 °C (44.6 °F) every 1000 m (3281 ft); maximum 5000 m (16405 ft) above sea level.
Permissible relative humidity (without condensation)	5 ... 95 %
Atmospheric pressure	700 ... 1060 hPa
Degree of protection according to EN 60529 (IEC 60529)	IP20
Dimensions (W × H × D)	25 × 380 × 230 mm (0.98 × 14.96 × 9.06 in)
Weight	2200 g (4.85 lb)

Digital inputs	**4**
• Input voltage	
- Rated value	24 V DC
- For "1" signal	15 ... 30 V
- For "0" signal	-3 ... +5 V
• Galvanic isolation	Yes, in groups of 4
• Current consumption typ. at 1-signal level	10 mA at 24 V
• Input delay, typ. (hardware)	L → H: 50 µs H → L: 150 µs
Digital inputs/outputs (parameterizable)	**4 (max. 3 as high-speed measuring inputs)**
If used as an input	
• Input voltage	
- Rated value	24 V DC
- For "1" signal	15 ... 30 V
- For "0" signal	-3 ... +5 V
• Galvanic isolation	No
• Current consumption typ. at 1-signal level	10 mA at 24 V
• Input delay, typ. (hardware)	
- 3 inputs (can also be used as measuring inputs)	L → H: 5 µs H → L: 50 µs
- 1 input	L → H: 50 µs H → L: 100 µs
• Measuring input, accuracy (reproducibility)	5 µs
If used as an output	
• Rated load voltage	24 V DC
- Permissible range	20.4 ... 28.8 V
• Galvanic isolation	No
• Current load, max.	500 mA per output
• Residual current, max.	2 mA
• Output delay time, typ./max. (hardware, with 48 Ω load)	L → H: 150 µs/400 µs H → L: 75 µs/100 µs
• Short-circuit protection	Yes
Additional technical specifications	
Approvals, according to	cULus

The SIMOTION CX32 Controller Extension comes with pre-installed spacer.

Selection and ordering data

Description	Order No.
SIMOTION CX32 Controller Extension	**6SL3040-0NA00-0AA0**

Overview

SIMOTION – The scalable system platform for Motion Control applications

The SIMOTION system has created a scalable system platform for automation tasks, particularly Motion Control applications.

The scalability of the system allows you to implement tailor-made and economic applications.

The modular SIMOTION software is perfectly integrated and offers easy-to-use functions for all phases of the automation process.

SIMOTION – Software for runtime, engineering and commissioning

The software for SIMOTION is divided into the following categories:

Runtime software

SIMOTION Kernel – Basic functionality
The SIMOTION Kernel provides the basic functionality and is a component of all SIMOTION devices.

SIMOTION technology packages
The SIMOTION technology packages support modular expansion of the functionality.

SIMOTION IT – Service and diagnostics functions
Supports simple diagnostics, service or HMI applications without SIMOTION SCOUT.

Engineering software

- SIMOTION SCOUT engineering software (with integrated STARTER commissioning tool)
- Optional CamTool package (cam editor)
- Optional Drive Control Chart (DCC) package

The SCOUT engineering system provides high-performance tools that provide simple, optimal support for all engineering steps required in the context of machine automation.

The SIMOTION CamTool is available as an optional package which permits simple creation of cams.

The optional Drive Control Chart package is available for easy graphical configuration of technology functions using predefined function blocks (Drive Control Blocks DCB).

The SCOUT engineering system can be used in SIMATIC STEP 7, either with integrated data management and configuration, or as a stand-alone engineering tool.

Supplementary software

In addition to the SIMOTION software, other standard software products are available, for example, for easy programming of HMIs on Operator, Touch or Multi Panels.

SIMATIC HMI software

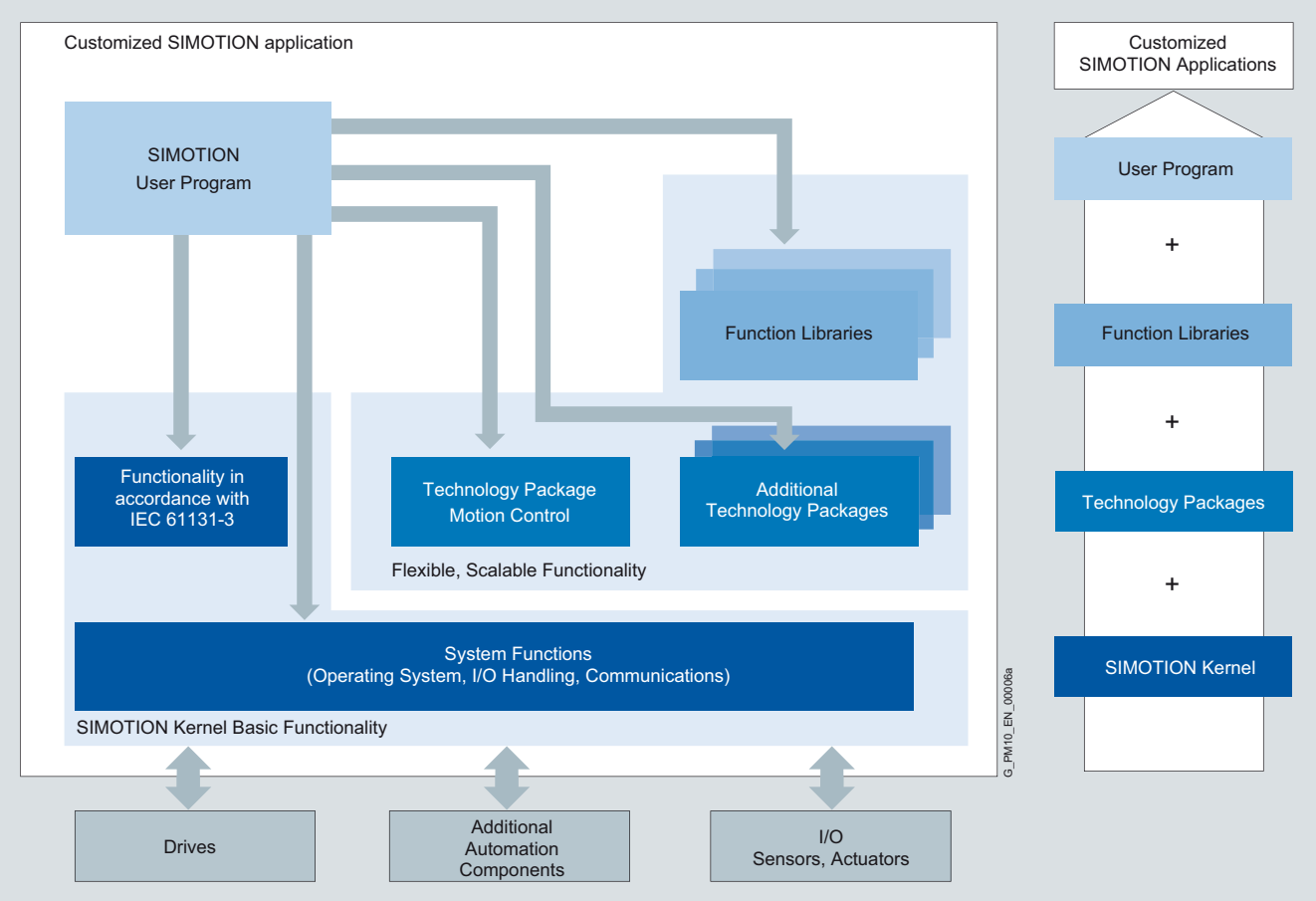
Optional software packages are:

- ProTool/Pro and WinCC flexible for user-friendly configuration of HMIs on Operator, Touch and Multi Panels
- SIMATIC NET for implementing HMI over OPC in Windows environments.

Further optional SIMATIC software

- SIMATIC Logon for user administration in projects with specific support for validation processes, for example, in the pharmaceutical industry.
- SIMATIC Version Trail for the easy versioning of projects (SIMATIC Logon is required).

Overview



Software structure of a SIMOTION application

SIMOTION Kernel – Basic functionality

The basic functionalities of the SIMOTION devices are combined within the SIMOTION Kernel.

The SIMOTION Kernel provides, among other features, high-performance functions for

- PLC functionality (to IEC 61131-3)
- Program control
- Timers, counters
- I/O operation
- Communication

It also provides a powerful runtime system with

- Cyclical (synchronized and cyclic) tasks
- Sequential tasks
- Time-driven tasks
- Event-driven tasks

The scope of the language conforms to the IEC 61131-3 standard and contains all PLC commands required for I/O management, process and machine control. LAD (Ladder Diagram), FBD (Function Block Diagram), ST (Structured Text), MCC (Motion Control Chart) and Drive Control Chart (DCC) are used for programming.

The SIMOTION Kernel basic functionality can be expanded by loading SIMOTION technology packages.

SIMOTION technology packages

SIMOTION technology packages combine software functions which are required for automation in mechanical engineering in a very wide variety of sectors. They are loaded into the controller during configuration and expand the basic functionality through additional system functions. The functions of the technology packages can be accessed in the SCOUT command library during engineering.

The technology packages enable the generation of technological objects, e.g. technology object "positioning axis", which are all set up, configured and parameterized by the same method.

Overview (continued)

Motion Control technology package

The comprehensive motion control functions in this technology package offer very open and flexible ways of programming applications and provide users with the assurance that they can implement even complex motion control applications.

The SIMOTION Motion Control technology package contains the following functions:

- Motion Control Basic
- Positioning – POS
- Synchronous operation/electronic gear – GEAR
- Cam – CAM
- Path interpolation – PATH
- Supplementary technology functions

The technology object functions in the technology package are accessed via additional language commands and system variables, as well as with function blocks in accordance with PLCopen. Programming of motion sequences is therefore simple and integrated.

Technology package for temperature control (TControl)

The SIMOTION technology package for temperature control provides temperature channels with extensive functions. These functions are also accessed via additional language commands and system variables.

Technology package for Drive Control Chart (DCC)

The SIMOTION technology package for Drive Control Chart (DCC) provides a library of "Drive Control Blocks" (DCBs). These blocks can be used to graphically configure open-loop and closed-loop control functions using an optional DCC editor that can be integrated into SCOUT.

Technology package for Direct Product Motion (DPM)

The SIMOTION technology package "DPM" provides functions for intelligent, contact-free product synchronization. These functions are also accessed via additional language commands.

Technology package Multipurpose Information Interface (MIIF)

The SIMOTION technology package MIIF functions as a server to permit symbolic access to SIMOTION data and makes them available to clients (e.g. operator panel) via Ethernet.

SIMOTION function libraries for I/O interfacing

These function libraries contain standard functions for integrating intelligent I/O and communication modules. They are a component part of the SCOUT command library and make it extremely easy to integrate modules such as FM 350-1/-2, FM 352, CP 340/341, SIWAREX FTA or identification systems into the SIMOTION user program. Programming examples and standard applications are also available in the SIMOTION Utilities & Applications.
The SIMOTION Utilities & Applications are supplied free of charge with SCOUT.

SIMOTION user program

In the SIMOTION user program, the functions of the technology packages, function libraries and system functions of the SIMOTION Kernel are accessed in a uniform manner by means of language commands.

The structure of the SIMOTION application program therefore supports merging of PLC functions with motion control functions and technology functions. This simplifies the optimization of motion sequences (no PLC/Motion interface), reducing engineering costs and increases both product quality and machine productivity (machine cycle and output) by eliminating interfaces and dead times.

A SIMOTION application can be programmed in different ways:

- The graphical programming languages LAD (Ladder Diagram), FBD (Function Block Diagram) and MCC (Motion Control Chart) make graphical programming user-friendly.
- Programming can also be performed textually, using Structured Text (ST).
- Using the optional technology package for Drive Control Chart (DCC), drive-based open-loop and closed-loop control functions can be easily configured graphically.

Direct access to the drive allows:

- Increased uniformity and integration depth as far as the drive (access to control/status words and drive data, flexible torque limits, additive torque setpoint)
- Highly-dynamic applications with servo drives thanks to DSC (Dynamic Servo Control) allows position control cycles of 125 µs
- Highly dynamic applications with hydraulic drives with position control cycles and pressure/force control cycles of 250 µs
- Synchronization with drives and modular open-loop controls

Apart from electrical drives, hydraulic drives within a controller or distributed over several controllers can be synchronized with each other. This supports the implementation of integrated automation solutions such as conveyor systems and press lines in the automotive industry, in which both electrical drives (winders, cross cutters, roller feeds) and hydraulic drives (e.g. deep-drawing presses) are implemented in the same system.

SIMOTION isochronous mode

In the SIMOTION system, all the components (one or more control units, drives, isochronous I/Os) are synchronized to the communication cycle of the machine, the PROFIBUS DP/PROFINET cycle. The application is also synchronized with this cycle through synchronous application tasks (in the servo and interpolator cycle). Isochronous mode therefore permeates the whole machine application (also in the case of distributed systems) and this provides considerable advantages:

- Short response times from terminal to terminal and terminal to axis
- High machine cycle times
- Programming of synchronous closed-loop control tasks
- High product quality thanks to a deterministic and reproducible machine response

Overview (continued)

Modular concepts – Modular machines

SIMOTION supports modular machine concepts and thus reduces engineering and commissioning costs through:

- Modular software development with libraries and reusable code
- Real-time synchronization as well as integrated data storage is now possible without any problems
- Division into individual machine modules, which are linked, for example, through distributed synchronous operation (over PROFIBUS DP or PROFINET IO with IRT). Based on a maximum project, the project can be reconfigured, for example, using HMI.
- Activation/deactivation of DP slaves/PROFINET IO devices (I/O components) and technology objects (drives, axes, external encoders, and cams) during engineering and at runtime.

The modular machine concept means scalable solutions and large axis line-ups to be achieved. Standardized modules can be easily adapted to special requirements and separately tested. These modules are then easily combined to form individual machine variants.

Communication via PROFIBUS

The communication functions are available via PROFIBUS on all platforms:

- I/O communication between SIMOTION and/or SIMATIC controllers
- Communication with programming devices (programming device functions)
- Communication with ProTool/Pro and WinCC flexible
- Communication with PCs on which SIMATIC NET OPC is installed.
  A prerequisite on the PC side is the SIMATIC NET SOFTNET S7 software.

Communication using Ethernet/PROFINET

The communication functions below are available via Ethernet on all platforms:

- I/O communication between SIMOTION and/or SIMATIC controllers
- Communication with SIMOTION devices, SIMATIC CPUs and non-Siemens devices via UDP and TCP/IP
- Communication with programming devices (programming device functions)
- Communication with ProTool/Pro and WinCC flexible
- Communication with PCs on which SIMATIC NET OPC is installed.
  A prerequisite on the PC side is the SIMATIC NET SOFTNET S7 software.

SIMOTION IT

SIMOTION IT enables additional communication functions via Industrial Ethernet (HTML over standard Internet browser):

- Diagnostics functions via SIMOTION IT DIAG
- Communication via SIMOTION IT OPC XML-DA
- SIMOTION IT Virtual Machine: Creation of Java applications for SIMOTION.

Overview

The basic concept: "pay only for what you need"

The functionally scalable licenses for SIMOTION runtime software and axis-specific licensing result in a simple pricing structure, allowing you to only pay for what you really need.

Runtime licenses are not bound to specific versions and are therefore valid for all firmware versions. In case of a firmware update the runtime licenses remain valid. The license key generated from the runtime licenses and the serial number of the memory card or SIMOTION P is stored on the memory card or on SIMOTION P.

How can licenses be obtained for runtime software?

Licenses for SIMOTION runtime software can be obtained as follows:

- Pre-installed licenses can be ordered when purchasing a SIMOTION memory card (SIMOTION C, D) or for SIMOTION P. The order number is expanded with one or more additional order codes (Z options) that specify the required licenses. Alternatively, pre-installed runtime licenses can be ordered using the configurator for SIMOTION runtime licenses in the Industry Mall.

  Homepage: www.siemens.com/industrymall
- Licenses can be ordered separately, independently of purchase of a SIMOTION controller or a SIMOTION memory card. The required software options are assigned to hardware (memory cards or SIMOTION P) by generating a license key over the Internet at:

  Homepage: www.siemens.com/automation/license
- Hardware and software bundles: "MultiAxes Bundles" can be obtained for SIMOTION C2xx and D4x5. These bundles contain the following: Motion Controller, memory card and MultiAxes Package license for the respective platform.

When do licenses need to be obtained for runtime software?

When configuring using SIMOTION SCOUT, the required licenses are displayed.

A license is required for the runtime software:

- When it is used in a machine or a machine component before it is supplied by the manufacturer
- When it is used by the customer on completion of initial commissioning
- When it is retrofitted following completion of initial commissioning
- In large-scale plants that are installed directly at the production site without previous initial commissioning by the manufacturer, on completion of initial commissioning before test operation commences.

Unlicensed basic functions

The rights of use for these software components are included when the basic unit is purchased:

- SIMOTION Kernel runtime software
  The SIMOTION Kernel is already installed on the device.
- Motion Control Basic technology functions
  Use of technology functions for speed-controlled axes, single output cams and cam tracks, sensor probes, and external encoders.
- Technology functions for Drive Control Chart
  By installing the optional SCOUT package Drive Control Chart, the technology functions of Drive Control Chart are made available to the SIMOTION runtime system.
- Supplementary technology functions
  Use of supplementary technology functions, such as adders, formula objects and fixed gears.
- Function libraries for I/O interfacing
- Communication functions
  This covers SIMATIC S7 communication functions on the SIMOTION side (programming device/OP communication to programming devices, for engineering and communication to TPs/OPs/MPs and PCs with SIMATIC HMI, e.g. ProTool/Pro, WinCC flexible or SIMATIC NET OPC), as well as UDP and TCP/IP communication.

Motion Control technology functions under license

The Motion Control Basic technology functions can be used without a license. When other technology functions of the Motion Control technology package are used, a license is required for each axis used. Licenses are only necessary for real axes; virtual axes and speed-controlled axes are not subject to license. A license is obtained for the different axis types using a separate order number for each.

POS, GEAR, CAM axis licenses

Three different axis licenses are available:

- POS – Use of the positioning technology function for a created positioning axis
- GEAR – Use of the positioning and synchronous operation technology functions for a created synchronous axis as well as additional path interpolation for a created path axis
- CAM – Use of the positioning, synchronous operation, path interpolation and cam technology functions for a created synchronous axis with cam

MultiAxes Packages

The platform-independent MultiAxes Package supports particularly simple licensing. It contains the license for unlimited use of the POS/GEAR/CAM technology functions on one SIMOTION controller. Variably priced, platform-specific packages for C2xx, P320-3, P350-3 or D425, D435 and D445/D445-1 are offered in addition to the platform-independent MultiAxes Package.

Note:
SIMOTION D410 is the SIMOTION D variant for single-axis applications and already contains the Motion Control technology functions for one real axis (speed control, positioning, synchronous operation, cam). A license is therefore not needed for this purpose. It is not possible to increase the number of axes using licenses in the case of SIMOTION D410. Apart from one real axis, further virtual axes can be configured.

Overview (continued)

Other technology functions which are subject to a license

TControl technology functions

The functions of the TControl technology package must be licensed for specific channels in packages, each package containing 8 temperature channels.

Direct Product Motion (DPM) technology functions

To use the functions of the DPM technology package, a separate license must be obtained for each SIMOTION controller.

Multipurpose Information Interface (MIIF) technology functions

To use the functions of the MIIF technology package, a separate license must be obtained for each SIMOTION controller.

SIMOTION IT communication functions

To use the SIMOTION IT communication functions, a separate license must be obtained for each SIMOTION controller.

Safety Integrated functions for SINAMICS S120 which are subject to license

SINAMICS S120 drives with safety functions can be integrated into a SIMOTION D application.

The following must be noted with regard to use of Safety Integrated functions:

- The Safety Integrated basic functions are unlicensed.
- A license is, however, required for each axis with safety functions in the case of Safety Integrated Extended Functions.

Note regarding SIMOTION D410

SIMOTION D410 is the SIMOTION D platform for single-axis applications and already contains the Motion Control technology functions for one real axis (speed, positioning, synchronous axis or cam).

A license is therefore not needed for this purpose. It is not possible to increase the number of axes using licenses in the case of SIMOTION D410.

Licensed runtime functions such as SIMOTION IT DIAG require licenses which can be ordered pre-installed on a CompactFlash card (CF) or individually.

Note regarding hardware and software bundles

Hardware and software bundles (in this case: MultiAxes Bundles) are available for SIMOTION C240, C240 PN and D4x5 and comprise the respective Motion Controller, one memory card and one MultiAxes Package license for the respective platform.

It is not possible to order other pre-installed runtime licenses using additional order codes (Z options) in combination with these MultiAxes Bundles. In such instances, other licenses for runtime software must be ordered individually.

Overview

Runtime licenses for SIMOTION C, D

Licenses for runtime software for SIMOTION C, D can be ordered individually or pre-installed (by order code/Z option) on memory card.

In both cases, the license certificate is enclosed.

- Memory card for SIMOTION C: Micro Memory Card 64 MB
- Memory card for SIMOTION D410, D4x5: CompactFlash card 1 GB

Runtime licenses for SIMOTION P

Licenses for runtime software for SIMOTION P can be ordered individually or by means of order code (Z option).

When ordered by means of order code (Z option), the runtime licenses are not pre-installed in this case, the license certificate is enclosed.

Exception:
When the MultiAxes Package license for SIMOTION P350-3 is ordered by way of order code M35, the license is pre-installed on the system.

Ordering individual licenses

Example:

A 1 GB CompactFlash card for SIMOTION D4x5 has been purchased, but without pre-installed runtime licenses. During the configuring process with SIMOTION SCOUT, a message is displayed to indicate that the following runtime licenses are needed:

- POS axis license: 6AU1820-1AA20-0AB0
- TControl license: 6AU1820-2AA20-0AB0

The order numbers can be found in column "Single-user license" in the selection and ordering data table.

Note:
If several licenses of the same type are needed, e.g. 3 x POS license, the order number must be repeated for each license.

Ordering pre-installed licenses

To order pre-installed licenses, the type and number of required licenses must be specified in the order using order codes (Z options). These order codes are added to the order number for the memory card.

Example 1:

64 MB Micro Memory Card for SIMOTION C240 with

- MultiAxes Package license for SIMOTION C2xx:

Order No.: 6AU1720-1KA00-0AA0**-Z M24**

Example 2:

1 GB CompactFlash card for SIMOTION D4x5 with

- 3 POS licenses
- 2 CAM licenses
- 1 TControl license and
- 1 Safety Integrated Extended Functions license:

Order No.: 6AU1400-2PA01-0AA0**-Z P03 C02 T01 F01**

The order codes (P03 …) can be found in column "Order codes for pre-installed licenses" in the selection and ordering data table.

Configurator for runtime licenses

An electronic ordering configurator is available in the Industry Mall for ordering SIMOTION hardware with corresponding runtime licenses.

Homepage: www.siemens.com/industrymall

This will guide you step by step through the process of selecting and ordering SIMOTION hardware with pre-installed runtime licenses.

Selection and ordering data

License type	Single-user license Order No.	Order codes for pre-installed licenses on SIMOTION memory cards: 64 MB Micro Memory Card: 6AU1720-1KA00-0AA0-Z 1 GB CompactFlash card: 6AU1400-2PA01-0AA0-Z For SIMOTION P: License certificates are enclosed	Licensed functions	License object	Notes
Axis licenses					
• POS axis license	**6AU1820-1AA20-0AB0**	**Pxx** – POS license and number (e.g. P02 = 2 POS licenses)	Positioning	Per axis	Not required for D410
• GEAR axis license	**6AU1820-1AB20-0AB0**	**Gxx** – GEAR license and number (e.g. G03 = 3 GEAR licenses)	Positioning, synchronous operation, path interpolation		
• CAM axis license	**6AU1820-1AC20-0AB0**	**Cxx** – CAM license and number (e.g. C01 = 1 CAM license)	Positioning, synchronous operation, path interpolation, cam (all functions of the Motion Control technology package)		
MultiAxes Packages					
• Platform independent	**6AU1820-0AA20-0AB0**	**M00** – MultiAxes Package license (platform independent)	Positioning, synchronous operation, path interpolation, cam (all functions of the Motion Control technology package)	Unlimited axes on one controller	Not required for D410
• For C2xx	**6AU1820-0AA24-0AB0**	**M24** – MultiAxes Package license for C2xx			
• For P320-3	**6AU1820-0AA32-0AB0**	**M32** – MultiAxes Package license for P320-3			
• For P350-3	**6AU1820-0AA35-0AB0**	**M35** – MultiAxes Package license for P350-3			
• For D425	**6AU1820-0AA42-0AB0**	**M42** – MultiAxes Package license for D425			
• For D435 (incl. D425)	**6AU1820-0AA43-0AB0**	**M43** – MultiAxes Package license for D435			
• For D445/D445-1 (incl. D435 and D425)	**6AU1820-0AA44-0AB0**	**M44** – MultiAxes Package license for D445/D445-1			
Licenses for other technology packages / technology functions					
• TControl	**6AU1820-2AA20-0AB0**	**Txx** – TControl license and number (e.g. T03 = 3 TControl licenses)	Temperature control	8 temperature channels per license	
• DPM (Direct Product Motion)	**6AU1820-3BA20-0AB0**	**B01** – DPM license	Direct Product Motion	Per controller	On one C2xx, P350-3, D435 or D445/D445-1
• MIIF (Multipurpose Information Interface)	**6AU1820-3DA20-0AB0**	**B02** – MIIF license	Multipurpose Information Interface	Per controller	On one C2xx, P3xx or D4x5
• Safety Integrated	**6AU1820-2AF20-0AB0**	**Fxx** – Safety license and number (e.g. F02 = 2 Safety Integrated Extended Functions)	SINAMICS Safety Integrated Extended Functions for SIMOTION D	Per safety axis with Safety Integrated Extended Functions	For integrated SINAMICS drives with SIMOTION D4xx and CX32
Licenses for SIMOTION IT communication functions					
• SIMOTION IT DIAG	**6AU1820-8BA20-0AB0**	**D00** – IT DIAG license	Integrated web server	Per controller	On platforms with Ethernet and/or PROFINET interface
• SIMOTION IT combined license	**6AU1820-8BD20-0AB0**	**J00** – combined license for SIMOTION IT	SIMOTION IT DIAG, OPC XML-DA, Virtual Machine for Java applications	Per controller	
License for SIMATIC NET OPC server on SIMOTION P350-3					
• License for SIMATIC NET OPC server on SIMOTION P350-3	**6AU1380-0AA20-0YB0**	**K00** – OPC server license, on SIMOTION P350-3, XP variant			

SIMOTION Kernel

Function

In addition to the high-performance functions for I/O handling, logic, arithmetic, program control, timers and communication, SIMOTION also has a very powerful runtime system.

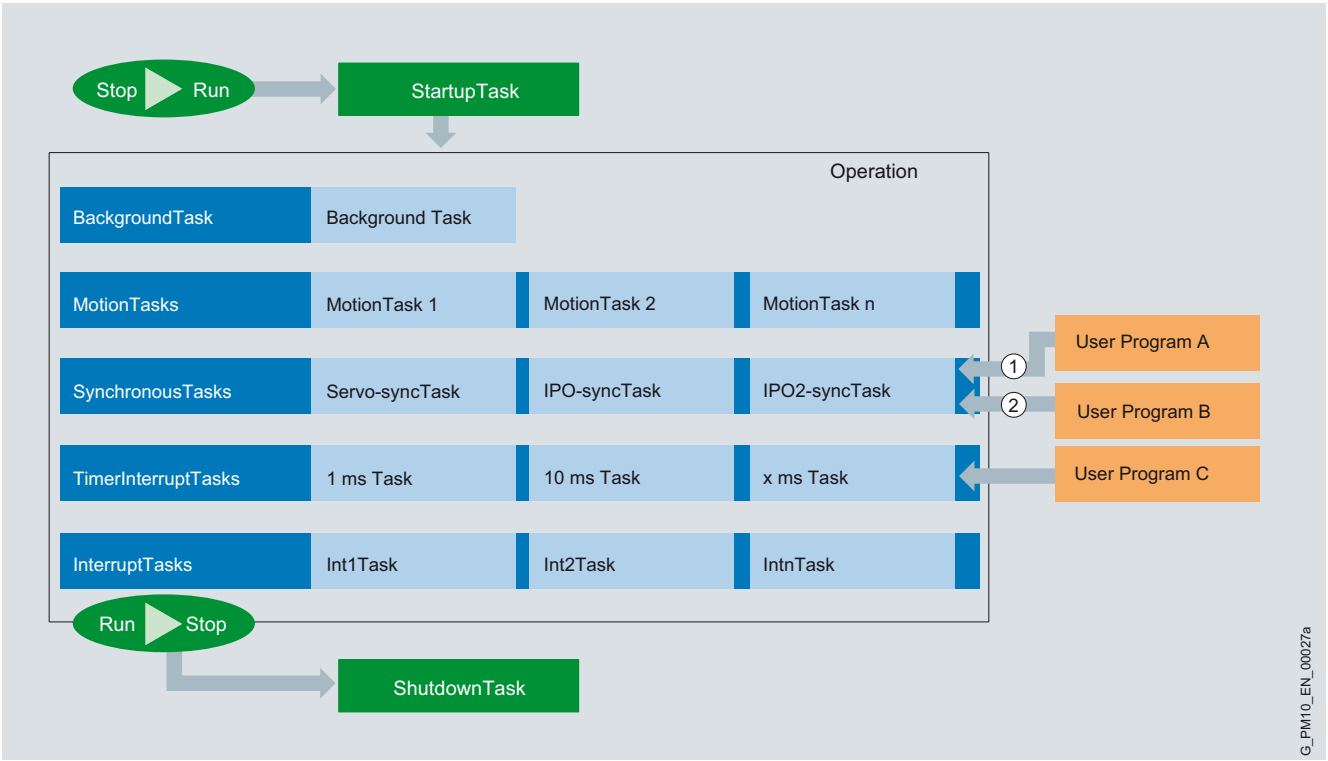
The SIMOTION Motion Control system uses high-performance CPUs on which a real-time operating system suitable for fast control processes is implemented. Each task is allocated a slice of the computing time. The organization of the task sequences is performed by the operating system.

The user can select between user and system tasks that are independent of one another. The user program is executed in various execution levels (tasks). The advantage of the task system is that user programs hung in the appropriate task levels can run in parallel.

In addition, execution levels are available which are synchronized with the system tasks and control cycle of the drives or the isochronous PROFIBUS/PROFINET. In this way, the whole application is in isochronous mode (Application program ↔ Drives ↔ I/O). This results in short response times and the application is easily reproducible.

The task structure of the execution system supports PLC, technology and Motion Control tasks and provides a variety of task types:

- Cyclic tasks
- Sequential tasks
- Time-controlled tasks, and
- Interrupt-driven tasks.



Task structure of a SIMOTION application

Function (continued)

The following execution levels are available:

- StartupTask
  The StartupTask is executed once at the operating mode transition from STOP to RUN; it controls the system start-up.
- BackgroundTask
  The BackgroundTask is executed cyclically and is used for general PLC tasks. Cycle time monitoring checks the maximum processing time of the BackgroundTask. The BackgroundTask can be compared with the OB1 of the SIMATIC.
- SynchronousTasks
  These tasks are synchronized with the isochronous PROFIBUS DP or PROFINET IO. In the servo-synchronous user task, time-critical terminal - terminal responses for I/O or fast influencing of setpoints can be implemented on the servo level (synchronous to the system cycle Servo of the technology objects, e.g. position controller).
  The two IPO synchronous user tasks are started synchronously immediately before the interpolator cycles IPO or the slower IPO2 (reference variables for the technology objects are calculated in system cycles IPO and IPO2). Fast Motion Control reactions can be implemented here, as well as closed-loop control tasks in which the acquisition of actual values and output of setpoints must be synchronized.
  The user program is therefore synchronized with the control cycle of the drives and with I/O processing. Synchronization ensures short response times and, above all, deterministic and reproducible machine behavior.
- DCC tasks
  Drive Control Chart (option) uses the above-mentioned SynchronousTasks. In addition, further synchronous execution levels (special tasks for DCC) can be assigned to the blocks.
- TimerInterruptTasks
  Several time-controlled tasks are available. The call cycles can be parameterized. Periodically recurring tasks are typically stored here.
- InterruptTasks
  InterruptTasks allow very fast responses to internal events. These can be triggered by system interrupts such as alarms, timeouts or user interrupts.
- Motion Tasks
  Motion tasks are provided for motion sequences. Command sequences in the same Motion Task are usually executed sequentially, for example, the next motion command is only started when the previous command has been completed. The Motion Task does not require computing time for these waiting states.
- ShutdownTask
  The ShutdownTask is called when there is a transition to STOP mode. Here you can define the specific behavior during the transition to this system state.

The complete command list is available for all tasks. This allows the current positioning command to be superimposed with an additional movement from a MotionTask which was triggered by a UserInterruptTask, for example.

Other features of the execution system are:

- Operating states – Run, Stop, StopU (Stop User Program for test and commissioning functions)
- Process images for inputs/outputs, is separate for BackgroundTask, SynchronousTasks and TimerInterruptTasks
- Debug functions such as
  - Controlling and monitoring of variables
  - Display of the program status
  - Breakpoints or single steps
  - Trace functions

More information can be found in section SIMOTION engineering software/SIMOTION SCOUT software package/ Diagnostics for testing and commissioning.

- Kernel updates can be implemented with new SCOUT versions.

More information can be found in section SIMOTION engineering software/SIMOTION SCOUT software package.

SIMOTION technology packages

Overview

Scalable functionality thanks to technology packages

The SIMOTION technology packages expand the basic functionality of the SIMOTION devices with additional language commands, which makes adaptation to the respective automation task easy.

The loadable technology packages support the creation of technology objects (e.g. positioning and synchronous axis, cam paths, external encoders, ...) which can be accessed over system functions and system variables for use in every SIMOTION programming language.

Function

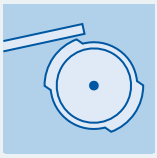
SIMOTION Motion Control technology package

The Motion Control Basic technology functions can be used without a license. Use of the extended functions of the Motion Control technology package is subject to a license.

The comprehensive functions of the Motion Control technology package offer very open and flexible ways of influencing application programming and ensure that you can also implement future motion control applications.

Using the Motion Control functions in conjunction with the powerful PLC functionality results in high machine cycles thanks to short response times as well as high product quality thanks to reproducible machine behavior.

Technology functions for Motion Control Basic



Speed-controlled axis technology object

- Speed setpoints are defined in the program (for servo and vector drives)
- In addition, additional torque setpoints and torque limits can be defined, for example, for controlling a winder drive with tension control
- Access to status and control words of the drive over PROFIdrive units can be specifically controlled (e.g. for braking signal).
- Reading and writing of drive parameters
- Support for SINAMICS drives which can perform safety-oriented monitoring functions (SOS = Safe Operating Stop, SLS = Safely Limited Speed) or stop reactions (STO = Safe Torque Off, SS1 = Safe Stop 1, SS2 = Safe Stop 2).
  The purpose of this support is to prevent stop reactions by the drive, where SIMOTION uses the application to control, e.g. within permissible velocity limits (with SLS) or stop (with SOS) the drive.
  Activation and deactivation of SINAMICS Safety Integrated Extended Functions SS2, SOS, SLS as well as their status are indicated on the axis with specific technology alarms and system variables.

Further information about SINAMICS Safety Integrated can be found in chapter Safety Integrated.

Function (continued)

External encoder technology object
External encoders can be used to detect actual position values of axes (on PROFIBUS/PROFINET, onboard for C240 and as a second encoder on the drive).

Cam and cam track technology object

- Generates position-dependent switching signals
- Number of cams and cam tracks depend on available system resources
- Each cam track can have up to 32 cams on one output

The following cam types are available:

- Trip cams
- Position-position cams
- Position-time cams
- Position-time-based cams with maximum ON length
- Counter cams
- Exact time setting of an output, exact time output cams

The cam statuses can be output with:

- Internal variables
- Standard digital outputs (SIMATIC S7-300, SIMATIC ET 200, ...)
- Onboard outputs D4xx/C2xx and TM15/TM17 High Feature (for high accuracy requirements in the µs range)
- The output can be inverted

The following can be used as reference points for the switching edges of the cams:

- Setpoints for real and virtual axes
- Actual values of real axes and external encoders

The following functions are available:

- Parameterizable hysteresis and effective direction
- Activation and deactivation times can be specified separately (dead time compensation)
- One-time and cyclic output of cam paths
- Parameterizable start/stop mode for cam paths (immediately, with next path cycle, ...)
- Edge-triggered enable of cam paths in conjunction with TM17 High Feature Terminal Module
- The status of each individual cam (activated/deactivated) can be read
- Single output cams on a cam track can also be directly defined as valid/invalid

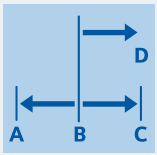
Sensor technology object
Sensors can be assigned to positioning and synchronous axes, external encoders or virtual axes and supply the axis position at the time of measuring.

The following functions are available:

- One-time measurement
- Cyclic measurement (2 edges per servo/IPO cycle in conjunction with TM17 High Feature or C240)
- Measuring on virtual axes (in conjunction with TM15, TM17 High Feature, D4xx, CX32, CUxx or C240)
- Several active measuring inputs on one axis or one measuring input for several axes (in conjunction with TM15, TM17 High Feature, D4xx, CX32, CUxx or C240)
- Parameterizable edge evaluation (rising, falling, both edges)
- Dynamic resolution range

Function (continued)

POS – Positioning technology functions

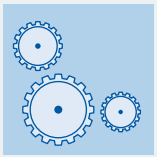


The positioning axis technology object

- Contains the functions of the speed-controlled axis technology object
- Supported axis types:
  - Linear axis, rotary axis
  - Modulo axis for linear and rotary axes
  - Real and virtual axis
  - Simulation axis
- Position control for:
  - Electrical drives
    Position control with digital setpoint output
    The following PROFIBUS DP/PROFINET protocol is used for this purpose: Profile drive technology, PROFIdrive, Version 4 (isochronous mode), use of Dynamic Servo Control (DSC) is possible with position control in the drive in, for example, 125 µs
    Position control with analog setpoint output
    (onboard I/Os for C240, ADI 4, IM 174)
  - Hydraulic drives
    Position control with analog setpoint output (onboard I/Os for C240, ADI 4, IM 174, analog outputs in the I/O range, e.g. in combination with ET 200S High Speed I/Os)
    The characteristics of the hydraulic valves are specified with cams
  - Stepper motors
    Position control with pulse direction output for stepper drives (onboard I/Os for C240, IM 174)
    Alternatively, stepper drives with a PROFIBUS interface can be connected, provided that they support the PROFIdrive profile. Stepper drives can be operated without an encoder or be position-controlled with an encoder.
- Position-controlled positioning:
  Axes can be manipulated individually without interpolation context by specifying, for example:
  - Axis name
  - Position
  - Velocity
  - Acceleration/delay, jerk
  - Transition behavior to next motion
- Speed-controlled operation of positioning axes
- Monitoring and limiting (standstill, positioning, dynamic following error, standstill signal, controlled variables, hardware/software end positions, encoder limit frequency, velocity error, measuring system difference/slip, limits for the dynamic response)
- Reversing block (prevents the output of setpoints which would cause a reversing motion)
- Movement profiles on axis defined over cams:
  - Path over time
  - Velocity over time
  - Velocity over path
- Force and pressure control of an axis:
  - Direct switchover from position-controlled to pressure-controlled operation and vice versa
  - Several pressure sensors possible
  - Pressure difference measurement
- Force and pressure limitation of an axis
- Force and pressure profiles specifiable over cams:
  - For closed-loop control and limitation
  - Force/pressure over time
  - Force/pressure over path
- Traveling to a fixed stop point
  - Stop on reaching a following error limit
  - Stop on reaching a torque limit
  - Stop with defined torque
- Traversing with additive torque, adjustable torque limiting and flexible torque limits B+/B-
- Transition behavior of successive motions:
  - attach, i.e. each motion is completed and the axis stops between motions (exact stop)
  - continuous move, i.e. the transition to the next motion begins when braking starts.
  - replace, i.e. the programmed motion is performed immediately. The active command is aborted.
- An additional motion can be performed during an active motion, for example, an active positioning motion can be performed simultaneously to a compensation motion.
- Concurrent start of positioning axes
- Homing:
  The following homing types are currently supported:
  - Active homing (reference point approach)/passive homing (homing on-the-fly)
    - With reference cam and encoder zero mark
    - With external zero mark only
    - With encoder zero mark only
    - BERO proximity switch and hardware limit switch as reversing cam
    - Hardware limit switch as reference cam
  - Direct homing / setting the home position
  - Relative direct homing (shift by specified offset)
  - Absolute encoder homing / absolute encoder calibration
- Compensations and reference points:
  - Reference point offset
  - Backlash on reversal compensation
  - Static friction compensation
  - Sliding friction compensation for hydraulics
  - Drift compensation for analog drives
- Pressure mark correction
- Encoder switchover:
  Up to 8 encoders can be specified for an axis:
  - For the position control, only one encoder is active at any one time
  - The switchover between encoders can be performed on-the-fly (with a change-over smoothing filter).
  - The actual value for the non-active encoder can be read with the application program and used for specific monitoring, for example.
- Override:
  - Factors can be superimposed online on the current traverse velocity and acceleration/deceleration.

Function (continued)

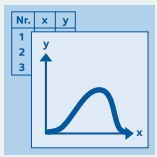
GEAR – Synchronous operation/ electronic gear technological functions



Synchronized axis technology object

- Contains the functions of the positioning axis technology object
- Synchronized speed for position-controlled axes
- Angular synchronization, electronic gear:
  Stable, long-time angular synchronization over several axes is ensured. The gear ratio can be adjusted in small steps.
- Absolute and relative gearbox synchronism
- Offset of the following axis
- Leading axis:
  The master value can be changed immediately between master value sources (transition dynamics must be specified).
  The following can be used as a leading axis or master value sources for the following axes:
  - Virtual axis:
    The virtual axis only exists in the control and therefore does not have a real drive, motor or encoder. A virtual axis can be controlled with commands in the same way as a real axis.
    The motion control calculates the setpoints with the interpolator which can be used as a master value for synchronous operation, for example.
  - Real axis:
    The real axis is a leading axis which is part of the SIMOTION system and can be coupled over a setpoint and actual value.
  - External encoder:
    The actual value is detected with an external encoder and supplied as a master value after conditioning.
- Setpoint value linkage as well as actual-value linkage with compensation of dead times.
- Angular position and electronic gear ratio for axes can also be changed during operation.
- Engaging/disengaging:
  Following axes can be stopped for one cycle or moved for only one cycle to remove a faulty component, for example. This can be flexibly implemented with the programmable synchronism functionality.
- Synchronization and desynchronization:
  - Following axes can be synchronized and desynchronized while the leading axis is in motion or standing still.
  - The angular position to the leading position can be specified.
- Different synchronization modes are available:
  - Synchronization via a specifiable master value distance
  - Synchronization based on specifiable dynamic response parameters (jerk-limited)
  - Synchronizing position for synchronization and desynchronization at a precision position
  - Position of synchronizing range (before, after and symmetrically with synchronizing position)
- Terminating synchronized operation of/to positioning
- Comprehensive synchronized operation monitoring functions
- External synchronization:
  By measuring a print-mark, for example, a material slip can be corrected with a simultaneous positioning function.
- Simultaneous motion during synchronized operation:
  A positioning motion or other synchronized operation can be performed during synchronized operation.
- Distributed synchronous operation and the option to implement synchronous operation beyond device limits.
  - PROFIBUS: Leading axis to PROFIBUS master, following axes to PROFIBUS slaves.
  - PROFINET: Changeover between leading axes to different SIMOTION controllers possible. Cascading of the synchronous operation over several SIMOTION controllers.
  - Dead times are compensated automatically.
  - Also possible across different projects (independent projects)

CAM – Cam technology functions



Cam technology object

- Contains the functions of the synchronous axis technology object
- The number of cams depends on the available system resources
- The number of support points or segments per cam depends on the available system resources
- Cam functions:
  - Definition over table support point or polynomials up to 6th degree with trigonometrical functions
  - Motion rules implementable to VDI 2143
  - Transition between support points/polynomials: Linear, continuous, spline
- Scalability, cam functions can be offset and switched even during operation:
  - The leading and following axis positions of the cam functions can be scaled and offset during operation.
  - The active cam function can be defined and switched during operation.
- Non-cyclic and cyclic editing of cams
- Absolute and relative curve synchronization
- Absolute and relative master value referencing
- Synchronization and desynchronization
  (see synchronous operation technology object)
- Overriding of 2 synchronized cams
- Cams can be defined and modified with the SCOUT engineering system or with an application program during runtime.

Function (continued)

PATH – Path interpolation technology functions

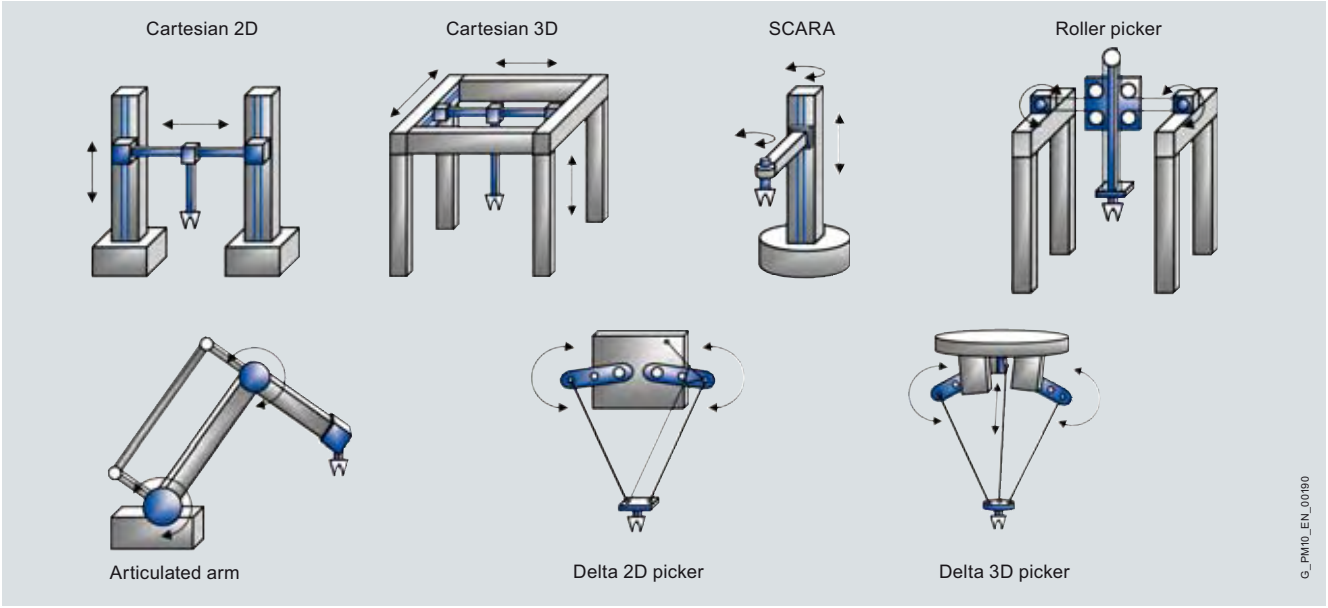
Path interpolation technology object

The path interpolation technology object is primarily intended for the automation of handling robots. Interpolation in machines for material machining is covered by the SINUMERIK machine tool controllers. (Further information about SINUMERIK controllers can be found in Catalogs NC 60 and NC 61.)

- The number of path objects is dependent on the performance of the hardware platform used.
- Interpolation types:
  - Linear interpolation in 2D and 3D
  - Circle interpolation in 2D and 3D
  - Polynomial interpolation in 2D and 3D
- Interconnection of a path object is possible with:
  - Up to 3 interpolating path axes
  - One positioning axis for path-synchronized motion (axis moves in synchronism with motion)
  - One cam for specifying velocity profiles along the path
- Connection of path-based cams, cam tracks and measuring inputs over the positioning axis for path-synchronized motion
- Interconnection of the Cartesian path coordinates with positioning axes is possible. Cams, cam tracks and measuring inputs can also be implemented on the path
- The path dynamics (acceleration, jerk) are specified on the path, axis limits are generally applicable regardless of the limits along the path
- Kinematic transformations for:
  - Cartesian gantry
  - SCARA
  - Articulated arm (toploader)
  - Roller picker
  - Delta 2D and Delta 3D picker
- Programming in ST and MCC

A pre-configured sample application can be used for easy implementation of handling robots, which allows both jog mode and the creation of motion programs (see SIMOTION Utilities & Applications which is supplied with SIMOTION SCOUT).

More information about handling applications can be found in chapter Sector-specific solutions.



Kinematics in the Motion Control technology package

Function (continued)

Supplementary technology functions

Fixed gear technology object
You can use the technological object fixed gear to implement a fixed synchronous operation (without synchronization/desynchronization) using a specified gear ratio. Fixed gearing converts an input variable to an output variable with a configured transmission ratio (gear ratio).
A Fixed Gear technology object can be used as follows, for example:

- To make allowance for diameters in a master variable.
- To implement a fixed gear ratio without coupling
- For speed synchronization on speed-controlled axes
- As a motion-coupled gear on master value, following axes are engaged or disengaged. In this way, the gear is always synchronized with the master value. Example: A paper web runs synchronously with the master.

Technology object summator
The summator object can be used to add up to four input vectors (motion vectors) to one output vector. An addition object can be used as follows, for example:

- To add up superimpositions/offsets in the main signal path, e.g. color register, cut-off register on the paper web

Technology object formula
Formula object for scalable variables and motion vectors.
A formula object can be used between interconnected objects to modify scalar variables in the main signal path, e.g.:

- Superimposition of torque
- Superimposition of master velocity
- Modification of torque variables B+, B-
- Enabling of torque limitations
- Enabling of torque

Technology object sensor
The sensor object can be used to acquire scalar measuring values. A sensor object reads out a value from the I/O and supplies an actual value as an output signal in standardized formats.

Technology object controller
The controller object can be used to prepare and control scalar variables.
A controller object can be used as a universal PIDT1 controller for scalar control variables as well as a PI and P controller.

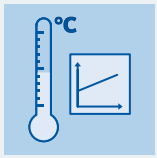
Interconnection of technology objects

The individual technology objects can be interconnected. The supplementary technology functions, for example, can be used to implement additional winder applications directly on the system level.

Note:
No license is necessary for using the supplementary technology functions.

SIMOTION TControl technology package

TControl – Temperature controller technology functions



Temperature Channel technology object

The controller core of the temperature technology package has a DPID structure. Pure heating controllers and cooling controllers as well as combined heating/cooling controllers can be configured and parameterized.

User-assignable functions are available for each temperature channel:

- Each temperature channel can either be configured as a heating or cooling section or as a combined heating/cooling section.
- The controllers either use a PID or DPID control algorithm or use the optional control zone functionality.
- In manual output mode, a replacement value can be output.
- You can select the operating mode for each controller channel separately. In this way, you can switch the output to a fixed value.
  The following operating modes are available:
  - Closed-loop control for operating setpoint
  - Actual value acquisition and output of the manual manipulated variable value
  - Actual value acquisition and output of 0
  - Self tuning
- Actual value acquisition and processing
  - Plausibility check for each new actual value and correction before corresponding filter measures
  - Filtering (by PT1 element)
- Actuating signal preparation and output
  - Digital, pulse-length modulated actuating signal
  - Prevention of minimal pulse durations for I/O cycles by integration of lost pulses
  - Manual actuating value (for manual output mode)
  - Output value limitation
  - Replacement value (calculated dynamically)
- Self-tuning for heating controllers
  - This ensures fast startup without overshooting and maintains the setpoint value without lasting system deviations.
  - Self-tuning can be used in parallel for all desired channels to ensure optimal parameter acquisition even for strongly coupled temperature sections.
- Monitoring and alarm functions
  - Actual value monitoring by definition of tolerance bands. The inner and outer tolerance bands can be defined independently as absolute or relative tolerance bands.
  - Measuring circuit monitoring for increased operational safety of a plant
  - Plausibility check
  - Alarm functions

The use of the TControl technology package is clarified by an application example. The application example provides functional expansions, function interfaces to the application and data interfaces to the HMI. It is contained in the Utilities & Applications which are supplied with SIMOTION SCOUT.

Function (continued)

SIMOTION technology package for Drive Control Chart (DCC)

Technology functions for Drive Control Chart

With Drive Control Chart (DCC), open-loop and closed-loop control functions can be easily configured graphically.
Multi-instance function blocks are selected from a block library using drag & drop, graphically interconnected and parameterized. The control structures are presented clearly.

The block library comprises a large selection of

- control,
- arithmetic and
- logic blocks as well as
- comprehensive open-loop and closed-loop control functions.

Further functions:

- For linking, evaluating and acquiring binary signals, all the commonly available logic functions are available, for example, AND, XOR, On/Off delays, RS flip-flops or counters.
- For monitoring and evaluating numerical values, numerous arithmetic functions are available, such as:
  - Summation
  - Divider
  - Minimum/maximum evaluation
- Apart from the automatic speed control, winders, PI controls, ramp-function generators and wobble generators can easily be configured.

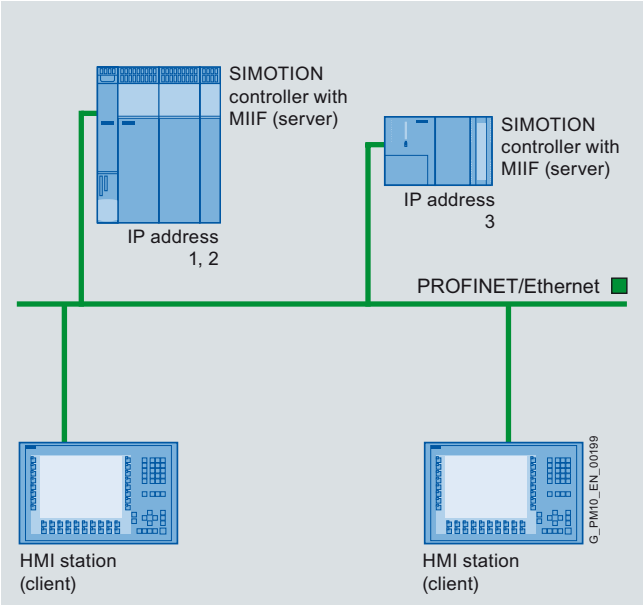
More information about Drive Control Chart (DCC) can be found in section SIMOTION SCOUT software packages.

SIMOTION technology package Multipurpose Information Interface (MIIF)

The SIMOTION technology package MIIF (Multipurpose Information Interface) functions as a server to permit symbolic access to SIMOTION data and makes them available to clients (e.g. operator panel) via Ethernet.

Access to SIMOTION variables is purely symbolic. The client application is not in any way dependent on the SIMOTION application. The communication is TCP/IP-based. Several controllers and HMI stations can be operated on an Ethernet line.

The server is active after being loaded to the controller. The server does not need to be configured in the application.



Symbolic access to SIMOTION data with MIIF

The technology package MIIF (Multipurpose Information Interface) is compatible with the following SIMOTION controllers:

- SIMOTION C240/C240 PN
- SIMOTION P320-3/P350-3
- SIMOTION D425/D435/D445/D445-1

Runtime software V4.1 SP4 or higher must be installed on the SIMOTION controller.

Function (continued)

SIMOTION technology package Direct Product Motion (DPM)

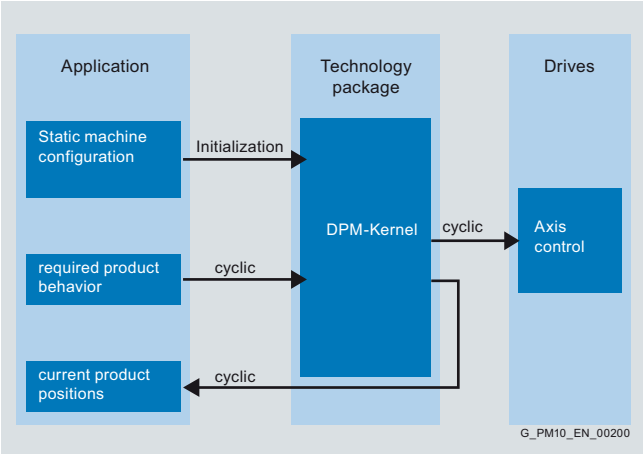
The purpose of the technology package Direct Product Motion (DPM) is to facilitate synchronization of a product flow on a pocket-type conveyor or similar transport medium in such a way that products do not accumulate.

For this purpose, the Direct Product Motion technology package provides a library of system functions which can be simply programmed to ensure separation of individual products.

The movement of products is formulated during programming. The DPM technology package evaluates of the sensors for product position sensing and modulates the speeds and acceleration rates of the conveyor belts as an automatic, background function.

This means that product movements and sorting strategy can be programmed independently of the machine configuration to a large extent. This means, for example, that it is rarely necessary to alter the product motion program when the number of conveyor belts is changed.

The Direct Product Motion technology package includes the DPM kernel which is controlled by the application program. The basic software structure is illustrated in the diagram below:



Software structure of an application with Direct Product Motion

- One DPM kernel can be used for each SIMOTION controller, i.e. a Motion Controller can control an interrelated series of input conveyors.
- Data are exchanged between the machine application and the DPM kernel via system functions that are supported by the technology package.
- The application for controlling product motion is programmed in Structured Text (ST) or in the ST Zoom of MCC or LAD/FBD.
- The DPM technology package utilizes the technology object "Axis" to move conveyor belts.

The DPM (Direct Product Motion) technology package is compatible with the following SIMOTION controllers:

- SIMOTION C230-2/C240/C240 PN
- SIMOTION P350-3
- SIMOTION D435/D445/D445-1

Runtime software V4.0 or higher must be installed on the SIMOTION controller.

Overview

Block library containing certified function blocks in accordance with PLCopen

PLCopen is an association of leading PLC manufacturers that was formed for the purpose of defining international standards in the field of PLC programming and promoting their use.

The PLCopen function blocks integrated into the Motion Control technology package are designed for use in cyclic programs/ tasks; they enable motion control programming in a PLC environment. The function blocks can be selected from the SCOUT command library and can therefore be easily used in all SIMOTION programming languages. They should preferably be used in LAD/FBD.

The following certified single-axis and multi-axis PLCopen blocks as well as extended functions are available:

Single-axis function blocks

- _MC_Power (axis enable)
- _MC_Stop (stop axis)
- _MC_Reset (reset axis)
- _MC_Home (reference point approach for axes)
- _MC_MoveAbsolute (absolute positioning of axes)
- _MC_MoveRelative (relative positioning of axes)
- _MC_MoveVelocity (traversing axes at a specified velocity)
- _MC_MoveAdditive (relative traversing of axes by a defined path additively to the remaining path)
- _MC_MoveSuperimposed (relative superimposition of a new motion in addition to existing motion)
- _MC_PositionProfile (traversing axis by a predefined and specified position/time profile)
- _MC_VelocityProfile (traversing axis by a predefined and specified velocity/time profile)
- _MC_ReadActualPosition (read actual position of axis)
- _MC_ReadStatus (read status of an axis)
- _MC_ReadAxisError (read error of an axis)
- _MC_ReadParameter (read axis parameter, LREAL data type)
- _MC_ReadBoolParameter (read axis parameter, BOOL data type)
- _MC_WriteParameter (write axis parameter, LREAL data type)
- _MC_WriteBoolParameter (write axis parameter, BOOL data type)

Multi-axis function blocks

- _MC_CamIn (enable cam with synchronization) contains implicit _MC_CamTableSelect (selection of cam)
- _MC_CamOut (disengage cam with desynchronization length)
- _MC_GearIn (synchronize)
- _MC_GearOut (desynchronize)
- _MC_Phasing (apply phase shift)

Apart from the standard PLCopen functions, the following additional standard axis function is included:

- _MC_Jog (continuous or incremental jogging)

OPC server

Overview

OPC (OLE for Process Control) is used by the Windows 2000 and Windows XP operating systems as a communications interface.

The basic principle of OPC is that OPC client applications can communicate with the OPC server over a standardized, open and multi-vendor interface. COM (Component Object Model) and DCOM (Distributed COM) are applied as basic procedures.

Pre-existing COM-capable Windows applications (MS Office or HMI systems) can be linked.

As a basic rule, however, software for communication via OPC must be installed on all systems.

The OPC servers fulfill the following specifications of the OPC Foundation:

- Data Access Automation Interface
- Data Access Custom Interface
- Alarm and Events Custom Interface

OPC on PC and PG

The SIMATIC SOFTNET S7 communication software for PC/PG is available for PROFIBUS DP and Industrial Ethernet and includes software for S7 communication, S5-compatible communication and communication with SIMOTION.

OPC on SIMOTION

The SIMATIC NET OPC server is pre-installed on SIMOTION P350-3, but its use is subject to to a license.
See selection and ordering data.

Communication can thus take place internally on SIMOTION P350-3 from Windows level to SIMOTION runtime level by means of OPC mechanisms and functions.

Benefits

- Standardized access to SIMATIC S7 and SIMOTION for OPC-capable applications under Windows 2000/XP
- Integration of automation products of different manufacturers
- The same, easy-to-use user interface for different components
- Can be accessed from every computer in the LAN
- High-performance data access over the "Custom Interface" (C++)
- Easy to use with the "Automation Interface" (VB) or the supplied OCX data control

Integration

A variety of different requirements must be fulfilled in order to set up a communication link from a PC/PG to SIMOTION via OPC:

Requirements for communication via PROFIBUS

- PC/PG with CP 5611 PCI card and SOFTNET S7 communication software for PROFIBUS DP, or
- PG/Notebook with CP 5512 PCMCIA card and SOFTNET S7 communication software for PROFIBUS DP

Requirements for communication via Industrial Ethernet

- PC/PG with standard Ethernet interface and SOFTNET S7 communication software for Industrial Ethernet or SOFTNET S7/LEAN for Industrial Ethernet (only 8 connections)

Function

Programming

- Synchronous and asynchronous reading and writing of variables
- Monitoring of variables using the OPC server with a signal to the client when a change occurs
- Transmission of alarms and events to client
- Use of batch operations, so a large volume of data can be processed in a short time

Interfaces

- Custom Interface (C++) for high OPC performance
- Automation Interface (VB, Excel, Access, Delphi, ...) for ease-of-use
- Graphics with OCX for configuring instead of programming

Bus systems

- Communication over OPC for PROFIBUS and Industrial Ethernet is supported.

Operating systems

- Windows 2000
- Windows XP Professional

Selection and ordering data

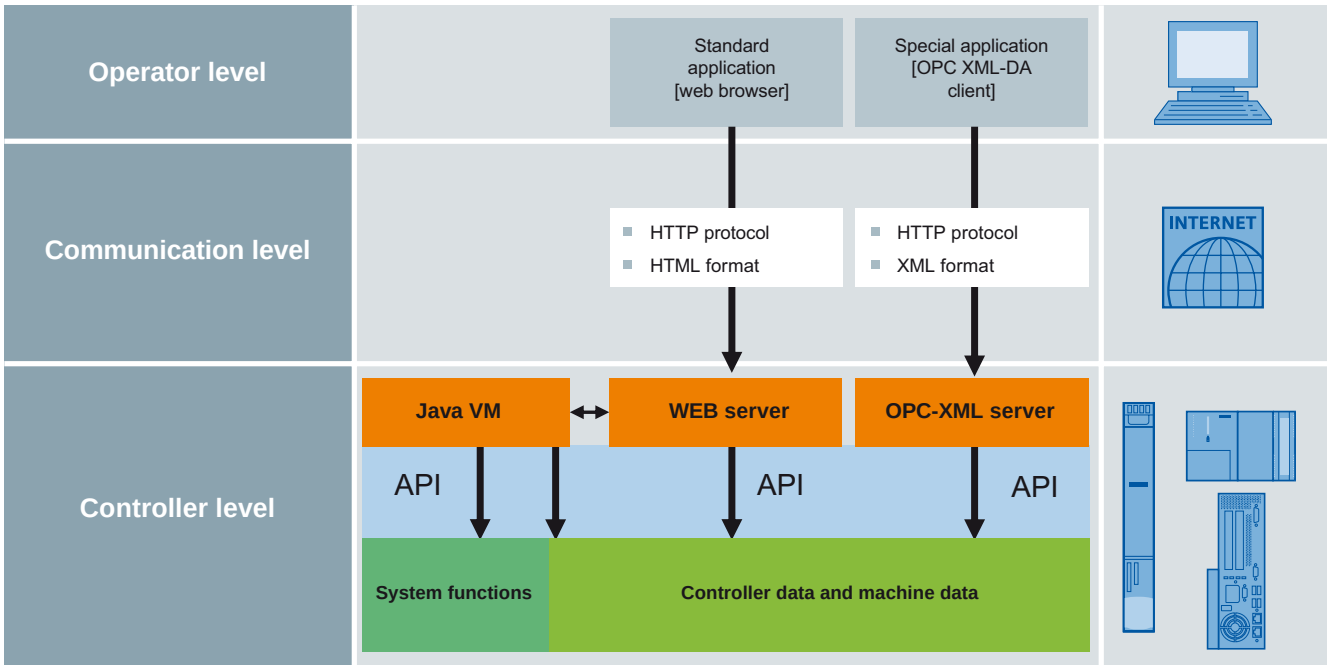
Description	Order No.
SOFTNET S7 communication software for PROFIBUS DP Software for S7 communication incl. FDL and S7 OPC server, with electronic manual on CD-ROM, for use with CP 5512 and CP 5611 modules	**6GK1704-5CW64-3AA0**
CP 5512 communications processor PCMCIA card for connecting a PG or notebook computer to PROFIBUS DP and MPI	**6GK1551-2AA00**
CP 5611 A2 communications processor PCI card for connecting a PG or AT-PC to PROFIBUS DP or MPI	**6GK1561-1AA01**
SOFTNET S7 communication software for Industrial Ethernet Software for S7 communication, S5-compatible communication (SEND/RECEIVE), incl. OPC, PG/PC communication, incl. S7 OPC server, with electronic manual	**6GK1704-1CW64-3AA0**
SOFTNET S7 LEAN communication software for Industrial Ethernet Software for S7/S5-compatible communication, incl. OPC, PG/OP communication and NCM PC, up to 8 connections	**6GK1704-1LW64-3AA0**
SIMATIC NET OPC server on SIMOTION P350-3 License for pre-installed communication software on the SIMOTION P350-3 Motion Controller	**6AU1380-0AA20-0YB0**

More information

More information about the SIMATIC NET software package with OPC server can be found in Catalog IK PI and the Industry Mall under Communication/Networks.

SIMOTION IT

Overview



SIMOTION IT: Three different technologies for easy access to control and machine data

SIMOTION IT: Service and diagnostics via the Internet

The SIMOTION controllers support communication with the outside world through the integrated Ethernet or PROFINET interface using standard IT protocols such as HTTP. Using the web functions integrated in SIMOTION IT, machine manufacturers and users can perform commissioning, diagnostic and service procedures on production machines easily and without additional engineering tools.

The web pages provided by SIMOTION IT supply comprehensive information about the current condition of a SIMOTION controller. This information can be accesssed with a standard PC and commercially available Internet browser. Extensive protection has been provided to ensure security against unauthorized access by third parties. The integrated web pages provide users with commissioning and service support, e.g. helping them to detect the causes of faults, and with upgrading the software on the SIMOTION controller.

Licensing and use of SIMOTION IT

A license to use SIMOTION IT must be obtained through one of the following two software options:

- SIMOTION IT DIAG: integrated web server on the SIMOTION controller
- SIMOTION IT combined license: Permits full use of the SIMOTION IT functions on the SIMOTION controller:
  - SIMOTION IT DIAG: Integrated web server
  - SIMOTION IT OPC XML-DA: Integrated OPC XML-DA server and
  - SIMOTION IT Virtual Machine: Integrated Java runtime environment.

SIMOTION IT DIAG and SIMOTION IT OPC XML-DA each provide a communications server on the SIMOTION controller. Via Industrial Ethernet/PROFINET, a client PC can then access data in the SIMOTION controller for diagnostic or service purposes or for visualization.

SIMOTION IT Virtual Machine provides a Java runtime environment on the SIMOTION controller. This means that Java applications can be executed on the SIMOTION controller. This allows you to create your own programs for commissioning, service and preventive maintenance.

Function

SIMOTION IT DIAG

SIMOTION controllers have a web server integrated into their operating systems. This function is licensed through the "SIMOTION IT DIAG" software option. For implementing applications with SIMOTION IT DIAG, a series of predefined web pages are stored in the SIMOTION controller that offer the following information and functions:

- Device information
  Detailed information about the firmware versions, hardware components and technology objects of the device
- Diagnostics
  Information about device resources such as: CPU load, memory usage, task duration times and operating state, diagnostic buffer, extended diagnostic buffer and technology object alarms, axis overview, watch tables and runtime trace
  The diagnostic pages for SIMOTION D also display drive alarms, drive diagnostic buffer and parameters of the integrated SINAMICS drive.
- Runtime trace
  Recorded data are loaded to the PC with a mouse click. The Web Trace Viewer for Windows XP offers a wide scope of options for evaluating recorded data: Graphical, with zoom and dual measuring cursor.
  SIMOTION D offers the Web Trace Viewer as a direct download.
- Access to the device file system
  An Internet browser can be used to store and access any number of files in the file system of the SIMOTION controller. In this way, documentation and service instructions can be stored directly in the controller, for example.
- Project update and firmware update
  A special web page can be used to update the SIMOTION project and also the firmware of the SIMOTION controller.
- Access protection
  The web pages are protected with a user name and password. Different user groups can be defined for different pages.
- User-specific web pages
  The user can create web pages and save them on the SIMOTION controller. "Server side includes" are used to access SIMOTION variables in these web pages. This is a special HTML syntax extension which allows the values of the selected variable to be inserted on a web page.

Read and write access to the SIMOTION variables is possible. Java scripts or applets can be used to implement active operation and display functions in the web pages that can be executed on a client PC with an Internet browser.

The standard pages of SIMOTION IT DIAG have the same design as the pages on a SIMATIC controller. The service overview and watch table can also be opened in parallel in separate windows.

A horizontal navigation can be created very easily for user-defined pages. No additional software is required.

SIMOTION IT OPC XML-DA

SIMOTION controllers have an OPC XML-DA server integrated in their runtime system. Use of this function is licensed through the " SIMOTION IT DIAG" combined license. OPC XML-DA is an interface specified by the OPC Foundation and is based on the standard IT protocol HTTP. The data requests of a client are coded in XML symbolically and transmitted to SIMOTION using the HTTP protocol. These are evaluated by the integrated OPC XML DA server and the response is then sent back to the client over the same path.

It is therefore possible, for example, to create HMI applications in different programming languages (C#, Visual Basic, Java) on any client systems independently of the operating system.

The application works with the symbolic names of the SIMOTION variables and has thus only a loose, symbolic dependence on the SIMOTION SCOUT database. A symbol export, similar to the Windows-based process on the SIMATIC NET OPC DA server, is not required. This ensures that consistency problems between the version of the client application and the project version in SIMOTION are avoided.

The OPC XML-DA server offers the following functions for access to the data of the SIMOTION controller:

- Read and write access to the SIMOTION variables
- Access to diagnostic buffer, extended diagnostic buffer and technology alarm objects
- Symbolic browsing function via the SIMOTION variables
- Cyclical reading of variables using "subscriptions"
- Access protection (password-based) can be configured, if required.

SIMOTION IT OPC XML DA is integrated directly in the SIMOTION Kernel. The functionality responds in accordance with the specification of the OPC Foundation "OPC XML-DA Specification Version 1.01".

Note:
SIMOTION offers two different access possibilities over OPC. The method already described over OPC XML-DA and the method over OPC DA. OPC DA requires that the SIMATIC NET package is installed on the client PC and it is described in the "OPC server" section.

More information about OPC can be found on the Internet at www.opcfoundation.org

Function (continued)

SIMOTION IT Virtual Machine

SIMOTION controllers have – in version V4.1 SP1 and above – an integrated Java runtime environment (Virtual Machine) in their runtime system. Use of this function is licensed by the "SIMOTION IT" combined license – in combination with the "SIMOTION IT DIAG" and "SIMOTION IT OPC XML-DA" options.

Java applications can be executed on a SIMOTION controller with SIMOTION IT Virtual Machine. This allows you to develop your own programs and concepts for commissioning, service and preventive maintenance.

The programs can be created with the standard development tools that are available on the market, such as Eclipse or Borland JBuilder. When they have been created, the programs can be downloaded into the SIMOTION controller online. There is no dependency on SIMOTION SCOUT.

All Java applications on the SIMOTION controller are executed in asynchronous tasks in the SIMOTION task system, not in real-time tasks.

The Java environment provides an interface (API) to the SIMOTION runtime system over special system functions. The following functions are available:

- Read and write access to the SIMOTION variables
- Read and write access to the non-volatile memory (NVRAM)
- Use of system functions (functions of the technology objects)
- Use of standard Java classes in the device (file access, network functions, string functions, ...)
- Creation of servlets, for the purpose of enhancing menu interfaces in web pages, in particular.

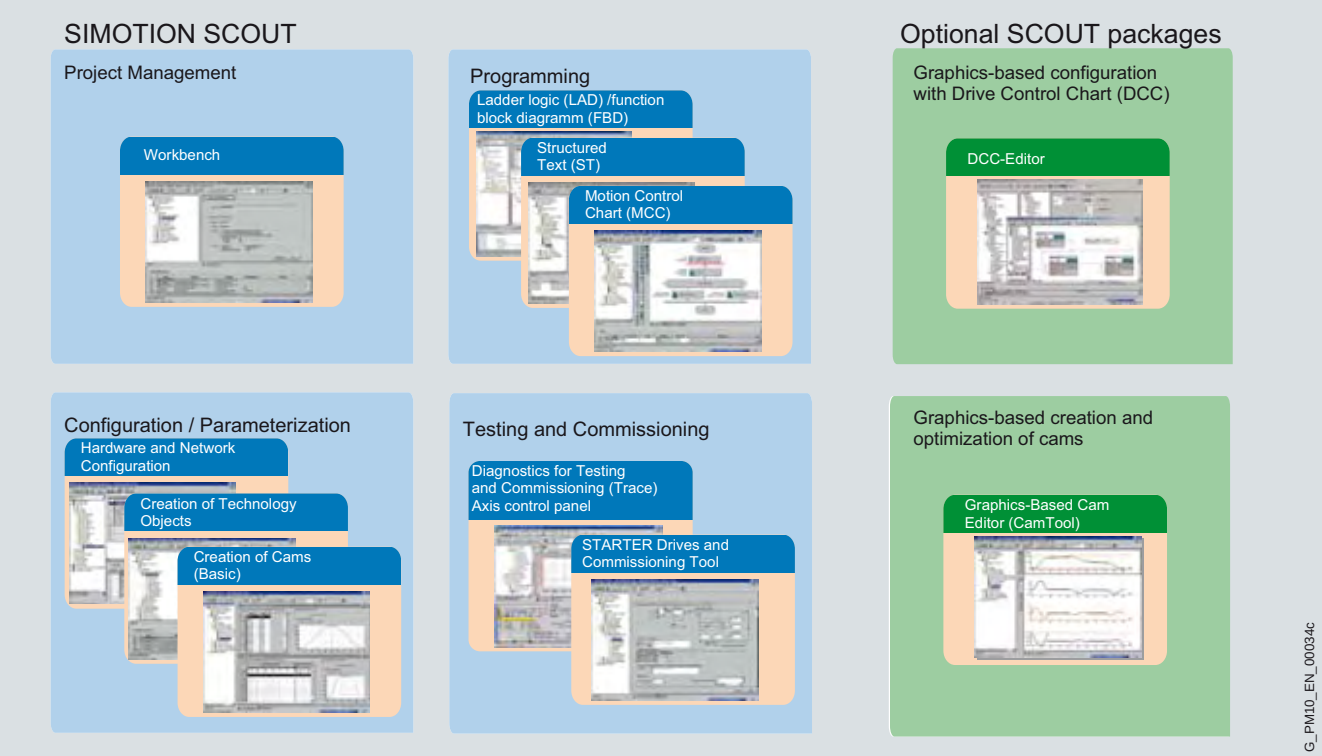
Selection and ordering data

Description	Order No.
As of SIMOTION version V4.1 SP1, the SIMOTION IT functions are included in the standard firmware of the SIMOTION devices. Use of the functions remains subject to the licenses in the following software options:	
SIMOTION IT DIAG Software option for licensing the integrated web server	**6AU1820-8BA20-0AB0**
SIMOTION IT combined license Software option for licensing: SIMOTION IT DIAG SIMOTION IT OPC XML-DA and SIMOTION IT Virtual Machine	**6AU1820-8BD20-0AB0**

Note

SIMOTION IT is available only on SIMOTION controllers with Ethernet or PROFINET interface. Therefore, SIMOTION D410 DP cannot be used in conjunction with SIMOTION IT. In this case, the SIMOTION D410 PN Motion Controller is available as an alternative.

Overview



SIMOTION SCOUT: a uniform view of your automation task

SIMOTION SCOUT – The holistic engineering system for your motion control applications

The SIMOTION Motion Control system provides a wide variety of preprogrammed functions and you can assign parameters and program it for customized use.

For practical implementation of your automation tasks, you therefore require a tool that will support all the necessary engineering steps in a user-friendly manner: SIMOTION SCOUT

SCOUT is the environment for uniform automation in mechanical engineering. It supports simple engineering of complex production machines with demanding PLC and Motion Control functions.

SCOUT is integrated in STEP 7 and is therefore also integrated into the SIMATIC landscape to ensure Totally Integrated Automation (TIA).

SCOUT provides

- an integrated, function-oriented view of your automation task, combined with
- a high level of user friendliness.

The possible SIMOTION applications range from a simple, parameterizable, speed-controlled single axis through to complex, mechatronically-coupled and programmable multi-axis machines.

Therefore, SCOUT provides views adapted to the task and can be expanded with additional tools (e.g. tool for the graphic creation of cams).

SIMOTION SCOUT – A tool for engineering, testing and diagnostics

SCOUT supports all the steps required for creating a Motion Control application: configuration, parameterization, programming, testing and diagnostics.

The integrated test and diagnostics functions are useful when commissioning and servicing.

The graphical menu system of SCOUT supports the user with important tasks, such as:

- Creation of the hardware and network configuration
- Creation, configuration and parameterization of technology objects such as axes, measuring inputs, output cams, cam tracks and cams.

SIMOTION SCOUT – Support for text-based and graphical programming

With SCOUT the following programming languages are available for programming a SIMOTION application:

- Structured Text in accordance with IEC 61131
- LAD (Ladder Diagram) and FBD (Function Block Diagram)
- MCC (Motion Control Chart): the graphical "flow diagram language" for easily describing and programming motion sequences for production machines
- DCC (Drive Control Chart): graphical configuration of open and closed-loop control functions

SIMOTION SCOUT software package

Overview (continued)

Optional CamTool package (cam editor)

The optional CamTool package expands SCOUT with a powerful graphical tool for creation and optimization of cams. Simple editors for creating cams are already integrated in SCOUT as standard.

Optional Drive Control Chart (DCC) package

With Drive Control Chart (DCC), drive-based open and closed-loop control functions can be easily configured graphically. Multi-instance function blocks are selected from a standard function block library, and then graphically linked by means of drag & drop and parameterized. The control structures are presented clearly in SCOUT.

The optional CamTool and Drive Control Chart packages are completely integrated in the SCOUT environment.

Design

The SIMOTION SCOUT software package is the basis for implementation of the SIMOTION Motion Control System.

It essentially contains the SIMOTION SCOUT engineering system including the integrated STARTER commissioning tool and the runtime software for all SIMOTION platforms.

SIMOTION SCOUT is available as an optional STEP 7 package or as SIMOTION SCOUT stand-alone.

SCOUT also supports the engineering of SIMOTION platforms with older runtime versions.

Scope of supply

SIMOTION SCOUT engineering software

- SCOUT with corresponding license
- License key for SCOUT
- Integrated STARTER commissioning tool

Optional packages for SIMOTION SCOUT

- Optional CamTool package without license
  The license must be ordered separately.
- Optional Drive Control Chart (DCC) package without license
  The license must be ordered separately.

Documentation

- Complete SIMOTION documentation on DVD

Other software

- SIMOTION – Utilities & Applications
  Free utilities (e.g. calculation tools, optimization tools, ...) and application examples (ready-to-apply solutions such as winders, cross cutters or handling)
- SIMATIC NET without license
- DriveES Basic with license
- SIMATIC software:
  With SCOUT stand-alone, the necessary components of STEP 7.

Design (continued)

System requirements

Software

- Windows XP SP3 or Windows Vista Business SP1
- SIMATIC STEP 7 V5.4 SP4 + HF2 (Windows XP) or V5.4 SP5 + HF3 (Windows XP and Vista) (not required for SCOUT stand-alone)

Hardware

Minimum system requirements PG/PC for SCOUT:

- Pentium IV 2.5 GHz, 1 GB RAM or higher
- At least 1024 MB main memory for PG/PC and SIMOTION P350-3; 2 GB main memory is recommended
- Screen resolution: 1024 x 768 pixels, 16 bit color depth
- Free hard disk memory: 1.6 GB,
  2.3 GB for SCOUT stand-alone

With additional installation of WinCC flexible ES:

- Pentium IV 2.5 GHz, 4 GB RAM

Integrated STARTER commissioning tool

The STARTER commissioning tool is directly integrated in SCOUT. It supports the simple and rapid commissioning, optimization and diagnostics of all new-generation Siemens drives with only one tool.

STARTER supports the drives:

- SINAMICS
- MICROMASTER 420/430/440
- MICROMASTER 411/COMBIMASTER 411
- COMBIMASTER

SIMOTION SCOUT stand-alone software package

If STEP 7 is not installed, the SIMOTION SCOUT stand-alone software package can be used. It also contains the components of STEP 7 that are required for SIMOTION SCOUT as well as the license key for SCOUT stand-alone.

It is not possible to operate the SCOUT and SCOUT stand-alone software packages on the same machine.

SIMOTION Kernel updates

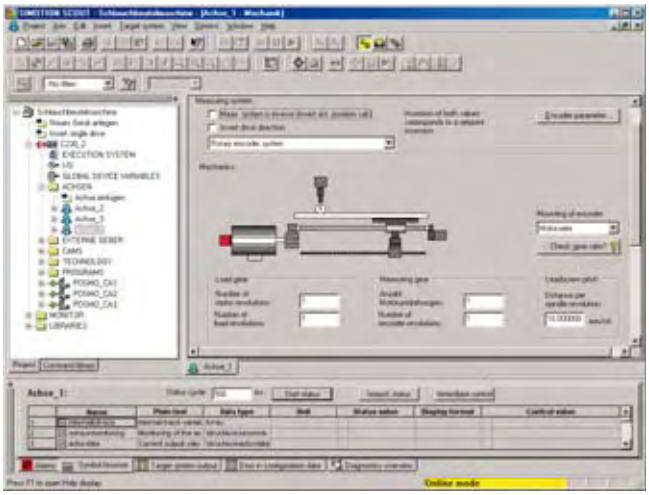
SIMOTION Kernel updates for all SIMOTION platforms are supplied on DVD and can then be copied from the PG/PC to the SIMOTION Micro Memory Card (C2xx) or SIMOTION CompactFlash card (D4x5, D410) or installed on P350-3.

A PC card adapter is needed to write to the SIMOTION MMC (Micro Memory Card) or the SIMOTION CF (CompactFlash card).

Adapters can usually be found in PC shops and at electronics shops.

SIMOTION SCOUT software package SCOUT Workbench

Function



The SCOUT Workbench is the common frame for all tools of the engineering system. The Workbench is thus the central navigation point for the individual engineering steps. It is used for the creation and management of SIMOTION projects and provides a uniform and integrated view of all devices, data and programs.

The SCOUT Workbench:
Project navigator – Work area – Information area

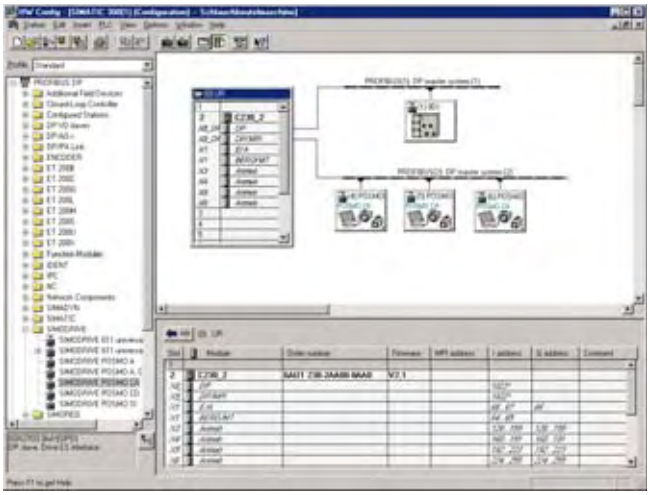
- Project navigator (left): The project navigator displays the technological tree structure of the project. All devices (controller, drives, etc.), all technological objects (axes, cam tracks, cams, etc.) and user programs are displayed in filterable hierarchical views. From here, new objects/programs can be created or existing ones called for modification.
- Work area (right): All editing tools of the engineering system (parameterization dialogs, program editors, etc.) can be integrated (SNAP IN) in this work area. This provides you with an individual view adapted to the situation in a fixed outer frame for each engineering task. If more than one window is open at the same time, they can be arranged as required or you can toggle between them by selecting the tabs.
- Detail area (bottom): The situation-dependent views for data and messages provided by the detailed display can be activated and deactivated. The data involves system variables provided by the devices and the technological objects, the peripheral data (inputs/outputs) and the user variables that you have defined. Their current states for an online connection with the SIMOTION device can be visualized. The message view refers both to the messages and alarms reported online from the SIMOTION devices and to warnings and faults created during the program creation.

Benefits

- Integrated, function-oriented view optimized for ease-of-use
- Integrated intuitive engineering system
- Central data and program management, even for distributed systems
- Function-oriented, technological project structure with filterable views
- Fast access to individual engineering tools, e. g. configuration, programming, and commissioning

SIMOTION SCOUT software package Hardware and network configuration

Function



One of the first engineering steps to define the automation topology and assign parameters to the components and networks is to create:

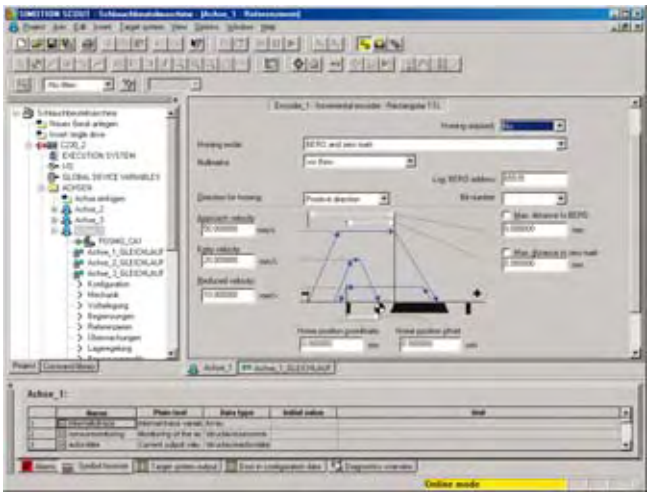
- Hardware configuration
- Network configuration

To do so, SCOUT uses the STEP 7 tools HW-Config and NetPro.

You make selections from a hardware catalog to combine all required hardware components graphically in the work area, assign parameters to the components, and create bus connections between the individual components. You are warned immediately of any illegal inputs, so that only plausible configurations can be generated.

SIMOTION SCOUT software package
Creation of technology objects

Function



All SIMOTION controllers feature basic functions which are predefined by the SIMOTION Kernel. The scope of the language is compatible with the IEC 61131-3 standard and contains all of the necessary PLC commands for I/O management, process or machine control.

Additional functions such as positioning, synchronous operation, cams and temperature channels are available with loadable technology packages.

These technology packages permit the generation of technology objects which provide you with a very simple and uniform view of the functions of the technology packages.

There are many technology objects, but all are generated, configured and parameterized in the same way.

In addition, the technology objects have programming interfaces through which you can use the functionality from application programs.

Working with technology objects

A brief description of the individual engineering steps will be given using the example of the technology object "Axis".

Generating

A new axis object is generated by double-clicking the "Insert New Axis" tab.

Configuration

A wizard helps to specify object properties such as:

- Name of the axis
- Functionality
  (e.g. positioning axis or synchronized axis)
- Connection to the drive
  (e.g. SINAMICS S120 over PROFIBUS DP or PROFINET IO or an analog drive on SIMOTION C240)

After the axis has been generated or configured, it is displayed in the project tree along with additional tabs for parameterizing the axis and an option for generating other technological objects associated with the axis (e.g. cam paths, probes).

Function (continued)

Assigning parameters

By double-clicking the "Referencing" tab, for example, all parameters for referencing can be set.

The "axis" object generated in this way also has a specified number of system variables which can be displayed in the detailed view when the axis is selected in the project tree.

The system variables are mainly used to visualize axis states such as:

- Display of the following error
- Target position to be reached
- Motion status
  (axis is accelerating, braking, motionless, etc.)

These system variables can also be used for:

- Online diagnostics
- Display on HMI
- Logging with the SIMOTION trace functionality
- Application programming through querying/comparing these system variables

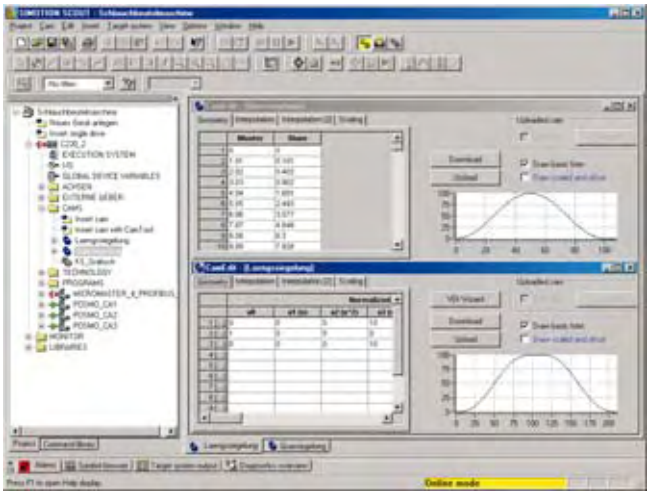
Application programs access the axis functionality with system functions (selected from the command library), which are part of the "axis" object when it is generated.

The command _pos(axis:=Axis1, position:=100, velocity:=123) would cause axis "Axis 1" to move to position 100 with velocity 123 (example for system function in Structured Text).

Benefits

- Easy generation of the technology object for determining the quantity structure
  - Axes
  - Output cams and cam tracks
  - Measuring inputs
  - Cams, etc.
- Menu-guided parameterization, graphically supported for easy understanding
- Easy visualization and access to functions through system variables and system functions of the technology objects
- User-friendly diagnostic information for function optimization of the technology objects
- Meaningful alarms in the form of numbers and plain text in the event of errors

Function



A cam generally specifies the motion relationship between a leading axis (master axis) and a following axis (slave axis). Cams can also mirror velocity profiles, pressure characteristics or valve characteristic compensation for hydraulic axes. The cam technology object can process cams which are defined as interpolation point tables or polynomial descriptions.

The basic scope of SCOUT contains editors to create simple cams in the form of text in a table or using polynomials (VDI assistant) in the form of graphics symbols with configuration support.

Creation of cams

When the technological object "Cam" is generated, the type "Interpolation point table" or "Polynomial" is defined.

- Interpolation point table:
  With this type, the master and slave positions are entered in a two-column table. It is also possible to use external interpolation point tables (ASCII file, Excel table).
- Polynomials:
  Polynomials describe motion rules in accordance with VDI 2143. SIMOTION supports polynomials up to the 6th degree. In polynomial mode, the cam is described by a number of consecutive polynomials. Polynomials are entered in the form of a polynomial table. Users can use a polynomial description dialog and/or VDI assistant.

The result of the input is displayed in the right-hand side of the window in the form of a curve in the coordinate system.

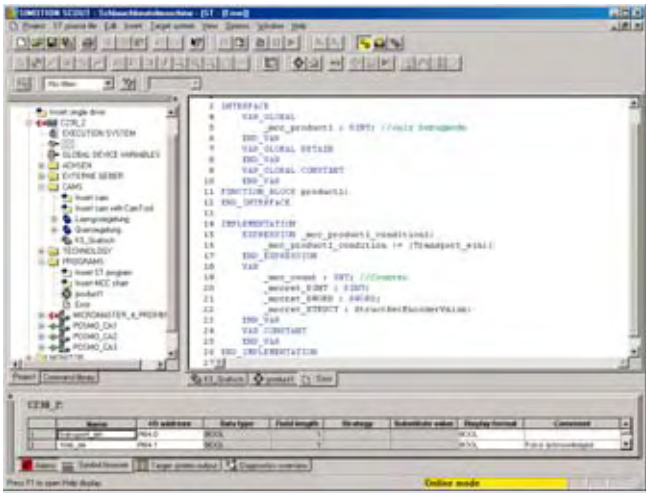
In addition, other parameters such as the interpolation type between the curve support points or the scale of the cam can be specified. The SIMOTION CamTool option package can be used to display and optimize cams graphically.

Benefits

- Editors for simple cams are included in the basic scope of functions of SCOUT
- Graphic visualization of the cam so that input errors can be quickly identified
- Representation as interpolation point table with options to transfer data from external sources (ASCII, Excel)
- Alternative: Representation by polynomials up to the 6th degree with inputs supported by polynomial description dialog and VDI wizard

SIMOTION SCOUT software package Structured Text (ST)

Function



The high-level language ST (Structured Text) provides all language elements as text commands. This enables well-structured applications to be created.

The basic scope of commands includes:

- Commands for data management
- Arithmetic functions
- Control structures
- Commands for accessing I/O and
- Communication functions

The addition of technology packages for Motion Control adds powerful, extremely flexible Motion Control commands to the mix (e.g.: _pos(...) for position-controlled positioning axes). The system functions can be selected from a clearly arranged library and can be used in the ST source by means of drag & drop.

An ST source file basically consists of continuous text. This text can be structured by dividing it into sections. These sections represent logical units of an ST source.

These sections can be:

- A program that is assigned to a runtime level
- A function block with its own memory
- A function without its own memory

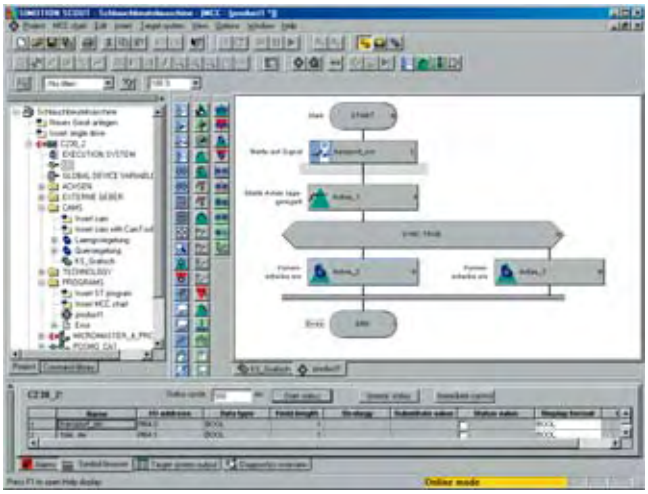
Function blocks and functions are not allocated to a runtime level, but are instead called in programs and supplied with parameters.

Benefits

- Motion Control, PLC, and technology functions in one language
- Well-structured programs with comment capability
- Powerful editing functions, such as syntax coloring and automatic indenting
- Easy-to-use debug functions for online testing and diagnostics: e. g. display of actual variable content of the code sequence and break points selected in the editor.

SIMOTION SCOUT software package Motion Control Chart (MCC)

Function



MCC (Motion Control Chart) is a "flow diagram language" that can be used to graphically formulate the process procedures of production in a simple manner. The result is one or more flow diagrams, comprising of MCC blocks that describe the time sequence of the individual machine actions. Due to its special means of expression, MCC (Motion Control Chart) is ideally suited to programming sequential processes.

Motion Control Chart supports the simple description of the motion sequences of machines with the help of powerful Motion Control commands, such as reference axis, position axis, synchronize or desynchronize cam, and many more.

Various MCC blocks are available for controlling the machine, for example, if conditions must be fulfilled, I/O signals can be read or set, calculations can be formulated and different control structures such as condition (IF), cases (CASE) and loops (WHILE, REPEAT UNTIL) can be programmed.

Several MCC programs may be created to describe different process situations. For example, you can create one MCC program to bring the machine to a defined initial state when it is switched on, a second MCC program for the normal production sequence, and a third MCC program to specify what the machine is to do in the event of a fault.

All MCC blocks – a selection of the most important SIMOTION functions – are available in toolbars. They are grouped according to function and are automatically inserted in the flow diagram at the point marked with a click. By clicking on different elements, individual dialog boxes are opened for further parameterization. Of course, it is also possible to include individual comments to document the process sequence. Functions from the SIMOTION command library that are not individually offered as MCC blocks can be used in an MCC program by means of a special command.

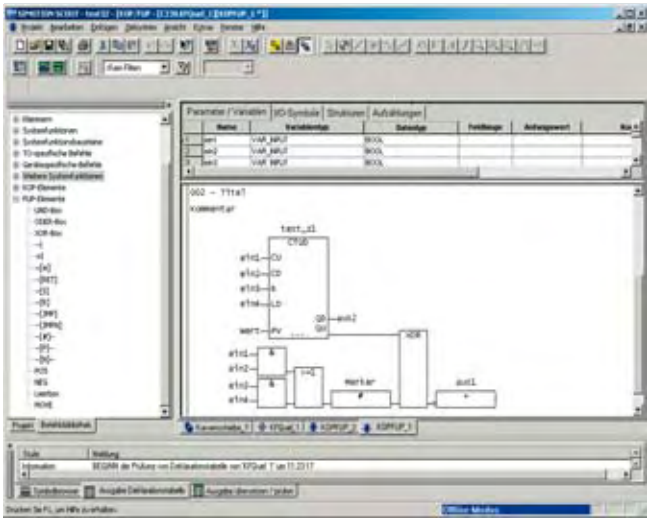
SIMOTION SCOUT software package Motion Control Chart (MCC)

Benefits

- Representation as graphical flowcharts make programming especially easy
- Hierarchical command library for Motion Control, PLC, and technology functions
- Control structures (IF, WHILE, CASE, etc.)
- Zoom-in functions for LAD, FBD and ST
- Subroutine calls (FB/FC)
- Structuring based on module creation, i.e. combination of command sequences to form a module command. Clicking on the module command invokes the corresponding command sequence.
- Powerful test functions for ONLINE connection with the SIMOTION controller such as graphical step tracing, single-step mode and breakpoints.

SIMOTION SCOUT software package – Ladder Diagram/Function Block Diagram (LAD/FBD)

Function



A powerful editor for LAD/FBD programming is available for ladder diagrams (LAD) or function block diagrams (FBD).

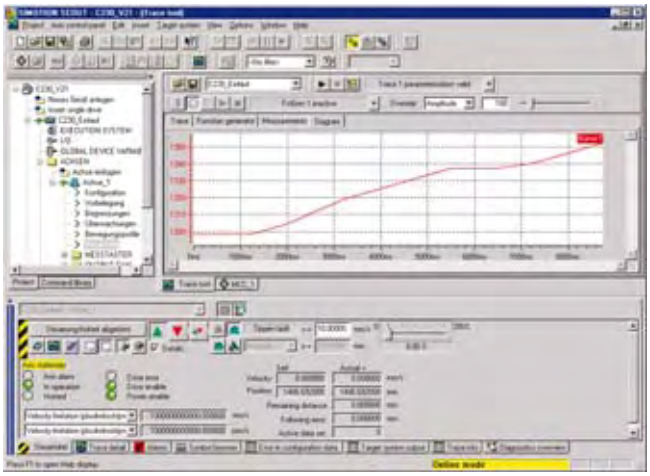
LAD/FBD also include commands for SIMOTION control using standard logic functions. It is recommended that motion control tasks are programmed with PLCopen blocks. Also, blocks which have been programmed in other SIMOTION languages can be called from LAD/FBD. User-friendly functions such as "on the fly" variable declarations or automatic syntax checks are available when programming in LAD or FBD. It is possible to switch over between LAD and FBD in the editor at any time. Any program can be viewed and processed in either LAD or FBD.

Benefits

- The LAD/FBD blocks are stored in the SIMOTION project
- Existing PLCopen, ST, LAD/FBD or MCC blocks can be called from within the LAD/FBD program.
- Network titles and comments are available.
- Special functions such as automatic syntax checking or "on the fly" variable declaration can be activated.
- The commands are loaded from a library

For startup and troubleshooting purposes, the status of the LAD/FBD program is displayed while in monitoring mode. In addition, break points can also be defined in LAD/FBD programs.

Function



SCOUT includes a number of diagnostic tools to make testing and startup of SIMOTION applications as simple as possible:

- Device diagnostics can be used to display program execution status, system load and memory usage.
- The diagnostic buffer is used to log the fault history. The following events are logged in the diagnostic buffer of the SIMOTION device:
  - All system status changes (RUN, STOP, etc.)
  - System interrupts with date and time
- All error messages related to technology objects, e.g. axis errors, are displayed in the Alarms window of SCOUT with the fault number and description.
- All SIMOTION system and application variables can be dynamically updated, monitored and controlled while online with the SIMOTION controller.
- All programming errors are displayed with the location and cause during compilation.
- The status display for programs with possible break points (LAD/FBD, MCC, ST) and additional step-by-step tracing (MCC) helps the user to troubleshoot and optimize their code. During program execution, the values of the variables are displayed as they arise, not only at the end of the cycle when the sum of all changes has been implemented.
- Watch tables can be used to combine important variables of different objects in the project to monitor them, even those of different SIMOTION devices.

Axis control panel

The axis control panel can be used to commission the axes with SIMOTION SCOUT. The axes can also be traversed and optimized without any user programs.

Trace function

The most powerful tool for testing and commissioning is the trace function integrated in SCOUT.

In this manner, a selection of any of the data in the system (user variables, I/O variables, data of the technology objects such as actual position of an axis) can be recorded and traced, real-time. Up to 32 signals are possible in test mode.

Each SIMOTION device has a trace buffer which can be configured with the trace functionality of SCOUT. When the trace is started, the configured data is logged in the SIMOTION device. On completion of the trace, the contents of the trace buffer is read by SCOUT and displayed graphically.

Configuring the trace function

The trace function can be configured using the following parameters:

- Trigger condition (e.g. rising edge of a definable signal) and pre-trigger
- Time Limit Recording (a multiple of the basic cycle of the SIMOTION device)
- Continuous Recording (or endless trace with ring buffer)
- System variables to be logged (system, I/O and user variables)

Evaluating the trace data

The logged data is displayed in the form of graphs over time for evaluation. The following functions are offered here:

- Different colors can be selected for the curves. Curves can be switched off and on again.
- The zoom function can be used to show details.
- Rulers support the measuring of, for example, signal level and duration.
- Possible changes can be viewed by superimposing measuring curves from different trace logs.

Apart from recording, the trace function also offers a "function generator" and mathematical functions.

The traced curves can be stored or exported to Microsoft Excel as a table for further evaluation. Of course, the plots can also be stored for documentation purposes, inserted in documents or printed out.

Automatic optimization of the control loops

Automatic optimization of the control loops makes commissioning of the axes and drives particularly easy. For SINAMICS S120 drives, the parameters for the speed controller and the position controller are automatically determined (with DSC).

Integrated measuring functions

The integrated measuring functions support the recording of, for example, step responses for optimization as well as the detection of electromagnetic weak points or resonant frequencies (using, for example, bode diagrams and FFT analysis). Electronic filters can be optimally placed at these resonant frequencies to achieve higher dynamics.

Function (continued)

Comparison function for projects

With SCOUT V4.1 SP2 and higher, it is possible to compare and, if necessary, merge the components of different projects.

It is therefore possible to perform a CPU-based comparison between the objects of a project.

An overview of the differences between objects is displayed. Objects with differences can be merged.

If necessary, to a highly detailed degree: Objects can be merged right down to data level also for individual data.

Advantages for practical working with SIMOTION:

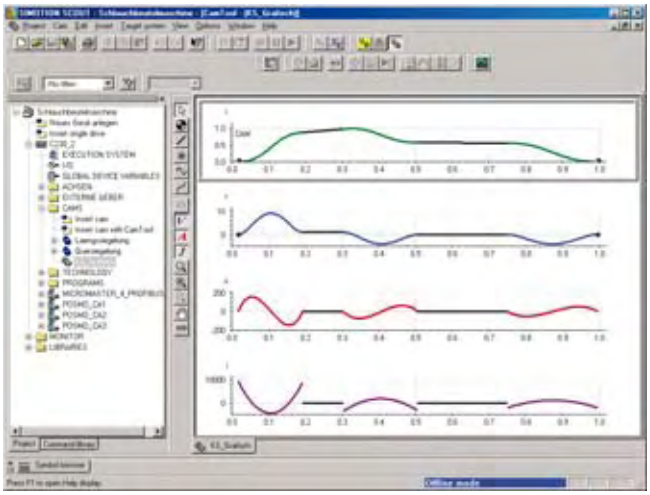
- Online/offline comparisons allow the target device and project to be merged
- Offline/offline comparisons make it possible to merge programs
- Detailed differences between data can be identified in the detailed comparison
- Data missing from the engineering project are easy to restore if the source data are stored in the target system.

Benefits

- Numerous easy-to-use and expressive diagnostic tools are fully integrated in SCOUT
- Extremely useful support with optimizing and troubleshooting
- All information can be printed in the form displayed on the screen for documentation purposes.
- Axis control panel for commissioning and optimizing the axes without the need for an application program
- Automatic controller optimization for fast commissioning

SIMOTION SCOUT software package
Optional CamTool package (graphical cam editor)

Overview



SIMOTION CamTool is a powerful, graphical editor for creating and optimizing cams.

SIMOTION CamTool can be used as an expansion package for SIMOTION SCOUT and is completely integrated in the SCOUT environment.

Benefits

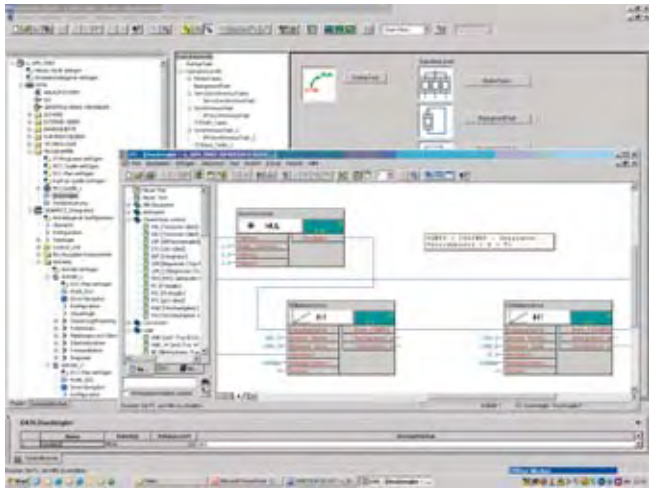
- Precise, graphic display of the CAM profile
- Entries can be made quickly and easily by inserting curve elements with drag-and-drop operation
- Fast and easy optimization of the curve by means of "dragging the profile"
- Simultaneous display of position, speed, acceleration, and jerk characteristics immediately indicates the effect on the maximum speed, the required motor torque, and the mechanical load
- Curve can also be optimized in relation to speed, acceleration, or jerk
- Basic principles of motion correspond to VDI 2143

Function

- The curve is displayed graphically in an x-y-diagram (positions of master and following axes). The curve profile is first roughly entered here with individual elements such as fixed points, lines and support points. Lines can be entered as straight lines, sine curves or arc sine curves.
- SIMOTION CamTool then connects these individual elements automatically to form a continuous curve. The transitions between the individual curve sections are automatically shaped as smooth as possible.
- You can optimize the curve by simply moving the specified curve sections with the mouse. The curve profile immediately adapts to your changes.
- In addition, SIMOTION CamTool can display the effects on the velocity, acceleration and jerk of the following axis over the motion of the leading axis.
- SCOUT can be used to convert cams created with CamEdit to the format used by CamTool or vice versa.

SIMOTION SCOUT software package
Optional Drive Control Chart (DCC) package

Overview



The Drive Control Chart (DCC) option packages for SIMOTION and SINAMICS extend the possibilities of SIMOTION SCOUT and the STARTER commissioning tool to graphically configure technology functions using predefined function blocks.

Multi-instance function blocks are selected from a library and are graphically interconnected using drag & drop capability. The function block library comprises of a large number of control, calculation and logic blocks as well as extensive open-loop and closed-loop control functions. Numerous calculation functions, such as summation, division and minimum/maximum evaluation are available for monitoring and evaluating numeric variables.

Drive Control Chart (DCC) does not limit the number of functions that can be used.

Benefits

- Clear visualization of technical control structures
- High degree of reusability of previously created plans
- Graphical editor for configuring open-loop and closed-loop control functions which can be operated without any programming know-how
- With Drive Control Chart for SIMOTION, closed-loop control structures can be programmed almost without constraints. These can then be combined with other programs to form complete program functionality.
- Drive Control Chart for SINAMICS S120 provides a convenient basis for implementing drive tasks directly in the converter.

Selection and ordering data

Description	Order No.
SIMOTION SCOUT software package	
SIMOTION SCOUT V4.1 SP5 (English/French/German/Italian), single-user license including STARTER, runtime software and documentation, on DVD	**6AU1810-1BA41-5XA0**
SIMOTION SCOUT V4.1 SP5 Upgrade (English/French/German/Italian), single-user license including STARTER, runtime software and documentation, on DVD	**6AU1810-1BA41-5XE0**
SIMOTION SCOUT stand-alone software package	
SIMOTION SCOUT V4.1 SP5 Stand-alone (English/French/German/Italian), single-user license including STARTER, runtime software and documentation, on DVD	**6AU1810-1CA41-5XA0**
SIMOTION SCOUT V4.1 SP5 Stand-alone Upgrade (English/French/German/Italian), single-user license including STARTER, runtime software and documentation, on DVD	**6AU1810-1CA41-5XE0**
Software maintenance service for SIMOTION SCOUT	
SIMOTION SCOUT software maintenance service current software version required	**6AU1810-0BA00-0XL0**
SIMOTION SCOUT stand-alone software maintenance service current software version required	**6AU1810-0CA00-0XL0**

Description	Order No.
Optional packages for SIMOTION SCOUT	
Optional package SIMOTION CamTool V3.0 (English/German), single-user license, with data carrier	**6AU1810-0FA30-0XA0**
Optional package SIMOTION CamTool V3.0 Upgrade (English/German), single-user license, with data carrier	**6AU1810-0FA30-0XE0**
DCC-SIMOTION/SINAMICS V2.0 SP5 for SCOUT/STARTER V4.1 SP5 (single-user engineering license, with DCC data carrier) DCC editor + DCB libraries for use on • SIMOTION V4.1 SP5 (English/French/German/Italian) • SINAMICS S120 V2.6 SP2 / V4.3 SP1 (English/French/German/Italian/Spanish)	**6AU1810-1JA20-5XA0**
DCC- SINAMICS V2.0 SP5 for STARTER V4.1 SP1 (single-user engineering license, with DCC data carrier) DCC editor + DCB library for use on SINAMICS S120 V2.6 SP2 / V4.3 SP1 (English/French/German/Italian/Spanish)	**6AU1810-1HA20-5XA0**

More information

A number of additional software products can be used in conjunction with SIMOTION SCOUT. It must be ensured that the corresponding versions of these software products are compatible. Please consult the compatibility list "software products in the SIMOTION environment".

Additional information is available in the Internet under:

http://support.automation.siemens.com/WW/view/en/18857317

● Basic version (function or license is purchased with the device or SCOUT) ○ Option (must be acquired as software/hardware) – Not possible	Notes	SIMOTION C240/C240 PN	SIMOTION P320-3/P350-3	SIMOTION D4xx
System cycles				
PROFIBUS DP cycle	For integrated drives with D445-1: 0.5 ... 8 ms	in 0.25 ms steps: 1 ... 8 ms	in 0.125 ms steps: P350-3 DP: 1 ... 8 ms	in 0.125 ms steps: D410 DP: 2 ... 8 ms D425: 2 ... 8 ms D435/D445-1: 1 ... 8 ms
PROFINET cycle		in 0.25 ms steps: C240 PN: 0.5 ... 4 ms	in 0.125 ms steps: P320-3, P350-3 PN: 0.25 ... 4 ms	in 0.125 ms steps: D410 PN: 0.5 ... 4 ms D4x5 with CBE30: 0.5 ... 4 ms
Position control and interpolation cycle System cycles for motion control: The position control cycle (SERVO) includes the position controller, the actual-value and setpoint system and the axis monitoring functions. The axis motion control functions are performed in the interpolation cycle.	The position control cycle and interpolation cycle are a multiple of the PROFIBUS/PROFINET cycle			
• Minimum position control cycle		0.5 ms	0.25 ms	D410: 2 ms D425: 2 ms D435: 1 ms D445-1: 0.5 ms
• Position control cycle to PROFIBUS cycle	Adjustable transformation ratio	1:1, 2:1	1:1, 2:1	1:1 ... 8:1
• Position control cycle to PROFINET cycle		1:1 ... 16:1	1:1 ... 16:1	1:1 ... 16:1
• Interpolation cycle 1 (IPO1) to position control cycle		1:1 ... 6:1	1:1 ... 6:1	1:1 ... 6:1
• Interpolation cycle 2 (IPO2) to interpolation cycle 1 (IPO1)		2:1 ... 64:1	2:1 ... 64:1	2:1 ... 64:1
Dynamic Servo Control (DSC) With Dynamic Servo Control (DSC), the control loop of the position controller is located in the drive (with cycles of 125 µs or higher)	With drives SINAMICS S120, SIMODRIVE and MASTERDRIVES MC	●	●	●

Notes:

With SIMOTION P and SIMOTION D, the availability of a PROFIBUS or PROFINET interface depends on the version used (e.g. D410 DP or D410 PN) or on the communication modules used (e.g. MCI-PN Communication Board with P350-3 or CBE30 Communication Board with D4x5). SIMOTION P320-3 is available as a PROFINET version only.
This information is not explicitly provided for every connection option or function.

The performance requirements for a SIMOTION application can be estimated using the SIZER configuring tool.
For more information about SIZER, refer to chapter System description – Dimensioning.

● Basic version (function or license is purchased with the device or SCOUT) ○ Option (must be acquired as software/hardware) – Not possible	Notes	SIMOTION C240/C240 PN	SIMOTION P320-3/P350-3	SIMOTION D4xx
Memory				
• Exchangeable memory media	MMC: Micro Memory card CF: CompactFlash card HDD: Hard Disk Drive	MMC 64 MB	P320-3: CF 4 GB P350-3: HDD 40 GB	CF 1 GB
• Remanent user variable (retain variable)	SIMOTION P: with UPS up to 256 KB	107 KB	15 KB	D410: 9 KB D4x5: 364 KB
• Permanent memory for user data (data storage on exchangeable memory medium)		52 MB	Optional, dependent on memory configuration	300 MB
• Load memory (RAM disk) for user data (for downloading the configuration and programs)	Memory sizes can be configured with SIMOTION P	23 MB	18 MB	D410: 17 MB D425/D435: 23 MB D445-1: 47 MB
• User memory (user RAM) (for code and data)	D4xx: additional 20 MB for Java applications	35 MB	24 MB Adjustable to a maximum of 100 MB	D410: 26 MB D425/D435: 35 MB D445-1: 70 MB
Address ranges				
• Logical I/O address space in KB		4	4	16
• Physical I/O address space in KB - PROFIBUS: max. per ext. subnet each for inputs and outputs - PROFINET: max. for inputs and outputs (each):	When PROFIBUS and PROFINET are used, the total address space applies	1 4	1 4	1 4
• Permanent process image for background task (I/O variables) in bytes		64	64	64
• Additional configurable process image for each cyclic task (I/O variables)		●	●	●
• Address space per PROFIBUS DP station in bytes		244	244	244
• Address space per PROFINET device in bytes		1400	1400	1400

● Basic version (function or license is purchased with the device or SCOUT) ○ Option (must be acquired as software/hardware) – Not possible	Notes	SIMOTION C240/C240 PN	SIMOTION P320-3/P350-3	SIMOTION D4xx
Drives on SIMOTION				
Maximum number of axes	Higher number of axes possible using multiple synchronized devices D410: max. 1 real axis; additional virtual axes can be created	32 axes	64 axes	D410: 1 axis D425: 16 axes D435: 32 axes D445-1: 64 axes
Integrated drive control The drive control integrated in SIMOTION D is based on SINAMICS S120 Control Units: • With SIMOTION D410 on the CU310 Control Unit, firmware version 2.x • With SIMOTION D4x5/CX32 on the CU320 Control Unit, firmware version 2.x The BOP20 Basic Operator Panel and the EPos basic positioner are not supported by the integrated drive control.	CX32 can be used to provide additional drive controls for SIMOTION D435 and D445-1: D435: max. 2 CX32 D445-1: max. 4 CX32 Per CX32: Servo: 1 ... 6 Vector: 1 ... 4 *V/f*: 1 ... 8	–	–	D410: Servo: 1 Vector: 1 *V/f*: 1 D4x5: Servo: 1 ... 6 Vector: 1 ... 4 *V/f*: 1 ... 8
Speed-controlled axis over PROFIBUS DP • SINAMICS S / SINAMICS G (servo, vector control) • SIMODRIVE 611 universal • SIMODRIVE POSMO CA • SIMODRIVE POSMO CD • SIMODRIVE POSMO SI • SIMOVERT MASTERDRIVES MC • SIMOVERT MASTERDRIVES VC • MICROMASTER/MICROMASTER Vector • MIDIMASTER Vector • COMBIMASTER/MICROMASTER Integrated • Drives with speed profile in accordance with standard message frames (PROFIdrive profile 1-6)	SIMOTION D: SINAMICS as the standard drive technology	●	– (P320-3) ● (P350-3 DP) ○ (P350-3 PN)	– (D410) ● (D4x5)
Intelligent positioning motor over PROFIBUS DP • SIMODRIVE POSMO A	Standard functions available in SCOUT command library	●	– (P320-3) ● (P350-3 DP) ○ (P350-3 PN)	● (D410 DP) – (D410 PN) ● (D4x5)

● Basic version (function or license is purchased with the device or SCOUT) ○ Option (must be acquired as software/hardware) – Not possible	Notes	SIMOTION C240/C240 PN	SIMOTION P320-3/P350-3	SIMOTION D4xx
Drives on SIMOTION (continued)				
Position-controlled axis over PROFIBUS DP with PROFIdrive	SIMOTION D: SINAMICS as the standard drive technology	● (C240) ● (C240 PN)	– (P320-3) ● (P350-3 DP) ○ (P350-3 PN)	– (D410) ● (D4x5)
• SINAMICS S110 (blocksize format) - Servo control				
• SINAMICS S120 (blocksize, booksize and chassis formats) - Servo control	Also linear motor [1]			
- Vector control	With external encoder (limited dynam. response)			
• SIMODRIVE 611 universal	Also linear motor [1]			
• SIMODRIVE POSMO CA				
• SIMODRIVE POSMO CD				
• SIMODRIVE POSMO SI				
• SIMOVERT MASTERDRIVES MC				
• SIMOVERT MASTERDRIVES VC	With external encoder (limited dynam. response)			
• MICROMASTER MM4				
• Certified servo/vector/stepper drives in acc. with standard message frames (PROFIdrive profile 1-6)				
Speed and position-controlled axis over PROFINET IO with IRT (PROFIdrive)		– (C240) ● (C240 PN)	● (P320-3) ○ (P350-3 DP) ● (P350-3 PN)	– (D410) ○ (D4x5)
• SINAMICS S120 (blocksize, booksize and chassis formats) - Servo control	Also linear motor [1]			
- Vector control	With external encoder (limited dynam. response)			
Drives with analog ±10 V setpoint interface				
• Via onboard drive interface	Configuration either as analog or stepper drive	4 (C240) – (C240 PN)	–	–
• Via ADI4 (Analog Drive Interface for 4 Axes)	See SIMOTION I/O components	●	– (P320-3) ● (P350-3 DP) ○ (P350-3 PN)	– (D410) ● (D4x5)
• Via IM 174 (Interface Module for 4 Axes)		●	– (P320-3) ● (P350-3 DP) ○ (P350-3 PN)	– (D410) ● (D4x5)
Hydraulic drives over ±10 V setpoint interface	Note: With D410, the max. number of real axes is 1.			
• Via onboard drive interface		4 (C240) – (C240 PN)	–	–
• Via ADI4 (Analog Drive Interface for 4 Axes)		●	– (P320-3) ● (P350-3 DP) ○ (P350-3 PN)	– (D410) ● (D4x5)
• Via IM 174 (Interface Module for 4 Axes)		●	– (P320-3) ● (P350-3 DP) ○ (P350-3 PN)	– (D410) ● (D4x5)
• Analog outputs through I/O		●	●	●
• Encoders through I/O		●	●	●
Stepper drives	Configuration either as analog or stepper drive			
• Onboard pulse direction interface for stepper drives		4 (C240) – (C240 PN)	–	–
• Via IM 174 (Interface Module for 4 Axes)		●	– (P320-3) ● (P350-3 DP) ○ (P350-3 PN)	– (D410) ● (D4x5)

[1] See chapter Direct drives.

● Basic version (function or license is purchased with the device or SCOUT) ○ Option (must be acquired as software/hardware) – Not possible	Notes	SIMOTION C240/C240 PN	SIMOTION P320-3/P350-3	SIMOTION D4xx
Encoders on SIMOTION				
Measuring systems that can be connected over the integrated interface	See Measuring systems			
• Number	SIMOTION D/CX32: Encoder connection via DRIVE-CLiQ	4 (C240) – (C240 PN)	–	1 (D410) – (D4x5)
• Absolute encoder with SSI interface		● (C240) – (C240 PN)	–	● (D410) – (D4x5)
• Incremental measuring systems	C240: TTL D410: TTL/HTL	● (C240) – (C240 PN)	–	● (D410) – (D4x5)
Measuring systems that can be connected over the bus				
• Resolver, absolute encoder (SSI and EnDat), incremental encoder (TTL and sin/cos)	Connected through drive or ADI 4/IM 174 (ADI 4/IM 174 for SSI absolute encoder and TTL incremental encoder)	●	●	●
Connection options for 2nd encoder (external encoder)				
• Via onboard interfaces		● (C240) – (C240 PN)	–	● (D410) – (D4x5)
• SINAMICS S110/S120	SIMOTION D/CX32: Encoder connection via DRIVE-CLiQ	●	●	●
• 2nd encoder sensing in SIMOVERT MASTERDRIVES MC	Option for SIMOVERT MASTERDRIVES MC	●	●	●
• SIMODRIVE 611 universal over 2nd axis control (2-axis module)	Option for SIMODRIVE 611 universal	●	●	●
• Isochronous PROFIBUS encoder	See Measuring systems	●	●	●
• Encoder on ADI 4 (Analog Drive Interface for 4 Axes)	At least one electric or hydraulic axis must be configured on ADI 4/IM 174.	●	– (P320-3) ● (P350-3 DP) ○ (P350-3 PN)	– (D410) ● (D4x5)
• Encoder on IM 174 (Interface Module for 4 Axes)		●	– (P320-3) ● (P350-3 DP) ○ (P350-3 PN)	– (D410) ● (D4x5)

● Basic version (function or license is purchased with the device or SCOUT) ○ Option (must be acquired as software/hardware) – Not possible	Notes	SIMOTION C240/C240 PN	SIMOTION P320-3/P350-3	SIMOTION D4xx
Measuring inputs				
Integrated measuring inputs				
• Number		C240: 2+4 C240 PN: 4	–	D410: 3 D4x5: 6
• Accuracy (reproducibility)		6 µs		5 µs
Measuring inputs on the drives				
• SIMODRIVE 611 universal, SIMOVERT MASTERDRIVES MC		1/axis	1/axis	–
• SINAMICS S110 (CU305)		2/closed-loop control	2/closed-loop control	2/closed-loop control
• SINAMICS S120 (CU310)		3/closed-loop control	3/closed-loop control	3/closed-loop control
• SINAMICS S120 (CU320)		6/closed-loop control	6/closed-loop control	6/closed-loop control
• SINAMICS S120 (CU320-2)		8/closed-loop control	8/closed-loop control	8/closed-loop control
• SIMOTION CX32	D435: max. 2 CX32 D445-1: max. 4 CX32	–	–	3/closed-loop control
• Over TM15 Terminal Module on SINAMICS S120 or SIMOTION D/CX32	See SIMOTION I/O components			
- Number of measuring inputs per Terminal Module, max.		24	24	24
- Accuracy (reproducibility)		125 µs	125 µs	125 µs
• Over TM17 High Feature Terminal Module on SINAMICS S120 or SIMOTION D/CX32				
- Number of measur. inputs per Terminal Module, max.		16	16	16
- Accuracy (reproducibility)		≤ 1 µs	≤ 1 µs	≤ 1 µs
Output cams				
High-speed output cams				
(hardware-supported outputs cams with higher resolution)				
• Integrated output cams		●	–	●
- Accuracy (reproducibility)		70 µs	–	D410: 200 µs D4x5: 125 µs
• Over TM15 Terminal Module on SINAMICS S120 or SIMOTION D/CX32	See SIMOTION I/O components			
- Accuracy (reproducibility)		125 µs	125 µs	125 µs
• Over TM17 High Feature Terminal Module on SINAMICS S120 or SIMOTION D/CX32				
- Accuracy (reproducibility)		≤ 10 µs	≤ 10 µs	≤ 10 µs
Standard output cams				
(update in position controller or interpolation cycle, switching accuracy depends on the output accuracy of the I/O)				
• Integrated output cams		●	–	●
• Over TM15/TM17 High Feature Terminal Module on SINAMICS S120 or SIMOTION D/CX32	See SIMOTION I/O components	●	●	●
• Over S7-300 backplane bus of SIMOTION C		●	–	–
• Over PROFIBUSDP		●	– (P320-3) ● (P350-3 DP) ○ (P350-3 PN)	● (D410 DP) – (D410 PN) ● (D4x5)
• Over PROFINET IO		– (C240) ● (C240 PN)	● (P320-3) ○ (P350-3 DP) ● (P350-3 PN)	– (D410 DP) ● (D410 PN) ○ (D4x5)
• Output to internal system variable		●	●	●

● Basic version (function or license is purchased with the device or SCOUT) ○ Option (must be acquired as software/hardware) – Not possible	Notes	SIMOTION C240/C240 PN	SIMOTION P320-3/P350-3	SIMOTION D4xx
Integrated I/O interfaces				
Programmable digital inputs/outputs (can be parameterized individually as either input or output)	Further inputs/outputs can be implemented for output cam or measuring inputs via the TM15 or TM17 High Feature Terminal Modules.	–	–	D410: 4 D4x5: 8
• of which for output cam, max.		–	–	D410: 4 D4x5: 8
• of which as measuring inputs, max.		–	–	D410: 3 D4x5: 6
Digital inputs (fixed inputs, cannot be parameterized)		18	–	D410: 4 D4x5: 8
• of which inputs with specific functions - Measuring inputs, max.		2+4 (C240) 4 (C240 PN)	–	–
- External zero mark signal for referencing, max.		4 (C240)	–	–
Digital outputs (fixed outputs, cannot be parameterized)		8	–	–
• of which for fast output cam, max.		8	–	–
Relay outputs with specific functions				
• Controller enable		4 (C240)	–	–
• Ready		1	–	–
Analog outputs	SIMOTION C240: Can be used as drive interface or standard analog outputs. SIMOTION D: D410: Over TM D4x5: Over TM or TB See SIMOTION I/O components	4 (C240)	–	○
Pulse direction interface for stepper drives	SIMOTION C240: Configuration either as analog or stepper drive	4 (C240)	–	–
SIMOTION C centralized I/O modules				
• Centralized I/O modules per system, max.		16	–	–
• Central/expansion rack, max.	SIMOTION C: max. two-tier configuration with IM 365 interface module	○	–	–
• Connectable central SIMATIC S7-300 I/Os	For suitable modules, see SIMOTION I/O components	●	–	–

● Basic version (function or license is purchased with the device or SCOUT) ○ Option (must be acquired as software/hardware) – Not possible	Notes	SIMOTION C240/C240 PN	SIMOTION P320-3/P350-3	SIMOTION D4xx
Connectable distributed I/O modules				
SINAMICS drive I/O (over DRIVE-CLiQ)				
• Via Terminal Modules TM15, TM17 High Feature, TM31, TM41, TM54F	For connection to SIMOTION C and P over SINAMICS S120	●	●	●
• Via TB30 Terminal Board	Plug-in card for SIMOTION D4x5 and SINAMICS CU320/CU320-2	●	●	– (D410) ● (D4x5)
Distributed I/O (over PROFIBUS DP)	For suitable modules, see SIMOTION I/O components	●	– (P320-3) ● (P350-3 DP) ○ (P350-3 PN)	● (D410 DP) – (D410 PN) ● (D4x5)
• SIMATIC ET 200S	Isochronous:			
• SIMATIC ET 200pro	SIMATIC ET 200S			
• SIMATIC ET 200M	SIMATIC ET 200M			
• SIMATIC ET 200eco	ADI 4			
• ADI 4 (Analog Drive Interface for 4 Axes)	IM 174			
• IM 174 (Interface Module for 4 Axes)				
• All certified standard slaves (DP-V0, DP-V1, DP-V2)				
Distributed I/O (over PROFINET IO)		– (C240) ● (C240 PN)	● (P320-3) ○ (P350-3 DP) ● (P350-3 PN)	– (D410 DP) ● (D410 PN) ○ (D4x5)
• SIMATIC ET 200S	Isochronous:			
• SIMATIC ET 200M	SIMATIC ET 200S			
• SIMATIC ET 200pro				
• SIMATIC ET 200eco PN				
• All certified PROFINET devices				

Overview of SIMOTION functions

● Basic version (function or license is purchased with the device or SCOUT)
○ Option (must be acquired as software/hardware)
– Not possible

	Notes	SIMOTION C240/C240 PN	SIMOTION P320-3/P350-3	SIMOTION D4xx
SIMOTION HMI devices				
Connection over PROFIBUS DP		●	– (P320-3) ● (P350-3 DP) ○ (P350-3 PN)	● (D410 DP) – (D410 PN) ● (D4x5)
• SIMATIC MP 170 Mobile Panel				
• SIMATIC MP 177 DP Mobile Panel				
• SIMATIC MP 277 Mobile Panel				
• SIMATIC TP 170B and TP 270 Touch Panel				
• SIMATIC TP 177B and TP 277 Touch Panel				
• SIMATIC OP 170B and OP 270 Operator Panel				
• SIMATIC OP 177B and OP 277 Operator Panel				
• SIMATIC MP 270B and MP 370 Multi Panel				
• SIMATIC MP 277 and MP 377 Multi Panel				
• SIMATIC Panel PC 477, PC 670, PC 677, PC 877				
Connection over Ethernet (when configured using ProTool/Pro)		●	●	– (D410 DP) ● (D410 PN) ● (D4x5)
• SIMATIC Panel PC 477, PC 670, PC 677, PC 877				
Connection over Ethernet/PROFINET (when configured using WinCC flexible)		●	●	– (D410 DP) ● (D410 PN) ● (D4x5)
• SIMATIC MP 177 PN Mobile Panel [1]				
• SIMATIC MP 277 Mobile Panel [1]				
• SIMATIC TP 277 Touch Panel [1]				
• SIMATIC TP 177B Touch Panel Color [1]				
• SIMATIC OP 177B Operator Panel Color [1]				
• SIMATIC MP 177				
• SIMATIC TP 270 Touch Panel				
• SIMATIC OP 270 Operator Panel				
• SIMATIC OP 277 Operator Panel [1]				
• SIMATIC MP 270B and MP 370 Multi Panel				
• SIMATIC MP 277 [1] and MP 377 Multi Panel [1]				
• SIMATIC Panel PC 477, PC 577, PC 670, PC 677, PC 877				
HMI software for SIMOTION				
• WinCCflexible		○	○	○
• ProTool/Pro		○	○	○
Software for extended communication with SIMOTION				
• SIMATIC NET OPC server	See SIMOTION runtime software	○	● [2]	– (D410 DP) ○ (D410 PN) ○ (D4x5)
• SIMOTION IT OPC XML-DA (over Ethernet) - Open communication over TCP/IP and SOAP standard protocols - Clients on any hardware with various operating systems (Windows, Linux, ...) - According to OPC Foundation standard OPC XML-DA V1.01		● [2]	● [2]	● [2]
• SIMOTION MIIF: Multipurpose Information Interface - Symbolic access to SIMOTION data via Ethernet - SIMOTION as server, e.g. operator panels as clients		○	○	– (D410) ○ (D4x5)

[1] PROFINET IO-capable
[2] Subject to license

● Basic version (function or license is purchased with the device or SCOUT) ○ Option (must be acquired as software/hardware) – Not possible	Notes	SIMOTION C240/C240 PN	SIMOTION P320-3/P350-3	SIMOTION D4xx
Communication				
PROFIBUS DP interfaces				
• Integrated/support isochronous communication	One interface can be used as an MPI. SIMOTION P350-3: The PROFIBUS version can be optionally retrofitted with PROFINET.	2/2	P320-3: –/– P350-3 DP: 2/2 P350-3 PN: –/–	D410 DP: 1/1 D410 PN: –/– D4x5: 2/2
• Integrated CP5611	For PG/PC and HMI	–	P350-3: 1	–
• Transmission rates in Mbit/s		1.5/3/6/12	1.5/3/6/12	1.5/3/6/12
• Number of PROFIBUS DP slaves	Per PROFIBUS DP subnet	64	64	64
PROFINET interfaces				
• Integrated ports	SIMOTION P350-3 DP, D4x5: PROFINET can be optionally retrofitted by means of MCI-PN, CBE30 Communication Boards	C240: – C240 PN: 3	P320-3: 3 P350-3 DP: 4, ○ P350-3 PN: 4	D410 DP: – D410 PN: 2 D4x5: 4, ○
• Number of PROFINET devices (provided that PROFINET interface is onboard or optionally retrofitted)		64	64	64
Ethernet interfaces				
• Number and transmission rates		1 x 10/100 Mbit/s	P320-3: 1 × 10/100/1000 Mbit/s P350-3: 2 × 10/100 Mbit/s	D410: – D4x5: 2 x 10/100Mbit/s
Further communication interfaces				
• Serial interfaces		–	1	–
• USB interfaces	P350-3: e.g. for mouse and keyboard D4x5: for upgrading D4x5 Control Units using a USB memory stick	–	P320-3: 4 × USB 2.0 P350-3: 4 × USB 2.0	D410: – D4x5: 2
• DRIVE-CLiQ interfaces		–	–	D410: 1 D425/D435: 4 D445-1: 6
Connections over PROFIBUS DP and Ethernet/PROFINET The connection resources can be assigned as required, over PROFIBUS DP or Ethernet.	PROFINET on SIMOTION C requires C240 PN			
• PROFIBUS DP		C240: ● C240 PN: ●	P320-3: – P350-3 DP: ● P350-3 PN: ○	D410 DP: ● D410 PN: – D4x5: ●
• Ethernet/PROFINET		C240: ●/– C240 PN: ●/●	P320-3: ●/● P350-3 DP: ●/○ P350-3 PN: ●/●	D410 DP: –/– D410 PN: –/● D4x5: ●/○
Online connections, max.		16	16	16
• SIMOTION SCOUT engineering system (SCOUT occupies up to 3 online connections)		2	2	2
• HMI		5	5	5
• OPC		●	●	●
• Basic communication Xsend / Xreceive (not via Ethernet)		5	5	5
• Standard TCP/IP connections		45	40	D410: 45 D4x5: 75
• SIMOTION IT		●	●	●

● Basic version (function or license is purchased with the device or SCOUT) ○ Option (must be acquired as software/hardware) – Not possible	Notes	SIMOTION C240/C240 PN	SIMOTION P320-3/P350-3	SIMOTION D4xx
Communication (continued)				
Communication functions over PROFIBUS between: • SIMOTION – SIMATIC HMI/WinCC flexible - HMI data exchange: Support from the SIMOTION operating system - Plant-wide access to process data and displays - Interrupt mechanism: Alarms are event-driven • SIMOTION – SIMATIC HMI/ProToolPro - HMI data exchange: Support from the SIMOTION operating system - Interrupt mechanism: Alarms are event-driven • SIMOTION – SIMOTION - Distributed I/O mechanisms Process image, e.g. (% I1.3) I/O variables (symbolic) - XSND/XRCV, max. 200 bytes • SIMOTION – SIMATIC S7 - Distributed I/O mechanisms Process image, e.g. (% I1.3) I/O variables - XSND/XRCV, max. 76 bytes • SIMOTION – SIMATIC NET OPC • SIMOTION – PG/PCs with STEP 7 and SCOUT • PROFIBUS DP slave-to-slave communication	Basic version with regard to SIMOTION	●	●	●
Communication functions over PROFINET IO between:	Basic version with regard to SIMOTION			
• SIMOTION – SIMOTION - Distributed I/O mechanisms Process image, e.g. (% I1.3) I/O variables (symbolic)	PROFINET standard-feature on C240 PN, P320-3, P350-3 PN, D410 PN.	●	●	●
• SIMOTION – SIMATIC S7 - Distributed I/O mechanisms Process image, e.g. (% I1.3) I/O variables - For SIMATIC – SIMOTION: SIMOTION as I-Device - For SIMOTION – SIMATIC: over SIMATIC CP	On P350-3 DP and D4x5 optionally by means of PROFINET board.	●	●	●
• Slave-to-slave communication between SIMOTION controllers		●	●	●

● Basic version (function or license is purchased with the device or SCOUT) ○ Option (must be acquired as software/hardware) – Not possible	Notes	SIMOTION C240/C240 PN	SIMOTION P320-3/P350-3	SIMOTION D4xx
Communication (continued)				
Communication functions over Ethernet/PROFINET between:	Not for D410 DP			
• SIMOTION – SIMATIC HMI/WinCC flexible - HMI data exchange: Support from the SIMOTION operating system - Plant-wide access to process data and displays - Interrupt mechanism: Alarms are event-driven		●	●	●
• SIMOTION – SIMATIC HMI/ProToolPro - HMI data exchange: Support from the SIMOTION operating system - Interrupt mechanism: Alarms are event-driven		●	●	●
• SIMOTION – SIMATIC NET OPC		●	●	●
• SIMOTION IT OPC XML-DA (over Ethernet) - Open communication over TCP/IP and SOAP standard protocols - Clients on any hardware with various operating systems (Windows, Linux, ...) - According to OPC Foundation standard OPC XML-DA V1.01		● [1]	● [1]	● [1]
• SIMOTION MIIF: Multipurpose Information Interface - Symbolic access to SIMOTION data via Ethernet - SIMOTION as server, e.g. operator panels as clients		○	○	– (D410) ○ (D4x5)
• SIMOTION – PG/PCs with STEP 7 and SCOUT		●	●	●
• Ethernet/PROFIBUS DP routing		●	●	●
UDP and TCP/IP communication functions over Ethernet/PROFINET between: • SIMOTION – SIMOTION • SIMOTION – SIMATIC • SIMOTION – PC	Not for D410 DP	●	●	●
Serial communication via a point-to-point connection	Basic version with regard to SIMOTION			
• CP 340 and CP 341 communication modules		●	●	●
• 1SI communication module (connected over ET 200S)		●	●	●
Communication via AS-Interface	Basic version with regard to SIMOTION			
• CP 343-2 P communication module		●	●	●
• DP/AS Interface Link 20E/Link Advanced		●	●	●
• IE/AS-Interface link PN IO		●	●	●
Connectable network couplers	Basic version with regard to SIMOTION			
• DP/DP coupler for connecting two PROFIBUS DP networks		●	●	●
• PN/PN coupler for connecting two PROFINET IO networks		●	●	●

[1] Subject to license

● Basic version (function or license is purchased with the device or SCOUT) ○ Option (must be acquired as software/hardware) – Not possible	Notes	SIMOTION C240/C240 PN	SIMOTION P320-3/P350-3	SIMOTION D4xx
SIMOTION Kernel				
Execution system				
• System tasks for motion control		●	●	●
- SERVO (position control cycle) - IPO (interpolation cycle)				
- MotionTasks (sequential)		20	32	32
- ServoSynchronousTask (cyclic, synchronous with the position control cycle)		1	1	1
• Task structure/program execution				
- BackgroundTask (cyclic)	Adjustable monitoring time	1	1	1
- TimerInterruptTasks (time-controlled down to 1 ms)		5	5	5
- IPOSynchronousTask (cyclic, synchronous with the interpolation cycle)		2	2	2
- InterruptTasks (for user) (event-driven)		2	2	2
- TControlTasks (temperature control)		5	5	5
- StartupTask (for transition from STOP to RUN)		1	1	1
- ShutdownTask (for transition from RUN to STOP)		1	1	1
• Task structure/error processing (SystemInterruptTasks)	Central troubleshooting is possible			
- ExecutionFaultTask (starts in the event of an error during program execution)		1	1	1
- TechnologicalFaultTask (starts in the event of an error on a technology object)		1	1	1
- PeripheralFaultTask (starts in the event of an error on the I/O)		1	1	1
- TimeFaultTask (starts in the event of a TimerInterruptTask timeout)		1	1	1
- TimeFaultBackgroundTask (starts in the event of a BackgroundTask timeout)		1	1	1
• Program organization		●	●	●
- Units (source program) - Programs - Function blocks (FBs) - Functions (FCs) - System functions (SFs) - Libraries				

● Basic version (function or license is purchased with the device or SCOUT) ○ Option (must be acquired as software/hardware) – Not possible	Notes	SIMOTION C240/C240 PN	SIMOTION P320-3/P350-3	SIMOTION D4xx
SIMOTION Kernel (continued)				
PLC command set (according to IEC 61131-3; optionally expandable by technology functions)		●	●	●
System functions, e.g. for		●	●	●
• Interrupt and error handling				
• Copying data				
• Clock functions				
• Diagnostic functions				
• Module parameterization				
• Operating mode transitions, Run/Stop				
• Reading and writing of data blocks from the user program to an exchangeable memory medium				
• DPV1 communication to DP slaves				
• Read/write drive parameters				
• DP slaves/PROFINET devices can be connected and disconnected from application				
• DP slave and IP address can be set in user program				
• DP station diagnostics				
• Activate/deactivate technology objects				
• Counter (IEC commands)				
• Timer (IEC commands)				
• Real-time clock, format [DATE_AND_TIME]				
Motion Control technology package				
Technology functions				
• Motion Control Basic	No license required	●	●	●
• POS – Positioning	Use of the functions during runtime is subject to license. SIMOTION D410 already contains the technology functions for precisely one real axis. (D410 no PATH)	● 1)	● 1)	● 2)
• GEAR – Synchronous operation		● 1)	● 1)	● 2)
• CAM – Cam		● 1)	● 1)	● 2)
• PATH – Path interpolation		● 1)	● 1)	● 2)
The technology package functions are accessed via language commands, system variables and through function blocks in accordance with PLCopen.				
Axis types				
• Electrical/hydraulic/stepper motor axes		●	●	●
• Speed-controlled axis		●	●	●
• Positioning axes - Rotary axis - Linear axis - Modulo for linear and rotary axes - Force/pressure-controlled axis - Force/pressure-limited axis	Included with POS license or higher	● 1)	● 1)	● 2)
• Synchronous axis	Included with GEAR license or higher	● 1)	● 1)	● 2)
• Path axis	Included with GEAR license or higher	● 1)	● 1)	● 2)
• Cam axis	Included with CAM license or higher	● 1)	● 1)	● 2)
• Virtual axis		●	●	●
• Simulation axis		●	●	●

1) Use of the functions during runtime is subject to license.

2) Subject to license only with SIMOTION D4x5. SIMOTION D410 already contains the technology functions for precisely one real axis.

● Basic version (function or license is purchased with the device or SCOUT) ○ Option (must be acquired as software/hardware) – Not possible	Notes	SIMOTION C240/C240 PN	SIMOTION P320-3/P350-3	SIMOTION D4xx
Motion Control technology package (continued)				
Systems of units				
• Metric (mm, m, Nm, Pa, ...)		●	●	●
• US (inch, feet, PSI, lb, ...)		●	●	●
Axis monitoring functions				
The activated monitoring functions are executed cyclically.		●	●	●
• Watchdog				
• Hardware and software limit switches				
• Position/zero-speed monitoring				
• Dynamic following error monitoring				
• Encoder monitoring, cable break				
• Force/pressure monitoring				
• Setpoint				
• Plausibility in data exchange				
Other technology packages				
TControl technology package				
• With technology functions for temperature control		● 1)	● 1)	● 1)
Drive Control Chart (DCC) technology package				
• With technology functions for Drive Control Chart		●	●	●
Direct Product Motion (DPM) technology package				
• With technology functions for intelligent, contact-free product synchronization		○ 1)	○ 1)	○ 1) (D435, D445-1)
Multipurpose Information Interface (MIIF) technology package				
• With multi-functional communication functions		○ 1)	○ 1)	○ 1) (D4x5)
SIMOTION IT				
SIMOTION IT DIAG	Licensed through the SIMOTION IT DIAG software option or by the SIMOTION IT combined license			
Integrated web server on the SIMOTION controller				
• Service and diagnostic functions provided via Internet browser with extensive information functions (hardware/software version display, processor utilization, memory usage, diagnostic buffer, task runtimes, user logbook, operating state, time of day, etc.)		● 1)	● 1)	● 1)
• Access to all variables on the control system using variable browser functions (watch tables, trace)				
• Generation of diagnostic data (diagnostic buffer, alarms, states of variables, ...)				
• Project update				
• Firmware update				
• Password-protected access				
• Remote access to SIMOTION file system				
• User-defined service and diagnostic pages				

1) Subject to license

● Basic version (function or license is purchased with the device or SCOUT) ○ Option (must be acquired as software/hardware) – Not possible	Notes	SIMOTION C240/C240 PN	SIMOTION P320-3/P350-3	SIMOTION D4xx
SIMOTION IT (continued)				
SIMOTION IT OPC XML-DA Integrated OPC XML-DA server on the SIMOTION controller • Read/write variables • Browse variables • Trace interface via SOAP • Password-protected access	Licensed by the SIMOTION IT combined license	● 1)	● 1)	● 1)
SIMOTION IT Virtual Machine Integrated Java runtime environment on the SIMOTION controller • Read and write access to the SIMOTION variables • Read and write access to the non-volatile memory (NVRAM) • Use of system functions (functions of the technology objects) • Use of standard Java classes in the device (file access, network functions, string functions, ...) • Creation of servlets, for the purpose of enhancing the display of menu interfaces in HTML pages	Licensed by the SIMOTION IT combined license	● 1)	● 1)	● 1)
SIMOTION SCOUT engineering system				
SIMOTION SCOUT basic functions • SCOUT Workbench • STARTER Drive commissioning/parameterization • Hardware and network configuration • Diagnostics for testing and commissioning • Axis control panel • Program editors/programming languages (command set in accordance with IEC 61131-3) - Structured Text (ST) - Ladder Logic (LAD) - Function Block Diagram (FBD) - Motion Control Chart (MCC) • Creation of cams (basic) • Creation of technology objects • Technology tools (function generator) • Operator interface, online help and documentation in English, French, German and Italian		●	●	●
SIMOTION SCOUT optional packages				
• CamTool (graphical cam editor)		○	○	○
• DCC editor (graphical editor for Drive Control Chart)		○	○	○

1) Subject to license

● Basic version (function or license is purchased with the device or SCOUT) ○ Option (must be acquired as software/hardware) – Not possible	Notes	SIMOTION C240/C240 PN	SIMOTION P320-3/P350-3	SIMOTION D4xx
Testing and diagnostics with SIMOTION SCOUT				
Information functions		●	●	●
• Hardware/software version				
• Processor utilization				
• Memory utilization				
• Diagnostic buffer				
• Task runtimes				
• User logbook				
• Operating status				
• Time				
Comparison function for projects		●	●	●
• Comparison of objects in projects: - Between offline projects - Between online and offline projects				
• Detailed comparison: Shows differences between objects in detail				
• Matching: Projects and objects can be merged				
Program test functions		●	●	●
• Control/status variables				
• Watch tables				
• Status program/FB/FC (with specification of the call point)				
• Single-step MCC				
• Breakpoints in all languages (ST, MCC, LAD/FBD)				
Trace		●	●	●
• Recording of I/O, system and program variables				
• Recording from position control cycle onwards (n × position control cycle)				
• Trigger: Instantaneous, rising/falling edge, at code point system variable				
• Measuring functions for optimizing the speed/position controller (step response, ramp, frequency curve)				
• Automatic setting of the speed controller/ position controller				
• Bode diagram, FFT analysis, function generator, mathematical functions				
• Endless trace				
• Recording over defined measuring period				

● Basic version (function or license is purchased with the device or SCOUT) ○ Option (must be acquired as software/hardware) – Not possible	Notes	SIMOTION C240/C240 PN	SIMOTION P320-3/P350-3	SIMOTION D4xx
Testing and diagnostics with SIMOTION SCOUT (continued)				
Further diagnostic functions				
• Module diagnostics - Centralized		●	●	●
- Distributed (e.g. ET 200M)				
• PROFIBUS DP station diagnostics	PROFINET standard feature on C240 PN, P320-3, P350-3 PN, D410 PN. Optional on P350-3 DP and D4x5 by means of PROFINET board.	●	●	●
• PROFINET station diagnostics		●	●	●
• Diagnostic buffer - No. of entries, max.	On SIMOTION D, one diagnostic buffer is provided for SIMOTION and another for the integrated SINAMICS drive.	200	200	D410: 2 × 100 D4x5: 2 × 200
• Process fault diagnostics (Alarm_S) - Messages from user program		●	●	●
- No. of entries, max.		40	40	40
Engineering drives				
STARTER (integrated in SCOUT) Drive/commissioning software for: • MICROMASTER 410/420/430/440 • COMBIMASTER 411 • SINAMICS S / SINAMICS G		●	●	●
Drive ES BASIC Engineering tools and integrated data storage in SIMATIC S7/SIMOTION projects for: • MICROMASTER 410/420/430/440 (STARTER) • COMBIMASTER 411 (STARTER) • SINAMICS S/SINAMICS G (STARTER) • SIMODRIVE (SimoCom U/SimoCom A) • SIMOVERT MASTERDRIVES (DriveMonitor)	Drive ES BASIC is included complete with license in the SIMOTION SCOUT software package.	●	●	●

Notes

SIMOTION
I/O components

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SIMOTION I/O components

Overview

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Overview

PS307 power supply, 5 A

The PS305/PS307 power supplies convert the line voltage (120 V/230 V AC, 24 V to 110 V DC) into the 24 V DC operating voltage and are directly snapped onto the SIMATIC S7-300 mounting rail.

The following versions are available for the output currents:

- 2 A
- 5 A
- 10 A

The required summation current should be taken into account when sizing in the power supply (e.g. current draw of SIMOTION C, supply for the digital outputs).

Application

Controlled 24 V DC power supply for:

- SIMOTION C
- Distributed I/O (e.g. SIMATIC ET 200M)
- Sensors
- Actuators

Design

The power supplies are snapped onto the SIMATIC S7-300 mounting rail to the left of the SIMOTION C Motion Controller or SIMATIC ET 200M interface (IM 153).

The front of the module contains:

- An LED
  (signals that the 24 V DC output voltage is ON)
- Supply voltage selector switch with protective cap
  for selecting the input voltage of 120 V AC or 230 V AC
- ON/OFF switch for 24 V DC output voltage
- Terminals
  for input voltage, output voltage and ground, covered by the front door

The power supplies can also be mounted onto a 35 mm DIN rail (EN 50022). Mounting adapters are required for this purpose:

- 1 adapter for PS307, 24 V DC/2 A, 24 V DC/5 A
- 2 adapters for PS307, 24 V DC/10 A

Selection and ordering data

Description	Order No.
SIMATIC S7-300 controlled power supply, 1-phase	
• 120/230 V AC; 24 V DC/2 A	**6ES7307-1BA01-0AA0**
• 24 V ... 110 V DC; 24 V DC/2 A (extended temperature range)	**6ES7305-1BA80-0AA0**
• 120/230 V AC; 24 V DC/5 A	**6ES7307-1EA01-0AA0**
• 120/230 V AC; 24 V DC/5 A (extended temperature range)	**6ES7307-1EA80-0AA0**
• 120/230 V AC; 24 V DC/10 A	**6ES7307-1KA02-0AA0**
Mounting adapter for snapping the PS307 onto 35 mm standard rails (EN 50022)	**6ES7390-6BA00-0AA0**

More information

For further information, see Catalog ST 70 and the Industry Mall under Automation technology/Power supplies/Power Supplies SITOP/.../ SITOP 24 V.

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Universal SITOP power supplies

Overview

Power supplies (1/ 2/ 3-phase)

The controlled SITOP power supplies are snapped onto a 35 mm standard mounting rail (EN 50022). They cannot be snapped onto the SIMATIC S7-300 mounting rail.

SITOP modular

The SITOP modular power supply comprises of standard devices with 5 A, 10 A, 20 A and 40 A options which can be expanded with additional modules. The modularity offers advantages with respect to flexibility and simple handling.

The wide-range input, Class B radio interference category according to EN 55022 and limitation of input current harmonics to EN 61000-3-2 make these power supplies suitable for use in many different application areas.

Basic units/features

- 5 A and 10 A basic units
  with 120/230 to 500 V AC wide-range input for operation on 1-phase network as well as 2-phase operation on 3-phase network (connection to two phases of a 3-phase supply network)
- 20 A and 40 A basic units
  with 120/230 V AC input voltage for 1-phase operation or with 400 to 500 V 3 AC wide-range input for 3-phase operation
- Extremely small width of the 3-phase 20 A basic unit (70 mm (2.76 in) wide)
- Selectable "constant current" or "stored tripping" short-circuit behavior
- 3 LEDs for signaling "24 V OK", "Overload" and "Stored tripping"
- Adjustable output voltage up to 28.8 V to compensate for voltage drops
- Power boost supports up to three times the rated current

Supplementary modules for function expansions

- Buffer module for extending the network failure buffering time to 100 ms for 40 A load currents and up to 800 ms for 5 A load currents
- Signaling module for providing signals about the operating status of the power supply ("DC Voltage OK", "Ready") as well as for remote activation/deactivation of the power supply
- Redundancy module for decoupling two power supplies during parallel operation

Overview (continued)

SITOP select diagnostics module

The SITOP select diagnostics module is used for dividing the load current into four current paths for monitoring the individual subcurrents.

SITOP smart

The 1-phase power supply for universal applications with a narrow construction; 150 % extra power and 120 % rated power up to 45 °C (113 °F). Without limitation of the line harmonics according to EN 61000-3-2 with the industrial version (-2AA01 types).

SITOP power in flat design

SITOP power in flat design is preferred where only small mounting depths are available, for example, when distributed I/O is used, in machines or recesses.

Selection and ordering data

Description	Order No.
SITOP modular power supplies	
• 1-phase/2-phase	
- 120/230 ... 500 V AC; 24 V DC/5 A	**6EP1333-3BA00**
- 120/230 ... 500 V AC; 24 V DC/10 A	**6EP1334-3BA00**
- 120/230 V AC; 24 V DC/20 A	**6EP1336-3BA00**
- 120/230 V AC; 24 V DC/40 A	**6EP1337-3BA00**
• 3-phase	
- 400 ... 500 V AC; 24 V DC/20 A	**6EP1436-3BA10**
- 400 ... 500 V AC; 24 V DC/40 A	**6EP1437-3BA00**
Add-on modules for SITOP modular	
• Buffer module	**6EP1961-3BA00**
• Signaling module	**6EP1961-3BA10**
• Redundancy module	**6EP1961-3BA20**
SITOP select diagnostics module, 4 channels	**6EP1961-2BA00**
SITOP smart power supply, 1-phase	
• 120/230 V AC; 24 V DC/2.5 A	**6EP1332-2BA10**
• 120/230 V AC; 24 V DC/5 A	**6EP1333-2BA01**
• 120/230 V AC; 24 V DC/5 A (industrial version)	**6EP1333-2AA01**
• 120/230 V AC; 24 V DC/10 A	**6EP1334-2BA01**
• 120/230 V AC; 24 V DC/10 A (industrial version)	**6EP1334-2AA01**
Power supply SITOP power, slimline design, 1-phase	
• 120/230 V AC; 24 V DC/5 A	**6EP1333-1AL12**
• 120/230 V AC; 24 V DC/10 A	**6EP1334-1AL12**

More information

For further information, see Catalog KT 10.1 and the Industry Mall under Automation technology/Power supplies/Power Supplies SITOP/.../ SITOP 24 V.

Uninterruptible SITOP power supplies with battery module

Overview

DC UPS module with battery module

By combining a DC UPS module with at least one 24 V battery module and one SITOP power supply, longer power failures can be completely bridged.

This combination can be used e.g. in

- mechanical engineering
- textile industry
- all types of production lines and filling systems

This prevents the negative effects which often result due to power failures.

Siemens offers the uninterruptible power supplies DC UPS 6 A, DC UPS 15 A and DC UPS 40 A as well as the battery modules 1.2 Ah, 2.5 Ah, 3.2 Ah, 7 Ah and 12 Ah for "NONSTOP" applications.

Benefits

- DC UPS modules for complete uninterruptible bridging of power failures including exhaustive discharge protection, battery life time monitoring and ON/OFF control current circuit.
- 24 V DC input voltage (supply through SITOP power supply from 5 A rated current)
- Rated output power 144 W (DC UPS 6 A) and 360 W (DC UPS 15 A)
- Rated output power 480 W or 960 W (DC UPS 40 A with one or two battery modules)
- High efficiency of approx. 95 to 97 %
- Power ON threshold adjustable through DIP switch between 22 V and 25.5 V
- Bridging time adjustable with DIP switch in the range between 5 and 635 s or until switched off automatically due to complete discharge
- Option: Signals can be output via serial interface or USB interface, automatic reset of industrial PCs supported through selectable shut-down behavior

More information

For further information, see Catalog KT 10.1 and the Industry Mall under Automation technology/Power supplies/Power Supplies SITOP/.../ SITOP 24 V.

Function

The rechargeable battery is connected to the system as soon as the load voltage or the voltage between the connections L+/M of the DC UPS module falls below the set value of the 22 to 25.5 V threshold.

After a power failure the battery module is disconnected automatically from the loads by electronic means and immediately recharged with a 0.2/0.4 A (DC UPS module 6 A), 0.35/0.7 A (DC UPS module 15 A) or 1/2 A (DC UPS module 40 A) constant current (U/I characteristic with 26.3 to 29.3 V end-of-charge voltage).

For increased load current demands (e.g., when incandescent lamps, power contactors with DC auto-connected windings, DC motors, DC/DC converters, electronic modules with high input capacity are connected to the system), electronically limited peak currents are supplied automatically.

The operating state (mains/battery operation, battery level > 85 % as well as buffer ready/alarm) is signaled with LEDs and isolated relay contacts.

For SIMOTION P350 and SIMOTION P320 applications, the UPS module can be used with a serial interface or USB interface. The operating state is indicated on an SP_SITOP application that is already installed on SIMOTION P350 and SIMOTION P320. An action can be defined for each status change of the UPS during configuration of the application. The operating status of the UPS is also available to the user program via a system variable.

Selection and ordering data

Description	Order No.
SITOP DC UPS module	
• 24 V / 6 A	**6EP1931-2DC21**
• 24 V / 6 A, with serial interface	**6EP1931-2DC31**
• 24 V / 6 A, with USB interface	**6EP1931-2DC42**
• 24 V / 15 A	**6EP1931-2EC21**
• 24 V / 15 A, with serial interface	**6EP1931-2EC31**
• 24 V / 15 A, with USB interface	**6EP1931-2EC42**
• 24 V / 40 A	**6EP1931-2FC21**
• 24 V / 40 A, with serial interface	**6EP1931-2FC42**
• 24 V / 15 A, with USB interface and 2.5 kW	**6EP1933-2EC41**
• DC UPS module, with USB interface and 5 kW	**6EP1933-2EC51**
• 24 V / 7 A, with USB interface and 5 kW	**6EP1933-2NC01**
• 24 V / 7 A, with USB interface and 10 kW	**6EP1933-2NC11**
SITOP battery module	
• 24 V / 1.2 Ah for DC UPS module 6 A	**6EP1935-6MC01**
• 24 V / 2.5 Ah for DC UPS module 6 A and 15 A	**6EP1935-6MD31**
• 24 V / 3.2 Ah for DC UPS module 6 A and 15 A	**6EP1935-6MD11**
• 24 V / 7 Ah for DC UPS module 6 A, 15 A and 40 A	**6EP1935-6ME21**
• 24 V / 12 Ah for DC UPS module 6 A, 15 A and 40 A	**6EP1935-6MF01**

Uninterruptible SITOP power supplies with capacitor module

Overview

DC UPS with capacitor module

Uninterruptible power supplies normally store the electrical energy in lead-acid batteries. The temperatures that prevail inside the cabinet, however, shorten the service life of the batteries considerably and require regular replacement, e.g. annually at ambient temperatures of 40 °C (104 °F). The innovative SITOP UPS500 is, however, based on completely maintenance-free capacitors with a long service life. Even at temperatures of 50 °C (122 °F) they still have more than 80 % of their capacity after 8 years, so there is no need to replace the energy stores. Because the capacitors do not emit any gas, the control cabinet does not have to be ventilated. Another advantage are the significantly shorter charging times of the double-layer capacitors which ensure that the buffer is ready very quickly after loss of power.

Benefits

SITOP UPS500S, basic device 15 A

- Compact design, degree of protection IP20
- Integrated energy storage: 2.5 kW or 5 kW
- Easily expanded with the 5 kW expansion module (up to 3 expansion modules can be connected)
- Signaling of the operating states and capacitor discharge > 85 %
- Support for automatic reset of industrial PCs through selectable shutdown characteristics
- USB interface

SITOP UPS500P, basic device 7 A

- Compact design, degree of protection IP65
- For distributed applications without control cabinet
- Integrated energy storage: 5 kW or 10 kW
- High efficiency of approx. 96.6 %
- Low power losses of approx. 6 W at 7 A load current
- Signaling of the operating states and capacitor discharge > 85 %
- USB interface

Function

Communication with the control can be implemented via the USB interface. In the case of the UPS500S, also via relay contacts.

The backup time is shorter than with lead-acid battery solutions, but in many cases it suffices in order to back up data and shut down the machine in a controlled manner.

Selection and ordering data

Description	Order No.
SITOP UPS500S with capacitor	
• 24 V / 15 A, with USB interface and 2.5 kW	**6EP1933-2EC41**
• 24 V / 15 A, with USB interface and 5 kW	**6EP1933-2EC51**
SITOP UPS500P with capacitor	
• 24 V / 7 A, with USB interface and 5 kW	**6EP1933-2NC01**
• 24 V / 7 A, with USB interface and 10 kW	**6EP1933-2NC11**
Accessories	
SITOP UPS501S expansion module For extension of the buffering time for connection to a SITOP UPS500S	
• 24 V / 15 A and 5 kW	**6EP1935-5PG01**
Connector set for UPS500P Input/output connector, USB signal cable 2 m	**6EP1975-2ES00**

More information

For further information, see Catalog KT 10.1 and the Industry Mall under Automation technology/Power supplies/ Power Supplies SITOP/SITOP 24 V/DC UPS uninterruptible power supplies.

Overview

SIMATIC S7-300 I/O Modules

The following SIMATIC S7-300 I/O modules can be used as:

- Central I/O within SIMOTION C240.
  The I/O configuration comprises two tiers for central I/O with up to 8 I/O Modules per tier, of which up to 4 can be Analog Modules. The second tier is connected over the IM 365 interface module.
- Distributed I/O in the modular I/O system SIMATIC ET 200M with the IM 153 Head Module
  (up to 8 or 12 I/O Modules per SIMATIC ET 200M, depending on the Head Module)

I/O modules transform the levels of the external digital and analog process signals into the internal signal levels for SIMOTION and vice versa. In addition, signal-preprocessing Function Modules and Communication Modules are available.

Benefits

- Optimal adaptation
  The number of inputs/outputs can be adapted to the corresponding task with the help of modules which can be combined as required. Unnecessary investments can be avoided.
- Flexible process connection
  SIMOTION can be connected to the process over different digital and analog actuators and sensors.
- Powerful analog technology
  Various input/output ranges and high resolution allows for the connection of many different analog sensors and actuators.
- Intelligent function modules
  Function Modules (FM) relieve the CPU from time-intensive tasks such as counting and output cams.
- Communication modules
  Communication modules (CP) implement serial data exchange over point-to-point connections and connection of AS-Interface slaves.

Integration

The following can be connected to SIMOTION over I/O Modules:

- Digital and analog sensors/actuators
- Switches
- Encoders
- Printers, barcode readers, ...
- AS-Interface slaves
- Identification systems
- Weighing systems
- …

Design

SIMATIC S7-300 I/O Modules for digital and analog inputs/outputs have the following mechanical characteristics:

- Compact design
  The rugged plastic casing contains:
  - Green LEDs for indicating the signal states on the inputs/outputs
  - Red LED to indicate that a diagnosis is being performed (for modules capable of diagnostics)
  - Sockets for front connectors, protected behind front door
  - Labeling area on front door
- Simple assembly
  The modules are mounted one after the other on the mounting rail from the left to the right and connected to neighboring modules with bus connectors. There are no slot rules.
- User-friendly wiring
  The modules are wired with front connectors. When the module is connected for the first time, a coding latches in the connector so that the connector now only fits onto modules of the same type. When a module is replaced, the front connector can be plugged onto the new module of the same type with the complete wiring. The front connectors are available with screw-type or spring-loaded terminals or with the Fast Connect connection system.

More information

For further information, see Catalog ST 70 and the Industry Mall under Automation technology/Automation and Control Systems/SIMATIC Industrial Automation Systems/Controllers/SIMATIC S7 modular controllers/S7-300/S../S7-300F.

The I/O Modules which can be used with SIMOTION are listed in a compatibility list which can be found at:

http://support.automation.siemens.com/WW/view/en/11886029

Selection and ordering data

Description	Order No.
Digital Input Modules SM 321 [1], **isolated**	
• **16 DI**, 24 V DC, 20-pole	
- Standard	**6ES7321-1BH02-0AA0**
- Isochronous, High Speed	**6ES7321-1BH10-0AA0**
- Active low input	**6ES7321-1BH50-0AA0**
• **32 DI**, 24 V DC, 40-pole	**6ES7321-1BL00-0AA0**
• **64 DI**, 24 V DC, active high/low (parameterizable)	**6ES7321-1BP00-0AA0**
• **8 DI**, 120/230 V AC	
- Standard, 20-pole	**6ES7321-1FF01-0AA0**
- With single-root, 40-pole	**6ES7321-1FF10-0AA0**
• **16 DI**, 24 ... 48 V AC/DC, 40-pole with single-root	**6ES7321-1CH00-0AA0**
• **16 DI**, 48 ... 125 V DC, 20-pole	**6ES7321-1CH20-0AA0**
• **16 DI**, 120/230 V AC, 20-pole	**6ES7321-1FH00-0AA0**
• **32 DI**, 120 V AC, 40-pole	**6ES7321-1EL00-0AA0**
• **16 DI**, 24 V DC, 20-pole Process alarm, diagnostics, parameterizable input delay, isochronous	**6ES7321-7BH01-0AB0**
Digital Output Modules SM 322 [1], **isolated**	
• **8 DO**, 24 V DC, 2 A, 20-pole	**6ES7322-1BF01-0AA0**
• **8 DO**, 48 ... 125 V DC, 1.5 A, 20-pole	**6ES7322-1CF00-0AA0**
• **16 DO**, 24 V DC, 0.5 A, 20-pole	
- Standard	**6ES7322-1BH01-0AA0**
- Isochronous, High Speed	**6ES7322-1BH10-0AA0**
• **32 DO**, 24 V DC, 0.5 A, 40-pole	**6ES7322-1BL00-0AA0**
• **64 DO**, 24 V DC, 0.3 A	
- Current sourcing	**6ES7322-1BP00-0AA0**
- Current sinking	**6ES7322-1BP50-0AA0**

Description	Order No.
Digital Output Modules SM 322 [1], **isolated**	
• **8 DO**, 120/230 V AC, 1 A, 20-pole	**6ES7322-1FF01-0AA0**
• **8 DO**, 120/230 V AC, 2 A, 40-pole With single-root and selectable failure mode	**6ES7322-5FF00-0AB0**
• **16 DO**, 120/230 V AC, 1 A, 20-pole	**6ES7322-1FH00-0AA0**
• **32 DO**, 120/230 V AC, 1 A, 2 × 20-pole, doublewidth	**6ES7322-1FL00-0AA0**
• **8 DO (relay)**, 24 V DC, 2 A or 230 V AC, 2 A, 20-pole	**6ES7322-1HF01-0AA0**
• **8 DO (relay)**, 24 V DC, 5 A or 230 V AC, 40-pole, 5 A, connector with spring-loaded terminal, can be used for 6ES7392-1BM01-0AA0 and higher	**6ES7322-1HF10-0AA0**
• **8 DO (relay)**, 24 V DC, 120 ... 230 V AC, 5 A, 40-pole With RC filter overvoltage protection	**6ES7322-5HF00-0AB0**
• **16 DO (solid state relay)**, 24 ... 48 V AC/DC, 0.5 A, 40-pole With single-root	**6ES7322-5GH00-0AB0**
• **16 DO (relay)**, 24 ... 120 V DC, 2 A or 48 ... 230 V AC, 2 A, 20-pole	**6ES7322-1HH01-0AA0**
• **8 DO**, 24 V DC, 0.5 A, 20-pole Short-circuit protection, diagnostics	**6ES7322-8BF00-0AB0**
Digital Input/Output Modules [1], **isolated**	
• **8 DI, 8 DO**, 24 V DC, 0.5 A, 20-pole	**6ES7323-1BH01-0AA0**
• **16 DI, 16 DO**, 24 V DC, 0.5 A, 40-pole	**6ES7323-1BL00-0AA0**
• **8 DI, 8 DX**, 24 V DC, 0.5 A, 20-pole, 8 DX per single channel parameterizable as DI or DO	**6ES7327-1BH00-0AB0**
Accessories	See page 10/14.

More information

For further information, see Catalog ST 70 and the Industry Mall under Automation technology/Automation and Control Systems/SIMATIC Industrial Automation Systems/Controllers/SIMATIC S7 modular controllers/S7-300/S7-300F/Signal modules/Digital modules.

[1] Incl. labeling strips and bus connectors, front connector required (if not specified otherwise).
64-channel modules require special terminal blocks and signal cables, see Accessories on page 10/14.

Selection and ordering data

Description	Order No.
Analog Input Modules SM 331 [1], **isolated**	
• **2 AI**, 20-pole (1 AI for resistance-based sensor), U/I/thermoelement/resistor/ Pt 100/Ni 100, alarm, diagnostics, resolution 9/12/14 bit (+ sign)	**6ES7331-7KB02-0AB0**
• **8 AI**, 20-pole (4 AI for resistance-based sensor), U/I/thermoelement/resistor/ Pt 100/Ni 100, alarm, diagnostics, resolution 9/12/14 bit (+ sign)	**6ES7331-7KF02-0AB0**
• **8 AI**, 40-pole U/I/resistor/Pt 100/Ni 100/Ni 1000/ LG-Ni 1000 (standard, air-conditioned), resolution 12 bit + sign/13 bit	**6ES7331-1KF02-0AB0**
• **8 AI**, 20-pole U/I, alarm and diagnostics, resolution 13 bit + sign/14 bit, isochronous, High Speed	**6ES7331-7HF01-0AB0**
• **8 AI**, 40-pole U/I, alarm and diagnostics, resolution 15 bit (+ sign)	
- 2 channels with limit value monitoring, isolation between channels and backplane bus	**6ES7331-7NF00-0AB0**
- Fast measured value update, 8 channels with limit value monitoring, isolation between channels and backplane bus as well as between channels in groups of 2	**6ES7331-7NF10-0AB0**
• **8 AI**, 40-pole 2/3/4-wire, resistor, Pt 100/200/500/1000, Ni 100/120/200/500/1000, Cu 10, characteristics acc. to GOST, 16 bit (24 bit internally)	**6ES7331-7PF01-0AB0**
• **8 AI**, 40-pole thermoelements Types B, E, J, K, L, N, R, S, T, U, TXK/TXK(L) according to GOST, 16 bit (24 bit internally)	**6ES7331-7PF11-0AB0**
Analog Output Modules SM 332 [1], **isolated**	
• **AO**, 0 ... 10 V, ± 10 V, 1 ... 5 V, 0/4 ... 20 mA, ± 20 mA 11 bit + sign/12 bit	
- 2 AO, 20-pole	**6ES7332-5HB01-0AB0**
- 4 AO, 20-pole	**6ES7332-5HD01-0AB0**
- 8 AO, 40-pole	**6ES7332-5HF00-0AB0**
• **4 AO**, 20-pole 0 ... 10 V, ± 10 V, 1 ... 5 V, 0/4 ... 20 mA, ± 20 mA 14 bit + sign/15 bit + sign, isochronous, High Speed	**6ES7332-7ND02-0AB0**

Description	Order No.
Analog Input/Output Modules [1]	
• **4 AI, 2 AO**, 20-pole, non-isolated, 0 ... 10 V, 0 ... 20 mA, 8 bit	**6ES7334-0CE01-0AA0**
• **4 AI, 2 AO**, 20-pole (2 AI under power), isolated, 12 bit, Input: 0 ... 10 V, Pt 100 (climatic range only), resistance measurement 10 kΩ, Output: 0 ... 10 V	**6ES7334-0KE00-0AB0**
Analog Input/Output Modules [1]	
4 fast analog inputs (basic conversion time for 4 channels, max. 1 ms), 4 fast analog outputs (conversion time per channel, max. 0.8 ms), encoders supplied with 10 V/25 mA, 1 counter input (24 V/500 Hz), special operating modes: "Measuring only" and "Comparator"	
• **4 AI, 4 AO**, 20-pole isolated, alarm and diagnostics, Input: ±1 V, ±2.5 V, ±10 V, 0 ... 2 V, 0 ... 10 V, ±10 mA, 0/4 ... 20 mA, 13 bit + sign, 14 bit; (up to 2 channels parameterizable) Output: ±10 V, 0 ... 10 V, 11 bit + sign, 12 bit	**6ES7335-7HG02-0AB0**
Accessories	See page 10/14.

More information

For further information, see Catalog ST 70 and the Industry Mall under Automation technology/Automation and Control Systems/ SIMATIC Industrial Automation Systems/Controllers/SIMATIC S7 modular controllers/S7-300/S7-300F/Signal modules/Analog modules.

10

[1] Incl. labeling strips and bus connectors, front connector required (if not specified otherwise).

FM 350-1 Counter Module

Overview

- Single-channel, intelligent Counter Module for simple counting tasks
- For direct connection of 24 V incremental encoders
- Compare function with two definable comparison values
- Integrated digital outputs for response output when the comparison value is reached
- Operating modes:
  - Continuous counting
  - One-time counting
  - Periodic counting
- Special functions:
  - Set counter
  - Latch counter
  - Start/stop counter via gate function
- Plug-in option for 20-pole front connector

Integration

The FM 350-1 Counter Module can be operated as follows:

- Centrally on SIMOTION C
- Distributed (via SIMATIC ET 200M) on SIMOTION C, SIMOTION P and SIMOTION D

The standard functions required to use the FM 350-1 Counter Module in combination with SIMOTION are part of the SCOUT command library.

Selection and ordering data

Description	Order No.
FM 350-1 Counter Module max. 500 kHz, 1 channel, incl. SIMATIC configuration package on CD-ROM	**6ES7350-1AH03-0AE0**
Accessories	See page 10/14.

FM 350-2 Counter Module

Overview

- 8-channel intelligent Counter Module for universal counting and measuring tasks
- For direct connection of 24 V incremental encoders, direction encoders, initiators, or NAMUR encoders
- Compare function with definable comparison values (number depends on operating mode)
- Integrated digital outputs for response output when the comparison value is reached
- Operating modes:
  - Continuous/one-time/periodic counting
  - Frequency/speed measurement
  - Period measurement
  - Dosing
- Plug-in option for 40-pole front connector

Integration

The FM 350-2 Counter Module can be operated as follows:

- Centrally on SIMOTION C
- Distributed (via SIMATIC ET 200M) on SIMOTION C, SIMOTION P and SIMOTION D

The standard functions required to use the FM 350-2 Counter Module in combination with SIMOTION are part of the SCOUT command library.

Selection and ordering data

Description	Order No.
FM 350-2 Counter Module max. 20 kHz, 8 channels, incl. SIMATIC configuration package on CD-ROM	**6ES7350-2AH01-0AE0**
Accessories	See page 10/14.

FM 352 Cam controller

Overview

- High-speed electronic cam controller
- Economical alternative to mechanical cam controllers
- 32 cam tracks, 13 onboard digital outputs for the direct output of actions
- Position sensing by means of incremental encoder or absolute encoder with synchronous serial transmission (SSI)
- Plug-in option for 20-pole front connector

Integration

The FM 352 Electronic cam controller can be operated:

- Centrally on SIMOTION C
- Distributed (via SIMATIC ET 200M) on SIMOTION C, SIMOTION P and SIMOTION D

The standard functions required to use the FM 352 cam controller in combination with SIMOTION are part of the SCOUT command library.

Selection and ordering data

Description	Order No.
FM 352 Electronic cam controller Incl. SIMATIC configuration package on CD-ROM	**6ES7352-1AH02-0AE0**
Sub-D connector 15-pole, pins; for encoder cable	**6ES5750-2AA21**
Accessories	See page 10/14.

FM 352-5 High-speed Boolean processor

Overview

- High-speed processor for Boolean operations (LAD, FBD); processes them at a fixed cycle time of 1 µs.
- Designed for applications that require an extremely fast response time
- 12 integrated digital inputs
- 8 integrated digital outputs
- 1 channel for connection of a 24 V incremental encoder, a 5 V incremental encoder (RS 422) or an SSI absolute encoder
- The application program is written with the STEP 7 program editor and stored on the Micro Memory Card (MMC) in compiled form after successful simulation
- Plug-in option for 40-pole front connector

Integration

The FM 352-5 High-speed Boolean processor can be operated:

- Centrally on SIMOTION C
- Distributed (via SIMATIC ET 200M) on SIMOTION C, SIMOTION P and SIMOTION D

Selection and ordering data

Description	Order No.
FM 352-5 High-speed Boolean processor	
• With current sinking digital outputs	**6ES7352-5AH00-0AE0**
• With current sourcing digital outputs	**6ES7352-5AH10-0AE0**
Configuration software for FM 352-5 (German, English, French, Italian, Spanish) on CD with electronic manual	**6ES7352-5AH00-7XG0**
Micro Memory Card	
• 128 KB	**6ES7953-8LG11-0AA0**
• 512 KB	**6ES7953-8LJ20-0AA0**
• 2 MB	**6ES7953-8LL20-0AA0**
Accessories	See page 10/14.

CP 340 Communication Module

Overview

- The cost-effective, complete solution for serial communication over a point-to-point connection
- 3 versions with various physical transmission characteristics: RS 232 C (V.24), 20 mA (TTY), RS 422/RS 485 (X.27)
- Implemented protocols: ASCII, 3964 (R) (not for RS 485), printer driver
- Simple configuration over SCOUT with integrated parameterization tool

Integration

The CP 340 Communication Module can be operated:

- Centrally on SIMOTION C
- Distributed (via SIMATIC ET 200M) on SIMOTION C, SIMOTION P and SIMOTION D

The standard functions required to use the CP 340 Communication Module in combination with SIMOTION are part of the SCOUT command library.

Selection and ordering data

Description	Order No.
CP 340 Communication Module Incl. SIMATIC configuration package on CD-ROM with:	
• 1 RS 232 C interface (V.24)	**6ES7340-1AH02-0AE0**
• 1 20 mA interface (TTY)	**6ES7340-1BH02-0AE0**
• 1 RS 422/485 (X.27) interface	**6ES7340-1CH02-0AE0**
RS 232 C signal cable	
• 5 m (16.41 ft)	**6ES7902-1AB00-0AA0**
• 10 m (32.81 ft)	**6ES7902-1AC00-0AA0**
• 15 m (49.22 ft)	**6ES7902-1AD00-0AA0**
20 mA (TTY) signal cable	
• 5 m (16.41 ft)	**6ES7902-2AB00-0AA0**
• 10 m (32.81 ft)	**6ES7902-2AC00-0AA0**
• 50 m (164 ft)	**6ES7902-2AG00-0AA0**
RS 422/485 signal cable	
• 5 m (16.41 ft)	**6ES7902-3AB00-0AA0**
• 10 m (32.81 ft)	**6ES7902-3AC00-0AA0**
• 50 m (164 ft)	**6ES7902-3AG00-0AA0**
Accessories	See page 10/14.

CP 341 Communication Module

Overview

- The fast and powerful serial data exchange over a point-to-point connection
- 3 versions with various physical transmission characteristics: RS 232 C (V.24), 20 mA (TTY), RS 422/RS 485 (X.27)
- Implemented protocols: ASCII, 3964 (R), RK 512
- Simple configuration over SCOUT with integrated parameterization tool

Integration

The CP 341 Communication Module can be operated:

- Centrally on SIMOTION C
- Distributed (via SIMATIC ET 200M) on SIMOTION C, SIMOTION P and SIMOTION D

The loadable special drivers of the CP 341 Communication Module are not supported by SIMOTION.

The standard functions required to use the CP 341 Communication Module in combination with SIMOTION are part of the SCOUT command library.

Selection and ordering data

Description	Order No.
CP 341 Communication Module Incl. SIMATIC configuration package on CD-ROM with:	
• 1 RS 232 C interface (V.24)	**6ES7341-1AH02-0AE0**
• 1 20 mA interface (TTY)	**6ES7341-1BH02-0AE0**
• 1 RS 422/485 (X.27) interface	**6ES7341-1CH02-0AE0**
RS 232 C signal cable	
• 5 m (16.41 ft)	**6ES7902-1AB00-0AA0**
• 10 m (32.81 ft)	**6ES7902-1AC00-0AA0**
• 15 m (49.22 ft)	**6ES7902-1AD00-0AA0**
20 mA (TTY) signal cable	
• 5 m (16.41 ft)	**6ES7902-2AB00-0AA0**
• 10 m (32.81 ft)	**6ES7902-2AC00-0AA0**
• 50 m (164 ft)	**6ES7902-2AG00-0AA0**
RS 422/485 signal cable	
• 5 m (16.41 ft)	**6ES7902-3AB00-0AA0**
• 10 m (32.81 ft)	**6ES7902-3AC00-0AA0**
• 50 m (164 ft)	**6ES7902-3AG00-0AA0**
Accessories	See page 10/14.

SM 374 Simulator Module

Overview

- Simulator Module for program testing during commissioning and operation
- Simulation of sensor signals over switches
- Display of signal states on outputs with LEDs

Design

The front panel is equipped with:

- 16 switches for the simulation of input signals
- 16 LEDs for displaying the signal state at outputs
- Mode selector
  With the aid of a screwdriver, you can set three operating modes:
  - 16 inputs (input simulation only)
  - 16 outputs (output simulation only)
  - 8 inputs and 8 outputs (input and output simulation)

Function

The SM 374 Simulator Module is mounted onto the SIMATIC S7-300 mounting rail instead of a Digital Input or Output Module.

The CPU reads the set input signal states of the Simulator Module and processes these in the user program. The output signal states are sent to the module as a result and are indicated with LEDs.

Selection and ordering data

Description	Order No.
SM 374 Simulator Module For simulating 16 inputs or 16 outputs or 8 inputs and 8 outputs (16 switches, 16 LEDs)	**6ES7374-2XH01-0AA0**
Accessories	See page 10/14.

DM 370 Dummy Module

Overview

- Dummy Module for reserving slots for unconfigured Signal Modules
- When replaced with a Signal Module (SM), configuration and address assignment remain unchanged

Application

The DM 370 Dummy Module reserves a slot for an unconfigured Signal Module.

When replaced with a Signal Module, the mechanical configuration and address assignment of the overall configuration remain unchanged.

Selection and ordering data

Description	Order No.
DM 370 Dummy Module Incl. bus connector, labeling strips	**6ES7370-0AA01-0AA0**
Accessories	See page 10/14.

Accessories

Selection and ordering data

Description	Order No.
Bus connector	**6ES7390-0AA00-0AA0**
Slot label	**6ES7912-0AA00-0AA0**
Labeling sheet, DIN A4, film, perforated, for printing with laser printer; 10 units	
For signal modules (16 channels)	
• Petrol	**6ES7392-2AX00-0AA0**
• Light-beige	**6ES7392-2BX00-0AA0**
• Yellow	**6ES7392-2CX00-0AA0**
• Red	**6ES7392-2DX00-0AA0**
For signal modules (32 channels)	
• Petrol	**6ES7392-2AX10-0AA0**
• Light-beige	**6ES7392-2BX10-0AA0**
• Yellow	**6ES7392-2CX10-0AA0**
• Red	**6ES7392-2DX10-0AA0**
Labeling strips 10 units	
• For modules with 20-pole front connector	**6ES7392-2XX00-0AA0**
• For modules with 40-pole front connector	**6ES7392-2XX10-0AA0**
Cover foil for labeling strips 10 units	
• For modules with 20-pole front connector	**6ES7392-2XY00-0AA0**
• For modules with 40-pole front connector	**6ES7392-2XY10-0AA0**
Shield connection element 80 mm wide, with 2 rows for 4 shield terminal elements each	**6ES7390-5AA00-0AA0**
Shield terminal element 2 units	
• For 2 cables with 2 ... 6 mm Ø	**6ES7390-5AB00-0AA0**
• For 1 cable with 3 ... 8 mm Ø	**6ES7390-5BA00-0AA0**
• For 1 cable with 4 ... 13 mm Ø	**6ES7390-5CA00-0AA0**
Front door Raised design 5 units	**6ES7328-0AA00-7AA0**

Description	Order No.
Front connector With screw-type terminals	
• 20-pole, 1 unit	**6ES7392-1AJ00-0AA0**
• 20-pole, 100 units	**6ES7392-1AJ00-1AB0**
• 40-pole, 1 unit	**6ES7392-1AM00-0AA0**
• 40-pole, 100 units	**6ES7392-1AM00-1AB0**
Front connector With spring-loaded terminals	
• 20-pole, 1 unit	**6ES7392-1BJ00-0AA0**
• 20-pole, 100 units	**6ES7392-1BJ00-1AB0**
• 40-pole, 1 unit	**6ES7392-1BM01-0AA0**
• 40-pole, 100 units	**6ES7392-1BM01-1AB0**
Front connector with Fast Connect terminals	
• 20-pole, 1 unit	**6ES7392-1CJ00-0AA0**
• 40-pole, 1 unit	**6ES7392-1CM00-0AA0**
Terminal block and signal cable for 64-channel modules 2 terminal blocks and 2 connecting cables are required per module	
• Length 1 m (3.28 ft), 2 units	**6ES7392-4BB00-0AA0**
• Length 2.5 m (8.20 ft), 2 units	**6ES7392-4BC50-0AA0**
• Length 5 m (16.41 ft), 2 units	**6ES7392-4BF00-0AA0**
• Terminal block with screw-type terminals, 2 units	**6ES7392-1AN00-0AA0**
• Terminal block with spring-loaded terminals, 2 units	**6ES7392-1BN00-0AA0**
Effective Range Modules for analog inputs 2 units	**6ES7974-0AA00-0AA0**
Fuse set 10 fuses 8 A , quick-response, 2 fuse holders	**6ES7973-1HD00-0AA0**
Sub-D connector	
• 9-pole, pins	**6ES5750-2AA11**
• 9-pole, socket	**6ES5750-2AB11**
• 15-pole, pins	**6ES5750-2AA21**
Mounting rail, SIMATIC S7-300	
• Length 160 mm (6.30 in)	**6ES7390-1AB60-0AA0**
• Length 480 mm (18.90 in)	**6ES7390-1AE80-0AA0**
• Length 530 mm (20.87 in)	**6ES7390-1AF30-0AA0**
• Length 830 mm (32.68 in)	**6ES7390-1AJ30-0AA0**
• Length 2000 mm (78.74 in)	**6ES7390-1BC00-0AA0**
SIMATIC Manual Collection Electronic manuals on DVD, multilingual	**6ES7998-8XC01-8YE0**
SIMATIC Manual Collection Update service for 1 year Current manual collection on DVD as well as the three subsequent updates	**6ES7998-8XC01-8YE2**

More information

For further information, see Catalog ST 70 and the Industry Mall under Automation technology/Automation and Control Systems/SIMATIC Industrial Automation Systems/Controllers/SIMATIC S7 modular controllers/S7-300/S7-300F.

Overview

SIMATIC ET 200 variants

Perfect communication on all levels

Distributed machine and plant configurations have now become common practice in automation technology. This reduces the wiring layout and significantly increases flexibility and reliability.

For connecting distributed I/O, in addition to PROFIBUS DP as the most successful open fieldbus in automation engineering, PROFINET is also available. And the AS-Interface handles communication on the actuator/sensor level. This allows problem-free data exchange throughout the whole automation world.

PROFIBUS DP

PROFIBUS DP is a fast, standardized bus system for the field level.

The following automation components, for example, can be connected to each other over the PROFIBUS DP fieldbus:

- Programmable SIMATIC controllers
- SIMOTION Motion Control System
- Numerical SINUMERIK controls
- SINAMICS drive system
- SIMATIC ET 200 distributed I/O system

With the distributed SIMATIC ET 200 I/O system, digital and analog inputs and outputs can be connected to SIMOTION. Intelligent I/O modules can also be used distributedly with SIMATIC ET 200.

The isochronous mode functionality also allows PROFIBUS DP to be used for high-speed, deterministic I/O processing as well as for integrating drives.

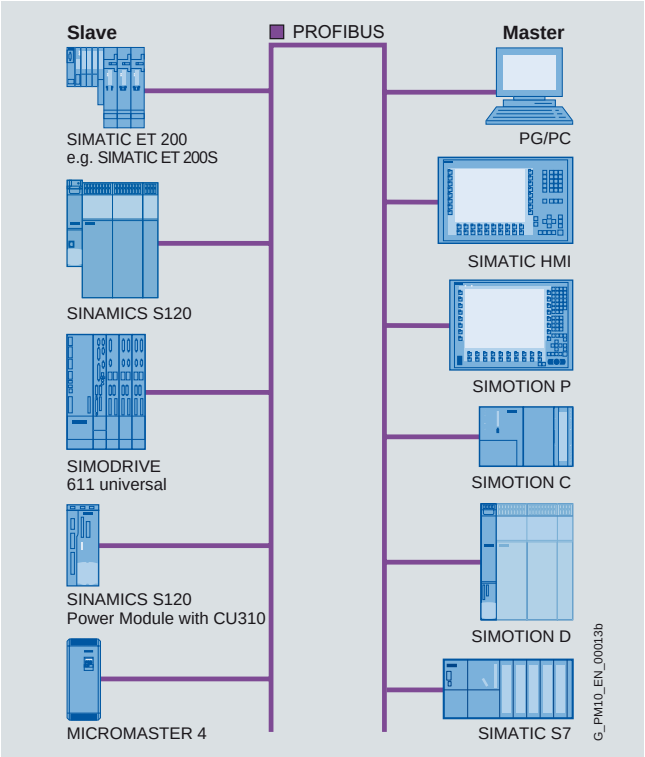
PROFINET

PROFINET is the innovative and open Industrial Ethernet standard (IEC 61158) for industrial automation. With PROFINET, devices can be linked up from the field level through to the management level. PROFINET is supported by the SINAMICS drive system and the SIMATIC ET 200S, SIMATIC ET 200M, SIMATIC ET 200pro and SIMATIC ET 200eco PN distributed I/O systems.

With Isochronous Real-Time (IRT) and the new SIMATIC ET 200S High Speed I/O, cycle times of 250 µs are achieved on the basis of PROFINET.

AS-Interface

With AS-Interface, actuators and sensors on the field level can be connected with a simple two-wire line. In addition to communication, this two-wire line is also used to supply the individual stations with power.



Master/slave configuration on PROFIBUS DP

SIMATIC ET 200 distributed I/O

The distributed SIMATIC ET 200 I/O provide I/O systems for many different applications:

- SIMATIC ET 200M: The modular I/O system for control cabinet installation and high channel densities.
- SIMATIC ET 200S: The finely scalable I/O system for control cabinet installation and time-critical applications in particular; including motor starters, safety technology and individual grouping of load groups
- SIMATIC ET 200pro: The modular I/O system with IP65/67 degree of protection for cabinet-free use close to the machine; with features such as small frame size, integrated PROFIsafe safety technology, PROFINET connection and hot swapping of modules
- SIMATIC ET 200eco: The compact, economical I/O system with IP65/67 degree of protection for local use without a control cabinet with flexible and fast ECOFAST or M12 connection system over PROFIBUS DP
- SIMATIC ET 200eco PN: The compact, economical I/O system with IP65/67 degree of protection for local use without a control cabinet with flexible and fast M12 connection system over PROFIBUS IO

More information

For further information, see Catalog IK PI and the Industry Mall under Automation technology/Automation and Control Systems/ SIMATIC Industrial Automation Systems/SIMATIC ET 200 Distributed I/O or at
www.siemens.com/et200

Manuals for the distributed I/O are available as PDF files:
www.siemens.com/simatic-docu

A list of all the I/O modules that can currently be used with SIMOTION is available under the following link:
http://support.automation.siemens.com/WW/view/en/11886029

SIMATIC ET 200M

Overview

SIMATIC ET 200M with power supply

SIMATIC ET 200M is a modular I/O system with IP20 degree of protection.

It can be expanded with Signal Modules, Communication Modules and Function Modules of the SIMATIC S7-300 automation system.

Due to the wide range of modules available, the SIMATIC ET 200M I/O system is especially well-suited for complex automation tasks with a high channel density.

For SIMATIC ET 200M, interface modules are available with PROFIBUS DP or PROFINET interfaces.

Signal states can be detected and output synchronously and at specified times via the isochronous PROFIBUS DP in combination with the IM 153-2 High Feature interface module. Isochronous mode is supported by selected I/O modules (see SIMATIC S7-300 I/O or ET 200M manual). It is possible to combine isochronous and non-isochronous modules in a single station.

Design

The SIMATIC ET 200M modular distributed I/O system consists of

- One IM 153 interface module
- Depending on the IM 153 interface module, 8 or 12 I/O modules of the SIMATIC S7-300 automation system
- A PS307 power supply, if required

The I/O modules can be combined as required and therefore optimally adapted to requirements.

The SIMATIC ET 200M I/O system is connected to PROFIBUS DP or PROFINET over an IM 153 interface module.

It can be connected to PROFIBUS DP with fiber-optic cables through integrated interfaces on the IM 153-2 FO or through additional OLMs (Optical Link Modules) or OBTs (Optical Bus Terminals).

Connection with bus connectors

The simple design with bus connectors of the SIMATIC S7-300 series makes SIMATIC ET 200M flexible and service-friendly:

- Module installation
  The modules are simply hooked onto the rail, swung into place and screwed tight.
- Integral backplane bus
  The backplane bus is integrated in the modules. Module interfacing takes place by means of bus connectors inserted into back of the housing.

Function

The user program in the SIMOTION Motion Control System can access the inputs and outputs of the SIMATIC ET 200M modular I/O system in the same manner as central inputs and outputs.

Communication over the bus system is handled completely by the SIMOTION Master and the IM 153 interface module. The diagnostics function is used to check that the SIMATIC ET 200M is operating correctly.

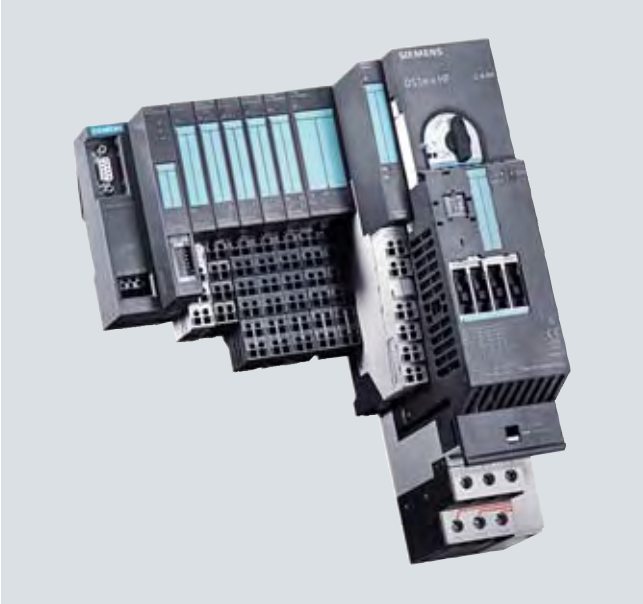
The SIMATIC ET 200M I/O system diagnoses the following:

- Module faults
- Short-circuits (outputs)
- Bus faults, i.e. faulty data transfer
- 24 V DC load voltage supply

Selection and ordering data

Description	Order No.
IM 153-1 Interface Module For connecting to PROFIBUS DP, with RS 485 interface, for max. 8 SIMATIC S7-300 modules	**6ES7153-1AA03-0XB0**
IM 153-2 High Feature Interface Module For connecting to PROFIBUS DP, with RS 485 interface, for max. 12 SIMATIC S7-300 modules, isochronous	**6ES7153-2BA02-0XB0**
IM 153-4 PN Interface Module For connecting to PROFINET, for max. 12 SIMATIC S7-300 modules with integrated switch	**6ES7153-4AA01-0XB0**

Overview



SIMATIC ET 200S Compact

- Extended block I/O with IP20 degree of protection and 32 integrated channels, comprising of terminal block and electronic block
- 2 variants: 32 DI or 16 DI/16 DO
- Finely scalable expansion to a maximum of 128 channels or 12 modules
- The complete SIMATIC ET 200S module spectrum can be used (with the exception of PROFIsafe modules and reserve modules)
- Minimal width supports installation in particularly small, compact terminal boxes
- Separation of connections and electronics with permanent wiring
- Screw-type and spring-loaded terminal connections
- Standard terminal block with 2-wire connection system; 3-wire and 4-wire systems available using optional add-on terminals
- Installation on a DIN rail
- Hot swapping of expansion modules
- Communication via PROFIBUS
- Up to 100 bytes inputs and outputs (address space)
- The system characteristics meet high machine and plant availability requirements.
- SIMATIC ET 200 Configurator software for designing the SIMATIC ET 200S Compact and creating order lists

SIMATIC ET 200S

- Distributed I/O system with IP20 degree of protection with minimal wiring
- Can be used with integrated SIMATIC S7-CPU as mini PLC:
  - also available as a fail-safe PROFIsafe version
  - with optional lower-level PROFIBUS DP
- Finely modular design for adaptation to the automation task at hand.
- Interface modules available with PROFIBUS DP or PROFINET interfaces
- PROFINET modules with integrated 2-port switch for a line topology
- The optimum solution for extremely time-critical tasks
  - Cycle times down to 250 µs based on PROFINET IO with Isochronous Real-Time (IRT)
  - Short terminal-to-terminal times through High Speed analog modules with conversion times of ≤ 20 µs per channel
- Combine digital and analog input or output modules, technology modules, motor starters and frequency converters
- Modules can be replaced during operation (hot swapping)
- Channel-specific diagnostics for high availability
- Can be supplied with integrated fiber optic interface if required
- Transfer rate up to 12 Mbit/s (PROFIBUS) or 100 Mbit/s (PROFINET)
- Flexible connection method (2/3/4-wire connections as screw-type and spring-loaded terminals and Fast Connect which requires no insulation stripping)
- Variable potential groups through power modules
- Option handling with or without reserve modules
- SIMATIC ET 200 Configurator software for designing the SIMATIC ET 200S and creating order lists

SIMATIC ET 200S

Application

The comprehensive module range with uniform handling for configuration, assembly and programming allows the SIMATIC ET 200S to be used as a universal I/O system.

The finely scalable design permits fast and optimal adaptation to the requirements of the automation task:

- No reserves
- No unnecessary channels

Even if requirements change frequently, setup times can be reduced significantly by replacing or combining different I/O modules.

The transmission rate of up to 12 Mbit/s with PROFIBUS DP and 100 Mbit/s with PROFINET IO as well as the powerful internal data transmission makes the SIMATIC ET 200S also perfectly suited for extremely time-critical applications such as highly dynamic hydraulic applications with position and pressure control.

In combination with the interface module

- IM 151-1 High Feature (PROFIBUS) or
- IM 151-3 PN High Speed (PROFINET)

signal states can be synchronously acquired or output over the isochronous PROFIBUS DP or over PROFINET IO with IRT at precisely defined points in time. Isochronous mode is supported by selected I/O modules (see SIMATIC S7-300 I/O or SIMATIC ET 200S manual). It is possible to combine isochronous and non-isochronous modules in a single station.

In addition to Interface Modules for connecting the SIMATIC ET 200S to PROFIBUS DP or PROFINET IO (either electrical or optical interface) for distributed automation tasks, an Interface Module with an integrated CPU is also available. The maintenance free CPU (without battery) integrated in the Interface Module is based on the SIMATIC S7-300 CPU 314 and is programmed with STEP 7. The CPU permits distributed on-site preprocessing of process data and communicates with the higher-level motion control system as a PROFIBUS DP slave or PROFINET IO Device.

Two different variants are available for integrating safety technology with SIMATIC ET 200S:

- Over local safety components in motor starter applications
- Over PROFIsafe components that replace the wiring-based safety logic with a freely programmable controller (up to SIL 3 according to IEC 61508 and Category 4 according to EN 954-1).

The construction of the SIMATIC ET 200S allows it to be used under increased mechanical load. The system features support high machine availability requirements.

Design

The SIMATIC ET 200S distributed I/O system consists of:

- IM 151 Interface Module
- Digital and Analog Electronic Modules
- Technology modules, e. g., for counter/position detection tasks
- Motor starters and frequency converters
- Terminating module (part of the scope of supply of the IM 151)
- Power modules

One SIMATIC ET 200S station comprises of up to 63 I/O modules. The I/O modules can be combined as required.

The SIMATIC ET 200S is installed with permanent wiring:

All modules are plugged onto purely mechanical Terminal Modules. These Terminal Modules contain the complete wiring and can be mounted on standard 35 × 15 mm (1.38 × 0.59 in) or 35 × 7.5 mm (1.38 × 0.30 in) mounting rails.

This results in the following advantages:

- Simple implementation of the wiring without additional electronics components
- Fast and safe testing of wiring even under power
- Tool-free replacement of Electronics Modules
- Automatic coding of Electronics Modules for safe replacement (protected against polarity reversal)

Function

IM 151-3 PN High Speed Interface Module: Ideal for fast I/O processing with SIMATIC ET 200S and PROFINET

The IM 151-3 PN High Speed Interface Module supports the following on a PROFINET IO basis with Isochronous Real-Time (IRT):

- Isochronous acquisition/output of signal states, synchronized with the user program
- Implementation of fast cycle times of 250 µs.

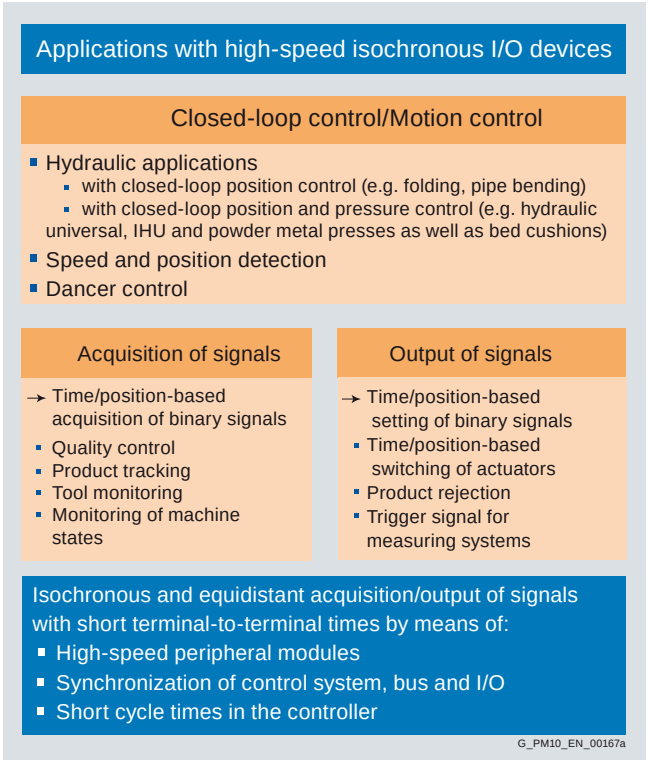
In comparison to PROFIBUS applications, much shorter terminal-to-terminal times can be implemented on the basis of PROFINET.

- The high data transmission rate of 100 Mbit/s and full-duplex mode (simultaneous transmitting and receiving) enable larger I/O volumes to be transmitted with the same bus cycle time as compared to PROFIBUS (125 bytes are transferred in approximately 10 µs).
- This communication performance is available on every PROFINET port of the controller – i.e. 4 ports on the SIMOTION D4x5 with the CBE30 and SIMOTION P350-3 with MCI-PN Communication Board, or 3 ports with SIMOTION P320-3.
- The IM 151-3 PN High Speed Interface Module as well as the associated I/O modules have extremely short signal processing times (e.g. conversion time of ≤ 20 µs per channel for Analog Modules) so that even during the same bus cycle significantly shorter terminal-to-terminal times can be achieved with PROFINET than with a comparable PROFIBUS cycle. The big advantage: the terminal-to-terminal times are reduced without reducing the computing time available to the application.
- Apart from Isochronous Real-Time (IRT) communication, Real-Time (RT) communication and standard TCP/IP communication can also be executed without losing the deterministic response of the IRT message frames due to the bandwidth reserved for IRT.

The minimum cycle times are usually dependent on the application to be implemented (computing load) and the performance capability of the controller used, e.g.
SIMOTION P350-3/SIMOTION P320-3: minimum 250 µs;
SIMOTION D445-1: minimum 500 µs.

SIMATIC ET 200S is the optimum I/O system for closed-loop control and motion control applications in which short cycle times, isochronous/equidistant signal acquisition and signal output are required.

SIMATIC ET 200S also supports the accurate and high-speed acquisition of digital inputs as well as time or position-based switching of digital outputs. For position-based switching of digital outputs, the SIMATIC ET 200S output is assigned to the SIMOTION technology object "TO Output Cam" or "TO Cam Track".



The modules listed below support isochronous operation with bus cycle times of 250 µs minimum:

Interface Module	M 151-3 PN High Speed
Power Modules	PM-E 24 V DC Standard PM-E 24 ... 48 V DC
Digital Electronic Modules	4 DI 24 V DC, High Feature 4 DO 24 V DC/0.5 A Standard 4 DO 24 V DC/2 A Standard
Analog Electronic Modules	2 AI, U, High Speed 2 AI, I, 2-wire High Speed 2 AI, I, 4-wire High Speed 2 AO, U, High Speed 2 AO, I, High Speed
Technology Modules	SSI module, 1 channel Counter module 1 COUNT, 24 V/100 kHz, 1 channel Counter module 1 COUNT, 5 V/500 kHz, 1 channel

Selection and ordering data

Description	Order No.
IM 151-1 Compact Interface Module for PROFIBUS DP Transmission rate up to 12 Mbit/s; for connecting to PROFIBUS DP, with RS 485 interface expandable with up to 12 power, electronic and motor starter modules (no F or reserve modules); including termination module	
• **32 DI, 24 V DC**	**6ES7151-1CA00-1BL0**
• **16 DI, 24 V DC; 16 DO, 24 V DC/0.5 A**	**6ES7151-1CA00-3BL0**
Terminal modules for SIMATIC ET 200S Compact	
• **TM-C120S Compact** With screw terminals	**6ES7193-4DL10-0AA0**
• **TM-C120C Compact** With spring-loaded terminals	**6ES7193-4DL00-0AA0**
Add-on terminals for terminal modules for SIMATIC ET 200S Compact	
• SIMATIC DP, add-on terminals for SIMATIC ET 200S and SIMATIC ET 200S Compact, screw-type	**6ES7193-4FL10-0AA0**
• SIMATIC DP, add-on terminals for SIMATIC ET 200S and SIMATIC ET 200S Compact, spring-loaded Please order two for 4-wire connection. The add-on terminals can also be attached to TM-E/TM-P Terminal Modules, provided at least 120 mm (4.72 in) of the construction width attains the same overall height as the Terminal Module.	**6ES7193-4FL00-0AA0**
Interface Modules for PROFIBUS DP Transmission rate up to 12 Mbit/s; incl. termination module	
• **IM 151-1 Basic** Data volume 88 bytes each for inputs and outputs; up to 12 power, electronic and motor starter modules can be connected (except F modules), with RS 485 interface	**6ES7151-1CA00-0AB0**
• **IM 151-1 Standard** Data volume 244 bytes each for inputs and outputs; up to 63 I/O modules can be connected, with RS 485 interface	**6ES7151-1AA05-0AB0**
• **IM 151-1 High Feature** As IM 151-1 Standard, but also for use with isochronous I/O and F modules	**6ES7151-1BA02-0AB0**
• **IM 151-1 FO** As IM 151-1 Standard, but with 128 byte data volume each for inputs and outputs, with fiber-optic interface	**6ES7151-1AB05-0AB0**
• **IM 151-7 CPU** With integrated PROFIBUS DP interface (RS 485 interface); 96 KB work memory	**6ES7151-7AA20-0AB0**

Description	Order No.
Interface Modules for PROFIBUS DP Transmission rate up to 12 Mbit/s; incl. termination module	
• **IM 151-7 CPU FO** As IM 151-7 CPU, but with fiber-optic interface, 48 KB work memory	**6ES7151-7AB00-0AB0**
• **IM 151-7 F-CPU** Integrated fail-safe CPU	**6ES7151-7FA00-0AB0**
Master interface module Expands the IM 151-7 CPU / IM 151-7 F-CPU / IM 151-8 PN DP CPU interface module with a DP master interface; up to one module per CPU	**6ES7138-4HA00-0AB0**
Interface Modules for PROFINET Transmission rate up to 100 Mbit/s, 2 × bus connection via RJ45, incl. termination module	
• **IM 151-3 PN Standard** Max. 63 I/O modules can be connected (except F modules; reserve modules)	**6ES7151-3AA23-0AB0**
• **IM 151-3 PN High Feature** As IM 151-3 PN Standard, but F modules can be used	**6ES7151-3BA23-0AB0**
• **IM 151-3 PN FO** As IM 151-3 PN High Feature, but with 2 PROFINET fiber-optic interfaces	**6ES7151-3BB23-0AB0**
• **IM 151-3 PN High Speed** Max. 32 power modules and electronic modules can be connected; for the use of isochronous I/O with cycle times of 250 µs minimum; only for use with selected I/O modules	**6ES7151-3BA60-0AB0**
• **IM 151-8 PN/DP CPU** With integrated PROFINET IO interface (3 RJ45 ports) 128 KB work memory	**6ES7151-8AB00-0AB0**
Micro Memory Card (MMC) - With IM 151-7 CPU, essential for program back-up - with IM 151-3 PN for saving the device name (64 KB) - required for firmware updates (more than 2 MB)	
• 64 KB	**6ES7953-8LF20-0AA0**
• 128 KB	**6ES7953-8LG11-0AA0**
• 512 KB	**6ES7953-8LJ20-0AA0**
• 2 MB	**6ES7953-8LL20-0AA0**
• 4 MB	**6ES7953-8LM20-0AA0**
• 8 MB	**6ES7953-8LP20-0AA0**
External EPROM programming device For programming Micro Memory Cards (MMC); connectable via USB interface	**6ES7792-0AA00-0XA0**

Selection and ordering data (continued)

Description	Order No.
Power Modules Width 15 mm (0.59 in)	
• **PM-E 24 V DC Standard** For electronic modules, with diagnostics	**6ES7138-4CA01-0AA0**
• **PM-E 24 V DC High Feature** [1] For electronic modules, with diagnostics	**6ES7138-4CA60-0AB0**
• **PM-E 24 ... 48 V DC** For electronic modules, with diagnostics	**6ES7138-4CA50-0AB0**
• **PM-E 24 ... 48 V DC, 24 ... 230 V AC** For electronic modules, with diagnostics and fuse	**6ES7138-4CB11-0AB0**
Potential Distributor Module for SIMATIC ET 200S For preparing the load voltage on additional terminals; Width 15 mm (0.59 in)	**6ES7138-4FD00-0AA0**
TM-P Terminal Modules for Power Modules [2] Width 15 mm (0.59 in)	
• **2 × 3 terminals** **With terminal access to AUX1, AUX1 connected through to the left**	
- TM-P15S23-A1, screw-type terminal	**6ES7193-4CC20-0AA0**
- TM P15C23-A1, spring-loaded terminals	**6ES7193-4CC30-0AA0**
- TM-P15N23-A1, Fast Connect	**6ES7193-4CC70-0AA0**
• **2 × 3 terminals** **With terminal access to AUX1, AUX1 interrupted to the left**	
- TM-P15S23-A0, screw-type terminal	**6ES7193-4CD20-0AA0**
- TM-P15C23-A0, spring-loaded terminals	**6ES7193-4CD30-0AA0**
- TM-P15N23-A0, Fast Connect	**6ES7193-4CD70-0AA0**
• **2 × 2 terminals** **Without terminal access to AUX1, AUX1 connected through to the left**	
- TM-P15S22-01, screw-type terminal	**6ES7193-4CE00-0AA0**
- TM-P15C22-01, spring-loaded terminals	**6ES7193-4CE10-0AA0**
- TM-P15N22-01, Fast Connect	**6ES7193-4CE60-0AA0**

Description	Order No.
Digital Electronic Modules 5 units (unless specified otherwise) Width 15 mm (0.59 in)	
• 2 DI, 24 V DC, Standard	**6ES7131-4BB01-0AA0**
• 4 DI, 24 V DC, Standard	**6ES7131-4BD01-0AA0**
• 8 DI, 24 V DC, Standard	**6ES7131-4BF00-0AA0**
• 4 DI, 24 V DC, SOURCE INPUT, activ low inputs	**6ES7131-4BD51-0AA0**
• 8 DI, 24 V DC, SOURCE INPUT, activ low inputs	**6ES7131-4BF50-0AA0**
• 4 DI, 24 V DC, NAMUR	**6ES7131-4RD00-0AB0**
• 2 DI, 120 V AC	**6ES7131-4EB00-0AB0**
• 2 DI, 230 V AC	**6ES7131-4FB00-0AB0**
• With parameterizable input delay and diagnostics	
- 2 DI, 24 V DC, High Feature [3]	**6ES7131-4BB01-0AB0**
- 4 DI, 24 V DC, High Feature [3]	**6ES7131-4BD01-0AB0**
- 4 DI, 24 ... 48 V DC [3]	**6ES7131-4CD00-0AB0**
• 2 DO, 24 V DC/0.5 A, Standard	**6ES7132-4BB01-0AA0**
• 4 DO, 24 V DC/0.5 A, Standard [3]	**6ES7132-4BD02-0AA0**
• 8 DO, 24 V DC/0.5 A, Standard [3] 1 unit	**6ES7132-4BF00-0AA0**
• 4 DO, 24 V DC/0.5 A, current sinking [3]	**6ES7132-4BD50-0AA0**
• 8 DO, 24 V DC/0.5 A, current sinking [3] 1 unit	**6ES7132-4BF50-0AA0**
• 2 DO, 24 V DC/2 A, Standard	**6ES7132-4BB31-0AA0**
• 4 DO, 24 V DC/2 A, Standard [3]	**6ES7132-4BD32-0AA0**
• With diagnostics for short-circuit and wire break, output of substitute value	
- 2 DO, 24 V DC/0.5 A, High Feature [3]	**6ES7132-4BB01-0AB0**
- 2 DO, 24 V DC/2 A, High Feature [3]	**6ES7132-4BB31-0AB0**
• 2 DO, 24 ... 230 V AC/1 A, output of substitute value	**6ES7132-4FB01-0AB0**
• 2 DO, 24 V DC ... 230 V AC/5 A, relay, NO contact, output of substitute value	**6ES7132-4HB01-0AB0**
• 2 DO, 24 V DC ... 230 V AC/5 A, relay, changeover contact, output of substitute value	**6ES7132-4HB10-0AB0**
• 2 DO, 24 V ... 48 V DC/5A, 24 V ... 230 V AC/5 A, relay, changeover contact, output of substitute value, with manual operation 1 unit	**6ES7132-4HB50-0AB0**
• 4 DO, 24 V DC/0.5 A, High Feature [3]	**6ES7132-4BD00-0AB0**
• 8 DO, 24 V DC/0.5 A, High Feature [3]	**6ES7132-4BF00-0AB0**
• 4 DO, 24 V DC/2 A, High Feature [3]	**6ES7132-4BD30-0AB0**

[1] Can be used for all electronic and technology modules except 2 DI 120 V AC / 2 DI 230 V AC / 2 DO 120/230 V AC

[2] Consult corresponding TM-P/TM-E manual or SIMATIC ET 200 Configurator software for selection.

[3] Can be used as isochronous I/O.

Selection and ordering data (continued)

Description	Order No.
Analog Electronic Modules Width 15 mm (0.59 in)	
• **2 AI, U, Standard,** Cycle time 65 ms per channel, ±5 V, ±10 V, 1 ... 5 V, 13 bit (+ sign)	**6ES7134-4FB01-0AB0**
• **2 AI, U, High Feature** [1], Process and diagnostic alarm, cycle time 0.5 ms (both channels), ±5 V, ±10 V, 1 ... 5 V, 15 bit (+ sign), basic error limit ±0.1 %	**6ES7134-4LB02-0AB0**
• **2 AI, U, High Speed** [1], Process and diagnostic alarm, cycle time 100 µs (both channels), ±2.5 V, ±5 V, ±10 V, 1 ... 5 V, 15 bit (+ sign)	**6ES7134-4FB52-0AB0**
• **2 AI, I, 2-wire, Standard,** Cycle time 65 ms per channel, 4 ... 20 mA, 13 bit	**6ES7134-4GB01-0AB0**
• **4 AI, I, 2-wire, Standard,** Cycle time 40 ms (both channels), 4 ... 20 mA, 13 bit	**6ES7134-4GD00-0AB0**
• **2 AI, I, 4-wire, Standard,** Cycle time 65 ms per channel, 4 ... 20 mA, ±20 mA, 13 bit (+ sign)	**6ES7134-4GB11-0AB0**
• **2 AI, I, 2/4-wire, High Feature** [1], Cycle time 0.5 ms (both channels), 4 ... 20 mA, ±20 mA, 15 bit (+ sign), basic error limit ±0.05 %	**6ES7134-4MB02-0AB0**
• **2 AI, I, 2-wire, High Speed** [1], Process and diagnostic alarm, cycle time 100 µs (both channels), 0/4 ... 20 mA, 15 bit	**6ES7134-4GB52-0AB0**
• **2 AI, I, 4-wire, High Speed** [1], Process and diagnostic alarm, cycle time 100 µs (both channels) 0/4 ... 20 mA, ±20 mA, 15 bit (+ sign)	**6ES7134-4GB62-0AB0**
• **2 AI, TC, Standard,** Cycle time 65 ms per channel, characteristic linearization for thermoelements of types: B, E, J, K, L, N, R, S, T, voltage measuring: ±80 mV, 15 bit (+ sign)	**6ES7134-4JB01-0AB0**
• **2 AI, TC, High Feature,** With internal temperature compensation, cycle time 80 ms per channel, characteristic linearization for thermoelements of types: B, C, E, J, K, L, N, R, S, T, voltage measuring: ±80 mV, 15 bit + sign (special TM required)	**6ES7134-4NB01-0AB0**
• **2 AI, RTD, Standard,** Cycle time 130 ms per channel, Pt 100, Ni 100, (Standard, climate) Resistance: 150 Ω, 300 Ω and 600 Ω, 14 ... 15 bit + sign	**6ES7134-4JB51-0AB0**
• **2 AI, RTD, High Feature** As RTD Standard, but with additional functions such as higher accuracy, additional measuring ranges, internal compensation of cable resistances	**6ES7134-4NB51-0AB0**
• **2 AO, U, Standard,** Cycle time < 1.5 ms (both channels), ±10 V, 13 bit (+ sign), 1 ... 5 V, 12 bit	**6ES7135-4FB01-0AB0**
• **2 AO, U, High Feature** [1], Cycle time < 0.5 ms (both channels), ±5 V, ±10 V, 15 bit (+ sign), 1 ... 5 V, 15 bit, basic error limit ± 0.05 %	**6ES7135-4LB02-0AB0**
• **2 AO, U, High Speed** [1], Cycle time 100 µs (both channels), ± 5 V, 14 bit (+ sign), ± 10 V, 15 bit (+ sign), 1 … 5 V, 14 bit	**6ES7135-4FB52-0AB0**
• **2 AO, I, Standard**, Cycle time < 1.5 ms (both channels), ± 20 mA, 13 bit (+ sign), 4 ... 20 mA, 13 bit	**6ES7135-4GB01-0AB0**
• **2 AO, I, High Feature** [1], Cycle time < 0.5 ms (both channels), ± 20 mA, 15 bit (+ sign), 4 ... 20 mA, 15 bit basic error limit ± 0.05 %	**6ES7135-4MB02-0AB0**
• **2 AO, I, High Speed** [1], Cycle time 100 µs (both channels), ± 20 mA, 15 bit (+ sign), 4 ... 20 mA, 15 bit	**6ES7135-4GB52-0AB0**

[1] Can be used as isochronous I/O.

Selection and ordering data (continued)

Description	Order No.
Technology Modules	
• **SSI module, 1 channel** [1] For connecting SSI absolute encoders, with latch input and comparison value, width 15 mm (0.59 in)	**6ES7138-4DB03-0AB0**
• **Pulse generator 2 PULSES, 2 channels** Pulse generator and Timer Module for controlling actuators, valves, heating elements, etc., optionally over PWM modulation, pulse trains or time-limited permanent signals at the 24 V output, width 15 mm (0.59 in)	**6ES7138-4DD00-0AB0**
• **Counter module 1 COUNT, 24 V/100 kHz, 1 channel** [1] Connection of incremental encoders, direction encoders and initiators; with DI, DO and comparison value; operating modes: counting, measuring, position detection; width 15 mm (0.59 in)	**6ES7138-4DA04-0AB0**
• **Counter module 1 COUNT, 5 V/500 kHz, 1 channel** [1] Connection of RS 422 incremental encoders; with DI, DO and comparison value; operating modes: counting, measuring, position detection; width 30 mm (1.18 in)	**6ES7138-4DE02-0AB0**
• **Sensor module 4 IQ-Sense** For connecting up to 4 IQ-Sense sensors, with SF-LED, width 15 mm (0.59 in), 5 units	**6ES7138-4GA00-0AB0**
• **1 SI interface module** Serial interface (1 channel): RS 232C, RS 422, RS 485, protocols: ASCII, 3964 (R), width 15 mm (0.59 in) *The standard functions required to use the module in connection with SIMOTION are included in the SCOUT command library.*	**6ES7138-4DF01-0AB0**
• **1 STEP stepper module, 1 channel** For controlled positioning of stepper motor axes, interface to RS 422 and 2 DI, width 15 mm (0.59 in)	**6ES7138-4DC00-0AB0**
• **IO-Link module** 4SI IO-Link, 4 point-to-point interfaces, IO-Link master width 15 mm (0.59 in)	**6ES7138-4GA50-0AB0**
• **1 POS U Positioning module, 1 channel** For controlled positioning with digital outputs for 5 V/24 V incremental encoder, SSI encoder, width 30 mm (1.18 in)	**6ES7138-4DL00-0AB0**
• **SIWAREX CS** Electronic weighing system for scales in SIMATIC ET 200S for applications with and without verified calibration, with EU type approval 2000 d, width 30 mm (1.18 in)	**7MH4910-0AA01**
• **SIWAREX CF** Transmitter for connecting DMS sensors, e.g. for force and torque measurement, width 30 mm (1.18 in)	**7MH4920-0AA01**

More information

For further information about the modules, see Catalogs: IK PI, ST 70, WT 10 and on the Internet at:

www.siemens.com/simatic

www.siemens.com/siwarex

www.siemens.com/industrymall

[1] Can be used as isochronous I/O.

Selection and ordering data (continued)

Description	Order No.
Reserve Module for reserving space in unused slots	
• Width 15 mm (0.59 in), 5 units	**6ES7138-4AA01-0AA0**
• Width 30 mm (1.18 in), 1 unit	**6ES7138-4AA11-0AA0**
TM-E Terminal Modules for Electronic Modules [1] Width 30 mm (1.18 in) for 1 COUNT 5 V/500 kHz, 1 POS U and SIWAREX CS/CF	
• **4 × 4 terminals** Without terminal access to AUX1, AUX1 connected through to the left	
- TM-E30S44-01, screw-type terminal	**6ES7193-4CG20-0AA0**
- TM-E30C44-01, spring-loaded terminals	**6ES7193-4CG30-0AA0**
• **4 × 6 terminals** With terminal access to AUX1, AUX1 connected through to the left	
- TM-E30S46-A1, screw-type terminal	**6ES7193-4CF40-0AA0**
- TM-E30C46-A1, spring-loaded terminals	**6ES7193-4CF50-0AA0**
TM-E Terminal Modules for Electronic Modules [1] Width 15 mm (0.59 in), for 2 AI TC High Feature	
• **Terminal Modules for internal temperature compensation for 2 AI TC High Feature**	
- TM-E15S24-AT, screw-type terminal	**6ES7193-4CL20-0AA0**
- TM-E15C24-AT, spring-loaded terminals	**6ES7193-4CL30-0AA0**

Description	Order No.
TM-E Terminal Modules for Electronics Modules [1]	
• Width 15 mm (0.59 mm), 5 units	
• **2 × 4 terminals** With terminal access to AUX1, AUX1 connected through to the left	
- TM-E15S24-A1, screw-type terminal	**6ES7193-4CA20-0AA0**
- TM-E15C24-A1, spring-loaded terminals	**6ES7193-4CA30-0AA0**
- TM-E15N24-A1, Fast Connect	**6ES7193-4CA70-0AA0**
• **2 × 6 terminals** With terminal access to AUX1, AUX1 connected through to the left	
- TM-E15S26-A1, screw-type terminal	**6ES7193-4CA40-0AA0**
- TM-E15C26-A1, spring-loaded terminals	**6ES7193-4CA50-0AA0**
- TM-E15N26-A1, Fast Connect	**6ES7193-4CA80-0AA0**
• **2 × 3 terminals** Without terminal access to AUX1, AUX1 connected through to the left	
- TM-E15S23-01, screw-type terminal	**6ES7193-4CB00-0AA0**
- TM-E15C23-01, spring-loaded terminals	**6ES7193-4CB10-0AA0**
- TM-E15N23-01, Fast Connect	**6ES7193-4CB60-0AA0**
• **2 × 4 terminals** Without terminal access to AUX1, AUX1 connected through to the left	
- TM-E15S24-01, screw-type terminal	**6ES7193-4CB20-0AA0**
- TM-E15C24-01, spring-loaded terminals	**6ES7193-4CB30-0AA0**
- TM-E15N24-01, Fast Connect	**6ES7193-4CB70-0AA0**

[1] Consult corresponding TM-P/TM-E manual or SIMATIC ET 200 Configurator software for selection.

Selection and ordering data (continued)

Description	Order No.
Standard motor starter With diagnostics, electromechanical, fuseless, expandable with Brake Control Module	
• DS1-x direct-on-line starters	**3RK1301-■■B00-0AA2**
• RS1-x reversing starters	**3RK1301-■■B00-1AA2**
< 0.06 kW [1]; 0.14 ... 0.20 A [2]	**0 B**
0.06 kW [1]; 0.18 ... 0.25 A [2]	**0 C**
0.09 kW [1]; 0.22 ... 0.32 A [2]	**0 D**
0.10 kW [1]; 0.28 ... 0.40 A [2]	**0 E**
0.12 kW [1]; 0.35 ... 0.50 A [2]	**0 F**
0.18 kW [1]; 0.45 ... 0.63 A [2]	**0 G**
0.21 kW [1]; 0.55 ... 0.80 A [2]	**0 H**
0.25 kW [1]; 0.70 ... 1.0 A [2]	**0 J**
0.37 kW [1]; 0.9 ... 1.25 A [2]	**0 K**
0.55 kW [1]; 1.1 ... 1.6 A [2]	**1 A**
0.75 kW [1]; 1.4 ... 2.0 A [2]	**1 B**
0.90 kW [1]; 1.8 ... 2.5 A [2]	**1 C**
1.1 kW [1]; 2.2 ... 3.2 A [2]	**1 D**
1.5 kW [1]; 2.8 ... 4.0 A [2]	**1 E**
1.9 kW [1]; 3.5 ... 5.0 A [2]	**1 F**
2.2 kW [1]; 4.5 ... 6.3 A [2]	**1 G**
3.0 kW [1]; 5.5 ... 8.0 A [2]	**1 H**
4.0 kW [1]; 7.0 ... 10 A [2]	**1 J**
5.5 kW [1]; 9.0 ... 12 A [2]	**1 K**
High Feature motor starters With diagnostics, fuseless, expandable with Brake Control Module	
• DS1e-x direct-on-line starters	**3RK1301-■■B10-0AA4**
• RS1e-x reversing starters	**3RK1301-■■B10-1AA4**
• DSS1e-x soft starters	**3RK1301-■■B20-0AA4**
0.3 ... 3.0 A [2]	**0 A**
2.4 ... 8.0 A [2]	**0 B**
2.4 ... 16.0 A [2]	**0 C**

Description	Order No.
Power Module for motor starter	
• PM-D Power Module for 24 V DC with diagnostics	**3RK1903-0BA00**
• Terminal Module for motor starter power module PM-D TM-P15-S27-01	**3RK1903-0AA00**
Accessories for standard motor starters	
Control Kit	
• For manually operating the contacts during start-up and servicing, 1 unit	**3RK1903-0CA00**
• For direct control of contactor (manual control) 24 V DC	**3RK1903-0CG00**
Terminal Modules for direct-on-line starter	
• TM-DS45-S32 With supply cable connection for power bus; incl. three caps for terminating the power bus	**3RK1903-0AB00**
• TM-DS45-S31 Without supply cable connection for power bus	**3RK1903-0AB10**
Terminal Modules for reversing starter	
• TM-RS90-S32 With supply cable connection for power bus: incl. three caps for terminating the power bus	**3RK1903-0AC00**
• TM-RS90-S31 Without supply cable connection for power bus	**3RK1903-0AC10**
Accessories for DS1-x, RS1-x motor starters	
DM-V15 Distance Module • For direct-on-line starters with high temperature and current load; width 15 mm (0.59 in)	**3RK1903-0CD00**
Terminal block PE/N	
• M45-PEN-F, Width 45 mm (1.77 in), incl. 2 caps; in combination with TM-DS45-S32 or TM-RS90-S32	**3RK1903-2AA00**
• M45-PEN-S, Width 45 mm (1.77 in), in combination with TM-DS45-S31 or TM-RS90-S31	**3RK1903-2AA10**

[1] Motor output for 3-phase standard motor at 400 V
[2] Setting range of the overcurrent release

Selection and ordering data (continued)

Description	Order No.
Accessories for standard and High Feature motor starters	
• **Jumper module**	
- M30-PEN, 30 mm (1.18 in) wide; for bridging a 30 mm (1.18 in) module	**3RK1903-0AJ00**
- M15-PEN, 15 mm (0.59 in) wide; for bridging a 15 mm (0.59 in) module	**3RK1903-0AH00**
- M30-L123, 30 mm (1.18 in) wide; for bridging a 30 mm (1.18 in) module	**3RK1903-0AF00**
- M15-L123, 15 mm (0.59 in) wide; for bridging a 15 mm (0.59 in) module	**3RK1903-0AE00**
• **Brake Control Module** For motors with a mechanical brake	
- **xB1** 24 V DC/4 A	**3RK1903-0CB00**
- **xB2** 500 V DC/0.7 A	**3RK1903-0CC00**
- **xB3** 24 V DC/4 A, 2 DI 24 V DC Local control with diagnostics: with 2 inputs with quick-stop function	**3RK1903-0CE00**
- **xB4** 500 V DC/0.7 A, 2 DI 24 V DC Local control with diagnostics: with 2 inputs with quick-stop function	**3RK1903-0CF00**
• **Terminal Modules**	
- TM-xB15 S24-01 for xB1 or xB2	**3RK1903-0AG00**
- TM-xB215 S24-01 for xB3 … xB4	**3RK1903-0AG01**

Description	Order No.
Accessories for High Feature motor starters	
• **Control Module 2DI, 24 V DC COM** Digital input module with two inputs	
- For local motor start functions for mounting to the front of a motor starter	**3RK1903-0CH10**
- For local motor start functions or manual operation for mounting to the front of a motor starter	**3RK1903-0CH20**
• **LOGO! PC signal cable** For connecting the High Feature motor starter with Switch ES interface to a PC	**6ED1057-1AA00-0BA0**
• **Terminal Modules**	
- **TM-DS65-S32** For direct on-line starters DS1e-x, DSS1e-x, with supply cable connection for power bus; incl. three caps for terminating the power bus	**3RK1903-0AK00**
- **TM-DS65-S31** For direct on-line starters DS1e-x, DSS1e-x, without supply cable connection for power bus	**3RK1903-0AK10**
- **TM-RS130-S32** For RS1e-x reversing starter, with supply cable connection for power bus; incl. three caps for terminating power bus	**3RK1903-0AL00**
- **TM-RS130-S31** For RS1e-x reversing starter, without supply cable connection for power bus	**3RK1903-0AL10**
• **M65-PEN-F Infeed Module** 65 mm (2.56 in) wide, incl. two caps, in combination with TM-DS65-S32/ TM-RS130-S32	**3RK1903-2AC00**
• **M65-PEN-S Connection Module** 65 mm (2.56 in) wide, in combination with TM-DS65-S31/TM-RS130-S31	**3RK1903-2AC10**

Selection and ordering data (continued)

Description	Order No.
Local Safety Modules	
• **Safety Module**	
- PM-D F1, with diagnostics, for EMERGENCY-STOP applications, monitored startup	**3RK1903-1BA00**
- PM-D F2, with diagnostics, for protective door monitoring, automatic startup	**3RK1903-1BB00**
- PM-D F3, with diagnostics, for expansion of PM-D F1/2 for an additional voltage group, time-delayed 0 ... 15 s	**3RK1903-1BD00**
- PM-D F4, with diagnostics, for expansion of PM-D F1/2 for an additional voltage group	**3RK1903-1BC00**
- PM-D F5, with diagnostics, for expansion of PM-D F1 ... F4 with four isolated enabling circuits, contact multiplier	**3RK1903-1BE00**
- PM-X, with diagnostics; connection module for connecting a safety group and an external incoming supply contactor or external safety circuit	**3RK1903-1CB00**
• **Terminal Modules for Safety Modules**	
- TM-PF30 S47-B1, for PM-D F1/2 with incoming supply U1/U2 and sensor connection	**3RK1903-1AA00**
- TM-PF30 S47-B0, for PM-D F1/2 with sensor connection	**3RK1903-1AA10**
- TM-PF30 S47-C1, for PM-D F 3/4 with incoming supply U1/U2 and IN+/IN- control input	**3RK1903-1AC00**
- TM-PF30 S47-C0, for PM-D F3/4 with incoming supply U2	**3RK1903-1AC10**
- TM-PF30 S47-D0, for PM-D F5	**3RK1903-1AD10**
- TM-X15 S27-01, for connection module PM-X	**3RK1903-1AB00**
• **F-Kit 1** Failsafe equipment for DS1-x standard direct-on-line starter [1]	**3RK1903-1CA00**
• **F-Kit 2** Failsafe equipment for RS1-x standard reversing starter [1]	**3RK1903-1CA01**

Description	Order No.
SIMATIC ET 200S Accessories	
Shield connection element Pluggable on TM-E and TM-P, 5 units	**6ES7193-4GA00-0AA0**
Shield terminal for 3 × 10 mm (0.39 in) busbar, 5 units	**6ES7193-4GB00-0AA0**
Grounding terminal for cable cross-sections up to 25 mm^2	**8WA2 868**
Busbar 3 × 10 × 1000 mm	**8WA2 842**
SIMATIC, DIN rail	
• 35 mm (1.38 in), length 483 mm (19.02 in) for 19" cabinets	**6ES5710-8MA11**
• 35 mm (1.38 in), length 530 mm (20.87 in) for 600 mm (23.62 in) cabinets	**6ES5710-8MA21**
• 35 mm (1.38 in), length 830 mm (32.68 in) for 900 mm (35.43 in) cabinets	**6ES5710-8MA31**
• 35 mm (1.38 in), length 2 m (6.56 ft)	**6ES5710-8MA41**
Labeling sheets DIN A4 10 units Each sheet contains 60 labeling strips for I/O Modules and 20 labeling strips for Interface Modules	
• Petrol	**6ES7193-4BH00-0AA0**
• Red	**6ES7193-4BD00-0AA0**
• Yellow	**6ES7193-4BB00-0AA0**
• Light-beige	**6ES7193-4BA00-0AA0**
Accessories for coding	
Color coding plate For TM-P, TM-E, 200 units	
• White	**6ES7193-4LA20-0AA0**
• Yellow	**6ES7193-4LB20-0AA0**
• Yellow/green	**6ES7193-4LC20-0AA0**
• Red	**6ES7193-4LD20-0AA0**
• Blue	**6ES7193-4LF20-0AA0**
• Brown	**6ES7193-4LG20-0AA0**
• Turquoise	**6ES7193-4LH20-0AA0**
Labels, inscribed 200 units	
• For slot numbering (1 to 20) 10 ×	**8WA8861-0AB**
• For slot numbering (1 to 40) 5 ×	**8WA8861-0AC**
• For slot numbering (1 to 64) 1 ×, (1 to 68) 2 ×	**8WA8861-0DA**
Labels, blank 100 units	
• For slot numbering	**8WA8848-2AY**

[1] The function of the failsafe kit is already integrated into High Feature motor starters.

SIMATIC ET 200eco

Overview

- Compact, cost-effective I/O devices for processing digital signals
- Designed for use without a control cabinet with IP65/67 degree of protection with flexible and fast connections
- Comprises of a basic module and various connection blocks for application-specific implementations
  - ECOFAST: 2 × RS 485 hybrid fieldbus connection with identification plug for setting the PROFIBUS address
  - M12: 2 × M12 and 2 × 7/8" with 2 rotary coding switches for assigning the PROFIBUS address
- Connection block contains T-functionality for PROFIBUS DP and power supply so that during commissioning and service, the modules can be disconnected and reconnected to the PROFIBUS without interruption
- Module variants:
  8 DI, 16 DI, 8 DI/8 DO (1.3 A), 8 DI/8 DO (2.0 A), 8 DO (2.0 A), 16 DO (0.5 A)
- Module diagnostics for load voltage and encoder short-circuit
- Transmission rates up to 12 Mbit/s

Application

SIMATIC ET 200eco is the compact block I/O with IP65/67 degree of protection and is distinguished by simple handling and installation.

SIMATIC ET 200eco allows the user to cost-effectively process digital signals over PROFIBUS DP.

Thanks to its high degree of protection and ruggedness, it is particularly suitable for use close to the machine.

The flexible connection blocks can be used to connect PROFIBUS DP over M12 or a standardized hybrid fieldbus connection (ECOFAST).

The compact SIMATIC ET 200eco can be used as an expansion for applications with high degree of protection in addition to the SIMATIC ET 200pro modular I/O family.

Design

SIMATIC ET 200eco comprises a basic module and a connection block.

For applications in many different industries, a compact, perfectly matched module spectrum of digital I/Os is available:

Number of channels	Type of connection
8 DI	8 individual channels over 8 × M12 screw connections for 8 digital input signals
16 DI	16 channels over 8 × M12 screw connections with double assignment for 16 digital input signals
8 DO	8 individual channels over 8 × M12 screw connections for 8 digital output signals (2 A)
16 DO	16 channels over 8 × M12 screw connections with double assignment for 16 digital output signals (0.5 A)
8 DI/8 DO (2 variants)	16 channels over 8 × M12 screw connections with double assignment for 8 digital input and 8 digital output signals (2 A or 1.3 A)

With the variable and flexible connection blocks, PROFIBUS DP can be connected over 2 × M12, 2 × 7/8" or 2 × hybrid fieldbus interfaces (ECOFAST).

The T-functionality for PROFIBUS DP and power supply are integrated in the connection block so that machines can be operated without interruption during commissioning and service of bus lines and without having to use supplementary components.

The pin assignment for the actuators and sensors are modeled on the IP65/67 standardization trends.

The PROFIBUS address can be set and seen from the outside or plugged.

The proven identification connector is used for ECOFAST interfaces. For M12 7/8" interfaces, two rotary coding switches which can be seen from the outside are used to set the PROFIBUS address.

Function

Communication is handled completely over PROFIBUS DP.

Diagnostic functions are available for checking the mode of operation of the SIMATIC ET 200eco:

- BF (bus fault)
- SF (system fault)
- Encoder and power supply

The diagnostic data is indicated by LEDs on the module and can be evaluated by software on the PG/PC or by SIMOTION.

Short-circuits of the encoder supply as well as missing load voltages are diagnosed for each module.

The connection block can be removed from and screwed back to the basic module while the power is on so that PROFIBUS and the power supply remain active for the application all the time.

Overview

SIMATIC ET 200eco PN is a compact block I/O with a PROFINET connection with IP65/IP67 degree of protection for cabinet-free installation directly at the machine.

Due to the fully potted, zinc die-cast housing, SIMATIC ET 200eco PN is extremely rugged and resistant to vibration, dust, oil and humidity.

SIMATIC ET 200eco PN can be flexibly expanded via PROFINET and supports star and line topologies within the same system.

Benefits

- Compact block I/O for processing digital, analog and IO-Link signals for connecting to the PROFINET bus system
- Cabinet-free installation with IP65/IP67 degree of protection with M12 connection system
- Extremely rugged and strong metal enclosure and fully potted
- Compact module in two types of enclosures
- 100 Mbit/s data transmission rate
- LLDP proximity detection without PG and fast startup (boot up within approx. 0.5 s)
- Channel-specific diagnostics

Application

The SIMATIC ET 200eco PN is ideal for applications directly at the machine in which space is at a premium. Due to its ruggedness and high degree of protection, it is implemented in a wide range of applications demanding a high degree of protection alongside the modular SIMATIC ET 200pro I/O family.

SIMATIC ET 200eco PN

Design

SIMATIC ET 200eco PN comprises a basic module and a connection block.

For applications in many different industries, a compact, perfectly matched module spectrum of digital I/Os is available:

Number of channels	Type of connection
8 DI	8 channels over 4 × M12 screw connections with double assignment for 8 digital input signals
8 DI	8 individual channels over 8 × M12 screw connections for 8 digital input signals
16 DI	16 channels over 8 × M12 screw connections with double assignment for 16 digital input signals
8 DO	8 channels over 4 × M12 screw connections with double assignment for 8 digital input signals (1.3 A)
8 DO	8 individual channels over 8 × M12 screw connections for 8 digital output signals (1.3 A)
8 DO	8 individual channels over 8 × M12 screw connections for 8 digital output signals (2 A)
16 DO	16 channels over 8 × M12 screw connections with double assignment for 16 digital output signals (1.3 A)
8 DI/DO	8 individual channels over 8 × M12 screwed connections for 8 digital input/output signals (1.3 A)
8 AI	8 individual channels over 8 × M12 screwed connections for 4 analog input signals (U/I) and 4 RTD/TC signals
4 AO	4 individual channels over 4 × M12 screwed connections for 4 analog output signals (U/I)
IO-Link master	16 channels over 8 × M12 screwed connections with double assignment for 4 IO-Link channels, 8 digital input signals and 4 digital output signals (1.3 A)

2 × M12 screwed connections with an integrated 2-port switch are used for connection to PROFINET IO, so line topologies can be configured. PROFINET address assignment is automatic.

The supply and load voltage connections are also implemented as 2 × M12 screwed connections. This makes supply voltage loop-through extremely easy. Using an optional terminal block, the supply voltage can be connected via insulating piercing terminals.

Function

The communication is performed exclusively via PROFINET IO.

Diagnostic functions are available for checking the mode of operation of SIMATIC ET 200eco PN:

- BF (bus fault)
- SF (system fault)
- Encoder and power supply

The diagnostic data are indicated by LEDs on the module and can be evaluated by software on the PG/PC or by SIMOTION. Short-circuits of the encoder supply as well as missing load voltages are diagnosed for each module.

Overview

SIMATIC ET 200pro is the modular I/O system with high IP65/67 degree of protection for local, cabinet-free applications. SIMATIC ET 200pro distinguishes itself through a small frame size and an innovative installation concept.

The SIMATIC ET 200pro station can be easily adapted to the requirements of the corresponding automation task with respect to the connection method, required I/O and fieldbus connection.

New features such as the integrated PROFIsafe safety technology, the PROFINET interface and the ability to hotswap modules permit it to be used for a wide range of applications.

Benefits

- Distributed I/O system with high IP65/67 degree of protection
- Flexible fieldbus connection through interface modules for PROFIBUS DP and PROFINET
- Modular design with up to 16 expansion modules for flexible adaptation to the automation task
- Comprehensive module range
  - Digital and Analog Input and Output Modules
  - Power Module for simple implementation of 24 V load groups
  - Motor starter
  - PROFIsafe module
- Simple, quick assembly and high vibration strength of the module carrier
- Integration of safety technology with PROFIsafe
- High plant availability through permanent wiring and the ability to replace Electronic Modules during operation (hot swapping)
- Low space requirements through small footprint (I/O module e.g. 130 mm (5.12 in) high and 45 mm (1.77 in) wide)
- Graduated diagnostics concept, optionally with module-specific or channel-specific diagnosis of faults of connected sensors or actuators
- Simple configuration through SIMATIC ET 200pro configurator software

Design

SIMATIC ET 200pro comprises of an interface module which contains the fieldbus interface and is expandable with a comprehensive module range.

The system bus and 24 V power wiring are configured with a busbar system which is integrated in the modules. Wiring using connecting cables is therefore not necessary.

Quick assembly and high vibration strength is achieved through a rack which is available in different options and is an integral part of the system. The modules are first latched onto this rack and then secured with a few screws to achieve a good fit and very high vibration strength.

SIMATIC ET 200pro is usually designed in two or three parts. Interface and Power Modules as well as Digital and Analog Expansion Modules comprise:

- one bus connector
  which constitutes the backplane bus of the system,
- one Electronics Module or Interface Module and
- one Connection Module.

The separation of module and bus/power connection technology, which has already been used for the SIMATIC ET 200eco, is now also used for the Digital and Analog Expansion Modules of the SIMATIC ET 200pro. For the interface module, this allows use of the T-functionality for the bus and 24 V power supply, and for the Expansion Modules it permits pre-wiring of sensor/actuator connections. This permanent wiring allows exactly one Electronics Module to be hotswapped in the event of a fault without having to switch off the whole station. This ensures very high machine and plant availability. When an electronics component is replaced, the whole I/O wiring can remain on the Connection Module and does not have to be marked or removed.

Power Modules can be added to the system if selective load groups have to be configured within a station or if a 24 V backfeed is required. The power modules interrupt the busbar integrated into the system for the 24 V load supply and feed the power back into the system at the point of connection.

- Up to 16 expansion modules can be used (max. station width: 1 meter (3.28 ft))
- Build-as-you-go busbars for 24 V power and communication within the station
- Flexible connection system
  - Connection for PROFIBUS DP and 24 V power supply over direct coupling (M20 cable gland), ECOFAST or M12 / 7/8"
  - Connection for PROFINET and 24 V power supply over M12 / 7/8"
  - Sensors and actuators for 8-channel I/O modules can be optionally connected to 4 × M12 or 8 × M12.

More information

SIMATIC ET 200pro Configurator software is available as a download for planning the SIMATIC ET 200pro and creating order lists:

http://www.siemens.com/ET200

SINUMERIK Analog Drive Interface for 4 Axes ADI 4 · SIMATIC Interface Module IM 174

Overview

The ADI 4 Analog Drive Interface for 4 Axes and the IM 174 Interface Module can be used to connect drives with analog ±10 V setpoint interfaces.

The IM 174 Interface Module also allows stepper drives with pulse/direction interfaces to be connected.

Application

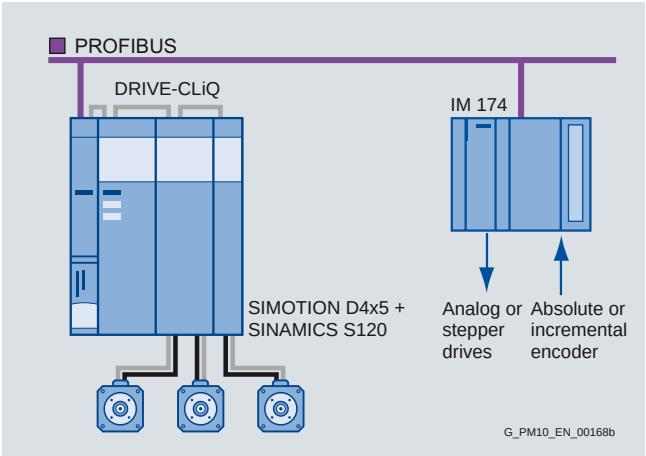
Up to four drives with analog setpoint interfaces can be operated on each of these modules. The isochronous PROFIBUS DP is used for coupling to SIMOTION.

The following can be connected:

- Electrical servo drives
  with analog ±10 V setpoint interface
- Hydraulic drives
  with analog ±10 V setpoint interface (e.g. for servo hydraulic valve)
- Stepper drives
  with pulse/direction interface (IM 174 Interface Module only)

ADI 4 and IM 174 can also be used for external encoders; at least one axis must be created.

Mixed operation of the 4 drive interfaces is possible.



Connection of an IM 174 to a SIMOTION D module via PROFIBUS DP

Integration

The modules are not certified PROFIBUS DP standard slaves and can therefore only be used in combination with the controllers intended for this purpose (e.g. SIMOTION C/P/D). The modules do not support acyclic communication and the I/O interfaces can only be used in combination with the encoder or drive functions.

ADI 4 and IM 174 must be operated on an isochronous PROFIBUS DP.
Supported PROFIBUS DP cycles:

- ADI 4: 1 ms and above (isochronous, max. 12 Mbit/s)
- IM 174: 1.5 ms and above (isochronous, max. 12 Mbit/s)

Design

Interfaces

Display and diagnostics

- Onboard status display on 4 diagnostics LEDs

Drive interfaces

- 4 analog outputs ±10 V for connecting drives with analog setpoint interface
- For IM 174 only: 4 interfaces for controlling stepper drives with or without encoder connection
- 4 relay contacts for drive enable axes 1 to 4

Encoder interfaces

- 4 encoder inputs for position acquisition. Each input can be connected either to an RS422 incremental encoder or to an SSI absolute encoder.
  Encoders with SINE/COSINE signals (1 V_{pp}) can be connected using external pulse shaping electronics (EXE) which convert the signals to the 5 V TTL level.

Communication

- PROFIBUS DP interface with Motion Control functionality (isochronous, max. 12 Mbit/s)

Digital inputs and outputs

- 10 DI, 24 V DC (e.g. for BERO, probe and "Drive Ready" signal)
- 8 DO, 24 V DC, 0.5 A (e.g. for drive enable)

Additional interfaces

- 2 relay contacts for "Ready" signal

An external power source (24 V DC) is required for supplying the module and the digital outputs.

All connections are at the front panel.

Function

The following functions are available in connection with SIMOTION:

- Speed-controlled axes
- Position-controlled axes
- External encoder for SIMOTION (at least one axis must be configured)
- Homing over BERO or
- Homing over zero marks (non-distance-coded zero marks/ reference marks)
- Measuring over Sensor 1 and Sensor 2 (one edge, rising or falling)

Technical specifications

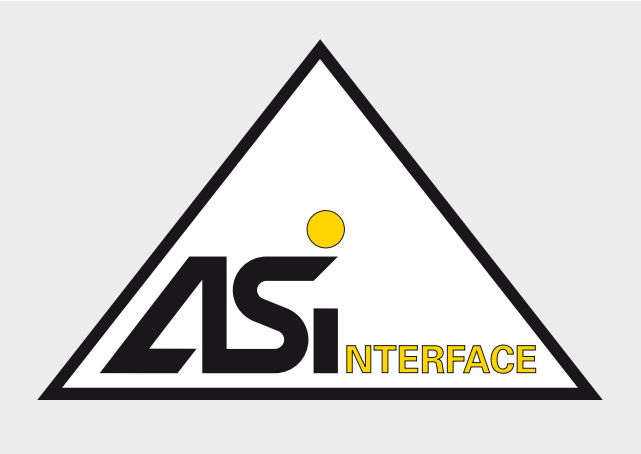
	ADI 4	IM 174
Input voltage	24 V DC	24 V DC
Power consumption, max.	30 W	typ. 12 W
Inputs/outputs	Isolated	Isolated
Relay contacts	Max. current carrying capacity: 2 A for 150 V DC or 125 V AC Switching cycles: - for 24 V DC, 1 A: 1×10^7 - for 24 V DC, 2 A: 1×10^5	Max. current carrying capacity: 1 A for 30 V DC Switching cycles: - for 30 V DC, 1 A: at least 5×10^5
Encoder inputs Can be used alternatively for incremental encoders (symmetrical) or absolute encoders (SSI)	4	4
Drive interfaces	4	4
• Analog drives (over analog output ± 10 V)	Yes	Yes
• Hydraulic drives (hydraulic valve over analog output, ± 10 V)	Yes	Yes
• Stepper drives (over pulse/direction interface)	No	Yes
Communication		
• PROFIBUS DP interfaces	1 (isochronous, max. 12 Mbit/s)	1 (isochronous, max. 12 Mbit/s)
• Minimum PROFIBUS DP cycle	1 ms	1.5 ms
Degree of protection to EN 60529	IP20	IP20
Condensation	Not permissible	Not permissible
Permissible ambient temperature		
• Storage	-20 ... +55 °C (-4 ... +131 °F)	-40 ... +70 °C (-40 ... +158 °F)
• Transportation	-40 ... +70 °C (-40 ... +158 °F)	-40 ... +70 °C (-40 ... +158 °F)
• Operation	0 ... +55 °C (+32 ... +131 °F)	0 ... +60 °C (+32 ... +140 °F)
Design	Housing in booksize format; fixed by screwing	SIMATIC S7-300 design (no backplane bus, connected over PROFIBUS)
Weight, approx.	1.5 kg (3.31 lb)	1 kg (2.21 lb)
Dimensions (W × H × D)	48.5 × 325 × 154.4 mm (1.91 × 12.80 × 6.08 in)	160 × 125 × 118 mm (6.30 × 4.92 × 4.65 in)

Selection and ordering data

Description	Order No.
SINUMERIK Analog Drive Interface for 4 Axes ADI 4	**6FC5211-0BA01-0AA4**
SIMATIC Interface Module IM 174	**6ES7174-0AA10-0AA0**
Accessories	
Front connector with screw-type contacts 40-pole, 100 units	**6ES7392-1AM00-1AB0**
Front connector with spring-loaded contacts 40-pole, 100 units	**6ES7391-1BM01-1AB0**
Front connector Fast Connect 40-pole, 1 unit	**6ES7392-1CM00-0AA0**

AS-Interface

Overview



An important characteristic of the AS-Interface technology is the use of an unshielded two-core cable for data transmission and distribution of auxiliary power to the sensors and actuators. The special AS-Interface power supply unit supports the AS-Interface transmission method. The mechanically coded and thus polarized AS-Interface cable is used for wiring. The AS-Interface Modules are connected to the AS-Interface cable with insulation piercing contacts.

The ASIsafe concept supports direct integration of safety-related components, such as EMERGENCY-STOP switches, protective door switches or safety light arrays, in the AS-Interface network.

Application

Process or field communication

Complex control cable wiring in the control cabinet and control cabinets full of terminal blocks can be replaced with AS-Interface. Thanks to a specially developed ribbon cable (easily recognized by its yellow color) and insulation piercing technology, the AS-Interface cable can be connected anywhere. This concept results in enormous flexibility and significant cost savings. AS-Interface is an open standard (EN 50295 / IEC 62026-2). Leading manufacturers of actuators and sensors worldwide support AS-Interface.

AS-Interface is used where individual actuators/sensors are spatially distributed over a machine (e.g. in a bottling plant or production line). AS-Interface replaces complex cable harnesses as well as connects binary and analog actuators and sensors such as proximity switches, measuring sensors, valves or indicator lights with a SIMOTION control. In practice this means: Installation runs smoothly because data and power are transported together over a single line. No special expertise is required for installation and commissioning. Furthermore, through simple cable laying, the freely configurable network topology as well as the special design of the cable, you not only significantly reduce the risk of errors, but also service and maintenance costs.

Application (continued)

Safety included

The ASIsafe concept supports direct integration of safety-related components, such as EMERGENCY-STOP switches, protective door switches or safety light arrays, in the AS-Interface network. These are fully compatible with the other AS-Interface components (masters, slaves, power supply units, repeaters, etc.) and are operated together on the yellow AS-Interface cable.

The signals of the safety sensors are evaluated by a safety monitor. The safety monitor not only monitors the switching signals of the safety sensors, but also continuously checks whether data transmission is functioning properly. Depending on the variant, the safety monitor has one or two release circuits which are used to put the machine or plant into a safe state. Each release circuit has two switching contacts to fulfill Safety Category 4 in accordance with EN 954-1 or SIL 3 to IEC 61508. Sensors and monitor can be connected at any point in the AS-Interface network. It is also possible to use several safety monitors on a single network.

A fail-safe control or special master is not necessary. The master treats safety slaves in the same way as all other slaves. The safety data is evaluated in the safety monitor. In this way, existing AS-Interface networks can also be expanded.

Design

AS-Interface network topology

AS-Interface is a single master system. A communications processor (CP 343-2 P), which controls the process or field communication as a master, is used for central application with SIMOTION C or distributed applications over SIMATIC ET 200M. The DP/AS-Interface Link 20E and DP/AS-Interface Link Advanced are used to establish a direct connection between AS-Interface and PROFIBUS DP.

IE/AS-Interface Link PN IO can also be used to connect AS-Interface to PROFINET.

The gateways enable AS-Interface to be used as a subnet for PROFIBUS DP or PROFINET on SIMOTION.

Up to 62 slaves can be operated on the AS-Interface. SIMOTION supports all digital and analog AS-Interface slaves (with Analog Profile 7.3 and higher).

The maximum extension of an AS-Interface network is 200 m (656 ft) (with AS-i extension plug) or 100 m (328 ft) (without AS-i extension plug). This length can be increased with the help of repeaters.

The following AS-Interface masters are available for SIMOTION:

- DP/AS-Interface Link 20E and DP/AS-Interface Link Advanced connect PROFIBUS DP to AS-Interface.
- The IE/AS-Interface Link PN IO connects PROFINET IO with AS-Interface.
- The CP 343-2 P is the AS-Interface master for central application with SIMOTION C or for the SIMATIC ET 200M distributed I/O system.

DP/AS-Interface Link Advanced and IE/AS-Interface Link PN IO support particularly easy diagnostics and commissioning on site over the integrated pixel graphics display and control keys or over the web interface using a standard browser.

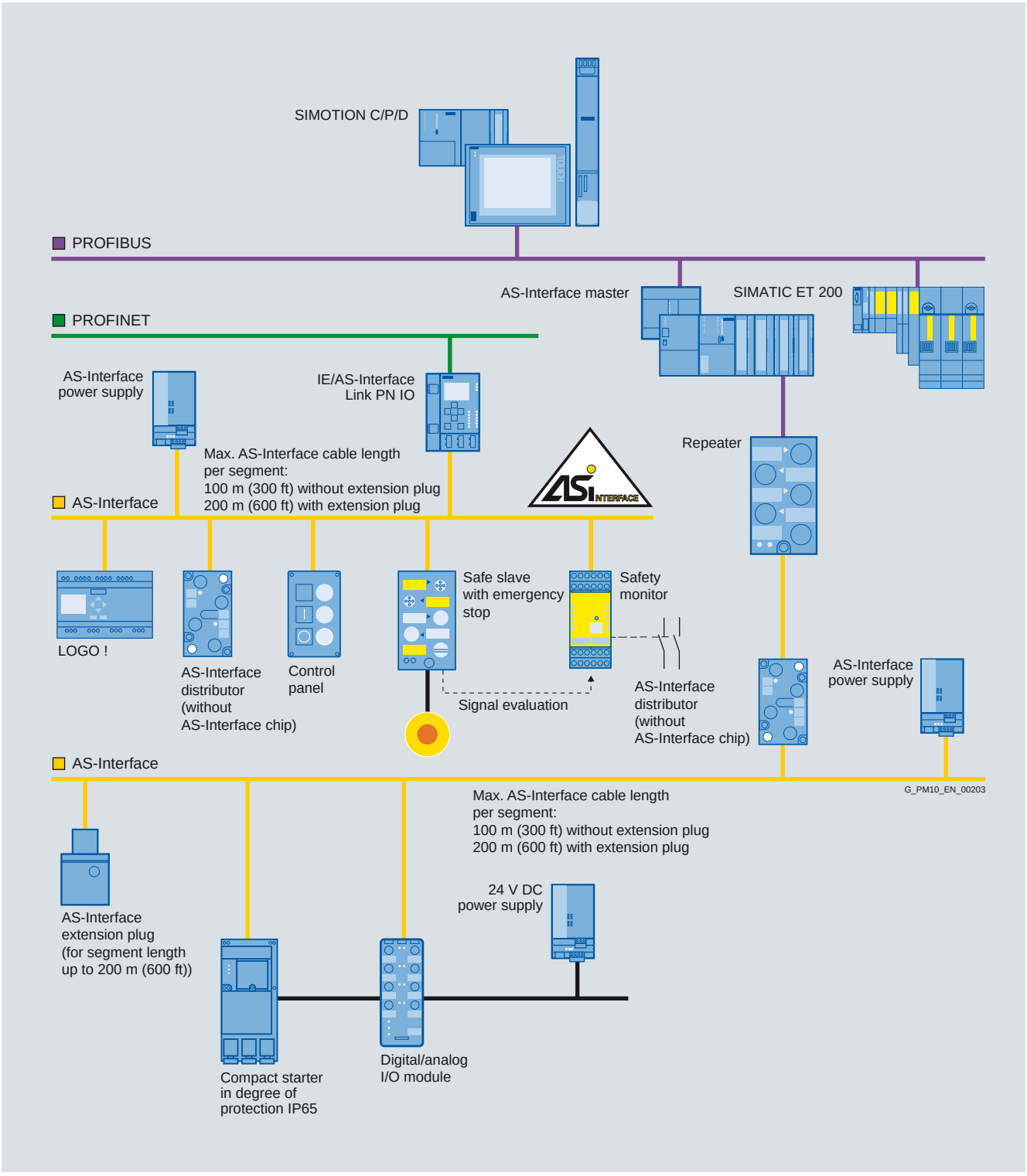
The modules operate in compliance with the latest AS-i specification 3.0 and therefore also support the operation of digital A/B slaves with 4 inputs and 4 outputs as well as analog A/B slaves.

If the optional C-PLUG is used, modules can be replaced without the need to set PROFIBUS or Ethernet addresses.

The SCOUT command library contains standard functions for easy handling of the AS-Interface components, e.g.

- for operating the command interface of the AS-Interface master
- for reading out the diagnostic information from the ASIsafe safety monitor

Design (continued)



Selection and ordering data

Description	Order No.
DP/AS-Interface Link 20E Router between PROFIBUS DP and AS-Interface specification V3.0 with IP20 degree of protection	**6GK1415-2AA10**
IE/AS-Interface LINK PN IO; Router between Industrial Ethernet and AS-Interface with master profiles M3, M4 in accordance with extended AS-Interface specification V3.0 for integration in PROFINET IO; IP20 degree of protection	
• Single master with display	**6GK1411-2AB10**
• Dual master with display	**6GK1411-2AB20**
DP/AS-Interface Link Advanced Router between PROFIBUS DP and AS-Interface; master profiles M3 and M4, extended AS-Interface specification V3.0; IP20 degree of protection	
• Single master with display	**6GK1415-2BA10**
• Dual master with display	**6GK1415-2BA20**
C-PLUG Swap medium for easy replacement of the devices in the event of a fault; for storing configuration data or engineering data and user data	**6GK1900-0AB00**
RS 485 bus connector with angled cable outlet (35°) With screw-type terminals, without PG interface	**6ES7972-0BA42-0XA0**
IE FC RJ45 Plug 90 RJ45 plug-in connector for Industrial Ethernet with a rugged metal housing and integrated insulation displacement contacts for connecting Industrial Ethernet FC installation cables; with 90° cable outlet	
• 1 pack = 1 unit	**6GK1901-1BB20-2AA0**
• 1 pack = 10 units	**6GK1901-1BB20-2AB0**
• 1 pack = 50 units	**6GK1901-1BB20-2AE0**
CP 343-2 P **Communications processor** For connecting SIMOTION C and SIMATIC ET 200M to AS-Interface; without front connector	**6GK7343-2AH11-0XA0**
Front connector suitable for CP 343-2 P	
with screw-type contacts	
• 20-pole, 1 unit	**6ES7392-1AJ00-0AA0**
• 20-pole, 100 units	**6ES7392-1AJ00-1AB0**
with spring-loaded contacts	
• 20-pole, 1 unit	**6ES7392-1BJ00-0AA0**
• 20-pole, 100 units	**6ES7392-1BJ00-1AB0**
with Fast Connect	
• 20-pole, 1 unit	**6ES7392-1CJ00-0AA0**

More information

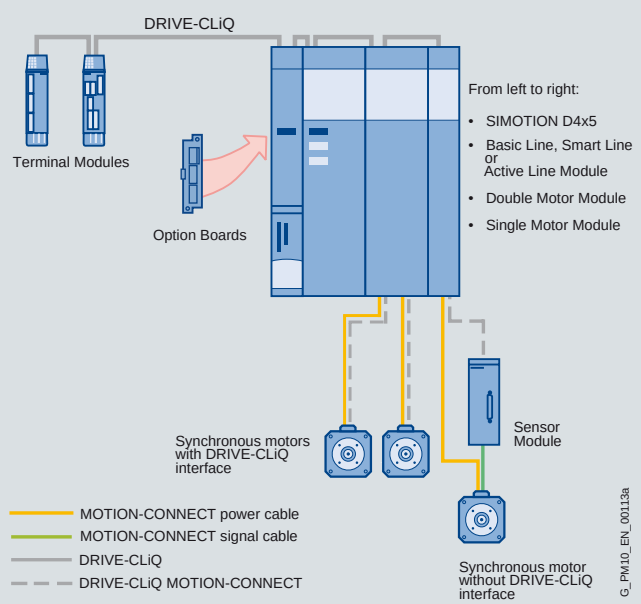
For further information about AS-Interface slaves, ASIsafe and ordering data, see Catalog IK PI and the Industry Mall under Automation technology/Industrial Communication/... and on the Internet at:

www.siemens.com/as-interface

DP/AS-Interface manuals are available as PDF files at:

http://support.automation.siemens.com/WW/view/en/22502402

Overview



SINAMICS drive I/O

With the modules of the SINAMICS drive I/O, the SIMOTION Motion Control system as well as the SINAMICS S120 drive system can be expanded with digital and analog inputs and outputs as well as encoder interfaces. The following modules are available:

- TB30 Terminal Board that is plugged into the option slot of the SINAMICS CU320/CU320-2/SIMOTION D4x5 Control Unit. It provides additional digital and analog inputs and outputs.
- TM Terminal Modules that are connected to SINAMICS/SIMOTION over DRIVE-CLiQ. The Terminal Modules expand SINAMICS/SIMOTION with additional digital and analog inputs/outputs.
- SMC/SME Sensor Modules that are connected to the SINAMICS/SIMOTION Control Unit over DRIVE-CLiQ. The SMC Sensor Modules (for control cabinet installation) and SME (IP67 version for installation outside the control cabinet) are required if motors are to be connected without DRIVE-CLiQ and/or if other encoders must be evaluated in addition to the motor encoder.

Connection to SINAMICS/SIMOTION

The modules of the SINAMICS drive I/O are connected to SINAMICS/SIMOTION over DRIVE-CLiQ. The only exception is the TB30 Terminal Board, which is plugged directly into the SINAMICS or SIMOTION Control Unit as a plug-in card.

DRIVE-CLiQ is used to connect SINAMICS Control Units and SIMOTION controllers to other drive-based components, such as Line Modules, Motor Modules, motors and encoders. Setpoints and actual values, control commands, status messages and electronic nameplate data for the connected components are transferred via DRIVE-CLiQ.

Benefits

- DRIVE-CLiQ significantly simplifies commissioning and diagnostics since all connected components are identified with the help of an electronic nameplate.
- The standardized cables and connectors reduce the variety of different parts and cut storage costs.

Application

TB30 Terminal Board

Fields of application

Expansion of the Control Unit with additional digital and analog inputs/outputs. (Plug-in Module for option slot of SIMOTION D4x5/SINAMICS S120 CU320/CU320-2 Control Unit)

Main features

4 DI, 4 DO, 2 AI, 2 AO

TM15/TM17 High Feature Terminal Modules

Fields of application

Implementation of measuring inputs and output cams as well as drive-related digital inputs and outputs with short signal delay times (TM17 High Feature can only be used in connection with SIMOTION)

Main features of TM15

24 isolated, bidirectional DI/DO with measuring input and cam functionality (measuring input and output cam functionality is available only in connection with SIMOTION)

Main features of TM17 High Feature

16 non-isolated, bidirectional DI/DO with measuring input and output cam functionality for the highest requirements with respect to resolution, accuracy and short input delay times. In addition, enabling inputs can be parameterized.

TM31 Terminal Module

Fields of application

Expansion of digital and analog inputs and outputs over DRIVE-CLiQ

Main features

- 8 DI, 4 bidirectional DI/DO, 2 relay outputs
- 2 AI, 2 AO
- 1 temperature sensor input (KTY84-130 or PTC)

TM41 Terminal Module

Fields of application

The TM41 Terminal Module is used for incremental encoder emulation. A master value (incremental signal) can be made available to a second control unit as an external encoder signal via the TM 41.

Main features

- 4 DI, 4 DI/O
- 1 AI
- 1 interface for TTL incremental encoder emulation (RS422)

TM54F Terminal Module

Fields of application

The TM54F provides safe digital inputs and outputs for controlling the Safety Integrated functions of SINAMICS.

Main features

- 4 fail-safe digital outputs (F-DO)
- 10 fail-safe digital inputs (F-DI)

Application (continued)

SMC10/SMC20/SMC30 Sensor Modules

Fields of application

Motor encoder and temperature evaluation of motors without DRIVE-CLiQ or when additional encoders are used (for example, machine encoders)

Main features of SMC10

One encoder connection for evaluating the resolver signals (two-pole and multi-pole). In addition, the motor temperature can be monitored with a KTY84-130 or PTC thermistor.

Main features of SMC20

One encoder connection for evaluating

- Incremental encoders (sin/cos 1 V_{pp})
- Absolute encoders (EnDat 2.1) and
- SSI encoders with incremental signals (sin/cos 1 V_{pp})

In addition, the motor temperature can be monitored with a KTY84-130 or PTC thermistor.

Main features of SMC30

One encoder connection for evaluating

- Incremental encoders (TTL/HTL), and
- SSI encoders with and without incremental signals (TTL/HTL)

In addition, the motor temperature can be monitored with a KTY84-130 or PTC thermistor.

SME20/SME25 Sensor Modules External

Fields of application

SME20/SME25 Sensor Modules External are encoder evaluation units for machine encoders (direct measuring systems). The devices are designed with IP67 degree of protection. This means that the units can be installed outside the control cabinet near the machine encoder.

Main features of SME20

One encoder connection for evaluating incremental encoders (sin/cos 1 V_{pp}) without rotor position track (C and D tracks).

Main features of SME25

One encoder connection for evaluating absolute encoders (EnDat) and SSI absolute encoders with incremental signals (sin/cos 1 V_{pp}).

SME120/SME125 Sensor Modules External

The SME120/SME125 Sensor Modules External are encoder evaluation units with IP67 degree of protection, especially suitable for use in linear and torque motor applications in which the temperature signals must be reliably electrically isolated from the encoder signals and the 24 V supply. They can be installed close to the motor systems and encoders in the machine.

Main features of SME120

One encoder connection for evaluating incremental encoders (sin/cos 1 V_{pp}).

Main features of SME125

One encoder connection for evaluating absolute encoders (EnDat).

With SME120 and SME125, the motor temperature can also be detected using KTY84-130 or PTC thermistors.

DMC20 DRIVE-CLiQ Hub Module

Fields of application

The DMC20 can be used to increase the number of DRIVE-CLiQ interfaces.

Main features

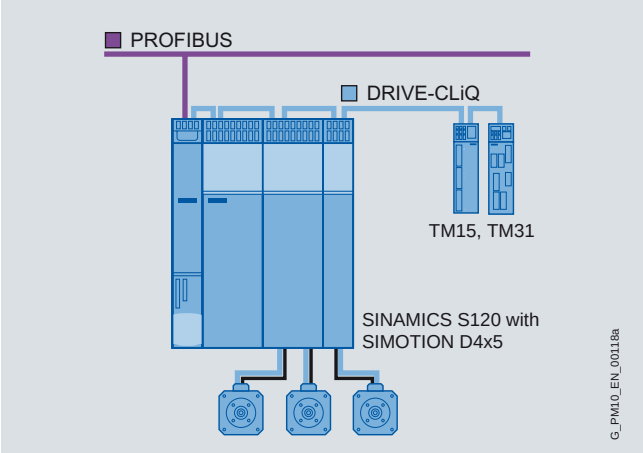
DRIVE-CLiQ hub with 6 DRIVE-CLiQ sockets for connecting 5 additional DRIVE-CLiQ nodes.

Integration

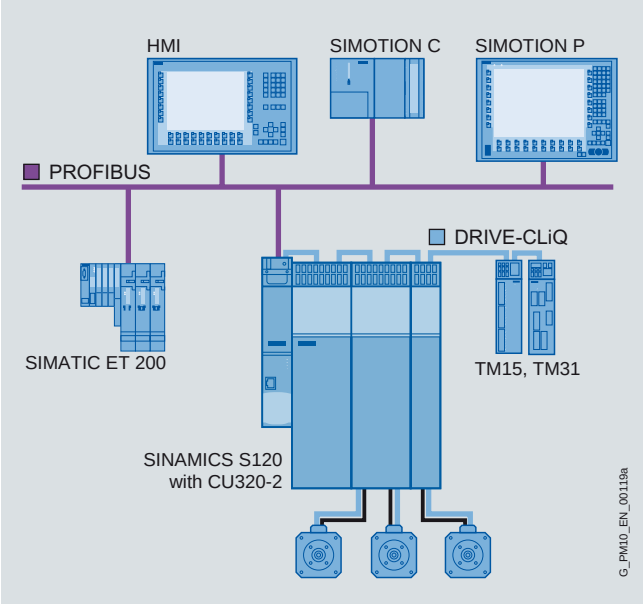
Integration of the SINAMICS drive I/O in a SIMOTION system

Two main options are available for SIMOTION for integrating the SINAMICS drive I/O via DRIVE-CLiQ:

- System configuration with integrated drives:
  In this configuration, the drive I/O are connected directly to SIMOTION D or to the CX32 Controller Extension (not shown in the figure).
- System configuration with external drives:
  In this configuration, the drive I/O are connected to a SINAMICS CU310 or CU320/CU320-2 Control Unit, which is connected to
  - SIMOTION C, P or D (see figure) via PROFIBUS DP, or
  - SIMOTION P or D via PROFINET IO.



Coupling of TM15 and TM31 with SIMOTION D4x5



Coupling of TM15 and TM31 with SIMOTION C, P over CU320-2

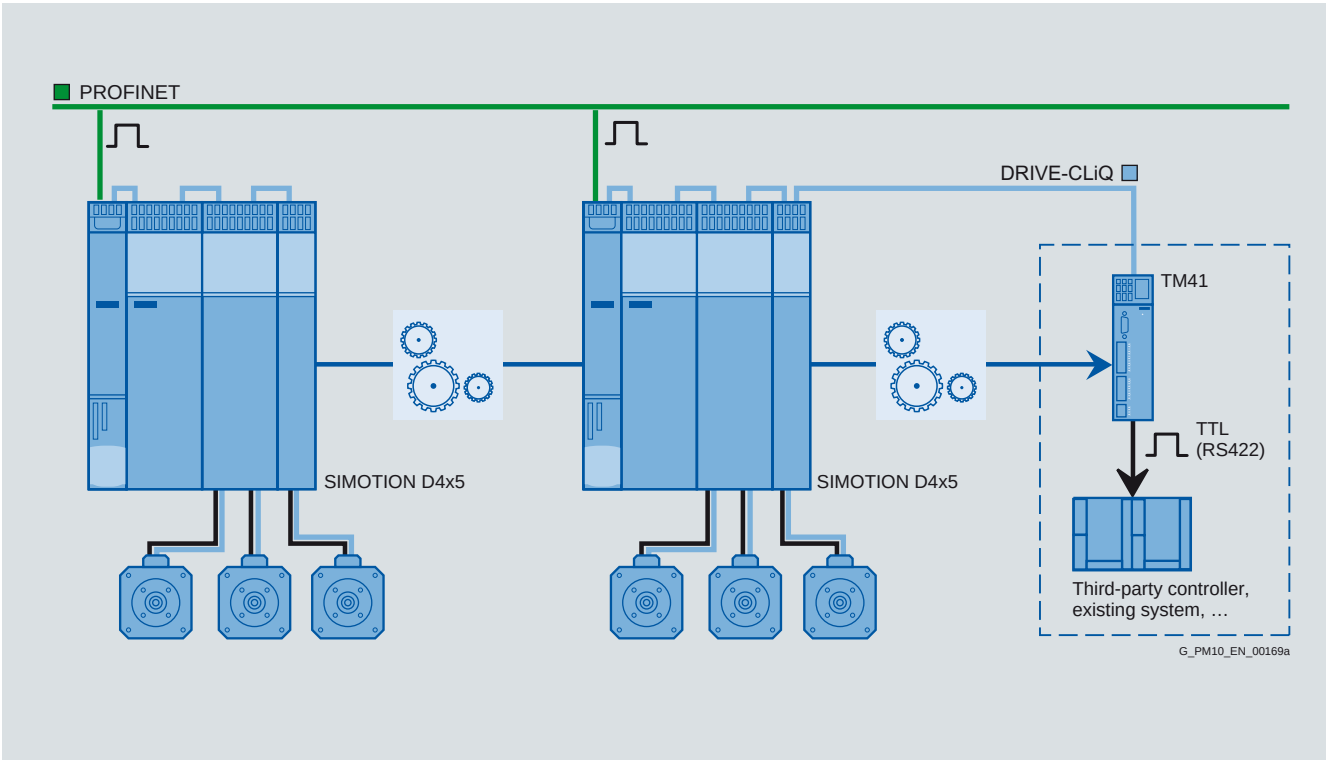
10

Integration (continued)

Use of the TM41 as incremental encoder emulation

The TM41 Terminal Module supplies TTL signals for incremental encoder emulation, e.g. for a higher-level control. The encoder interface (incremental encoder emulation) can be linked to an encoder signal from the Control Unit, e.g. incremental encoder sin/cos, by parameter assignment.

Alternatively, as far as SIMOTION is concerned, TM41 can be handled in the same manner as an axis. This allows you to return the axis position (a master value) as an encoder signal to a second controller, for example.



TM41 Terminal Module as incremental encoder emulation

Overview

Terminal Modules TM15 (left) and TM17 High Feature (right)

TM15 and TM17 High Feature Terminal Modules provide the measuring inputs and output cams for the Motion Control System SIMOTION. Furthermore, the Terminal Modules provide drive-related digital inputs and outputs with short signal delay times.

The "Measuring input", "Cam" and "Cam Track" technology objects support easy integration in SIMOTION.

Application

The main field of application for the TM15 and TM17 High Feature Terminal Modules are applications which in addition to digital inputs and output cams require very accurate measuring inputs and output cams. Several measuring inputs or output cams can be assigned to a real axis, virtual axis, or external encoder.

Examples for precise sensing with binary signals:

- Edge detection
- Quality monitoring (e.g. product is good/bad)
- Product tracing (e.g. product is available/not available)
- Detection of print marks
- Print mark correction
- Tool monitoring (e.g. for presses)
- Machine status monitoring (e.g. for broken threads in the textile industry)

Examples for precise output of binary signals

- Position-dependent switching of actuators
  - Camera trigger signal (quality assurance)
  - Control of an air nozzle for blowing away cut-offs
  - Controlling a nozzle for applying glue
- Product extraction from production line
- Implementation of line Motion Control systems
- Output of pulse patterns

Design

Interfaces

Display and diagnostics

- The status of the TM15 and TM17 High Feature Terminal Modules is indicated via a multi-color LED.
- The logical status of a channel is indicated with the corresponding green status LED.

Interfaces for I/O

- TM15: 24 DI/DO, parameterizable channel-by-channel
- TM17 High Feature: 16 DI/DO, parameterizable channel-by-channel

Communication

- 2 DRIVE-CLiQ sockets

Power supply

- Connection for the electronic power supply over the 24 V DC infeed connector

Installation

The signal cable shield is connected to the TM15 and TM17 High Feature Terminal Modules with a shield connection terminal, e.g. type SK8 by Phoenix Contact or type KLBÜ CO 1 by Weidmüller.

The TM15 and TM17 High Feature Terminal Modules are snapped onto a standard mounting rail according to EN 50022 (35 × 15 / 7.5).

TM15 and TM17 High Feature Terminal Modules

Function

Each of the 24 DI/DO (TM15) or 16 DI/DO (TM17 High Feature) can be parameterized channel-by-channel as:

- Digital input (DI) or digital output (DO)
- Measuring input
- Output cam

Each channel can also be inverted, as required.

Parameterization is performed with the SIMOTION SCOUT engineering software.

Parameterization of the TM17 High Feature Terminal Module

The differences between the TM15 and TM17 High Feature Terminal Modules depend on the field of application. TM17 High Feature has fewer I/O channels than TM15, but more functionality.

TM17 High Feature is distinguished by especially high resolution and accuracy as well as a parameterizable input filter and enabling inputs.

Parameterized enable inputs can enable measuring inputs or output cams (gate function).

- Level-controlled enable for measuring inputs
- Level or edge-controlled enable for output cams

TM17 High Feature also supports cyclic measuring of up to 2 edges per servo/interpolator cycle.

Due to their high accuracy, the DI/DO channels of the TM17 High Feature are non-isolated.

Integration

The TM15 and TM17 High Feature Terminal Modules are connected directly to SIMOTION D via DRIVE-CLiQ. Alternatively, TM15 and TM17 High Feature Terminal Modules can be connected to a SINAMICS CU310 or CU320/CU320-2 Control Unit, which is connected to

- SIMOTION C, P or D via PROFIBUS DP, or
- SIMOTION C, P or D via PROFINET IO

The number of Terminal Modules which can be used depends on the number of axes configured with SIMOTION D, CU310, CU320/CU320-2 or CX32 as well as the functionality configured for TM15 and TM17 High Feature.

For further information, refer to the TM15 and TM17 High Feature Terminal Modules commissioning manual.

Note:

TM17 High Feature can only be used on a SINAMICS CU310 or CU320/CU320-2 Control Unit in combination with the SIMOTION Motion Control system.

Selection and ordering data

Description	Order No.
TM15 Terminal Module 24 DI/DO; 24 V DC/0.5 A (without DRIVE-CLiQ cable)	**6SL3055-0AA00-3FA0**
TM17 Terminal Module High Feature 16 DI/DO; 24 V DC/0.5 A (without DRIVE-CLiQ cable)	**6SL3055-0AA00-3HA0**

Technical specifications

General data	TM15 Terminal Module	TM17 High Feature Terminal Module
Power supply (rated value)	24 V DC	24 V DC
Current consumption (no-load), max.	0.15 A	0.2 A
Power loss, max.	3 W	4 W
Conductor cross-section, max.	2.5 mm^2	2.5 mm^2
Number of DRIVE-CLiQ interfaces	2	2
I/O		
• Digital inputs/outputs	24 DI/DO, parameterizable channel-by-channel	16 DI/DO, parameterizable channel-by-channel
• Isolation	Yes, in groups of 8	No
• Connections	Plug-in screw-type terminals	Plug-in screw-type terminals
• Conductor cross-section, max.	1.5 mm^2	1.5 mm^2
Digital inputs	Each channel can be parameterized as: Digital input/measuring input	Each channel can be parameterized as: Digital input/measuring input/enabling input (max. 6 units)
Input voltage (rated value)	24 V DC	24 V DC
• For signal 0 min.	-30 V	-30 V
max.	5 V	5 V
• For signal 1 min.	15 V	15 V
max.	30 V	30 V
Input delay		
at rated value of input voltage	0 → 1 / 1 → 0: typical 50 µs / 100 µs	1 µs / 125 µs ±15 % (parameterizable in 2 steps)
Measuring input function		
• Accuracy	±125 µs	≤ ±1 µs
• Resolution	125 µs	1 µs
Digital outputs	Each channel can be parameterized as: Digital output/output cam The logical status of the digital outputs can be read back for diagnostic purposes	Each channel can be parameterized as: Digital output/output cam The logical status of the digital outputs can be read back for diagnostic purposes
Output voltage (rated value)	24 V DC	24 V DC
Sustained-short-circuit-proof	Yes	Yes
Output current per channel	0.5 A	0.5 A
Aggregate current of outputs (per group)		
• Up to 60 °C (140 °F), max.	2 A	2 A
• Up to 50 °C (122 °F), max.	3 A	3 A
• Up to 40 °C (104 °F), max.	4 A	4 A
Output delay (ohmic load)		
At 0 to 1		
• Typical	50 µs	50 µs
• Max.	100 µs	100 µs
At 1 to 0		
• Typical	150 µs	75 µs
• Max.	225 µs	150 µs
Cam function		
• Accuracy	±125 µs	≤ ±10 µs
• Resolution	125 µs	1 µs
Weight, approx.	0.86 kg (1.90 lb)	0.86 kg (1.90 lb)
Dimensions		
• Width	50 mm (1.97 in)	50 mm (1.97 in)
• Height	150 mm (5.91 in)	150 mm (5.91 in)
• Depth	111 mm (4.37 in)	111 mm (4.37 in)
Approvals, according to	UL and cULus	UL and cULus

SIPLUS extreme

Overview

SIPLUS extreme is the product family with hardened/specially designed components based on standard products (e.g. SIMATIC S7, SIMATIC ET 200, MICROMASTER, POSMO A). SIPLUS permits distributed use of automation components, even under demanding environmental conditions.

- Ambient temperature range from -40/-25 °C (-40/-13 °F) to +60/+70 °C (+140/+158 °F)
- Condensation, increased humidity, increased degree of protection (dust, water)
- Extreme atmospheric exposure, e.g. toxic atmospheres
- Increased mechanical load, increased noise immunity
- Voltage ranges deviating from the standard
- Sector-specific solutions

More information

For further information on SIPLUS, see:

www.siemens.com/siplus

SIMATIC RFID systems

Overview

SIMATIC RFID systems control and optimize the material flow. They identify reliably, quickly and economically, are unaffected by contamination and store data directly on the product.

The data exchange between the tag (mobile data memory) and the reader (write/read device) is fully automatic and contactless by means of radio frequencies (RF) and does not require a direct line of sight.

SIMATIC RFID systems are available for different fields of application, e.g. for smart labels (ultra-slim data memory) for logistics, rugged tags for production lines or "long-range" tags for locating and localization.

For user-friendly, standardized data exchange between the SIMOTION system and the standard profile RFID systems (PIB = Proxy Ident Block), function blocks (FB) are available in the SCOUT command library. This standard profile is, for example, supported by the SIMATIC RFID system ASM 456, which is connected to SIMOTION over PROFIBUS DP.

More information

For further information on SIMATIC RFID systems, see:

http://www.siemens.com/simatic-sensors/rf

SIMATIC Machine Vision

Overview

Visual inspection and recognition of products in manufacturing is becoming more important because the demands on quality and production speed are increasing. The advantages:

- Increased productivity
- Reliable, automatic visual inspection saves time and costs
- Optimization of the material flow
- Reduced machine standstill times

The intelligent SIMATIC MV220, MV230, MV420, MV440, VS 120 and VS 130 vision sensors have been developed especially for application-specific image processing. Thanks to their user-friendly operation, no special image processing knowledge is required since the intelligent vision sensors are trained rather than programmed.

More information

For further information on Machine Vision, see:

www.siemens.com/simatic-sensors/vs

SIWAREX Weighing systems

Overview

Wherever forces or weights have to be measured in automation and process engineering today, modern weighing systems are involved in monitoring and controlling the different production sequences.

They are used in simple applications for monitoring forces, detecting fill levels of containers and even in complex portioning tasks such as filling containers with liquid and bagging solid material.

In the case of the SIWAREX FTA Weighing module in SIMATIC S7-300 design, the function block (FB) is an integral component of the SCOUT command library. SIWAREX FTA is therefore the optimum solution for applications that can be calibrated such as filling systems, loading stations, bagging stations, rotary packers or inspection stations.

Apart from SIWAREX FTA, the SIMATIC S7-300 module SIWAREX U as well as the SIMATIC ET 200S modules SIWAREX CS and SIWAREX FTC are available for simple applications such as load and force measurements for SIMOTION.

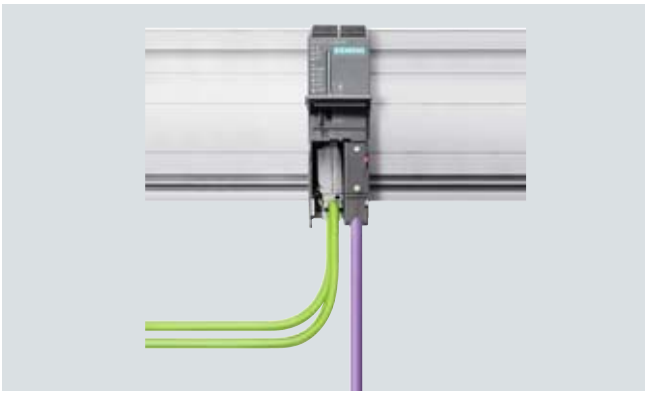
More information

For further information on SIWAREX weighing systems, see:

www.siemens.com/siwarex

PROFIBUS DP / PROFINET IO Devices

Overview



The PROFIBUS DP fieldbuses and the PROFINET IO Devices are powerful, open and rugged bus systems for fast, cyclic data exchange between field devices. The openness of PROFIBUS DP or PROFINET IO permits connection of standard components from other manufacturers.

In addition to the I/O modules approved for SIMOTION, all certified standard slaves or PROFINET IO Devices can, in principle, be connected to SIMOTION if they support PROFIBUS DP with:

- cyclic data traffic (DP-V0) and, possibly,
- acyclic data traffic (DP-V1) or
- isochronous data traffic (DP-V2)

and PROFINET IO

- Real-time communication (RT) or
- Isochronous Real-time Communication (IRT)

These modules are integrated via the GSD file or GSDML file of the respective device manufacturer. Please note that in individual cases further boundary conditions must be fulfilled in order to integrate standard slaves or PROFINET IO Devices into SIMOTION. Thus, "driver modules" that permit or simplify a linking, for example, in the form of function blocks, are required for some modules.

More information

For further information about industrial communication and field devices, see Catalog IK PI and the Industry Mall under Automation technology/Industrial Communication/... and on the Internet at:

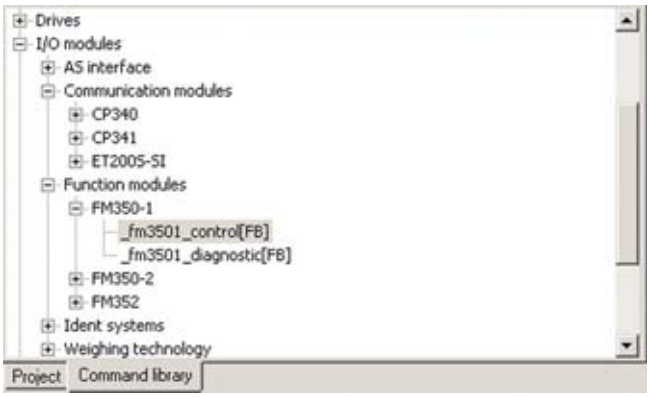
www.siemens.com/simatic-net

A list of all the I/O modules that can currently be used with SIMOTION (centralized, distributed PROFIBUS/PROFINET, DRIVE-CLiQ) is available under the following link:

http://support.automation.siemens.com/WW/view/en/11886029

Function blocks for I/O modules

Overview



Function blocks for I/O modules are available as an integral component of the SCOUT command library. The function blocks are easily copied into the application program by means of drag & drop. Sample programs are also provided in SIMOTION Utilities & Applications which demonstrate integration of the function blocks. SIMOTION Utilities & Applications are included in the scope of supply of SIMOTION SCOUT.

Function blocks are available in the SCOUT command library for the following I/O modules:

- SIMODRIVE POSMO A, intelligent positioning motor
- FM 350-1, single-channel Counter Module
- FM 350-2, 8-channel Counter Module
- FM 352, cam controller
- CP 340, Communication Module
- CP 341, Communication Module
- SIWAREX FTA, Weighing Module
- SIMATIC ET 200S, 1SI serial Interface Module (3964R, ASCII)
- SIMATIC ET 200S, frequency converter
- ASM 456, RFID system
- AS-Interface master (function block for operation of the command interface)
- ASIsafe safety monitor (with one or two enabling circuits)

SIMOTION HMI devices

11/2 **Overview**

11/3 **Introduction**

11/4 **Mobile Panels**
11/4 SIMATIC Mobile Panel 177
11/4 SIMATIC Mobile Panel 277

11/5 **Touch Panels / Operator Panels**
11/5 SIMATIC TP 177B / SIMATIC TP 177B Widescreen / SIMATIC OP 177B
11/6 SIMATIC TP 277 / SIMATIC OP 277

11/7 **Multi Panels**
11/7 SIMATIC MP 177 / SIMATIC MP 277
11/8 SIMATIC MP 377

11/9 **Panel PCs**
11/9 SIMATIC HMI IPC477C
11/11 SIMATIC HMI IPC577C
11/13 SIMATIC HMI IPC677C

11/15 **SIMATIC WinCC flexible ES engineering software**

11/16 **SIMATIC WinCC flexible RT visualization software**

	Designation	Description	Page
Mobile devices			
	SIMATIC Mobile Panel 177	Mobile HMI devices for direct operator control of the plant and machine from any point 5.7" STN display with touch screen, 256 colors, 14 configurable function keys	**11/4**
	SIMATIC Mobile Panel 277	Mobile HMI devices for direct operator control of the plant and machine from any point 7.5"/10" TFT display with touch screen, 65536 colors, 18 configurable function keys	**11/4**
Touch Panels / Operator Panels			
	SIMATIC TP 177B SIMATIC TP 177B Widescreen SIMATIC OP 177B	Touch Panel/Operator Panel with comprehensive functionality for demanding machine visualization Universal entry-level device with 4.3" color TFT Widescreen or 5.7" STN display	**11/5**
	SIMATIC TP 277 SIMATIC OP 277	Touch Panel/Operator Panel with comprehensive functionality for demanding machine visualization Comprehensive functionality 5.7" TFT display	**11/6**
Multi Panels			
	SIMATIC MP 177	Multi Panels combine the rugged construction of Operator Panels with the flexibility of PCs 5.7"/10.4" TFT display and touch screen	**11/7**
	SIMATIC MP 277	Multi Panels combine the rugged construction of Operator Panels with the flexibility of PCs 7.5"/10.4" TFT display	**11/7**
	SIMATIC MP 377	Multi Panels combine the rugged construction of Operator Panels with the flexibility of PCs 12.1"/15.1"/19" TFT display	**11/8**
Panel PCs			
	SIMATIC HMI IPC477C	Industry-standard PC platform for PC-based automation Ultra-compact, rugged and maintenance-free	**11/9**
	SIMATIC HMI IPC577C	Industry-standard PC platform for PC-based automation Full PC-openness	**11/11**
	SIMATIC HMI IPC677C	Industry-standard PC platform for PC-based automation High performance, flexibility and safety	**11/13**
Engineering/visualization software SIMATIC WinCC flexible			
	SIMATIC WinCC flexible ES	Engineering tool for the configuration of SIMATIC HMI devices, of the SIMATIC Panel PCs as well as PLC-based visualization system WinCC flexible RT	**11/15**
	SIMATIC WinCC flexible RT	PC-based visualization software for single user systems directly at the machine	**11/16**

Overview

HMI devices

A finely graded range of HMI devices is available for local operator control and monitoring.

Mobile Panels

The portable HMI devices allow operator control and monitoring on the actual scene of the event with direct process access and visualization. They offer simple and secure hot-swapping and can be used flexibly on individual machines or with entire systems.

177/277 series graphics panels

The 177/277 series graphics panels have pixel graphic displays for realistic representation of process sequences (for 177B and higher also in color). They are available as touch panels (TPs) with touch-sensitive display or as operator panels (OPs) with membrane keyboard.

177/277/377 series Multi Panels

The 177/277/377 series Multi Panels can be used for operator control and monitoring in the same way as the panels, by means of touch screens or membrane keyboards. In addition, the Multi Panels (MPs) permit installation of additional applications and thus allow integration of several automation tasks on a single platform; for example, with PLC WinAC MP software.

Rugged and compact for use at machine level

With IP65/NEMA 4 degree of protection on the front side, high EMC and extreme vibration resistance, the SIMATIC HMI devices are ideally suited for use in rough industrial environments. Thanks to their compact design with a shallow mounting depth, the stationary HMI devices can be fitted anywhere, even where only restricted space is available.

The extremely rugged and shock-proof enclosure with IP65 degree of protection makes the Mobile Panels especially suitable for industrial applications. Their low weight and ergonomic design means they are user-friendly and easy to operate.

One configuration software for everything

SIMATIC WinCC flexible is the tool for continued configuration of all SIMATIC Panels as well as PC-based systems with the visualization software WinCC flexible Runtime. ProTool/PRO and ProTool Runtime are also available for PC-based systems.

Please note that the panels of the 177/277 and Mobile series can only be configured using WinCC flexible.

Various options are available for every task. The software permits simple and efficient configuration. Programming experience is not required.

Completed configurations can be reused within the family.

Innovative operator control and monitoring

The Mobile Panels, Panels and Multi Panels of the 177, 277 and 370 series, which are based on the Windows CE operating system, allow innovative operator control and monitoring combined with ruggedness, stability and simplicity. Standard hardware and software interfaces provide more flexibility and openness to the office world via the MMC/PC/CF card, USB, Ethernet, PROFIBUS DP, Visual Basic scripts or customer-specific ActiveX controls.

HMI software

With the SIMATIC WinCC flexible and SIMATIC WinCC product families, SIMATIC HMI offers visualization and configuration software for the entire spectrum.

SIMATIC WinCC flexible

is the continued further development of the SIMATIC HMI software products. WinCC flexible is an essential hub for HMI applications in automation (until now this has been covered by the ProTool family) with respect to configuration efficiency and new innovative automation concepts. For process-oriented plant and mechanical engineering as well as series production of machines, SIMATIC WinCC flexible 2008 also offers:

- Further productivity improvements (configuration efficiency) when creating HMI projects
- Implementation of innovative TCP/IP and web-based automation and HMI concepts
- Reduced downtime of the machines and systems through new service concepts
- Secure, flexible and world-wide access to process data
- New SIMATIC HMI devices
- Integration of WinCC flexible in SIMOTION SCOUT

Changing from the ProTool family to WinCC flexible is possible by simply converting the old configuration data to WCF. The ProTool family, however, will be available alongside WinCC flexible for the foreseeable future.

SIMATIC WinCC will remain the process visualization system for plant monitoring with single or multiple station solutions and the platform for IT & Business integration under Windows 2000 and XP Professional.

Connection of HMI systems from other manufacturers to SIMOTION via TCP/IP is possible with the MIIF technology package.

More information

Further information on HMI can be found in

- the Catalog ST 80
- the Industry Mall under Automation technology/SIMATIC HMI Operator Control and Monitoring Systems

or on the Internet at:

- www.siemens.com/panels
- www.siemens.com/panel-pc
- www.siemens.com/wincc-flexible

SIMATIC Mobile Panel 177
SIMATIC Mobile Panel 277

Overview

- Mobile HMI devices for direct operator control of the plant and machine from any point
- Support optimized monitoring of the workpiece or process providing at the same time direct access and direct line of sight to the HMI device
- Flexible implementation thanks to hot swapping
- Pixel graphics, brilliant 5.7" color STN display with touch screen (analog/resistive), 256 colors (MP 177)
- Pixel graphics, brilliant 7.5"/10" color TFT display with touch screen, 65536 colors (MP 277)
- PROFIBUS or PROFINET variants
- 14 user-configurable and user-label function keys (8 with LED) for MP 177
- 18 user-configurable and user-label function keys (18 with LED) for MP 277 7.5"
- 2 three-stage enabling buttons
- Communication is supported via a serial, MPI/PROFIBUS or PROFINET link
- Connection point detection
- Fast system availability after plugging into the junction box
- Connected to the PLC and power supply via the junction box and the connecting cable

Benefits

- Hot swapping without interruption of the emergency stop circuit (with connection box variant PLUS) and without the occurrence of bus faults
- Fast, accurate setup and positioning
- Ergonomic, compact and light-weight (approx. 1.3 kg)
- Rugged enough to withstand industrial use
- Graphics library available with off-the-shelf picture objects
- The data in the message buffer is retained without battery backup even when the Mobile Panel is disconnected from the supply
- Can be used worldwide:
  - 32 languages can be configured (incl. Asian and Cyrillic character sets)
  - Up to 5 languages can be selected online on MP 177
  - Up to 16 languages can be selected online on MP 277
- Reduction of service and commissioning costs through:
  - Backup/restore via a process interface or via a standard Multi Media Card
  - Updates of the configuration with automatic transfer recognition via all device interfaces
  - Long service life of the backlit display
- Simple engineering with comprehensive documentation on the SIMATIC HMI Manual Collection DVD

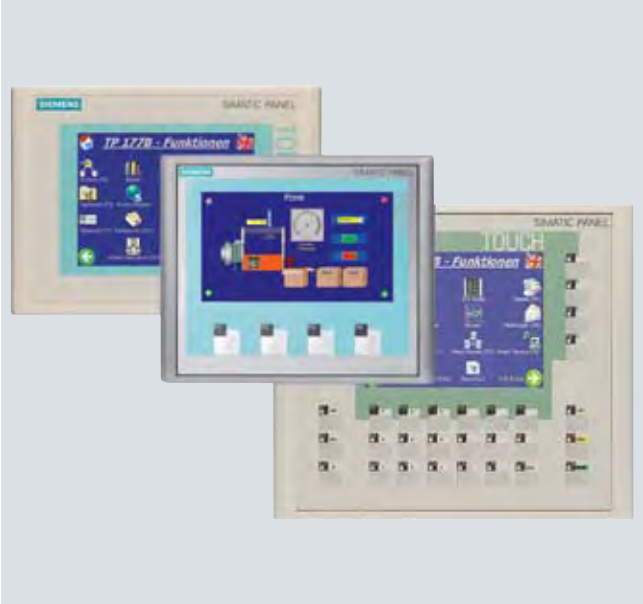
Application

Regardless of the industry or application, if mobility is required for the on-site control and monitoring of machines and plants, SIMATIC Mobile Panels offer many crucial advantages: The machine operators and commissioning engineers are therefore able to work exactly where they have the best view of the workpiece or process. Even with larger production facilities, complex or enclosed machines, long materials handling or production lines and conveyor systems, mobile HMI devices allow faster and more precise setting up and positioning during commissioning. They also ensure shorter downtimes during retooling, maintenance or repairs.

Design

- Ergonomic and compact with different holding and gripping points (suitable for right-handed and left-handed personnel)
- Pixel graphics brilliant color display with touch screen (analog/resistive)
- Freely configurable and user-label function keys with LED (not MP 277 10")
- The front is resistant to various oils, greases and standard detergents
- 2 three-stage enabling buttons
- Extremely impact-resistant due to twin-wall construction and rounded enclosure
- Dust-proof and jet-proof enclosure with IP65 degree of protection on all sides
- Slot for a standard Multi Media Card for backups and restoring or for storing recipes
- Connection to the PLC via the rugged and reliable junction boxes with IP65 degree of protection
  - BASIC junction box: Enables the STOP pushbutton to be integrated into the safety circuit
  - PLUS junction box: Enables the STOP pushbutton to be integrated into the safety circuit. The emergency stop circuit remains closed regardless of whether a Mobile Panel is plugged in or not. If the Mobile Panel is disconnected during operation, the emergency stop circuit in the junction box is automatically closed which prevents triggering of the emergency stop circuit.
- Fast system availability after plugging into the junction boxes:
  - By using an optional rechargeable battery pack, the connection boot-up time of the Mobile Panel – after a short period of separation from the junction box – can again be significantly reduced.
- Detection of the connection point can be used to perform machine-specific HMI authorizations or actions depending on the selected connection point

Overview



- Touch Panels TP 177B/TP 177B Widescreen and Operator Panel OP 177B for operator control and monitoring of machines and plants
- Touch/Key combination for OP 177B and TP 177B Widescreen
- Universal entry-level device in the touch panel class with graphics capability featuring an extensive range of functions
- Pixel graphics display with analog touch screen (analog/resistive)
  - 4.3" color TFT Widescreen (256 colors) or
  - 5.7" Blue mode/color STN (4 blue levels/256 colors)
- Configurable system keys for OP 177B and TP 177B Widescreen
- Interfaces for communication with SIMATIC S7 and SIMOTION are integrated (e.g. MPI, PROFIBUS DP, Ethernet interface for color variant)
- USB interface for I/O, e.g. for downloads, printer
- S5 controllers and PLCs from other manufacturers can be connected through easy-to-use drivers/converters

Benefits

- Integral component of Totally Integrated Automation (TIA): Increased productivity, minimized engineering, reduced lifecycle costs
- Reduction of service and commissioning costs through:
  - Backup/restore via a process interface, USB or via a standard Multi Media Card
  - Remote downloading of the configuration with automatic transfer recognition even via WAN (Wide Area Network) using TeleService adapter
  - Maintenance-free design (no battery) and long service life of the backlit display
- Non-volatile, maintenance-free message buffer
- Can be used worldwide:
  - 32 languages can be configured (incl. Asian and Cyrillic character sets)
  - Up to 16 online languages can be selected directly on the device
- Graphics library available with off-the-shelf picture objects
- Standard hardware and software interfaces for increased flexibility
- Standard Multi Media Card slot
  - Used for recipe data records and for backups of configuration/system data
- Integrated printer port
- Extensive documentation on the SIMATIC HMI Manual Collection DVD

Application

The TP/OP 177B Touch Panels can be used wherever machines and systems are controlled and monitored directly on-site – whether in production, process or building automation. They are used in all types of sectors and applications.

Design

- Display variants
  - 4.3" TFT Widescreen display with 256 colors or
  - 5.7" STN display with 256 colors or 4 blue levels
- LED or CCFL[1)] backlit display with long service life
- Resistive analog touch
- Numerical "on-screen" system keyboard for decimal, binary and hexadecimal number formats
- On-screen alphabetic keyboard (English font)
- Compact design with low mounting depth
- Rugged plastic enclosure
- The front is resistant to various oils, greases and standard detergents
- A protective cover is available as an option to achieve NEMA 4 degree of protection and as additional protection against scratching
- Plug-in terminals for connecting the power supply
- Interfaces for connection of PLC, printer and engineering computer are integrated
- Standard Multi Media Card slot

1) **C**old **C**athode **F**luorescence **L**amps

SIMATIC TP 277 / SIMATIC OP 277

Overview

- Touch Panel TP 277 and Operator Panel OP 277 with comprehensive functionality for demanding machine visualization
- Display:
  - TP 277: Pixel graphics 5.7" TFT touch screen (analog/resistive)
  - OP 277: TFT display, color (256 colors)
- Keyboard:
  - TP 277: Numeric and alphanumeric on-screen keyboard
  - OP 277: Membrane keyboard with 36 system keys, 24 user-programmable function keys, 18 of which with LEDs
- All interfaces are on-board, e.g. MPI/PROFIBUS DP, USB, PROFINET/Ethernet
- Maintenance-free, non-volatile (retentive) message buffer

Benefits

- Integral component of Totally Integrated Automation (TIA): Increased productivity, minimized engineering, reduced lifecycle costs
- Modular expansion possible with options such as:
  - WinCC flexible/Sm@rtAccess for communication between different SIMATIC HMI systems
  - WinCC flexible Sm@rtService for remote maintenance and servicing of machines/plants via the Intranet/Internet
- Reduction of service and commissioning costs through:
  - Backup/restore via USB, MPI, PROFIBUS DP, RS 232 (serial), Ethernet (TCP/IP) or CompactFlash card (CF card)
  - Remote download/upload of configuration and firmware
  - Specific drivers can be reloaded
  - Long service life of the backlit display
- Graphics library available with off-the-shelf picture objects
- Can be used worldwide:
  - 32 languages can be configured (incl. Asian and Cyrillic character sets)
  - Up to 16 languages can be selected online
- Standard hardware and software interfaces for increased flexibility
- External Multi Media Card can be used for recipe data records, archives and for backups of configuration/system data
- Integrated USB interface for "hot swapping" of peripherals (printer, keyboard, mouse, barcode reader)
- Standard Windows storage formats (CSV) for archives and recipes for use with other standard tools (e.g. Microsoft Excel)
- The Smart Access and Smart Services options can be used

Application

The SIMATIC TP 277 Touch Panels/SIMATIC OP 277 Operator Panels can be used wherever machines and systems are controlled and monitored on-site – whether in production, process or building automation. They are used in all types of sectors and applications.

Diskless and fan-free operation, real-time capability and short boot-up times support demanding machine visualization even under harsh industrial conditions.

Design

- Display:
  - TP 277: Pixel graphics 5.7" TFT touch screen (analog/resistive)
  - OP 277: TFT display, color (256 colors)
- Keyboard:
  - TP 277: Numeric and alphanumeric on-screen keyboard
  - OP 277: Membrane keyboard with 36 system keys, 24 user-programmable function keys (18 with LEDs)
- Scripts and archives
- Compact design with low mounting depth
- IP65/NEMA 4/NEMA 12 (front) or IP20 (rear)
- The front is resistant to various oils, greases and standard detergents
- High electromagnetic protection and extreme vibration strength
- Plug-in terminals for 24 V DC power supply
- Interfaces:
  - MPI, PROFIBUS DP (up to 12 Mbit/s) as well as USB 1.1 (max. 100 mA) on-board
  - Ethernet (PROFINET IO capable)
- External Multi Media Card, can be used for the recipe data, records, archives and for backups of configuration and system data.

Overview

- Like operator panels, Multi Panels (MP) are used for on-site machine operation and monitoring
- Their functionality can be expanded with the installation of additional Windows CE applications (Multi Panel and Panel options)
- The SIMATIC MP 177/MP 277 Multi Panels running Windows CE combine the ruggedness of operator panels with the flexibility of PCs
- Pixel graphics TFT display, color (64 k colors) with 5.7" display diagonal for MP 177, with 7.5" or 10.4" display diagonals for MP 277
- MP 177, touch screen (analog/resistive)
- MP 277 8" Keys: 26 function keys or direct keys (e.g. over PROFINET IO)
- MP 277 10" Keys: 36 function keys or direct keys (e.g. over PROFINET IO)
- MP 277 8" and 10" Touch: Touch screen (analog/resistive)
- All interfaces are on-board, e.g. MPI, PROFIBUS DP, USB, Ethernet, serial
- Maintenance-free, non-volatile (retentive) message buffer
- Windows CE 5.0

Benefits

- Integral component of Totally Integrated Automation (TIA): Increased productivity, minimized engineering, reduced lifecycle costs
- Modular expansion possible with options such as:
  - ThinClient/MP for use as a terminal client on a Windows terminal server
  - WinCC flexible/Sm@rtAccess for communication between different SIMATIC HMI systems
  - WinCC flexible/Sm@rtService for remote maintenance and servicing of machines/plants via the Intranet/Internet
  - WinCC flexible/OPC server for communication with applications from various manufacturers
  - MS Pocket Internet Explorer (already included in scope of delivery)
- Reduction of service and commissioning costs through:
  - Backup/restore via Ethernet (TCP/IP), USB, MPI, PROFIBUS DP, RS 232 (serial) or PC/CF card
  - Remote download/upload for configuration and firmware
  - Specific drivers can be reloaded
  - Long service life of the backlit display
- Graphics library available with off-the-shelf picture objects
- Can be used worldwide:
  - 32 languages can be configured (incl. Asian and Cyrillic character sets)
  - Up to 16 languages can be selected online
- Standard hardware and software interfaces for increasing flexibility:
  - SD/Multi Media Card combination slot for memory expansions, backup/restore or additional interfaces
  - Ethernet (TCP/IP) for central data and project management; when configuring with WinCC flexible, and for communication with the control link to SIMATIC S7
  - Standard Windows storage formats (CSV) for archives and recipes permit use with other standard tools (e.g. Microsoft Excel)

Application

The SIMATIC MP 177 / SIMATIC MP 277 Multi Panels can be used wherever machines and systems are operated and monitored directly on-site – whether in production, process or building automation. These are used in the most popular branches and applications and can be expanded in their applications with the Multi Panel options, e.g. displaying HTML documents via the Microsoft Pocket Internet Explorer.

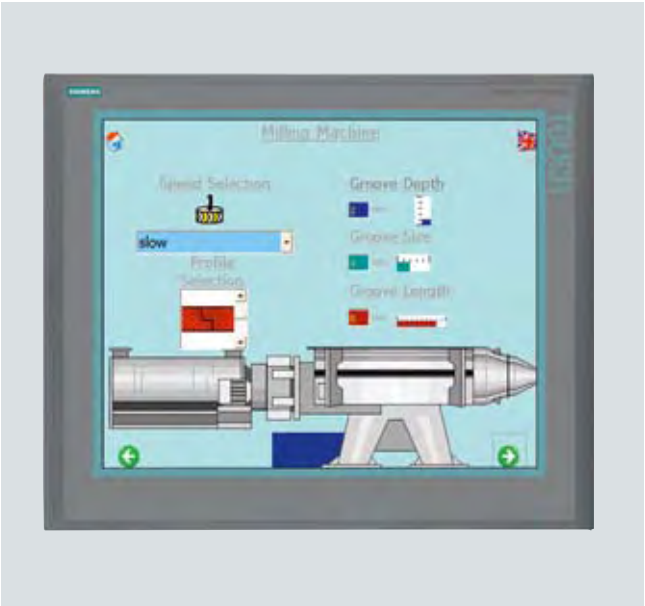
Windows CE meets the basic prerequisites for applications in rough industrial environments. The diskless and fan-free design enables implementation in areas where high vibration or dust load limits the operation of a PC. Short boot-up times make the Multi Panels ready for operation quickly.

Design

- Compact design with low mounting depth
- The front is resistant to various oils, greases and standard detergents
- Degree of protection IP65/NEMA 4x/NEMA 12 (front) or IP20 (rear)
- Plug-in terminals for 24 V DC power supply
- Interfaces:
  - RS 485/RS 422 or Ethernet interface for process connections (MPI, PROFIBUS DP up to 12 Mbit/s, PROFINET)
  - USB for mouse, keyboard, printer, barcode reader and downloading/uploading the configuration
  - Ethernet (TCP/IP), for exchanging data with a higher-level PC, connection of a network printer and downloading/uploading the configuration
- SD/Multi Media Card combination slot

SIMATIC MP 377

Overview



- Like operator panels, Multi Panels (MP) are used for on-site machine operation and monitoring
- Their functionality can be expanded with the installation of additional Windows CE applications (Multi Panel and Panel options)
- SIMATIC MP 377 devices running Windows CE combine the rugged construction of operator panels with the flexibility of PCs
- Pixel graphics 12.1", 15.1" and 19" TFT display, color (64 k colors)
- MP 377 12" Keys:
  38 system keys, 36 user-configurable and user-label function keys
- MP 377 12", 15", and 19" Touch:
  Touch screen (analog/resistive)
- All interfaces are on-board, e.g. MPI, PROFIBUS DP, PROFINET IO, USB, Ethernet, serial

Benefits

- Integral component of Totally Integrated Automation (TIA): Increased productivity, minimized engineering, reduced lifecycle costs
- Modular expansion possible with options such as:
  - Software PLC SIMATIC WinAC MP
  - WinCC flexible/Sm@rtAccess for communication between different SIMATIC HMI systems
  - WinCC flexible/Sm@rtService for remote maintenance and servicing of machines/plants via the Intranet/Internet
  - WinCC flexible/OPC server for communication with applications from various manufacturers
  - MS Pocket Internet Explorer (already included in scope of delivery)
  - Multimedia: Viewer for .pdf, .xls, .doc files; Internet Explorer, Media Player and cameras over standard interfaces
- Reduction of service and commissioning costs through:
  - Backup/restore via Ethernet (TCP/IP), USB, MPI, PROFIBUS DP, RS 232 (serial) or via PC/CompactFlash card
  - Remote download/upload for configuration and firmware changes
  - Specific drivers can be reloaded
  - Long service life of the backlit display
- Graphics library with off-the-shelf picture objects
- Can be used worldwide:
  - 32 languages can be configured (incl. Asian and Cyrillic character sets)
  - Up to 5 languages can be selected online
- Standard hardware and software interfaces for increasing flexibility:
  - PC/CF card slot for memory expansions, backup/restore or for additional interfaces
  - Ethernet (TCP/IP) for central data and project management
  - Standard Windows storage formats (CSV) for archives and recipes permit use with other standard tools (e.g. Microsoft Excel)

Application

The SIMATIC MP 377 Multi Panels can be used wherever machines and systems are operated and monitored directly on-site – whether in production, process or building automation. These are used in the most popular branches and applications and can be expanded with the Multi Panel options, e.g. by displaying HTML documents via the Microsoft Pocket Internet Explorer.

Windows CE meets the basic prerequisites for applications in rough industrial environments. The diskless and fan-free design enables implementation in areas where high vibration or dust load limits the operation of a PC. Short boot-up times make the Multi Panels ready for operation quickly.

Design

- Compact design with low mounting depth
- The front is resistant to various oils, greases and standard detergents
- Degree of protection IP65/NEMA 4x/NEMA 12 (front) or IP20 (rear)
- Plug-in terminals for 24 V DC power supply
- Interfaces:
  - TTY/RS 232, RS 485/RS 422 interface for process connections (MPI, PROFIBUS DP up to 12 Mbit/s)
  - USB for mouse, keyboard, printer, barcode reader and downloading/uploading the configuration
  - Ethernet (TCP/IP), PROFINET for exchanging data with a higher-level PC, connection of a network printer and downloading/uploading the configuration
- Retentive, maintenance-free message buffer
- Slot for CompactFlash card (CF card)
- Slot for PC card

Overview

- Embedded PC platform with extremely high industrial compatibility for demanding tasks in the field of PC-based automation
- Maintenance-free (no rotating components such as fan and hard disk)
- Rugged construction:
  The PC can withstand the most harsh mechanical stresses while maintaining reliable operation
- Compact design (only 75 mm (2.95 in) mounting depth)
- High investment security
- Fast integration capability
- Front panel versions:
  - 12", 15" and 19" TFT Touch
  - 12" and 15" TFT Key

Benefits

- Excellent industrial compatibility due to rugged construction, even when subjected to extreme vibration and shock
- High investment protection thanks to assured spare parts availability of the components (for 5 years following the end of active marketing)
- Excellent continuity of components for long-term machine concepts without any new engineering costs
- Front and rear USB 2.0 interfaces for quick and easy connection of additional hardware components
- High degree of industrial functionality thanks to integrated PROFIBUS DP/MPI and Ethernet interfaces
- Maintenance-free since there are no rotating parts (fans and hard disk)
- Reduction in downtime thanks to high system availability
  - Efficient self-diagnostics (SIMATIC PC DiagMonitor)
  - The high security and reliability of an embedded platform
- Integral component of Totally Integrated Automation (TIA): Increased productivity, minimized engineering, reduced lifecycle costs
- Ready-to-run, complete solutions (software is already installed and preconfigured) for visualization and automation with WinCC flexible and WinAC RTX

Application

The SIMATIC HMI IPC477C is designed for use on site directly at the machine, when a combination of ruggedness and reliability (i.e. the reliability of an embedded platform) and the openness of a PC are required (e.g. module expansions and the connection of I/O devices such as printers, keyboards, etc.).

Due to the low mounting depth of only 75 mm (2.95 in), it can also be used in confined spaces.

The PC can be used in production automation as well as in process automation and can be mounted in control cabinets, consoles, 19" cabinets/racks and in swing arms (booms).

SIMATIC Panel PCs are the ideal platform for PC-based automation:

- PC-based visualization on site at the machine with SIMATIC WinCC flexible
- PC-based control with SIMATIC WinAC RTX
- SIMATIC WinCC Web Client for web-based solutions with WinCC/Web Navigator

Siemens offers a complete modular system of automation components that are designed to integrate perfectly.

Design

Compact powerful industrial PC in embedded technology, comprising operator control unit with integrated computer unit.

Components of the computer unit:

- Rugged metal installation housing, resistant to vibrations and shocks, with high electromagnetic protection.
- Processor, configurable: Intel Celeron M 1.2 GHz, Intel Core 2 Solo 1.2 GHz and Intel Core Duo 1.2 GHz
- Main memory: 1 DIMM socket, DDR3, 1 GB, alternatively 2 GB or 4 GB
- Battery-backed retentive memory 2 MB
- Compact Flash Drive (internal) with pre-installed Windows XP Embedded (Image) operating system and optional software
- Graphics on-board (VGA analog, 1024 × 768)

Interfaces

- 2 × Ethernet on-board (10/100/1000 Mbit/s)
- 5 × USB 2.0 port, 500 mA (1 × front)
- 1 × COM 1 (RS 232)
- 1 × DVI-I interface (for connecting a second display unit)
- 2 × slot for CF card (2 GB, 4 GB or 8 GB) Solid State Disc (at least. 32 GB)
- Fieldbus: Configurable with PROFINET or PROFIBUS onboard

Power supply

- 24 V DC, with On/Off switch

Design (continued)

Components of the operator control unit:

The operator control units are available in the following versions:

12" Key

- 12.1" TFT color display, 800 × 600 pixels (SVGA)
- Membrane keyboard with international PC character set and 36 additional function keys with LED and an integrated mouse

12" Touch

- 12.1" TFT color display, 800 × 600 pixels (SVGA)
- Touch screen (analog/resistive)

15" Key

- 15.1" TFT color display, 1024 × 768 pixels (XGA)
- Membrane keyboard with international PC character set and 36 additional function keys with LED and an integrated mouse

15" Touch

- 15.1" TFT color display, 1024 × 768 pixels (XGA)
- Touch screen (analog/resistive)

19" Touch

- 19.1" TFT color display, 1280 × 1024 pixels (SXGA)
- Touch screen (analog/resistive)

The operator control units feature a USB 2.0 port on the front for connecting external peripheral devices, such as a mouse or keyboard. They fulfill the requirements of degrees of protection IP65 and NEMA 4. All operator control units are also available without a USB port on the front.

The computer unit is connected via a connecting cable attached at the rear of the operator control unit.

Expansion components

SIMATIC PC DiagMonitor

- PC diagnostics/alarm software for the early detection and diagnostics of PC problems
- Comprehensive monitoring of temperature and watchdog
- Operating hours counter for preventive maintenance
- Integrated log functions, comprehensive text messages, online help (English/German)
- Network-wide monitoring via SNMP and OPC interface possible

SIMATIC PC/PG Image & Partition Creator

- Software tool for data backup of mass storage contents (CF cards, hard disks)
- Fast, bit-exact restoration of system and data partitions; application software and special installations are also backed up
- Software tool for adaptation of mass storage partitioning

3.5" USB disk drive

The USB disk drive is provided for the high-speed exchange of user data, such as recipes, or files. The drive should not be used as a cyclic archiving drive. The front-panel mounting and degree of protection IP54 permit data exchange from the front without opening the control cabinet door.

The device is connected via the USB interface of the Panel PC. The power is also supplied over the USB interface. A USB cable of 1 m (3.28 ft) length is included in the scope of supply. The disk drive complies with the USB 1.1 standard. 3.5" high density disks can be used (1.44 MB).

SIMATIC PC USB FlashDrive

- Mobile memory medium for SIMATIC PC/PG
- High-speed data transfer (USB 2.0) and high memory capacity
- Ultra-compact and rugged

Industrial USB Hub 4

- USB peripherals can be connected and operated via the USB Hub 4 without opening the control cabinet door
- Industry-standard USB 2.0 Hub, Front IP65
- Mounting in control cabinet door or on DIN rail
- Inspection window and LEDs for each of the four interfaces

Overview

- Industry-standard PC platform for demanding operator control and monitoring tasks
- Maximum performance thanks to high processor performance at an attractive entry-level price
- Fast integration capability
- Intel Core 2 Duo processors up to 1.86 GHz
- RAM DDR3 technology from 1 to 4 GB
- Gigabit Ethernet ports
- High-speed USB 2.0 port on front
- Front panel versions:
  - 12", 15" and 19" TFT Touch

Benefits

- Suitable for industrial environments subject to vibration and shock loads
- High investment protection thanks to guaranteed availability of spare parts
- Excellent continuity of components for long-term machine concepts without any new engineering costs
- USB interface for quick and easy connection of required components
- Reduction in downtime thanks to high system availability
  - Efficient self-diagnostics (SIMATIC PC DiagMonitor)
  - Solutions for data backup
- Integral component of Totally Integrated Automation (TIA): Increased productivity, minimized engineering, reduced life-cycle costs

Application

The SIMATIC HMI IPC577C is used in production and process automation and can be installed in control cabinets and switchboards.

SIMATIC Panel PCs are a flexible platform for PC-based automation:

- PC-based visualization on site at the machine with SIMATIC WinCC flexible
- Complex solutions with SIMATIC WinCC process visualization
- PC-based control with SIMATIC WinAC Software PLC or with SIMATIC WinAC Slot PLC

Siemens offers a complete modular system of automation components that are designed to integrate perfectly.

The SIMATIC HMI IPCs can be ordered together with WinCC flexible or WinCC as SIMATIC HMI Packages at a lower price.

Design

The SIMATIC HMI IPC577C comprises a computer unit and an operator control unit.

Components of the computer unit:

- Rugged metal installation housing, resistant to vibrations and shocks, with high electromagnetic protection.
- Processor:
  - Intel Celeron M 1.2 GHz, 1 MB L2 cache, 800 MHz FSB
  - Intel Core 2 Solo 1.2 GHz, 3 MB L2 cache, 800 MHz FSB
  - Intel Core 2 Duo 1.86 GHz, 6 MB L2 cache, 1066 MHz FSB
- Main memory: 1 DIMM socket, DDR3, basic configuration 1 GB, expandable up to 4 GB
- 3.5" hard disk drive: ≥ 80 GB
- DVD-RW drive
- Interfaces:
  - 2 × Gbit Ethernet onboard
  - 4 × USB 2.0 port, 1 × USB at front
  - 1 × serial V.24 (9-pin)
  - 1 × parallel
  - 1 × slot for CF card
  - 1 × ext. graphics (DVI-I)
- Free slots for expansion:
  - 1 × PCI slot
- Fieldsbus (configurable with PROFIBUS or PROFINET onboard)
- Power supply:
  - 100/240 V AC (autorange), 50/60 Hz
  - 24 V DC

Design (continued)

Components of the operator control unit:

The operator control units are available in the following versions:

12" Touch

- 12.1" TFT color display, 800 × 600 pixels (SVGA)
- Touch screen (analog/resistive)
- USB 2.0 port on front

15" Touch

- 15.1" TFT color display, 1024 × 768 pixels (XGA)
- Touch screen (analog/resistive)
- USB 2.0 port on front

19" Touch

- 19.1" TFT color display, 1280 × 1024 pixels (SXGA)
- Touch screen (analog/resistive)

Expansion components

SIMATIC PC/PG Image & Partition Creator

- Software tool for data backup of hard disk contents
- Fast, bit-exact restoration of system and data partitions; application software and special installations are also backed up
- Software tool for hard disk partitioning

3.5" USB disk drive

The USB disk drive is provided for the high-speed exchange of user data, such as recipes, or files. The drive should not be used as a cyclic archiving drive. The front-panel mounting and degree of protection IP54 permit data exchange from the front without opening the control cabinet door.

The device is connected via the USB interface of the SIMATIC HMI IPC. The power is also supplied over the USB interface. A USB cable of 1 m (3.28 ft) length is included in the scope of supply. The disk drive complies with the USB 1.1 standard. 3.5" high density disks can be used (1.44 MB).

Operation of the USB disk drive with SIMATIC HMI IPCs:

- Windows XP: possible without separate driver
- Windows 2000: the required driver is included in the scope of supply of the operating system

Industrial USB Hub 4

- USB peripherals can be connected and operated via the USB Hub 4 without opening the control cabinet door
- Industry-standard USB 2.0 Hub, Front IP65
- Mounting in control cabinet door or on DIN rail
- Inspection window and LEDs for each of the four interfaces

Overview

- PC platform with high degree of industrial compatibility for demanding tasks in the area of PC-based automation
- Rugged construction:
  The PC can withstand the most harsh mechanical stresses while maintaining reliable operation
- Compact design
- High investment security
- Fast integration capability
- Front panel versions:
  - 12", 15" and 19" TFT Touch
  - 12" and 15" TFT Key
- Operator control unit can be located at a distance of up to 30 m (98.4 ft) from the computer unit (optional)

Benefits

- Excellent industrial compatibility due to rugged construction, even when subjected to extreme vibration and shock
- High investment protection thanks to spare parts availability of the components (for 5 years following the end of active marketing)
- Excellent continuity of components for long-term machine concepts without any new engineering costs
- Savings in time and costs due to service-friendly equipment construction:
  - The operating unit and computing unit can be simply hinged apart for the rapid replacement of components or for future expansions
  - Front and rear USB 2.0 interfaces for quick and easy connection of additional hardware components
- High degree of industrial functionality thanks to integrated PROFIBUS DP/MPI and two Gigabit Ethernet interfaces
- Operational reliability:
  Using the optional direct key module, the process can be controlled without delay over PROFIBUS DP independently of the operating system
- 2 × ≥ 80 GB SATA hard disk system (configured as a single disk system or RAID1)
- Reduction in downtime thanks to high system availability
- Efficient self-diagnostics (SIMATIC PC DiagMonitor)
  - Solutions for preventive data backup
- Integral component of Totally Integrated Automation (TIA):
  Increased productivity, minimized engineering, reduced lifecycle costs
- Additional mounting possibilities available due to separation of the computing unit and operating unit by means of the Remote Kit (up to 30 m (98.4 ft), optionally available as accessory)

Application

The SIMATIC HMI IPC677C is designed for use directly on-site at the machine. Due to the minimal mounting depth of only 105/130 mm (4.13/5.12 in), it can also be used in confined spaces.

The PC can be used in production automation as well as in process automation and can be installed in control cabinets and consoles, 19" cabinets/racks and in swing arms (booms).

The Dual Core CPUs with Intel Core Duo technology support high-performance control and visualization.

With PCIe (x4), the new PCI express (PCIe) cards (x1 and x4) are also supported.

A SIMATIC Panel PC is the ideal platform for PC-based automation:

- PC-based visualization on site at the machine with SIMATIC WinCC flexible
- Complex solutions with SIMATIC WinCC process visualization
- PC-based control with SIMATIC WinAC Software PLC or with SIMATIC WinAC Slot PLC

Siemens offers a complete modular system of automation components that are designed to integrate perfectly.

The SIMATIC Panel PCs can be ordered in combination with WinCC flexible or WinCC as SIMATIC HMI packages at a lower price.

Design

The SIMATIC HMI IPC677C comprises a computer unit and an operator control unit.

Components of the computer unit:

- Rugged metal installation housing, resistant to vibrations and shocks, with high electromagnetic protection.
- Processor:
  Mobile processors
  - Core 2 Duo T7400, 2.16 GHz, Dual Core, 4 MB SLC
  - Core 2 Duo T5500, 1.66 GHz, Dual Core, 2 MB SLC
  - Celeron M 440, 1.86 GHz, 1 MB SLC
- Intel chipset: 945 GM Express with ICH7R – integrated RAID controller
- Intel graphics media accelerator GMA950 for high-performance graphics
- Standard main memory configuration:
  512 MB, expandable up to 4 GB (DDR2 667 RAM)
- SATA hard disks with up to 160 GB capacity and NCQ technology, the special vibration-absorbing hard disk support ensures reliable operation even under extreme mechanical stress
- On-board graphics
- Interfaces:
  - 2 × Ethernet 10/100/1000 Mbit/s ports (Gbit LAN)
  - 4 × high-speed USB 2.0 ports on the computing unit
  - PROFIBUS DP/MPI on-board, isolated
  - 1 × serial RS 232 C (9-pin)
  - DVI-I interface (for VGA and/or DVI-D monitor)

Design (continued)

- Second monitor with identical screen content (Clone) or in extended monitor mode (Extended)
- Latching mechanism for innovative RJ45 Fast Connect plug
- Slot for CompactFlash card externally accessible
- Diskless version (optional with Windows XPe on CompactFlash card)
- Slots either 2 × PCI or 1 × PCI and 1 × PCIe x4
- Power supply: 110 V/230 V AC (autorange), 50/60 Hz or 24 V DC
- 2 MB battery-backed SRAM memory on-board (for use with WinAC RTX 2005 SP2)

Optional additional components:

- Main memory expansion to 1 GB, 2 GB or 4 GB
- SATA hard disk ≥ 160 GB
- Double hard disk module 2 × ≥ 60 GB SATA
- DVD-ROM drive
- DVD±RW±R combo drive
- Direct key module

Components of the operator control unit:

The operator control units are available in the following versions:

12" Key

- 12.1" TFT color display, 800 × 600 pixels (SVGA)
- Membrane keyboard with international PC character set and 36 additional function keys with LED and an integrated mouse

15" Key

- 15.1" TFT color display, 1024 × 768 pixels (XGA)
- Membrane keyboard with international PC character set and 36 additional function keys with LED and an integrated mouse

12" Touch

- 12.1" TFT color display, 800 × 600 pixels (SVGA)
- Touch screen (analog/resistive)

15" Touch

- 15.1" TFT color display, 1024 × 768 pixels (XGA)
- Touch screen (analog/resistive)

19" Touch

- 19.1" TFT color display, 1280 × 1024 pixels (SXGA)
- Touch screen (analog/resistive)

The operator control units feature a USB 2.0 port on the front for connecting external peripheral devices, such as a mouse or keyboard. They fulfill the requirements of degrees of protection IP65 and NEMA 4. All operator control units are also available without a USB port on the front.

The computer unit is connected via a connecting cable attached at the rear of the operator control unit.

Expansion components

SIMATIC Panel PC Remote Kit

- Separate mounting of computer and operator control unit is possible
- At a maximum distance of 30 m (98.4 ft)
- Pure hardware solution, no need to install additional software
- Maintaining the panel PC front functionality

SIMATIC PC DiagMonitor

- PC diagnostics/alarm software for the early detection and diagnostics of PC problems
- Comprehensive monitoring of temperature, fans, hard disks (SMART), watchdog
- Operating hours counter for preventive maintenance
- Integrated log functions, comprehensive text messages, online help (English/German)
- Network-wide monitoring via SNMP and OPC interface possible

SIMATIC PC/PG Image & Partition Creator

- Software tool for data backup of hard disk contents
- Fast, bit-exact restoration of system and data partitions; application software and special installations are also backed up
- Software tool for hard disk partitioning

3.5" USB disk drive

The USB disk drive is provided for the high-speed exchange of user data, such as recipes, or files. The drive should not be used as a cyclic archiving drive. The front-panel mounting and degree of protection IP54 permit data exchange from the front without opening the control cabinet door.

The device is connected via the USB interface of the Panel PC. The power is also supplied over the USB interface. A USB cable of 1 m (3.28 ft) length is included in the scope of supply. The disk drive complies with the USB 1.1 standard. 3.5" high density disks can be used (1.44 MB).

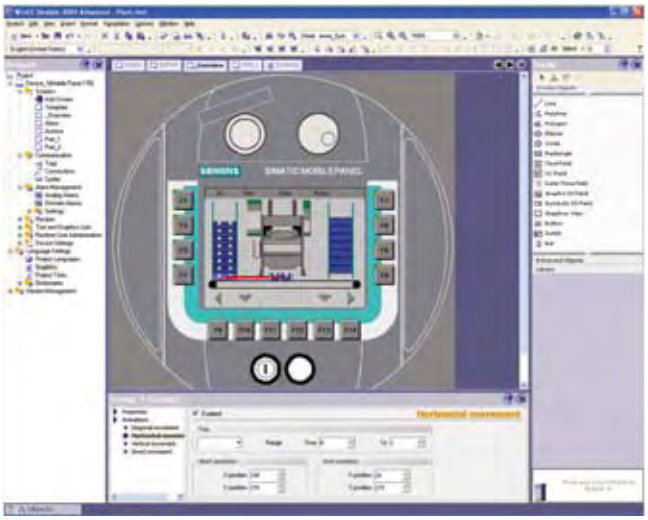
SIMATIC PC USB FlashDrive

- Mobile memory medium for SIMATIC PC/PG
- High-speed data transfer (USB 2.0) and high memory capacity
- Ultra-compact and rugged

Industrial USB Hub 4

- USB peripherals can be connected and operated via the USB Hub 4 without opening the control cabinet door
- Industry-standard USB 2.0 Hub, Front IP65
- Mounting in control cabinet door or on DIN rail
- Inspection window and LEDs for each of the four interfaces

Overview



Integrated family of **engineering tools** for configuring SIMATIC HMI Operator Panels, the operating device of SIMATIC C7 units, SIMOTION/SINUMERIK Panel PCs as well as the PC-based visualization software WinCC flexible Runtime.

- Runs under Windows XP Professional / Windows 7 Professional, Ultimate, Enterprise
- **Current version:**
  - SIMATIC WinCC flexible 2008 Service Pack 2 Advanced
  - SIMATIC WinCC flexible 2008 Service Pack 2 Standard
  - SIMATIC WinCC flexible 2008 Service Pack 2 Compact
  - SIMATIC WinCC flexible 2008 Service Pack 2 Micro

Benefits

- The integrated configuration software reduces training, maintenance and service overhead and protects the customer's investments
- Minimized engineering overhead and reduction of lifecycle costs thanks to Totally Integrated Automation (TIA)
- Minimized configuration overhead due to reuse of scalable and dynamizable objects
- Intelligent tools for efficient and simple configuration:
  - Wizard for defining the basic structure of the HMI project
  - Table-based editors simplify the generation and processing of similar types of object, e.g. for tags, texts, or alarms
  - Complex configuration tasks such as the definition of paths of motion or the creation of the fundamental operator prompting are simplified by means of graphical configuration
- Comprehensive support of multi-language configurations for worldwide use
  - Selectable views for entering configuration data in several languages
  - System and user-specific text lexicons
  - Export/import of language-dependent texts
- Investment protection due to
  - Import of the configuration from the configuration tools of the ProTool family
  - Import of static screen contents and tags from WinCC V6.2

Design

The engineering tools of the SIMATIC WinCC flexible range are based on one another. The available editors largely depend on the respectively configured target systems and their functions. A more comprehensive engineering tool such as WinCC flexible Standard also offers the facilities of the smaller engineering tools, e.g. WinCC flexible Compact or Micro.

Upgrading of a smaller engineering tool to a larger one is possible using a Powerpack. An exception is WinCC flexible Micro.

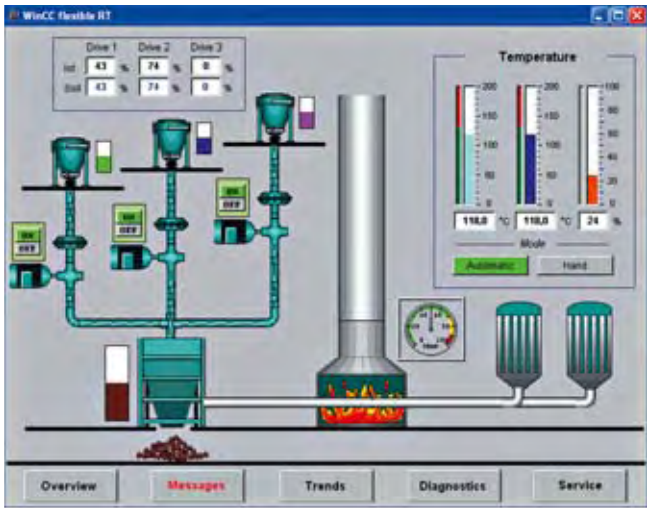
The scope of functions of the WinCC flexible engineering tools already includes project support for the Runtime options available for SIMATIC Panels or WinCC flexible Runtime, independent of the RT licenses purchased. Separate licensing is required for the target system in order to use the configured Runtime options.

Function

Integration into automation systems

- Integration into SIMATIC STEP 7 (Version V5.3 and higher or Professional Edition 2004)
  - Administration of the HMI projects within STEP 7
  - Shared use of communication settings and process point definitions, i.e. symbols and messages
  - Display of the HMI engineering objects in the SIMATIC Manager of STEP 7
- Integration into Component Based Automation (CBA) with SIMATIC iMap
  - Management of CBA components with runtime and HMI components in SIMATIC iMap
  - Interconnection of CBA components with/without HMI components in SIMATIC iMap
  - Generation of HMI basic data in SIMATIC iMap for WinCC flexible Advanced, e.g. tag list and interconnected HMI modules
- Integration of WinCC flexible in SIMOTION SCOUT

Overview



PC-based visualization software for single-user systems directly at the machine.

- Runs under Windows XP Professional and Windows 7 Professional, Ultimate, Enterprise
- Current version: SIMATIC WinCC flexible 2008 Runtime with Service Pack 2

SIMATIC WinCC flexible Runtime is configured with the SIMATIC WinCC flexible Advanced configuration software.

Benefits

- Optimum price/performance ratio thanks to individually scalable system functionality
- Functions for all visualization tasks:
  Operator functions, graphical and trend displays, signaling system, log system, archiving (option), recipe management (option), Audit Trail (option), process fault diagnostics (option)
- Flexible runtime functionality thanks to Visual Basic scripts
- Innovative service concepts with remote operation, diagnostics and administration via intranet and Internet as well as e-mail communication to increase availability (option)
- Support for simple distributed automation solutions based on TCP/IP networks at the machine level (option)

Application

SIMATIC WinCC flexible Runtime is the high-performance visualization software for simple visualization tasks at machine level. It can be used as a single-user solution for all automation applications in production automation, process automation and building services automation.

SIMATIC WinCC flexible Runtime can be employed in connection with the following operator devices:

- SIMATIC Panel PCs
  - Panel PC 477B/477C
  - Panel PC 577/HMI IPC577C
  - Panel PC 677B
- SIMOTION P350
- Standard PCs with resolutions (W × H in pixels) of:
  - 640 × 480, 800 × 600, 1024 × 768, 1280 × 1024, 1600 × 1200

Design

SIMATIC WinCC flexible Runtime is available as a software package with 128, 512, 2048 or 4096 PowerTags. The term PowerTags is used exclusively to identify process variables and range pointers that have a process link to the controller. Variables without process link, constant limit values of variables, and messages (up to 4000 bit-triggered messages) are also available for additional system performance.

The range of functions of WinCC flexible Runtime includes the centralized HMI components for visualizing and reporting, and it can be expanded to suit requirements and costs by using optional packages.

SIMATIC WinCC flexible Runtime is configured with the SIMATIC WinCC flexible Advanced configuration software.

Options

WinCC flexible RT can be expanded with the following features:

- WinCC flexible Archives for logging process values and messages
- WinCC flexible Recipes for managing data sets which contain associated machine or production data
- SIMATIC WinCC flexible /Audit for
  - recording of operator actions in an Audit Trail
  - The ChangeControl option restricts users based on plant validation
  - Checking for later changes via security mechanisms
  - Simplified compliance with GPM guidelines
- SIMATIC Logon for central, plant-wide user administration
- WinCC flexible Sm@rtAccess for communication between different Simatic HMI systems
- WinCC flexible Sm@rtService for remote maintenance and servicing of machines/plants via the Intranet/Internet
- WinCC flexible OPC server for use as a data server (OPC server) for higher-level automation components such as control systems or systems in the office area.

Safety Integrated

12/2	**Overview**
12/3	**Function**
12/3	Safe Torque Off (STO)
12/3	Safe Brake Control (SBC)
12/4	Safe Stop 1 (SS1)
12/4	Safe Stop 2 (SS2)
12/4	Safe Operating Stop (SOS)
12/5	Safely Limited Speed (SLS)
12/5	Safe Speed Monitor (SSM)
12/6	Basic Functions and Extended Functions
12/6	Safe speed/position sensing
12/7	PROFIsafe
12/7	Licensing
12/8	The operating principle of Safety Integrated

Safety Integrated

Overview

The integrated Safety functions of SINAMICS S120 provide highly effective application-oriented protection for personnel and machinery.

The current version of SINAMICS S120 offers the following Safety Integrated functions (terms as defined in IEC 61800-5-2):

- Safe Torque Off (STO)
- Safe Brake Control (SBC)
- Safe Stop 1 (SS1)
- Safe Stop 2 (SS2)
- Safe Operating Stop (SOS)
- Safely Limited Speed (SLS)
- Safe Speed Monitor (SSM)

The Safety Integrated functions are completely integrated into the drive system. They can be activated as follows:

- Over terminals on the Control Unit and on the power unit (STO, SBC, SS1 only)
- Over terminals on the TM54F Terminal Module
- Over PROFIBUS or PROFINET with PROFIsafe profile

The Safety Integrated functions are implemented electronically and therefore offer short response times in comparison to solutions with externally implemented monitoring functions.

SIMOTION provides support for SINAMICS drives that can execute safety-related monitoring functions (SOS, SLS) or stop reactions (STO, SS1, SS2). This support ensures that limit violations are prevented at the drive end in that SIMOTION controls the drive through the application, for example, within the permissible velocity (with SLS) or brings it to a standstill (with SOS).

The selection and deselection of the functions SS2, SOS, and SLS and their state are indicated by means of specific technological alarms and system variables on the axis.

Legal framework

Machine manufacturers and plant managers must ensure that their machines or plants cannot cause danger due to malfunctions apart from the general risks.

In Europe, for example, compliance with the machinery directive is required by law in the EU industrial safety directive. In order to ensure the conformity with this directive, it is recommended that the corresponding harmonized European standards are applied. This triggers the presumption of conformity and provides manufacturers and operators with legal certainty in terms of compliance with both national regulations and EU directives. The machine manufacturer uses the CE marking to document the compliance with all relevant directives and regulations in the free movement of goods.

Safety-related standards

Functional safety is specified in various standards.
EN ISO 12100 and EN ISO 14121-1, for example, are concerned with the construction and risk assessment of machines. EN 62061 (only applicable for electrical and electronic control systems) and EN ISO 13849-1, which will replace the extensively used EN 954-1 as from the end of 2011, define the functional and safety-related requirements of control systems with relevance to safety.

The above-mentioned standards define different safety requirements that the machine has to satisfy in accordance with the risk, frequency of a dangerous situation, probability of occurrence and the opportunities for recognizing impending danger:

- EN 954-1: Categories B, 1 … 4
- EN ISO 13849-1: Performance Level PL a … e
- EN 62061: Safety Integrity Level SIL 1 … 3

Trend toward integrated safety systems

The trend toward greater complexity and increasing modularity of machines have caused the safety functions to move away from the classical central safety functions (for example, deactivation of the complete machine using a main switch) and into the machine control system and the drives. This is often accompanied by a significant increase in productivity because the changeover times are shortened and during this changeover, depending on the type of machine, some subcomponents can even continue to manufacture.

Integrated safety functions act much faster than those of a conventional design. The safety of a machine is increased further with Safety Integrated. Furthermore, safety measures controlled by integrated safety systems are perceived as less interfering by the operator of the machine due to the custom actions, so the motivation to consciously bypass safety functions is significantly reduced.

Function

Safety functions integrated into the drive with SINAMICS S120

SINAMICS S120 is characterized by a number of integrated Safety functions.

They satisfy the requirements of

- Category 3 according to EN 954-1 or EN ISO 13849-1
- Performance Level (PL) d according to EN ISO 13849-1
- Safety Integrity Level (SIL) 2 according to EN 61508

In addition, the Safety Integrated functions of SINAMICS S120 are generally certified by independent institutes. An up-to-date list of certified components is available on request from your local Siemens office.

The Safety Integrated functions currently available in SINAMICS S120 are listed below (terms as defined in IEC 61800-5-2):

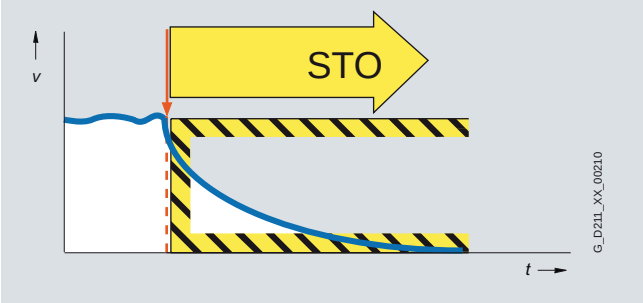
Safe Torque Off (STO)

Description of function

This function prevents the drive from restarting unexpectedly, in accordance with EN 60204-1, Section 5.4. Safe Torque Off disables the drive pulses and disconnects the power supply to the motor (corresponds to Stop Category 0 of EN 60204-1). The drive is reliably torque-free. This state is monitored internally in the drive.

Application, customer benefits

STO has the immediate effect that the drive cannot supply any more torque-generating energy. STO can be used wherever the drive will reach a standstill in a sufficiently short time based on the load or friction or when coasting down of the drive will not have any relevance for safety.



Safe Brake Control (SBC)

Description of function

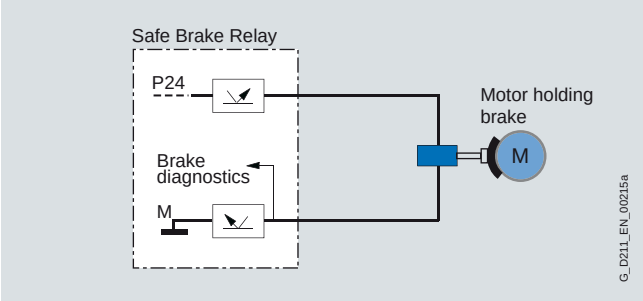
Safe Brake Control SBC is used to control holding brakes which are operative at zero current, e.g. motor holding brakes. The brake control circuit is a fail-safe, two-channel design.

The Safe Brake Control is activated when the Safe Torque Off function is activated and when safety monitors respond resulting in safe pulse suppression.

- Note 1: Safe Brake Control does not detect mechanical faults in the brake itself, such as worn brake linings.
- Note 2: For Motor Modules in booksize format, the terminals for the motor brake are integrated. In the case of blocksize format an additional Safe Brake Relay is required, and in the case of chassis format an additional Safe Brake Adapter is necessary.

Application, customer benefits

In combination with STO and SS1, SBC can also be activated. SBC allows a holding brake to be safely activated on the motor after the torque-generating energy has been shut down, to prevent, for example, sudden drop of suspended axes.



Function (continued)

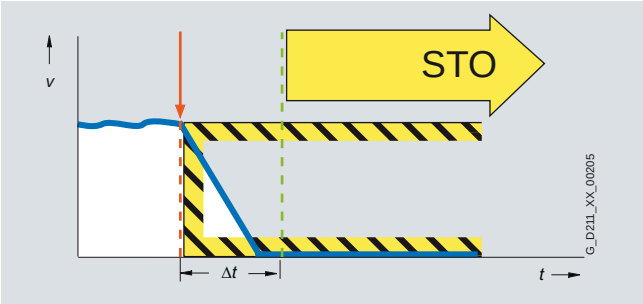
Safe Stop 1 (SS1)

Description of function

The Safe Stop 1 function can safely stop the drive in accordance with EN 60204-1, Stop Category 1. When the SS1 function is selected, the drive brakes autonomously along a quick-stop ramp (OFF3) and automatically activates the Safe Torque Off and Safe Brake Control functions (if enabled) when the parameterized safety delay time expires.

Application, customer benefits

If the drive does not stop sufficiently quickly as a result of load torque when the stop function is activated, it can be actively braked by the converter. With this integrated quick brake function, it is often possible to eliminate mechanical brakes which wear, or to lessen the load on them, so that maintenance costs and the stress on the machine can be reduced.



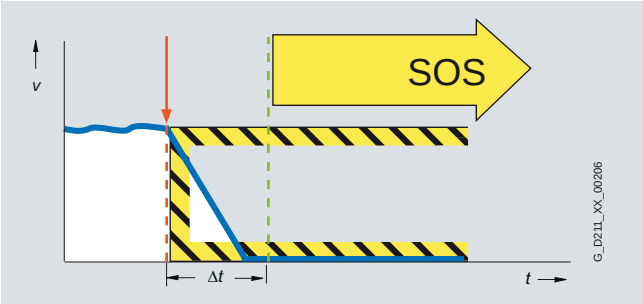
Safe Stop 2 (SS2)

Description of function

The Safe Stop 2 function can safely stop the drive in accordance with EN 60204-1, Stop Category 2. When the SS2 function is selected, the drive brakes autonomously along a quick-stop ramp (OFF3). In contrast to SS1, the automatic speed control remains operational afterwards, i. e. the motor can supply the full torque required to maintain the current position. Standstill is safely monitored (Safe Operating Stop function).

Application, customer benefits

As in the case of SS1, the drive is automatically braked when the stop function is selected. In contrast to SS1, the drive can also supply the full torque at standstill.



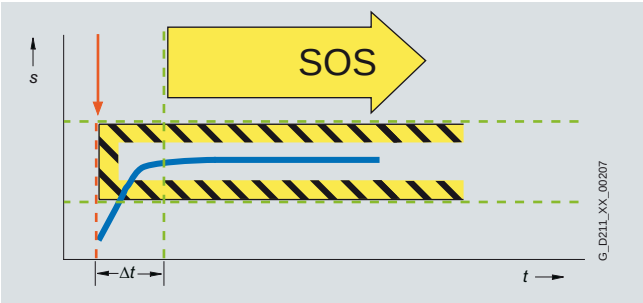
Safe Operating Stop (SOS)

Description of function

The Safe Operating Stop function represents safe standstill monitoring. The drive control remains in operation. The motor can therefore deliver the full torque to hold the current position. The actual position is reliably monitored. In contrast to safety functions SS1 and SS2, the speed setpoint is not influenced automatically. After SOS has been selected, the higher-level control must bring the drive to a standstill within a parameterized safe time Δt and then hold the position setpoint. After the time Δt has elapsed, SOS is activated and monitored to ensure that the current standstill position is not exited.

Application, customer benefits

SOS is an ideal solution for applications for which the machine or parts of the machine must be at a safe standstill in certain steps, but the drive must also supply a holding torque. The speed control continues to operate and ensures that the drive remains in its current position despite opposing torques. SOS monitors the current standstill position. When SOS is selected, in contrast to SS1 and SS2, the drive does not influence the speed setpoint autonomously. Conversely, before SOS is activated the higher-level control has the option of ramping down the affected axes in a coordinated manner in the network within a delay time that can be set. This can be used to prevent any damage to the machine or product.

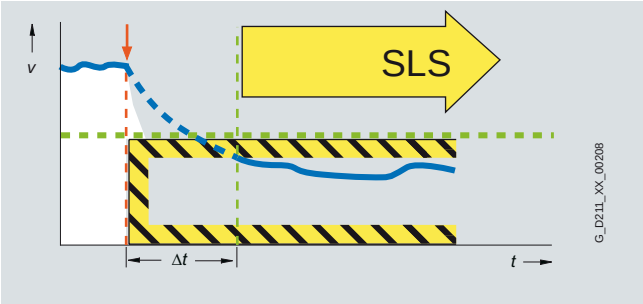


Function (continued)

Safely Limited Speed (SLS)

Description of function

The Safely Limited Speed function is used to monitor the drive against a programmable maximum speed. Four different limit values can be activated. As in the case of SOS, the speed setpoint is not automatically influenced. After SLS has been selected, the higher-level control must bring the drive down below the selected speed limit within a parameterizable time Δt.



Application, customer benefits

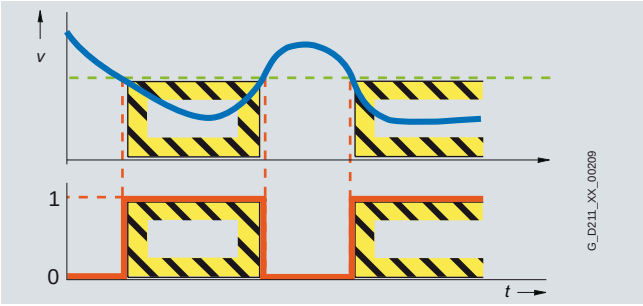
When many machines are being set up, the operating personnel must be working on the machine that is in motion. This either occurs step-by-step because the danger area must be exited again and again during starting or the operator is working on the moving machine and is therefore exposed to increased risk. The SLS function can save a considerable amount of time here and the safety of the operating personnel is assured despite this. The speed of the drive can then be safely limited to a lower speed that is not dangerous.

The adjustable delay time before activation of SLS allows the drive control to ramp down coordinated axes in a defined manner. This can be used to prevent any damage to the product.

Safe Speed Monitor (SSM)

Description of function

The Safe Speed Monitor function supplies a safe checkback signal (active High), when the drive undershoots a settable speed limit. In contrast to the functions described above, there is no automatic error response from the drive when the limit is overshot.



Application, customer benefits

The safe SSM checkback can be used in a higher-level controller for safety-related responses. As there is no automatic response from the drive to a limit violation, the higher-level safety controller can respond to the alarm flexibly in accordance with the situation. In the simplest case, the SSM signal can be used to release a protective door when a safe speed has been reached.

Function (continued)

Basic Functions and Extended Functions

The Safety Integrated functions of the SINAMICS S120 drive system are grouped into Basic Functions and Extended Functions. The Basic Functions are included in the standard scope of supply, so they do not require a license.

A license is however required for each axis before the Extended Functions can be used. The Extended Functions are activated over terminals on the TM54F Terminal Module or over the safe communication of PROFIsafe on PROFIBUS or PROFINET [1]. The Basic Functions can also be activated via on-board terminals on the device or via PROFIsafe [2].

- **Basic Functions**
  - Safe Torque Off (STO)
  - Safe Brake Control (SBC)
  - Safe Stop 1 (SS1)
- **Extended Functions**
  - Safe Stop 1 (SS1) with SBR
  - Safe Stop 2 (SS2) with SBR
  - Safe Operating Stop (SOS)
  - Safely Limited Speed (SLS)
  - Safe Speed Monitor (SSM)

With Extended Functions Safe Stop 1 (SS1) and Safe Stop 2 (SS2) with SBR, safe acceleration monitoring (SBR) is performed during braking to ensure that any faults during braking will be detected.

The Extended Functions are available for Motor Modules in booksize and chassis formats as of Version 3 (last position of Order No. ≥ 3).

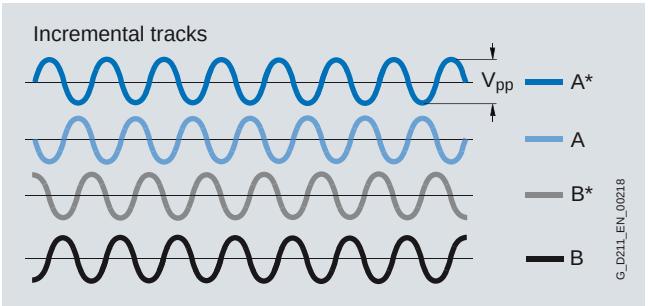
The Basic Functions – activated via on-board terminals on the device or via PROFIsafe – do not require an encoder.

As from SINAMICS firmware version V4.3 [3], the Extended Functions Safe Stop 1 (SS1) with SBR and Safely Limited Speed are also available without encoder (initially in combination with asynchronous motors only).

In the case of extremely high dynamic requirements, it can be necessary to configure safe speed/position sensing for the functions Safe Stop 1 (SS1) with SBR and Safely Limited Speed. The Extended Functions Safe Stop 2 (SS2) with SBR, Safe Operating Stop and Safe Speed Monitor always require safe speed/position sensing.

Safe speed/position sensing

Only incremental encoders or absolute encoders with photoelectric sampling can be used for safe sensing of the position values on a drive. Safe actual value sensing relies on redundant evaluation of the incremental channels A/B that supply sin/cos signals of 1 V_{pp}.



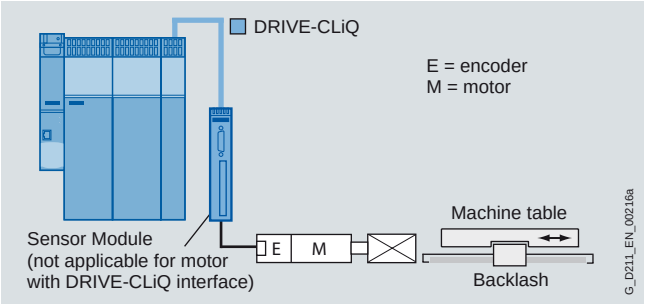
Signal progression for the incremental tracks

When motors with a DRIVE-CLiQ interface are used, the speed/position actual values are generated directly in the motor as safe values and are transferred to the Control Unit over safe communication via DRIVE-CLiQ.

The following can be used for safe speed/position sensing:

- Single-encoder systems or
- Dual-encoder systems

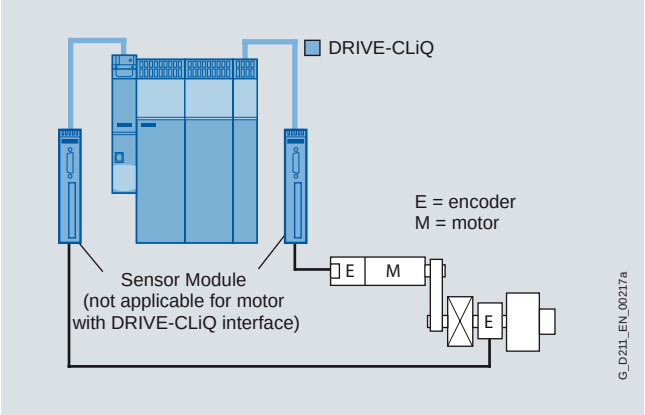
Single-encoder system



Example of a single-encoder system

In a single-encoder system, the motor encoder is used exclusively for safe actual value sensing.

Dual-encoder system



Example of a dual-encoder system on a spindle

The safe actual values for a drive are provided by two separate encoders. The actual values are transferred to the Control Unit over DRIVE-CLiQ. When motors without a DRIVE-CLiQ connection are used, a Sensor Module (SMC/SME) must be implemented. Each measuring system requires a separate DRIVE-CLiQ connection.

Further information

Absolute encoders (e. g. ECI, EQI) that offer an EnDat interface with additional sin/cos tracks, but operate according to an inductive measuring principle internally, are not permitted.

For motors without a DRIVE-CLiQ interface, the connection is established by means of additional Sensor Modules:

- SMC20
- SME20/SME25
- SME120/SME125

[1] PROFIsafe on PROFINET: As from SINAMICS firmware version V2.6; available soon for SIMOTION D.

[2] As from SINAMICS firmware version V2.6 SP2 or SIMOTION firmware version V4.1 SP4.

[3] Not available for CU310/D410/D4x5/CX32 (SINAMICS firmware version V2.x).

Function (continued)

PROFIsafe

PROFIsafe is an open communications standard that supports standard and safety-related communication over the same communications cable (wired or wireless). A second, separate bus system is therefore not necessary. To ensure safe communication, the transmitted message frames are continuously monitored. Possible errors, such as lost or repeated messages or those received in the wrong order are avoided in that safety-related messages are numbered consecutively, their arrival is monitored within a defined period, and an identifier for the sender and receiver of a message is transferred. A CRC (cyclic redundancy check) data security mechanism is also used.

SINAMICS 120 supports the PROFIsafe profile based on PROFIBUS as well as on PROFINET.

Licensing

The Safety Integrated Basic Functions do not require a license.

In the case of Safety Integrated Extended Functions, however, a license is required for every axis using these functions. It is of no consequence here which safety functions are used and how many.

The required licenses can be optionally ordered with the CompactFlash Card:

For the order numbers of the CompactFlash Cards, see sections SINAMICS S120 drive system and SIMOTION D.

Notes: On one SIMOTION D4x5/CX32, up to 5 safety axes are currently possible with Extended Functions. On one CU320-2, up to 6 safety axes are currently possible with Extended Functions.

The CU310/D410 Control Units have been designed to control only single axes. Only one license is therefore required for the Extended safety functions (order code **F01**).

An overview of the Safety Integrated functions of SINAMICS S120 and their boundary conditions is given in the following table:

Functions	Activation	Underlying function	Reaction to limit overshoot	External set-point input effective	Encoder required	License required
STO	• EP terminals on the device and on the CU3xx/D4xx/CX32 • Terminals on TM54F • PROFIsafe	SBC (if activated)	–	No	No [1]	No [2]
SBC	• With STO (directly or following expiry of the delay with SS1)	–	–	–	No	No
SS1	• EP terminals on the device and on the CU3xx/D4xx/CX32 • PROFIsafe	STO following expiry of the parameterized delay, SBC (if activated)	–	No	No	No
SS1 with SBR	• Terminals on TM54F • PROFIsafe	Safe acceleration monitoring (SBR) during braking. STO and SBC (if activated) following expiry of the parameterized delay or undershooting of the minimum speed limit	STO	No	No [3]	Yes (per safety axis)
SS2	• Terminals on TM54F • PROFIsafe	Safe acceleration monitoring (SBR) during braking. Following expiry of the parameterized delay SOS	STO	No	Yes	Yes (per safety axis)
SLS sensorless	• Terminals on TM54F • PROFIsafe	–	SS1, STO or SOS (parameterizable)	Yes	No [3]	Yes (per safety axis)
SLS	• Terminals on TM54F • PROFIsafe	–	SS1, STO or SOS (parameterizable)	Yes	Yes	Yes (per safety axis)
SOS	• Terminals on TM54F • PROFIsafe	–	SS1/STO	Yes	Yes	Yes (per safety axis)
SSM	Always active	–	Indication only	Yes	Yes	Yes (per safety axis)

[1] The activation option using terminals on TM54F currently requires an encoder.

[2] The activation option using terminals on TM54F currently requires a license.

[3] As from SINAMICS firmware version V4.3; not available for CU310/D410/D4x5/CX32 (SINAMICS firmware version V2.x).

Function (continued)

The operating principle of Safety Integrated

Two independent switch-off signal paths

Two independent switch-off signal paths are available. All switch-off signal paths are low active, thereby ensuring that the system is always switched to a safe status if a component fails or in the event of cable breakage. If an error is discovered in the switch-off signal paths, the Safe Torque Off or Safe Stop 1 function is activated (depending on the parameterization, see the previous table) and a system restart inhibited.

Two-channel monitoring structure

All the main hardware and software functions for Safety Integrated are implemented in two independent monitoring channels (e.g. switch-off signal paths, data management, data comparison). A cyclic crosswise comparison of the safety-relevant data in the two monitoring channels is carried out.

The monitoring functions in each monitoring channel work on the principle that a defined status must prevail before each action is carried out and a specific acknowledgement must be made after each action. If these expectations of a monitoring channel are not fulfilled, the drive coasts to a standstill (two channel) and an appropriate message is output.

Forced dormant error detection using test stop

The functions and switch-off signal paths must be tested at least once within a defined time in order to meet requirements as per EN 954-1/ISO 13849-1 and IEC 61508 relating to prompt fault detection. This functionality must be implemented by means of test stop triggering either in cyclic manual mode or by the automated process. The test stop cycle is monitored and an alarm is output following a timeout.

A test stop does not require a Power Cycle. The acknowledgment is set by canceling the test stop request.

It can be assumed that a running machine will not pose any risk to personnel if appropriate safety equipment (e.g. protective doors) is installed. For this reason, only an alarm is output to inform the user that a forced dormant error detection run is due, thereby requesting that this be carried out at the next available opportunity.

Examples of when forced dormant error detection runs are required:

- When the drives are at a standstill after the system has been switched on
- Before the protective door is opened
- At defined intervals (e.g. every 8 hours)
- In automatic mode, dependent on time and event

System description – Dimensioning

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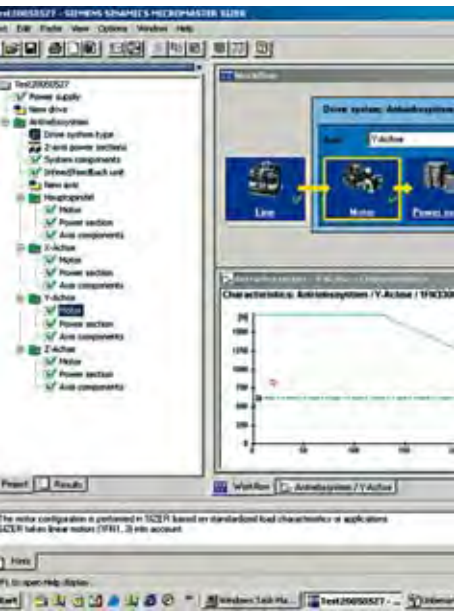

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13/3 EMC information

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13/29 Motor reactors, sine-wave filters, Sensor Modules, expansion modules, Braking Modules and braking resistors
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13/33 **Mechanical configuration of the drive system**
13/33 Specification of components for connection system
13/33 Configuration of a drive line-up in booksize format
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13/34 Configuration of a mixed drive line-up

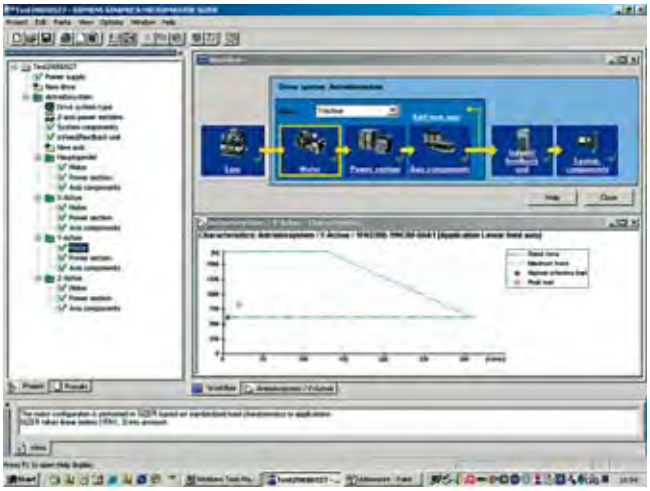
13/36 **Heat dissipation**
13/36 Mandatory minimum installation clearances
13/38 Calculation of internal control cabinet temperature

Part 3 **Engineering software**
STARTER commissioning tool
Drive Control Chart (DCC)
Drive ES engineering software

Part 14 **CAD CREATOR**
Dimension drawing and 2D/3D CAD generator
www.siemens.com/cadcreator

SIZER configuration tool

Overview



The following drives and controls can be engineered in a user-friendly fashion using the SIZER configuration tool:

- SINAMICS Low Voltage, MICROMASTER 4, DYNAVERT T, SIMATIC ET 200S FC and SIMATIC ET 200pro FC drive systems
- Motor starters for network configuring
- SINUMERIK solution line CNC control
- SIMOTION Motion Control System
- SIMATIC Technology

It provides support when setting up the technologies involved in the hardware and firmware components required for a drive task. SIZER supports the complete configuration of the drive system, from simple individual drives to complex multi-axis applications.

SIZER supports all of the configuring steps in a workflow:

- Configuring the power supply
- Designing the motor and gearbox, including calculation of mechanical transmission elements
- Configuring the drive components
- Compiling the required accessories
- Selecting the line-side and motor-side power options, e.g. cables, filters, and reactors

When SIZER was being designed, particular importance was placed on a high degree of usability and a universal, function-based approach to the drive application. The extensive user guidance makes using the tool easy. Status information keeps you continually informed about the progress of the configuration process.

The SIZER user interface is available in German, English, French and Italian.

The drive configuration is saved in a project. In the project, the components and functions used are displayed in a hierarchical tree structure.

The project view permits the configuration of drive systems and the copying/inserting/modifying of drives already configured.

The configuration process produces the following results:

- A parts list of the required components (export to Excel, use of the Excel data sheet for import to VSR)
- Technical specifications of the system
- Characteristic curves
- Comments on system reactions
- Mounting arrangement of drive and control components and dimension drawings of motors

These results are displayed in a results tree and can be reused for documentation purposes.

Technological online help is available:

- Detailed technical data
- Information about the drive systems and their components
- Decision-making criteria for the selection of components
- Online help in German, English, French, Italian, Chinese and Japanese

Minimum system requirements

PG or PC with Pentium III 500 MHz (Windows XP)

512 MB RAM (1024 MB RAM recommended)

At least 4.1 GB of free hard disk space

An additional 100 MB of free hard disk space on Windows system drive

Screen resolution 1024 × 768 pixels

Windows XP Professional SP2 / XP Home Edition SP2 / Windows Vista Business

Microsoft Internet Explorer 5.5 SP2

Selection and ordering data

	Order No.
SIZER configuration tool For SINAMICS and MICROMASTER German, English, French, Italian	**6SL3070-0AA00-0AG0**

Overview

General configuration sequence

The function description of the machine provides the basis for the configuration. The definition of the components is based on physical dependencies and is usually carried out as follows:

Step	Description of configuration activity
1	Clarification of type of drive
2	Definition of boundary conditions and integration into automated system
3	Definition of loading case, calculation of max. load torque, definition of motor
4	Definition of the Motor Module
5	Repetition of steps 3 and 4 for additional axes
6	Calculation of the required DC link power and definition of the Line Module
7	Specification of the required control performance and selection of the Control Unit, definition of component cabling
8	Specification of the line-side options (main switch, fuses, line filters, etc.) and cable cross-sections for system connection and motor connection
9	Definition of additional system components
10	Calculation of the current requirement for the 24 V DC supply for the components and specification of power supplies (SITOP devices, Control Supply Modules)
11	Specification of components for connection system
12	Configuration of drive line-up components
13	Thermal design of the control cabinet

Configuration begins with the mechanical interface to the machine. A suitable motor is selected according to the specified torques and speeds. A matching power unit is then also chosen. Depending on the requirements of the machine, the motor is supplied as a single drive via a Power Module or within a multi-motor drive group via a Motor Module. Once the basic components have been defined, the system components for matching to the electrical and mechanical interfaces are selected.

The SIZER configuring tool helps the user to select the correct components quickly and easily. The user enters the relevant torque and speed characteristics and SIZER then guides him confidently through the configuring process, identifying suitable motors and matching SINAMICS power units and other system components.

The following sections describe those SINAMICS S120 components which are needed to create a drive system subject to certain boundary conditions. For information about individual components, please refer to the online help in the SIZER configuring tool system.

EMC information

The electromagnetic compatibility describes - according to the definition of the EMC Directive - the "capability of a device to work satisfactorily in the electromagnetic environment without itself causing electromagnetic interference which is unacceptable for other devices present in this environment". To guarantee that the appropriate EMC Directives are observed, the devices must demonstrate a sufficiently high noise immunity, and also the emitted interference must be limited to acceptable values.

The EMC requirements for "Variable-speed drive systems" are described in the product standard EN 61800-3. A variable-speed drive system (or Power Drive System PDS) consists of the Control Unit and Power Module or Control Unit, Line Module and Motor Module plus the relevant electric motors and encoders including connecting cables. The driven machine is not part of the drive system. EN 61800-3 defines different limits depending on the location of the drive system, referred to as the first and second environments.

Residential buildings or locations at which the drive system is directly connected to a public low-voltage supply without intermediate transformer are defined as the **first environment**.

The term **second environment** refers to all locations outside residential areas. These are basically industrial areas which are supplied from the medium-voltage line supply via their own transformers.

Four different categories are defined in EN 61800-3 depending on the location and the power of the drive:

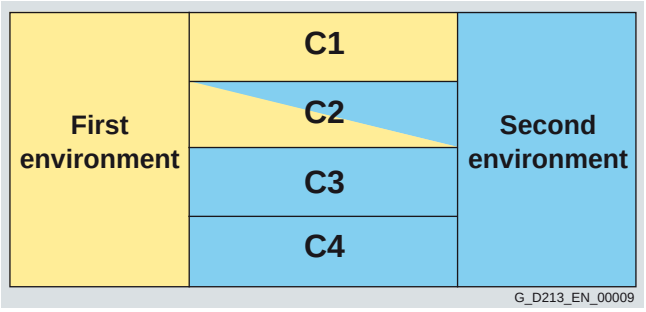
Category C1: Drive systems for rated voltages < 1000 V for unlimited use in the first environment.

Category C2: Stationary drive systems for rated voltages < 1000 V for use in the second environment. Use in the first environment is possible if the drive system is marketed and installed by qualified personnel. The warning information and installation instructions supplied by the manufacturer must be observed.

Category C3: Drive systems for rated voltages < 1000 V for exclusive use in the second environment.

Category C4: Drive systems for rated voltages ≥ 1000 V or for rated currents ≥ 400 A for use in complex systems in the second environment.

The following diagram shows how the four categories are assigned to the first and second environments:



SINAMICS S120 built-in units are designed for use in the second environment.

In order to limit **emitted interference**, RFI filters (some of which are integrated in the unit) are provided which are capable of meeting the requirements of Category C3 or C2 (see chapter SINAMICS S120 drive system).

SINAMICS S120 built-in units fulfill the requirements for **noise immunity** defined in EN 61800-3 for the second environment and consequently also the lower noise immunity values in the first environment.

It is essential to follow the installation instructions in order to ensure compliance with interference emission and immunity values.

SINAMICS S120 Control Units

Overview

Drive functions and basic technological tasks can be carried out by the SINAMICS S120 Control Units. The CU320-2 Control Unit is available for multi-axis applications and the CU310 Control Unit for single drives.

Sophisticated Motion Control tasks are best supported by the powerful SIMOTION D Control Units (D410, D425, D435 and D445-1) with graded performance.

Each of these Control Units is based on an object-oriented SINAMICS S120 standard firmware which contains all the most popular *V/f* control modes and closed-loop control variants, that can be scaled to meet even the most advanced performance requirements.

The following are ready-to-configure drive objects (drive controls):

- The control for a line infeed:
  Infeed Control
- The control for the broad scope of rugged asynchronous (induction) motors and torque motors, including sensorless:
  Vector Control
- The control for permanent-magnet excited synchronous and servo asynchronous motors with demanding dynamic requirements:
  Servo Control

All these control variants are based on the principle of field-oriented, closed-loop Vector control.

The most commonly used *V/f* control modes are stored in the Vector Control drive object and are ideal for implementing even simple applications such as, for example, group drives with SIEMOSYN motors.

Guide to selecting a closed-loop control variant

The two tables below titled "Closed-loop control characteristics" and "Performance characteristics" are provided to help users select the "right" type of closed-loop control.

SIMOTION D425, D435, D445-1 and CX32 Control Units have the integral drive computing power of a SINAMICS Control Unit.

For this reason, the following statements concerning performance features and closed-loop control characteristics of a Control Unit also apply in most respects to SIMOTION D Control Units.

The basic positioner EPos and the Basic Operator Panel BOP20 are not supported by SIMOTION D410, D4x5 and CX32.

Closed-loop control characteristics SINAMICS S

Criteria for assessing control quality	Explanations, definitions
Rise time	The rise time is the period which elapses between an abrupt change in a setpoint and the moment the actual value first reaches the tolerance band (2 %) around the setpoint. The dead time is the period which elapses between the abrupt change in the setpoint and the moment the actual value begins to increase. The dead time is partially determined by the read-in, processing and output cycles of the digital closed-loop control. Where the dead time constitutes a significant proportion of the rise time, it must be separately identified.
Characteristic angular frequency -3 dB	The limit frequency is a measure of the dynamic response of a closed-loop control. A pure sinusoidal setpoint is input to calculate the limit frequency; no part of the control loop must reach the limit. The actual value is measured under steady-state conditions and the ratio between the amplitudes of actual value and setpoint is recorded. -3 dB limit frequency: Frequency at which the absolute value of the actual value drops by 3 dB (to 71 %) for the first time. The closed-loop control can manage frequencies up to this value and remain stable.
Ripple	The ripple is the undesirable characteristic of the actual value which is superimposed on the mean value (useful signal). Oscillating torque is another term used in relation to torque. Typical oscillating torques are caused by motor slot grids, by limited encoder resolution or by the limited resolution of the voltage control of the IGBT power unit. The torque ripple is also reflected in the speed ripple as being indirectly proportional to the mass inertia of the drive.
Accuracy	Accuracy is a measure of the magnitude of the average, repeatable deviation between the actual value and setpoint under nominal conditions. Deviations between the actual value and setpoint are caused by internal inaccuracies in the measuring and control systems. External disturbances, such as temperature or speed, are not included in the accuracy assessment. The closed-loop and open-loop controls should be optimized with respect to the relevant variable.

Configuration

Performance characteristics SINAMICS S

Characteristics	Servo Control	Vector Control	*V/f* Control	Notes
Typical application	• Drives with highly dynamic motion control • Angular-locked synchronism with isochronous PROFIBUS/PROFINET in conjunction with SIMOTION • For use in machine tools and clocked production machines	• Speed-controlled drives with high speed and torque stability in general mechanical engineering systems • Particularly suitable for asynchronous motors (induction motors)	• Drives with low requirements on dynamic response and accuracy • Multi-motor group drives, e.g. on textile machines with SIEMOSYN motors	Mixed operation of Servo Control and Vector Control is not possible on a single CU320-2. Mixed operation with *V/f* control modes is possible with servo or vector control.
Dynamic response	Very high	High	Low	Highest dynamic response with 1FK7/1FT7 High Dynamic synchronous motors and Servo Control.
Control modes with encoder	Position control/ Speed control/ Torque control	Position control/ Speed control/ Torque control	None	SIMOTION D with Servo Control is standard for coordinated motion control.
Control modes without encoder	Speed control	Speed control/ torque control	All *V/f* control modes	With Servo for asynchronous motors (induction motors) only. With *V/f* control the speed can be kept constant by means of selectable slip compensation.
Asynchronous motor (induction motor)	Yes	Yes	Yes	*V/f* control (textiles) is recommended for SIEMOSYN motors.
Synchronous motor	Yes	No	No	
Torque motor	Yes	Yes	No	
Linear motor	Yes	No	No	
Permissible ratio of motor rated current to rated current of Motor Module	1:1 to 1:4	1.3:1 to 1:4	1:1 to 1:12	Maximum control quality in the case of Servo and Vector Control up to 1:4. Between 1:4 and 1:8 increasing restrictions as regards torque and rotational accuracy. *V/f* Control is recommended for < 1:8.
Maximum number of parallel-connected motors per Motor Module	4	8	Unlimited in theory	Motors connected in parallel must be asynchronous (induction) motors with identical power ratings. With *V/f* control, the motors can have different power ratings.
Setpoint resolution position controller	31 bit + sign	31 bit + sign	–	
Setpoint resolution speed/frequency	31 bit + sign	31 bit + sign	0.001 Hz	
Setpoint resolution torque	31 bit + sign	31 bit + sign	–	
Maximum output frequency				
• For current controller clock cycle/pulse frequency	660 Hz with 125 µs/4 kHz	330 Hz with 250 µs/4 kHz	400 Hz with 250 µs/4 kHz	Note limit voltage (2 kV) and use of VPM Module with synchronous motors. Asynchronous (induction) motors only: When using edge modulation, 600 Hz are possible at 4 kHz, or 300 Hz at 2 kHz and 200 Hz at 1.25 kHz.
• For current controller clock cycle/pulse frequency (chassis frame sizes FX and GX)	330 Hz with 250 µs/2 kHz	160 Hz with 250 µs/2 kHz	200 Hz with 250 µs/2 kHz	
• For current controller clock cycle/pulse frequency (chassis frame sizes HX and JX)	Not permitted	100 Hz with 400 µs/1.25 kHz	100 Hz with 400 µs/1.25 kHz	
Maximum field weakening				
• For asynchronous (induction) motors	5 times	5 times	4 times	With Servo Control combined with encoder and appropriate special motors, field weakening up to 16 times the field-weakening threshold speed is possible.
• For synchronous motors	2 times	2 times	–	These values refer to 1FT7/1FK7 synchronous motors. Note limit voltage (kE factor) with non-Siemens motors.

SINAMICS S120 Control Units

Configuration

Fundamental closed-loop control characteristics of SINAMICS S

- Booksize format, pulse frequency 4 kHz, closed-loop torque control

	Servo Control		Vector Control		Notes
Synchronous motor	**1FK7 with R14DQ** [1]	**1FT7**	Vector Control is not designed as an operating mode for 1FK7/1FT7 synchronous motors.		
Controller cycle	125 µs	125 µs			
Rise time (without delay)	0.7 ms	0.5 ms			At a speed operating range from 50 rpm for resolver.
Characteristic angular frequency -3 dB	650 Hz	900 Hz			In this case, the dynamic response is determined primarily by the encoder system.
Torque ripple	3 % of M_0	0.6 % of M_0			With speed operating range of 20 rpm up to rated speed. A ripple of < 1 % is possible with an absolute encoder ≤ 1 rpm. Not possible with resolver.
Torque accuracy	± 1.5 % of M_0	± 1.5 % of M_0			Measured value averaged over 3 s. With motor identification and friction compensation. In torque operating range up to ± M_0. Speed operating range 1:10 up to rated speed. Notice: External influences such as motor temperature can cause an additional long-time inaccuracy (constancy) of about ± 2.5 %. Approx. ± 1 % less accuracy in field-weakening range.
Asynchronous motor (induction motor)	**1PH7/1PH8 without encoder**	**1PH7/1PH8 with incremental encoder 1024 S/R**	**1PH7/1PH8 without encoder**	**1PH7/1PH8 with incremental encoder 1024 S/R**	
Controller cycle	125 µs	125 µs	250 µs	250 µs	
Total rise time (without delay)	–	0.8 ms	2 ms	1.2 ms	With encoderless operation in speed operating range 1:10, with encoder 50 rpm and above up to rated speed.
Characteristic angular frequency -3 dB	–	600 Hz	250 Hz	400 Hz	With encoderless operation in speed operating range 1:10. The dynamic response is enhanced by an encoder feedback.
Torque ripple	–	1.5 % of M_{rated}	2 % of M_{rated}	2 % of M_{rated}	With encoderless operation in speed operating range 1:20, with encoder 20 rpm and above up to rated speed.
Torque accuracy	–	± 3.5 % of M_{rated}	± 2 % of M_{rated}	± 1.5 % of M_{rated}	Measured value averaged over 3 s. With motor identification and friction compensation, temperature effects compensated by KTY84 and mass model. In torque operating range up to ± M_{rated}. Approx. additional inaccuracy of ± 2.5 % in field-weakening range. Servo: Speed operating range 1:10 referred to rated speed. Vector: Speed operating range 1:50 referred to rated speed.

[1] R14DQ: Resolver 14 bit (resolution 16384, internally 2-pole).

Configuration

- Booksize format, pulse frequency 4 kHz, closed-loop speed control

	Servo Control		Vector Control		Notes
Synchronous motor	**1FK7 with R14DQ** [1]	**1FT7**	Vector Control is not designed as an operating mode for 1FK7/1FT7 synchronous motors.		
Controller cycle	125 µs	125 µs			
Total rise time (without delay)	3.5 ms	2.3 ms			With encoderless operation in speed operating range 1:10, with encoder 50 rpm and above up to rated speed.
Characteristic angular frequency -3 dB	140 Hz	250 Hz			In this case, the dynamic response is determined primarily by the encoder system.
Speed ripple	See note	See note			Determined primarily by the total mass moment of inertia, the torque ripple and especially the mechanical configuration. It is therefore not possible to specify a generally applicable value.
Speed accuracy	≤ 0.001 % of n_{rated}	≤ 0.001 % of n_{rated}			Determined primarily by the resolution of the control deviation and encoder evaluation in the converter. This is implemented on a 32-bit basis for SINAMICS.
Asynchronous motor (induction motor)	**1PH7/1PH8 without encoder**	**1PH7/1PH8 with incremental encoder 1024 S/R**	**1PH7/1PH8 without encoder**	**1PH7/1PH8 with incremental encoder 1024 S/R**	
Controller cycle	125 µs	125 µs	250 µs	250 µs	
Total rise time (without delay)	12 ms	5 ms	20 ms	10 ms	With encoderless operation in speed operating range 1:10, with encoder 50 rpm and above up to rated speed.
Characteristic angular frequency -3 dB	40 Hz	120 Hz	50 Hz	80 Hz	With encoderless operation in speed operating range 1:10. The dynamic response is enhanced by an encoder feedback. Servo with encoder is slightly more favorable than Vector with encoder, as the speed controller cycle with Servo is quicker.
Speed ripple	See note	See note	See note	See note	Determined primarily by the total mass moment of inertia, the torque ripple and especially the mechanical configuration. It is therefore not possible to specify a generally applicable value.
Speed accuracy	0.1 × f_{slip}	≤ 0.001 % of n_{rated}	0.05 × f_{slip}	≤ 0.001 % of n_{rated}	Without encoder: Determined primarily by the accuracy of the calculation model for the torque-producing current and rated slip of the asynchronous motor (induction motor) (see table Typical slip values). With speed operating range 1:50 (vector) or 1:10 (servo) and with activated temperature evaluation.

[1] R14DQ: Resolver 14 bit (resolution 16384, internally 2-pole).

SINAMICS S120 Control Units

Configuration

- Blocksize, booksize compact, booksize and chassis, pulse frequency 4 kHz, position control

	Servo Control		Vector Control		Notes
Synchronous motor	**1FT7**	**1FK7**	Vector Control is not designed as an operating mode for 1FT7/1FK7 synchronous motors.		
Position controller cycle	1 ms	1 ms			
Resolution	4.19×10^6 incr./rev.	16384 incr./rev.			Correspondingly better with multi-pole resolver.
Attainable positioning accuracy	10^5 ... 10^6 incr./rev.	4096 incr./rev.			In practice, the resolution must be higher than the required positioning accuracy by a factor of 4 to 10. These values are approximate nominal values only.
• In relation to the motor shaft, approx.	0.00072 °	0.1 °			
Asynchronous motor (induction motor)	**1PH7/1PH8 with AM22DQ[1)]**	**1PH7/1PH8 with incremental encoder 1024 S/R**	**1PH7/1PH8 with AM22DQ[1)]**	**1PH7/1PH8 with incremental encoder 1024 S/R**	
Position controller cycle	1 ms	1 ms	2 ms	2 ms	
Resolution	4.19×10^6 incr./rev.	4096 incr./rev.	4.19×10^6 incr./rev.	4096 incr./rev.	
Attainable positioning accuracy	10^5 ... 10^6 incr./rev.	1024 incr./rev.	10^5 ... 10^6 incr./rev.	512 incr./rev.	In practice, the resolution must be higher than the required positioning accuracy by a factor of 4 to 10. These values are approximate nominal values only. Vector is less accurate than servo by a factor of approximately 2.
• In relation to the motor shaft, approx.	0.00072 °	0.35 °	0.00072 °	0.7 °	

[1)] AM22DQ: Absolute encoder 22 bit single-turn (resolution 4194304, encoder-internal 2048 S/R) + 12 bit multi-turn (traversing range 4096 revolutions).

Configuration

- Chassis format, pulse frequency 2 kHz, closed-loop torque control

	Servo Control		Vector Control		Notes
Synchronous motor	**1FT7 without encoder**	**1FT7 with AM22DQ**[1]	Vector Control is not designed as an operating mode for 1FT7 synchronous motors.		
Controller cycle	250 µs	250 µs			
Total rise time (without delay)	–	1.2 ms			
Characteristic angular frequency -3 dB	–	400 Hz			In this case, the dynamic response is determined primarily by the encoder system.
Torque ripple	–	1.3 % of M_0			A ripple of < 1 % is possible with an absolute encoder ≤ 1 rpm. Not possible with resolver.
Torque accuracy	–	± 1.5 % of M_0			Measured value averaged over 3 s. With motor identification and friction compensation. In torque operating range up to ± M_0. Speed operating range 1:10 up to rated speed. Notice: External influences such as motor temperature can cause an additional long-time inaccuracy (constancy) of about ± 2.5 %. Approx. ± 1 % less accuracy in field-weakening range.
Asynchronous motor (induction motor)	**1PH7/1PH8 without encoder**	**1PH7/1PH8 with incremental encoder 1024 S/R**	**1PH7/1PH8 without encoder**	**1PH7/1PH8 with incremental encoder 1024 S/R**	
Controller cycle	250 µs	250 µs	250 µs	250 µs	
Total rise time (without delay)	–	1.6 ms	2.5 ms	1.6 ms	With encoderless operation in speed operating range 1:10, with encoder 50 rpm and above up to rated speed.
Characteristic angular frequency -3 dB	–	350 Hz	200 Hz	300 Hz	With encoderless operation in speed operating range 1:10. The dynamic response is enhanced by an encoder feedback.
Torque ripple	–	2 % of M_{rated}	2.5 % of M_{rated}	2 % of M_{rated}	With encoderless operation in speed operating range 1:20, with encoder 20 rpm and above up to rated speed.
Torque accuracy	–	± 3.5 % of M_{rated}	± 2 % of M_{rated}	± 1.5 % of M_{rated}	Measured value averaged over 3 s. With motor identification and friction compensation, temperature effects compensated by KTY84 and mass model. In torque operating range up to ± M_{rated}. Approx. additional inaccuracy of ± 2.5 % in field-weakening range. Servo: Speed operating range 1:10 referred to rated speed. Vector: Speed operating range 1:50 referred to rated speed.

[1] AM22DQ: Absolute encoder 22 bit single-turn (resolution 4194304, encoder-internal 2048 S/R) + 12 bit multi-turn (traversing range 4096 revolutions).

SINAMICS S120 Control Units

Configuration

- Chassis format, pulse frequency 2 kHz, closed-loop speed control

	Servo Control		Vector Control		Notes
Synchronous motor	**1FT7 without encoder**	**1FT7 with AM22DQ**[1]	Vector Control is not designed as an operating mode for 1FT7 synchronous motors.		
Controller cycle	250 µs	250 µs			
Total rise time (without delay)	–	5 ms			With encoderless operation in speed operating range 1:10, with encoder 50 rpm and above up to rated speed.
Characteristic angular frequency -3 dB	–	100 Hz			In this case, the dynamic response is determined primarily by the encoder system.
Speed ripple	–	See note			Determined primarily by the total mass moment of inertia, the torque ripple and especially the mechanical configuration. It is therefore not possible to specify a generally applicable value.
Speed accuracy	–	≤ 0.001 % of n_{rated}			Determined primarily by the resolution of the control deviation and encoder evaluation in the converter. This is implemented on a 32-bit basis for SINAMICS.
Asynchronous motor (induction motor)	**1PH7/1PH8 without encoder**	**1PH7/1PH8 with incremental encoder 1024 S/R**	**1PH7/1PH8 without encoder**	**1PH7/1PH8 with incremental encoder 1024 S/R**	
Controller cycle	250 µs	250 µs	250 µs	250 µs	
Total rise time (without delay)	21 ms	8 ms	20 ms	12 ms	With encoderless operation in speed operating range 1:10, with encoder 50 rpm and above up to rated speed.
Characteristic angular frequency -3 dB	25 Hz	80 Hz	35 Hz	60 Hz	With encoderless operation in speed operating range 1:10. The dynamic response is enhanced by an encoder feedback. Servo with encoder is slightly more favorable than Vector with encoder, as the speed controller cycle with Servo is quicker.
Speed ripple	See note	See note	See note	See note	Determined primarily by the total mass moment of inertia, the torque ripple and especially the mechanical configuration. It is therefore not possible to specify a generally applicable value.
Speed accuracy	0.1 × f_{slip}	≤ 0.001 % of n_{rated}	0.05 × f_{slip}	≤ 0.001 % of n_{rated}	Without encoder: Determined primarily by the accuracy of the calculation model for the torque-producing current and rated slip of the asynchronous motor (induction motor) (see table Typical slip values). With speed operating range 1: 50 (Vector) or 1:10 (Servo) and with active temperature evaluation.

[1] AM22DQ: Absolute encoder 22 bit single-turn (resolution 4194304, encoder-internal 2048 S/R) + 12 bit multi-turn (traversing range 4096 revolutions).

Configuration

Typical slip values for standard asynchronous motors (induction motors)

Motor output	Slip values	Notes
< 1 kW (1.34 HP)	6 % of n_{rated} e.g. motor with 1500 rpm: 90 rpm	The slip values of 1PH asynchronous motors are very similar to those of standard motors
< 10 kW (13.4 HP)	3 % of n_{rated} e.g. motor with 1500 rpm: 45 rpm	
< 30 kW (40.2 HP)	2 % of n_{rated} e.g. motor with 1500 rpm: 30 rpm	
< 100 kW (134 HP)	1 % of n_{rated} e.g. motor with 1500 rpm: 15 rpm	
> 500 kW (671 HP)	0.5 % of n_{rated} e.g. motor with 1500 rpm: 7.5 rpm	

Performance of integrated closed-loop drive control with SIMOTION D4x5/CX32 (closed-loop drive control based on firmware version 2.x)

The degree to which the capacity of the closed-loop drive control with SIMOTION D4x5/CX32 is utilized depends on requirements in terms of number of axes, functional scope and control dynamic response.

When additional software functions (DCC, Safety, etc.) are activated and other components (Terminal Modules, CX32, ...) are employed, fewer axes can be computed by the integrated closed-loop drive control. With the SIZER configuration tool, it is easy to configure the SINAMICS S120 drive family including SIMOTION D. It can also be used to determine the possible number of axes and the resulting load according to performance requirements.

The following table provides a rough overview of computing performance as a function of current controller clock cycle (dynamic response) and number of axes with basic scope of functions (factory setting).

	Dynamic response (current controller clock cycle)	Number of axes	Note
Servo Control	125 µs	6	Including one infeed (Basic Line Module, Smart Line Module, Active Line Module). Number of axes applies only to basic functionality. Without expanded setpoint channel. Note power unit derating where applicable.
	250 µs	6	
Vector Control	250 µs	2	Including one infeed (Basic Line Module, Smart Line Module, Active Line Module). Number of axes applies only to basic functionality. Expanded setpoint channel included as standard. Note power unit derating where applicable.
	500 µs	4	
V/f Control	250 µs	4	Including one infeed (Basic Line Module, Smart Line Module, Active Line Module). Number of axes applies only to basic functionality. Expanded setpoint channel included as standard.
	400 µs	6	
	500 µs	8	
Mixed operation			
Servo Control plus *V/f* Control	125 µs + 250 µs/500 µs	5	Including one infeed (Basic Line Module, Smart Line Module, Active Line Module). Maximum 2 *V/f* axes with 250 µs current controller clock cycle, otherwise divide as required.
Vector Control plus *V/f* Control	250 µs/500 µs	2/4	Including one infeed (Basic Line Module, Smart Line Module, Active Line Module). In mixed operation Vector with *V/f* no difference to pure Vector operation.

SINAMICS S120 Control Units

Configuration

CU320-2: Axis licensing according to performance expansion (firmware version 4.3 and higher)

The CU320-2 is licensed purely according to axis number. The performance expansion is essentially required with four or more servo axes, four or more vector axes and seven or more *V/f* axes, irrespective of computing capacity.

	Dynamic response (current controller clock cycle)	Number of axes without performance expansion	Number of axes with performance expansion	Note
Servo Control	62.5 µs	3	3	3 servo axes are possible with a cycle time of 62.5 µs. The performance expansion is therefore ineffective. The performance expansion is required with 4 or more servo axes irrespective of computing capacity.
	125 µs	3	6	
	250 µs	3	6	
Vector Control	250 µs	3	3	3 servo axes are possible with a cycle time of 250 µs. The performance expansion is therefore ineffective. The performance expansion is required with 4 or more vector axes irrespective of computing capacity.
	500 µs	3	6	
V/f Control	250 µs	6	6	6 *V/f* axes are possible with a cycle time of 250 µs. The performance expansion is therefore ineffective. The performance expansion is required with 7 or more *V/f* axes irrespective of computing capacity.
	500 µs	6	12	
Mixed operation				
Servo Control plus *V/f* Control	125 µs/500 µs	3+0; 2+2; 1+4; 0+6	6+0; 5+2; 4+4; 3+6 2+8; 1+10; 0+12	Two *V/f* axes can be computed instead of a servo or vector axis.
Vector Control plus *V/f* Control	500 µs/500 µs	3+0, 2+2; 1+4; 0+6	6+0; 5+2; 4+4; 3+6 2+8; 1+10; 0+12	

CU320-2: Possible quantity structures, maximum configurations

In addition to the number of axes, the following functions and hardware components also have an influence on the possible quantity structure (maximum configuration) of the CU320-2:

- Extended Safety (SS2, SOS, SSM, SLS)
- EPos
- DCC
- CAN bus
- High-speed Terminal Modules (task = 250 µs)

Some examples of possible quantity structures

Examples with Servo

- 6 servo axes (125 µs) + 2 EPos + 2 extended safety
- 5 servo axes (125 µs) + 5 EPos + 5 extended safety
- 6 servo axes (250 µs) + 6 EPos + 6 extended safety + 100 DCC blocks (task: 2 ms)

Examples with Vector

- 6 vector axes (500 µs) + 50 DCC blocks (task: 2 ms)
- 4 vector axes (500 µs) + 50 DCC blocks (task: 2 ms) + 2 winders (task: 4 ms, DCC-based)

Examples with *V/f*

- 12 *V/f* axes (500 µs) + 50 DCC blocks (task: 2 ms)
- 10 *V/f* axes (500 µs) + 100 DCC blocks (task: 2 ms) + 2 extended safety

The SIZER configuration tool can be used to perform very quick reliability checks on more complex quantity structures.

Configuration

Influencing variables on minimum required pulse frequency of power unit

Basic requirements such as maximum speed or necessary dynamic response of the control have a direct effect in determining the minimum pulse frequency of the power unit. If the minimum pulse frequency exceeds the rated pulse frequency, derating must be implemented accordingly (see chapter SINAMICS S120 drive system).

The following table provides a general overview.

Influencing variables		Minimum pulse frequency	Notes
Servo Control, Vector Control (required max. output frequency/ speed)	100 Hz correspond to: 3000 rpm for Z_p = 2 1500 rpm for Z_p = 4 428 rpm for Z_p = 14 352 rpm for Z_p = 17	1.25 kHz	Z_p is the number of pole pairs of the motor. This equals 2 on 1PH asynchronous motors (induction motors). 1FT7/1FK7 synchronous motors have between 3 and 5 pairs of poles. For torque motors, the numbers of pole pairs are typically 14 and 17. When edge modulation is used (only possible for asynchronous motors), the output frequency is increased by a factor of 2.
	160 Hz correspond to: 4800 rpm for Z_p = 2 2400 rpm for Z_p = 4 685 rpm for Z_p = 14 565 rpm for Z_p = 17	2 kHz	
	200 Hz correspond to: 6000 rpm for Z_p = 2 3000 rpm for Z_p = 4 856 rpm for Z_p = 14 704 rpm for Z_p = 17	2.5 kHz	
	300 Hz correspond to: 9000 rpm for Z_p = 2 4500 rpm for Z_p = 4 1284 rpm for Z_p = 14 1056 rpm for Z_p = 17	4 kHz	
	400 Hz correspond to: 12000 rpm for Z_p = 2 6000 rpm for Z_p = 4	4 kHz	Notice: For Servo Control with 1FT7/1FK7 motors only. Note field weakening requirements and suitable encoder system for higher speeds.
V/f Control (required max. output frequency/ speed)	100 Hz correspond to: 6000 rpm for Z_p = 1 3000 rpm for Z_p = 2	1.25 kHz	*V/f* Control is designed only for asynchronous (induction motors) and SIEMOSYN motors. Z_p is the number of pole pairs of the motor. This is mainly between 1 and 4 on 1LA/1LG standard asynchronous motors (induction motors). SIEMOSYN motors have 1 or 2 pole pairs or, with larger shaft heights, 3 pairs.
	160 Hz correspond to: 9600 rpm for Z_p = 1 4800 rpm for Z_p = 2	2 kHz	
	200 Hz correspond to: 12000 rpm for Z_p = 1 6000 rpm for Z_p = 2	2.5 kHz	
	300 Hz correspond to: 18000 rpm for Z_p = 1 9000 rpm for Z_p = 2	4 kHz	
	400 Hz correspond to: 24000 rpm for Z_p = 1 12000 rpm for Z_p = 2	4 kHz	
Dynamic response requirement (current controller clock cycle)	125 µs 250 µs 400 µs 500 µs	4 kHz 2 kHz 2.5 kHz 1 kHz	Servo Control requires a minimum pulse frequency of 2 kHz.
Sine-wave filters	–	4 kHz	Notice: If sine-wave filters are operated at low pulse frequencies, resonance problems can occur and cause the filters to severely overheat.
Output reactor to motor	Max. frequency: 150 Hz correspond to 4500 rpm for Z_p = 2		The output reactor can be operated at minimum 2 kHz only.

Configuration

Core topologies: Component cabling with DRIVE-CLiQ

The components communicate with one another via the standard DRIVE-CLiQ interface.

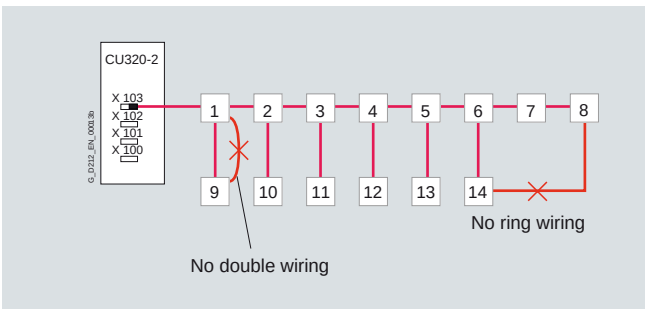
This interface connects a Control Unit with the power components, encoders and other system components, e.g. Terminal Modules. Setpoints and actual values, control commands, status messages, and rating plate data for the components are transferred via DRIVE-CLiQ.

Note: The following basic rules governing the wiring of components with DRIVE-CLiQ are also applicable to SIMOTION D425, D435, D445-1 and CX32.

Basic rules for wiring with DRIVE-CLiQ

The following rules apply to the wiring of components with DRIVE-CLiQ:

- A maximum of 14 nodes can be connected to a DRIVE-CLiQ socket on the CU320-2 Control Unit.
- Up to 8 nodes can be connected in a line. A line is always seen from the perspective of the Control Unit
- Maximum 6 Motor Modules can be operated in a line
- Ring wiring is not permitted
- Components must not be double-wired
- The motor encoder should be connected to the associated Motor Module
- Up to 9 encoders can be operated on one Control Unit
- A maximum of 8 Terminal Modules can be connected
- The Terminal Module TM54F must not be operated on the same DRIVE-CLiQ line as Motor Modules
- The Terminal Modules TM15, TM17 High Feature and TM41 have faster sampling cycles than the TM31 and TM54F. For this reason, the two groups of Terminal Modules must be connected in separate DRIVE-CLiQ lines.
- A DRIVE-CLiQ Hub DMC20 counts as two nodes

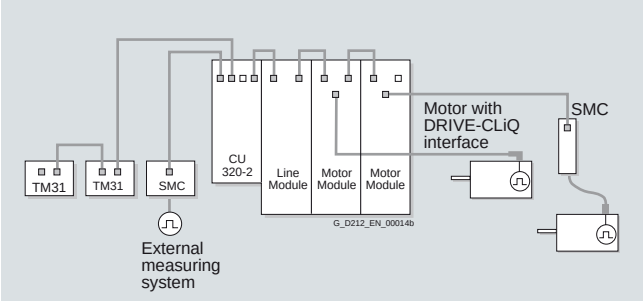


DRIVE-CLiQ configuration examples

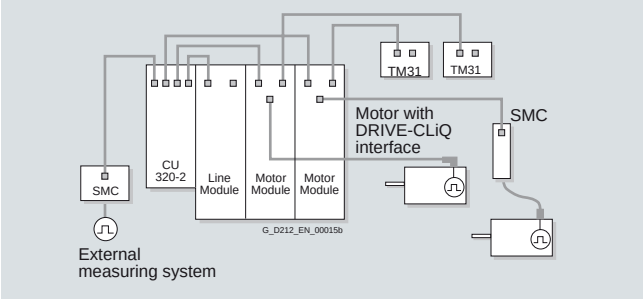
There is a basic clock cycle within a DRIVE-CLiQ connection. For this reason, only combinations of modules with the same sampling cycle or integer-divisible sampling times can be operated on a DRIVE-CLiQ connection. To simplify the configuring process, it is advisable to supply the Line Module and Motor Modules via separate DRIVE-CLiQ connections.

The power components are supplied with the required DRIVE-CLiQ connecting cables for connection to the adjacent DRIVE-CLiQ node in the axis grouping (line topology). Preassembled DRIVE-CLiQ cables in various lengths up to 100 m (328 ft) are available for connecting motor encoders, direct measuring encoders, Terminal Modules, etc.

The DRIVE-CLiQ cable connections inside the control cabinet must not exceed 70 m (230 ft) in length, e.g. connection between the CU320-2 Control Unit and the first Motor Module or between Motor Modules. The maximum permissible length of DRIVE-CLiQ MOTION-CONNECT cables to external components is 100 m (328 ft).

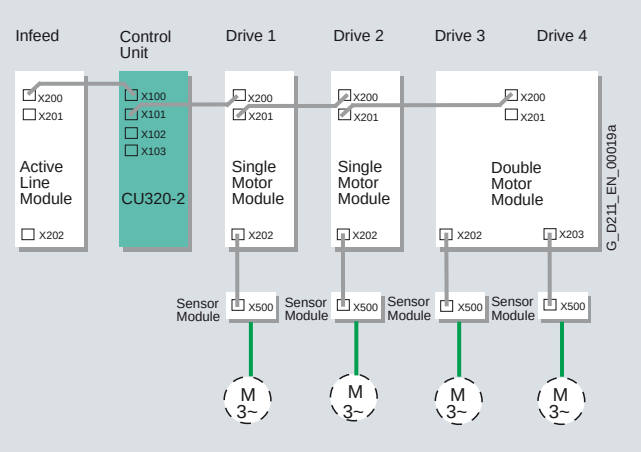


Example of a line topology for standard solutions

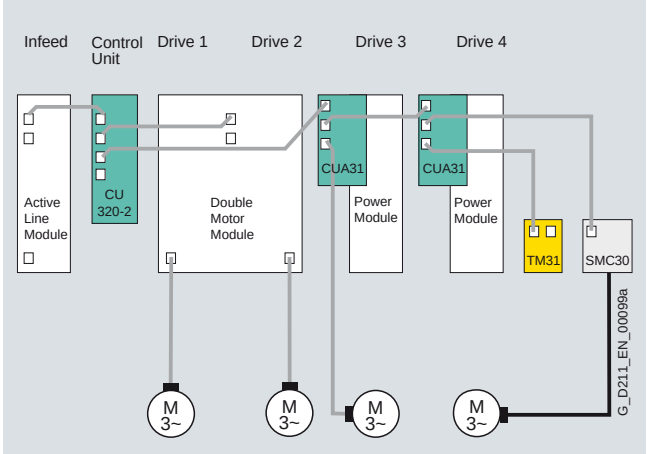


Example of a tree topology for high-performance solutions, e.g. high-dynamic axes in direct motion control group; selective access to individual axes/axis groupings for maintenance operation, etc.

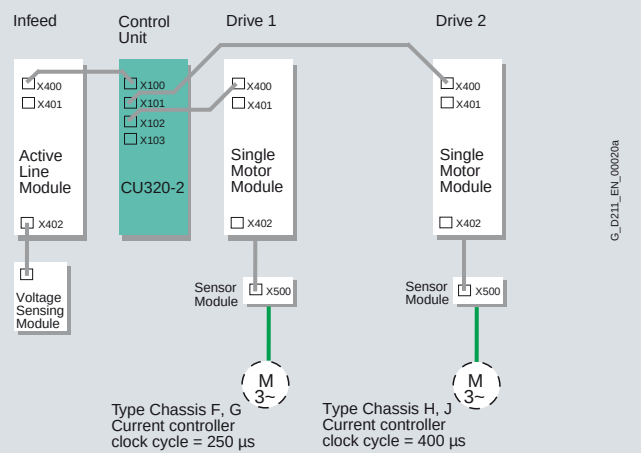
Configuration



Preferred wiring of DRIVE-CLiQ connections illustrated by example of booksize format
Active Line Module: Current controller clock cycle 250 µs.
Motor Modules: 4 × vector control = current controller clock cycle 500 µs



Example of wiring: Power Modules can also be operated on a CU320-2 when connected via a CUA31



Wiring illustrated by example of chassis format with different current controller clock cycles

Motors

Configuration

Motor selection

The motor is selected on the basis of the required torque which is defined by the application, e.g. traveling drives, hoisting drives, test stands, centrifuges, paper and rolling mill drives, feed drives or main spindle drives. Gear units for movement conversion or for adapting the motor speed and motor torque to the load conditions must also be considered.

As well as the load torque which is determined by the application, the following mechanical data are among those required to calculate the torque to be provided by the motor:

- Masses to be moved
- Diameter of the drive wheel/diameter
- Leadscrew pitch, gear ratios
- Frictional resistance data
- Mechanical efficiency
- Traversing paths
- Maximum velocity
- Maximum acceleration and maximum deceleration
- Cycle time

You must decide whether synchronous or asynchronous motors (induction motors) are to be used.

Synchronous motors should be selected for compact construction volume, low rotor moment of inertia and therefore maximum dynamic response.

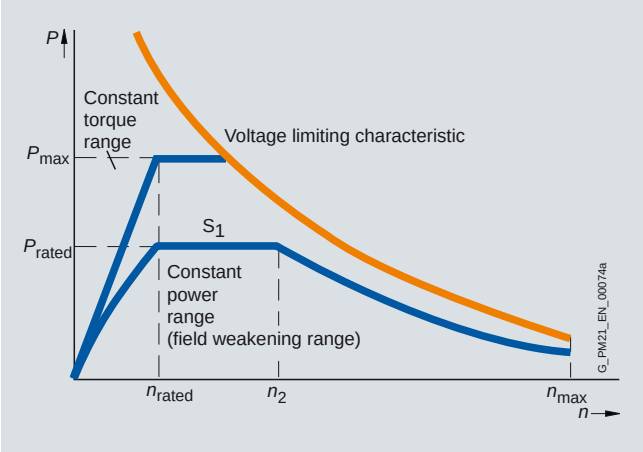
Asynchronous motors (induction motors) can be used to increase maximum speeds in the field-weakening range. Asynchronous motors (induction motors) for higher powers are also available.

The following factors are of prime importance during configuration:

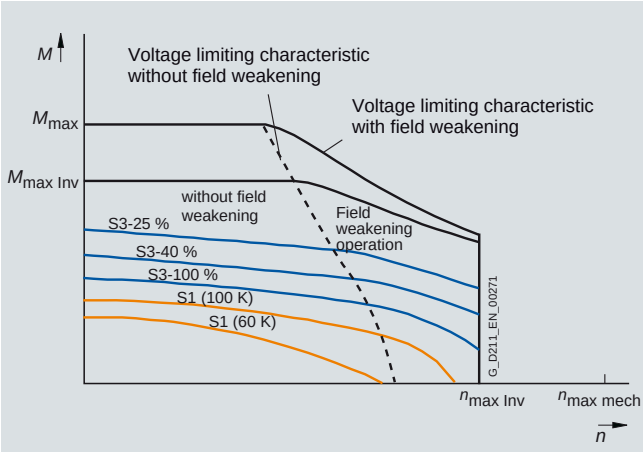
- The line supply configuration when using specific types of motor and/or line filters on IT systems (non-grounded systems)
- The ambient temperatures and the installation altitude of the motors and drive components

The motor-specific limiting characteristics provide the basis for defining the motors.

These define the torque or power characteristic over speed and take into account the motor limits based on the DC link voltage of the Power or Motor Module. The DC link voltage in turn is dependent on the line voltage and, with multi-motor drives, on the type of Line Module.



Typical speed/power graph for asynchronous (induction) motors



Torque characteristics of synchronous motors

For detail engineering information, please refer to the motor configuration manuals.

An updated overview of configuration manuals is available in a number of languages on the Internet at:
www.siemens.com/motioncontrol

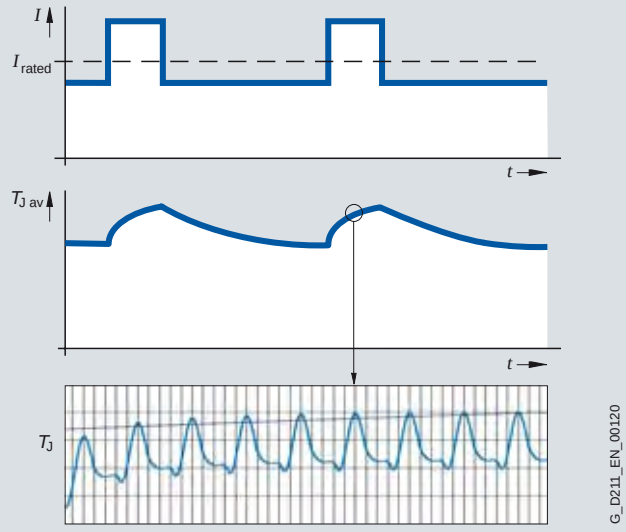
Follow menu items
Support > Technical Documentation > Ordering Documentation > Printed Documentation or download at:
Support > Technical Documentation > Download Documentation > DOConWEB.

The SIZER configuration tool is available to support engineering.

Configuration

Overload capability

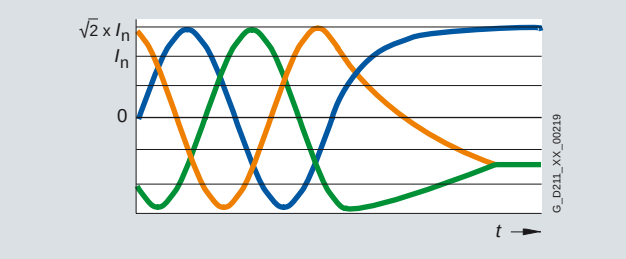
The power units of the Line Modules, Motor Modules and Power Modules are designed for brief overloads, i.e. the Modules are capable of supplying more than the rated current I_{rated} for short periods. In this instance, the thermal capacity of the heat sink is utilized, allowing for the relevant thermal time constants. The power semiconductors and actual current sensing circuit are rated for a maximum current I_{max} which must not be exceeded. The overload capability is determined by I_{max}, I_{rated} and the thermal time constants. A number of characteristic duty cycles are defined in the technical specifications for the power units. The SIZER configuring tool calculates the load on the basis of a specified duty cycle with optional time characteristic and then identifies the power unit which is required.



$T_{J\,av}$ average junction temperature of the power semiconductor
T_J junction temperature of the power semiconductor

The thermal time constant of a power semiconductor chip is typically within the range of 100 ms. With frequencies below 10 Hz, the overload capacity is therefore limited. The software takes account of these limitations by means of a thermal model and protects the devices against overload in all operating states. It must be noted, especially at frequencies around 0 Hz, that the specified rated current I_{rated} is the root-mean-square value of a sinusoidal current. If the frequency of the three-phase system is reduced to 0 Hz, a pure direct current flows in all phases at standstill. The root-mean-square value of this direct current can reach the peak value of the sinusoidal current depending on the phase relation.

The output current in this state is greater than the rated current I_{rated} by a factor of √2. The individual motor terminals and cables are designed thermically for the rated current in normal operation, so the devices are protected against this overload while taking account of the thermal time constant.



Derating characteristics

The power units can be operated with rated current or power and the specified pulse frequency up to an ambient temperature of 40 °C (104 °F). The heat sink reaches the maximum permissible temperature at this operating point. If the ambient temperature increases above 40 °C (104 °F), the resulting heat loss must be reduced to prevent the heat sink from overheating.

At a given current, the heat loss increases in proportion to the pulse frequency. The rated output current I_{rated} must be reduced to ensure that the maximum heat loss or heat sink temperature for higher pulse frequencies is not exceeded. When the correction factor k_f for the pulse frequency is applied, the rated output current I_{ratedf} that is valid for the selected pulse frequency is adjusted.

When configuring a drive, please note that power units may not be capable of supplying the full current or power in the temperature range between 40 °C (104 °F) and 55 °C (131 °F). The power units measure the heat sink temperature and protect themselves against thermal overloading at temperatures > 40 °C (104 °F).

The air pressure, and therefore air density, drops at altitudes above sea level. At these altitudes, the same quantity of air does not have the same cooling effect and the air gap between two electrical conductors can only insulate a lower voltage. Typical air pressure values are:

0 m above sea level: 100 kPa

2000 m (6562 ft) above sea level: 80 kPa

3000 m (9843 ft) above sea level: 70 kPa

4000 m (13124 ft) above sea level: 62 kPa

5000 m (16405 ft) above sea level: 54 kPa

At installation altitudes above 2000 m (6562 ft), the line voltage must not exceed certain limits to ensure that surge voltages can be insulated in accordance with EN 60664-1 for surge voltage category III. If the line voltage is higher than this limit at installation altitudes > 2000 m (6562 ft), measures must be taken to reduce transient category III surge voltages to category II values, e.g. equipment must be supplied via an isolating transformer.

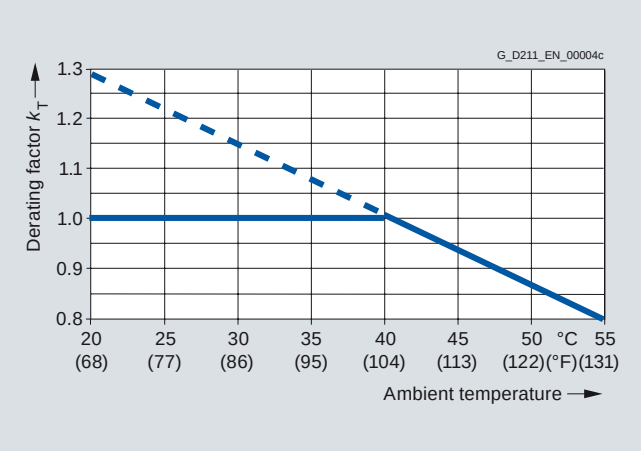
In order to calculate the permissible output current or power, the derating factors must be multiplied for the effects described above. The derating factor k_I for current as a function of installation altitude can be offset against the derating factor k_T for ambient temperature. If the result of multiplying derating factor k_T by derating factor k_I is greater than 1, then the calculation must be based on a rated current of I_{rated} or I_{ratedf}. If the result is < 1, then it must be multiplied by the rated current I_{rated} or I_{ratedf} to calculate the maximum permissible continuous current. The derating factor $k = k_f \times k_T \times k_I$ calculated by this method to obtain the total derating value must be applied to all current values in the specified duty cycles (I_{rated}, I_H, I_L).

The derating characteristic curves of Power Modules, Line Modules and Motor Modules can be found in the technical specifications of the relevant Modules (see chapter SINAMICS S120 drive system).

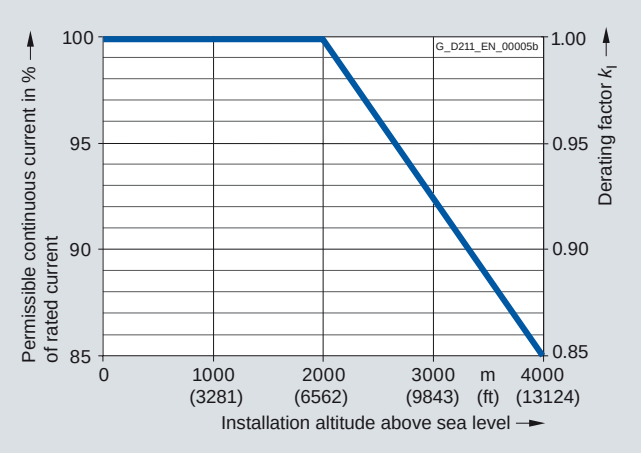
Power units

Configuration

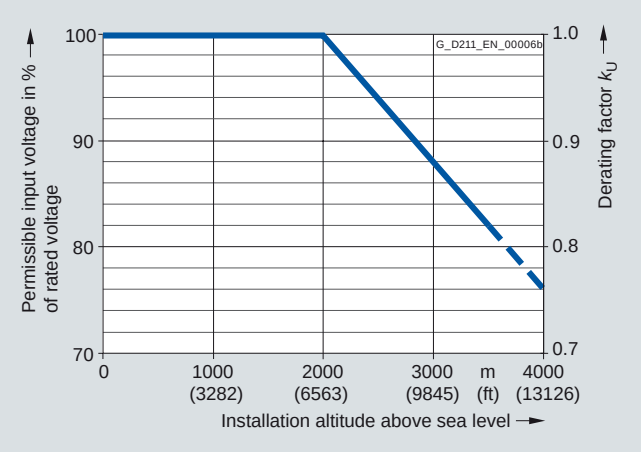
Examples of derating characteristic curves and calculation of the permissible output current:



Current derating as a function of the ambient temperature



Current derating as a function of the installation altitude



Voltage derating as a function of the installation altitude

Example 1

A drive system is to be operated at an altitude of 2500 m (8203 ft) at a maximum ambient temperature of 30 °C (86 °F) and rated pulse frequency.

Since the ambient temperature is below 40 °C (104 °F), a compensation calculation (installation altitude/ambient temperature) can be applied.

Installation altitude 2500 m (8203 ft):
Derating factor $k_I = 0.965$, $k_U = 0.94$

Max. ambient temperature 30 °C (86 °F):
Derating factor $k_T = 1.133$

$k_I \times k_T = 0.965 \times 1.133 = 1.093 \Rightarrow 1.0$ due to installation altitude/ambient temperature compensation

$k = k_f \times (k_I \times k_T) = 1.0 \times (1.0) = 1.0$

Result: Current derating is not required.

However, IEC 60664-1 stipulates that voltage derating is required.

The units in voltage range 380 V to 480 V can be operated up to a voltage of 480 V x 0.94 = 451 V, and the units in voltage range 660 V to 690 V up to 690 V × 0.94 = 648 V.

Example 2

When a drive line-up is configured, a Motor Module with the order number 6SL3320-1TE32-1AA0 is selected (rated output current 210 A, base load current for high overload 178 A). The drive line-up is to be operated at an altitude of 3000 m (9843 ft) where ambient temperatures could reach 35 °C (95 °F) as a result of the installation conditions. The pulse frequency must be set to 4 kHz to provide the required dynamic response.

Installation altitude 3000 m (9843 ft):
Derating factor $k_I = 0.925$, $k_U = 0.88$

Max. ambient temperature 35 °C (95 °F):
Derating factor $k_T = 1.066$

$k_I \times k_T = 0.925 \times 1.066 = 0.987 \Rightarrow$ not fully compensated by installation altitude/ambient temperature

$k = k_f \times (k_I \times k_T) = 0.82 \times (0.925 \times 1.066) = 0.809$

Result: Current derating is required.

Where these boundary conditions apply,

- the max. permissible continuous current of the Motor Module is: 210 A × 0.809 = 170 A
- the base-load current for high overloading is: 178 A × 0.809 = 144 A

IEC 60664-1 stipulates that voltage derating is required.

The selected unit can be operated up to a voltage of 480 V 3 AC × 0.88 or 720 V DC × 0.88 = 422 V 3 AC or 634 V DC, i.e. under these conditions a 400 V asynchronous motor (induction motor) can be operated without restriction. Due to the installation altitude, however, derating might be required for the asynchronous motor (induction motor).

Configuration

Selection of the Power Module or Motor Module

The Motor Module is selected initially on the basis of standstill current $I_{0\ 100\ K}$ (rated current for winding temperature rise 100 K) for synchronous motors and the rated current I_{rated} for asynchronous motors (induction motors), and is specified in the motor description. Dynamic overloads, e.g. during acceleration, must be taken into account by duty cycles and may demand a more powerful Power Module or Motor Module. In this context, it is also important to remember that the output current of the Power Module or Motor Module decreases as a function of installation altitude, ambient temperature and pulse frequency setting (see explanations of derating characteristic curves).

For an optimum configuration, the rms motor current I_{load} calculated from the duty cycle is replicated on the Power Module or Motor Module. The following must apply:

$I_{rated,\ module} \geq I_{load}$

$I_{rated,\ module}$ = permissible continuous current of Power Module or Motor Module taking derating characteristic curves into account

The Power Modules or Motor Modules can be required to supply a higher output current for specific time periods. The characteristic curves or overload capability must be noted (see chapter SINAMICS S120 drive system) when modules are engineered for overload.

The SIZER configuration tool is capable of performing precise overload calculations.

Rated current – permissible and non-permissible motor/converter combinations

- Motor rated current higher than rated output current of the Power Module or Motor Module:
  In cases where a motor with a higher rated current than the rated output current of the Power Module or Motor Module is to be connected, the motor will only be able to operate under partial load. The following limit applies:
  The short-time current (=1.5 × base-load current I_H) should be higher or equal to the rated current of the connected motor. Adhering to this dimensioning rule is important because the low leakage inductance of large motors causes current peaks which may result in drive system shutdown or in continuous output limiting by the internal protective electronic circuitry.
- Motor rated current significantly lower than rated output current of the Power Module or Motor Module:
  With the vector control system used, the rated motor current must equal at least $^1/_8$ of the rated output current of the Power Module or Motor Module. With smaller motor currents, the drive can be operated in *V/f* control mode.

Using pulse width modulation, the Power Modules or Motor Modules generate an AC voltage to feed the connected motor from the DC voltage of the DC link. The magnitude of the DC link voltage is determined by the line voltage and, in the case of a Motor Module, by the Line Module used and thus the maximum possible output voltage (see chapter SINAMICS S120 drive system). The speed and loading of the connected motor define the required motor voltage. The maximum possible output voltage must be greater than or equal to the required motor voltage; it may be necessary to select a motor with a different winding.

It is not possible to utilize all modes of pulse width modulation when a sine-wave filter is connected. The maximum possible output voltage (see sine-wave filter) is lower as a result.

Power units

Configuration

Long motor cables

Using pulse width modulation, the Power Modules or Motor Modules generate an AC voltage to feed the connected motor from the DC voltage of the DC link. Capacitive leakage currents are generated in clocked operation and these limit the permissible length of the motor cable. The maximum permissible motor cable length is specified for each Power Module or Motor Module in the component description.

Motor reactors limit the rate of rise and magnitude of the capacitive leakage currents, thereby allowing longer motor cables to be used. The motor reactor and motor cable capacitance form an oscillating circuit which must not be stimulated by the pulse pattern of the output voltage. The resonant frequency of this oscillating circuit must therefore be significantly higher than the pulse frequency. The longer the motor cable, the higher the cable capacitance and the lower the resonant frequency. To provide a sufficient safety margin between this resonant frequency and the pulse frequency, the maximum possible motor cable length is limited, even when several motor reactors are connected in series. The maximum cable lengths in combination with motor reactors are specified in the technical specifications for the motor reactors.

Booksize format Motor Modules

Where a long motor cable is required, a higher rating of Motor Module must be selected or the permissible continuous output current $I_{continuous}$ must be reduced in relation to the rated output current I_{rated}. The configuring data for booksize format Motor Modules are given in the following table:

Motor Module	**Length of motor cable (shielded)**			
Rated output current I_{rated}	> 50 … 100 m (164 … 328 ft)	> 100 … 150 m (328 … 492 ft)	> 150 … 200 m (492 … 656 ft)	> 200 m (656 ft)
3 A/5 A	Use Motor Module 9 A	Use Motor Module 9 A	Not permissible	Not permissible
9 A	Use Motor Module 18 A	Use Motor Module 18 A	Not permissible	Not permissible
18 A	Use Motor Module 30 A or $I_{max} \le 1.5 \times I_{rated}$ $I_{continuous} \le 0.95 \times I_{rated}$	Use Motor Module 30 A	Not permissible	Not permissible
30 A	Always permissible	$I_{max} \le 1.35 \times I_{rated}$ $I_{continuous} \le 0.9 \times I_{rated}$	$I_{max} \le 1.1 \times I_{rated}$ $I_{continuous} \le 0.85 \times I_{rated}$	Not permissible
45 A/60 A	Always permissible	$I_{max} \le 1.75 \times I_{rated}$ $I_{continuous} \le 0.9 \times I_{rated}$	$I_{max} \le 1.5 \times I_{rated}$ $I_{continuous} \le 0.85 \times I_{rated}$	Not permissible
85 A/132 A	Always permissible	$I_{max} \le 1.35 \times I_{rated}$ $I_{continuous} \le 0.95 \times I_{rated}$	$I_{max} \le 1.1 \times I_{rated}$ $I_{continuous} \le 0.9 \times I_{rated}$	Not permissible
200 A	Always permissible	$I_{max} \le 1.25 \times I_{rated}$ $I_{continuous} \le 0.95 \times I_{rated}$	$I_{max} \le 1.1 \times I_{rated}$ $I_{continuous} \le 0.9 \times I_{rated}$	Not permissible

The permissible cable length for an unshielded motor cable is 150 % of the length for a shielded motor cable.

Motor reactors can also be installed in order to permit the use of longer motor cables.

Configuration

Line Modules

In multi-axis drive applications, a number of Motor Modules are operated on a common DC link, which is supplied with power by a Line Module.

The first task is to decide whether a Basic Line Module, Smart Line Module or an Active Line Module will be used. On the one hand, this depends on whether the drive must be capable of regenerative feedback to the supply and, on the other hand, whether the power supply infeed is to be unregulated and therefore dependent on the power supply voltage, or regulated to a constant DC link voltage.

The chassis format units are available in the 380 V to 480 V voltage range, but also include units in the 500 V to 690 V range. Basic Line Modules are designed for infeed operation only. Active Line Modules have regulated infeeds which feature a step-up function.

In order to calculate the required DC link power and select the correct Line Module, it is important to analyse the entire operating sequence of the drive line-up connected to the DC link. Factors such as partial load, redundancies, duty cycles, coincidence factors and the operating mode (motor / generator mode) must be taken into account.

The DC link power P_d of a single Motor Module is calculated from the shaft output P_{mech} of the motor and the efficiency of the motor η_m and Motor Module η_{wr}.

The following applies in motor mode: $P_d = P_{mech} / (\eta_m \times \eta_{wr})$

The following applies in generator mode: $P_d = P_{mech} \times \eta_m \times \eta_{wr}$

The motor and generator outputs must be added with the corresponding sign in order to calculate the total DC link power. For performance assessment purposes, the DC link voltage U_d can be assumed as a constant, so the required DC link voltage can be calculated as $I_d = P_d/U_d$

Basic Line Modules

The DC link voltage U_d of the Basic Line Modules is load-dependent. Under no-load conditions, the DC link is charged to the line voltage crest value U_L, i.e. $U_d = \sqrt{2} \times U_L$, e.g. U_d = 566 V when a 400 V supply system is connected.

Under load conditions, the DC link voltage reaches the average value of the rectified line voltage applied to the terminals. This average value is determined by the line voltage x factor 1.35. Owing to the voltage drop across the line reactor and in the line feeder cable, the DC link voltage under full load conditions is slightly lower than the theoretical value. In practice, the range of the DC link voltage U_d is as follows:

$1.41 \times U_L > U_d > 1.32 \times U_L$ (no load → rated output)

Smart Line Modules

The DC link voltage U_d of Smart Line Modules is regulated to the average value of the rectified line voltage U_L, i.e. $U_d \approx 1.35 \times U_L$

Due to the voltage drop across the line reactor and in the line feeder cable, the DC link voltage decreases in motor operation and increases in generator operation. The DC link voltage U_d thus varies within the same range as on drives with a Basic Line Module:

$1.41 \times U_L > U_d > 1.32 \times U_L$ (rated output generator mode → rated output motor mode)

Active Line Modules

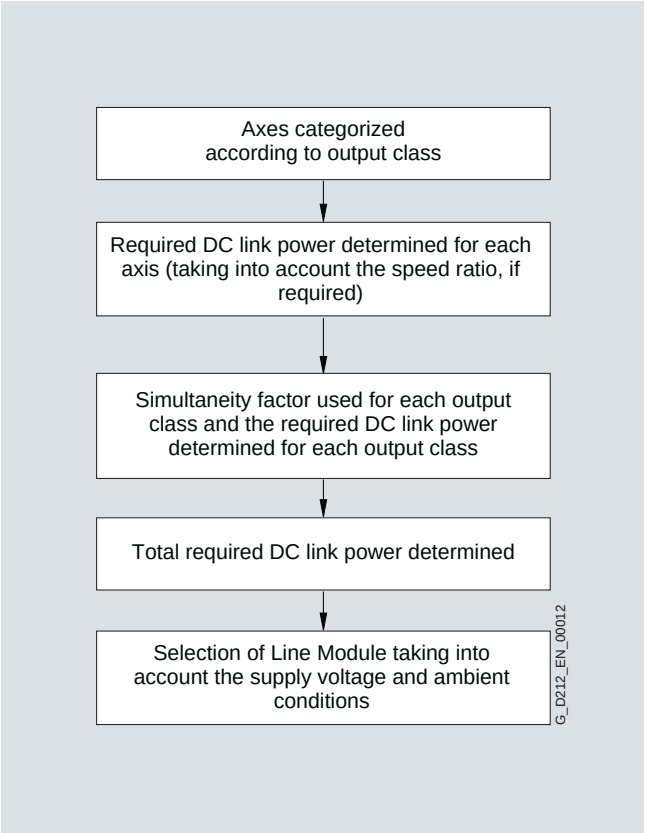
The DC link voltage U_d is regulated to an adjustable value (Active Mode). An Active Line Module can also be switched to Smart Mode and then operates like a Smart Line Module. In Active Mode, the Active Line Module draws a virtually sinusoidal current from the supply system.

The rated infeed power of the Line Module refers to a line voltage of 380 V, 400 V or 690 V (690 V applies only to chassis format Line Modules). The output power of the Line Modules may be affected if they are operated on line voltages other than those stated above.

Depending on the ambient conditions (installation altitude, ambient temperature), the rated infeed power of the Line Modules may need to be reduced (see chapter SINAMICS S120 drive system).

The coincidence factor takes into account the time characteristic of the torque for each individual axis.

On the basis of these principles, the following procedure can be used to dimension the Line Module:



Power units

Configuration

The following factors must also be taken into account when dimensioning the DC link:

Braking operation

As device losses are important in motor mode, the dimensioning for motor mode is also applicable to generator mode. With respect to motor braking operation, check that the energy fed back into the DC link does not exceed the permissible peak load capability of the Line Module.

In the case of higher regenerative outputs and to control the "line failure" operating scenario, a Braking Module must be provided, the Smart or Active Line Module must be overdimensioned or the regenerative output reduced by longer braking times.

For the configuration of the "EMERGENCY STOP" operating scenario, the Line Module must either be overdimensioned or an additional Braking Module must be used, so that the DC link energy can be dissipated as quickly as possible.

Checking the DC link capacitance

During power-up, the Line Modules limit the charging current for the DC link capacitors. Due to the limits imposed by the pre-charging circuit, it is essential to observe the maximum permissible DC link capacitance values for the drive line-up specified in the technical specifications.

DC link pre-charging frequency

The pre-charging frequency of the DC link via a booksize format Line Module is calculated using the following formula:

$$\text{Number of precharges within 8 min} = \frac{\text{Max. permissible DC link capacitance infeed module in } \mu F}{\Sigma \text{ DC link capacitance of configured drive line-up in } \mu F}$$

For chassis format Line Modules, the maximum permissible DC link pre-charging interval is 3 minutes.

Special considerations for operation on Basic or Smart Line Module

Basic Line Modules and Smart Line Modules provide a lower DC link voltage than Active Line Modules. As a result, the following boundary conditions apply:

- When operating asynchronous motors (induction motors), a lower maximum motor power is available at high speeds at the same line voltage.
- On synchronous motors, a reduction in the dynamic drive characteristics must be expected at high speeds.
- On synchronous motors, the rated motor speed cannot be fully utilized when an overload capability is required.

Parallel connection of power units

Up to 4 Motor Modules or Line Modules in chassis format can be connected in parallel. Parallel connections can operate only in Vector Control mode.

Parallel connections may only include Motor Modules or Line Modules of the same type and with the same voltage and output ratings. Mixtures of different modules, e.g. Basic Line Modules and Active Line Modules, cannot be connected in parallel. The CU320-2 or SIMOTION D Control Unit can control only one drive object of type "Parallel connection Line Modules" and one of type "Parallel connection Motor Modules". It is assumed that all Line Modules or Motor Modules linked to the Control Unit are connected in parallel. A Control Unit can control, for example, the following components:

- 1 Line Module + 2 parallel-connected Motor Modules
- 2 parallel-connected Line Modules + 3 parallel-connected Motor Modules

Combinations such as the following are not permissible:
2 Line Modules + 2 parallel-connected Motor Modules + 1 Motor Module

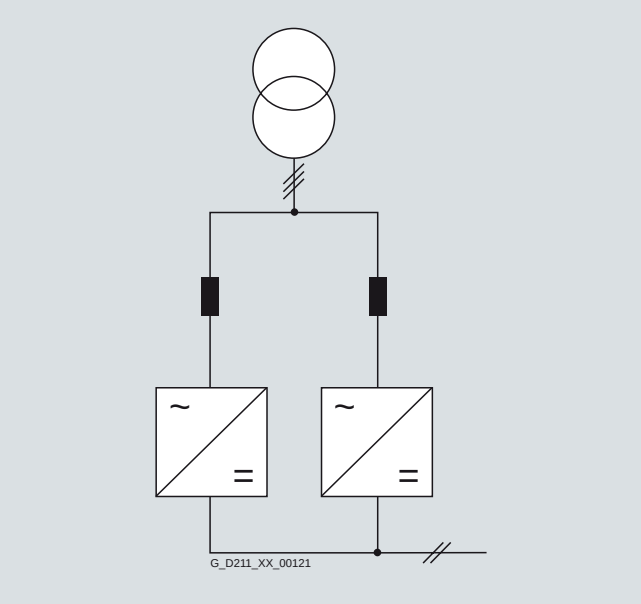
In order to ensure symmetrical current distribution among all parallel-connected modules, inductances must be provided for subsystem decoupling. However, the current compensatory control cannot completely prevent asymmetrical current distribution, which means that the following derating factors apply to parallel connections:

Designation	Derating factor for parallel connection of 2 to 4 Modules	Max. permissible number of parallel-connected Modules
Active Line Modules	0.95	4
Basic Line Modules	0.925	4
Motor Modules	0.95	4

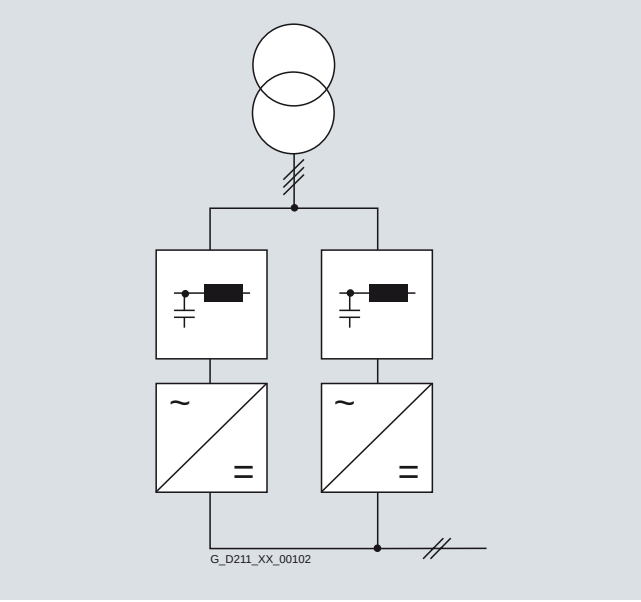
Configuration

Chassis format Line Modules

Line reactors are needed to decouple individual Basic Line Modules, while the appropriate Active Interface Modules are required to decouple Active Line Modules.



Parallel connection of Basic Line Modules using line reactors



Parallel connection of Active Line Modules using Active Interface Modules

Chassis format Motor Modules

Three-wire or four-wire cables should be used where possible to connect Motor Modules in parallel.

In this case, a minimum clearance of 50 mm (1.97 in) must be left between the cables of the individual subsystems. A three-phase system must be connected to each of the cables of equal length (U2, V2, W2). In order to ensure adequate decoupling between subsystems, the motor cables must be of a minimum length so as to provide the necessary inductance.

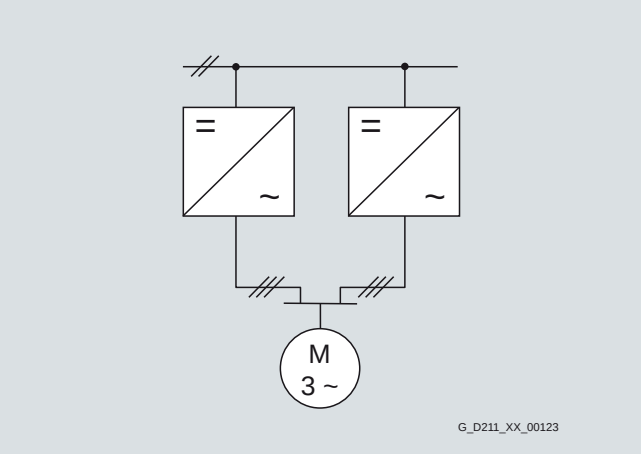
Motor Module Frame size	P_M kW (HP)	$I_{rated\ rms}$ A	Minimum length of motor feeder cable m (ft)
Output voltage 380 to 480 V			
FX	110 (148)	210	30 (98.43)
FX	132 (177)	260	27 (88.59)
GX	160 (215)	310	20 (65.62)
GX	200 (268)	380	17 (55.78)
GX	250 (335)	490	15 (49.22)
HX	315 (422)	605	13 (42.65)
HX	400 (536)	745	10 (32.81)
HX	450 (603)	840	9 (29.53)
JX	560 (751)	985	8 (26.25)
JX	710 (952)	1260	6 (19.69)
JX	800 (1073)	1405	5 (16.41)
Output voltage 500 to 600 V			
FX	75 (101)	85	80 (262.48)
FX	90 (121)	100	72 (236.23)
FX	110 (148)	120	65 (213.27)
FX	132 (177)	150	55 (180.46)
GX	160 (215)	175	50 (164.05)
GX	200 (268)	215	40 (131.24)
GX	250 (335)	260	32 (104.99)
GX	315 (422)	330	25 (82.03)
HX	400 (536)	410	20 (65.62)
HX	450 (603)	465	18 (59.06)
HX	560 (751)	575	15 (49.22)
JX	710 (952)	735	13 (42.65)
JX	800 (1073)	810	11 (36.09)
JX	900 (1207)	910	10 (32.81)
JX	1000 (1341)	1025	8.5 (27.89)
JX	1200 (1609)	1270	7 (22.97)
Output voltage 660 to 690 V			
FX	75 (101)	85	100 (328.10)
FX	90 (121)	100	90 (295.29)
FX	110 (148)	120	80 (262.48)
FX	132 (177)	150	70 (229.67)
GX	160 (215)	175	60 (196.86)
GX	200 (268)	215	50 (164.05)
GX	250 (335)	260	40 (131.24)
GX	315 (422)	330	30 (98.43)
HX	400 (536)	410	25 (82.03)
HX	450 (603)	465	25 (82.03)
HX	560 (751)	575	20 (65.62)
JX	710 (952)	735	18 (59.06)
JX	800 (1073)	810	15 (49.22)
JX	900 (1207)	910	12 (39.37)
JX	1000 (1341)	1025	10 (32.81)
JX	1200 (1609)	1270	8 (26.25)

Power units

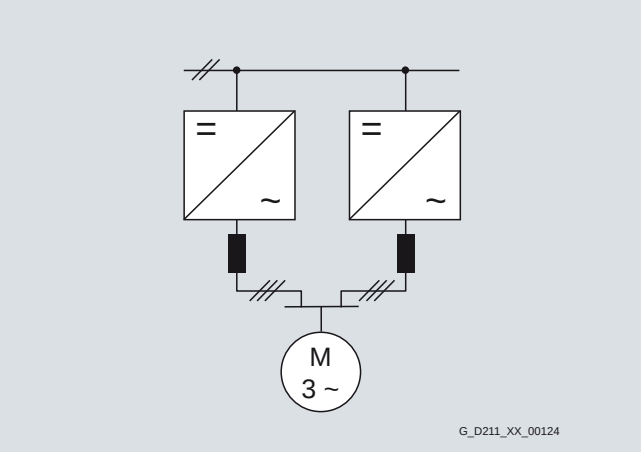
Configuration

If the drive configuration cannot accommodate the minimum required cable length, the appropriate motor reactor for the Motor Module must be installed. Alternatively, motors with two separate winding systems can be used.

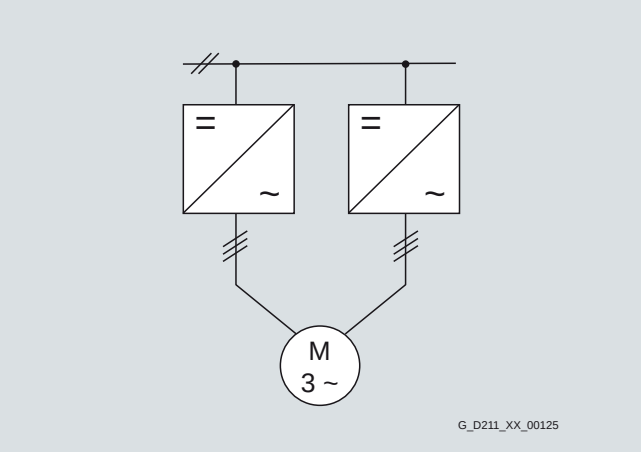
The latter option is preferable for drives with higher outputs, as the motor terminal boxes are subject to current limits in this case.



Parallel connection with identical motor cables of the required minimum length



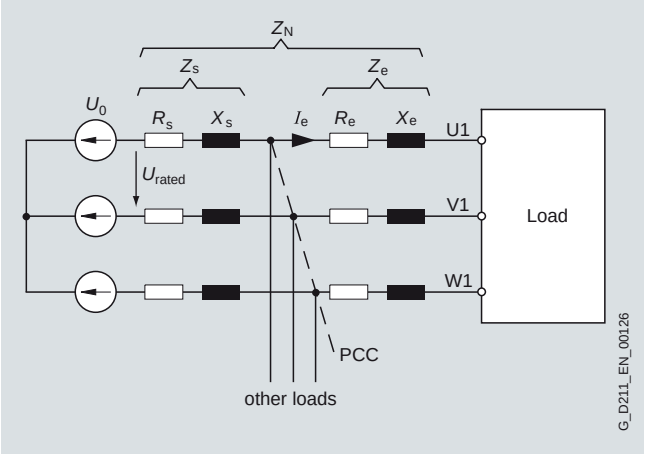
Use of motor reactors



Asynchronous motor (induction motor) with two separate winding systems

System disturbances

The voltage drops across the impedance between the supply system and a load as soon as the load draws current. In a symmetrical three-phase supply system, this is the network impedance Z_n which is calculated from the impedance Z_s of the supply system and the line-side impedance Z_e of the load.



Effective impedances when a load is connected to a three-phase supply system

$Z_N = Z_s + Z_e = R_s + j\,X_s + R_e + j\,X_e = R_n + j\,X_n$

On a variable-speed drive, the line-side impedance Z_e is normally the total impedance provided by the line reactor and the feeder cable up to the PCC (Point of Common Coupling) for further loads. The ohmic component R_n is generally negligible as compared to the inductive component X_n. The inductance of an RI suppression filter is irrelevant for the purpose of this calculation, as this inductance is effective only for asymmetrical interference voltages, but not for a symmetrical line current.

If a load causes voltage drops across the impedance Z_s, this system disturbance has an impact at the PCC and thus also in the supply voltage to all other loads.

The voltage drop is proportional to current I_e and the impedance. To facilitate comparison of voltage drops under different supply and load conditions, the voltage drop is specified – normally at rated current – with reference to the phase voltage U_o. The calculation formula, e.g. for the per unit voltage drop u_k across an impedance Z is as follows:

$u_k = Z \times I_e / U_o$

Configuration

Example 1:

A Power Module with rated line current I_e is directly connected to a low-voltage transformer and the PCC is the transformer connection terminal. The equation for the ratio between rated line current I_e of the Power Module and rated current I_{rated} of the transformer is $I_e = 0.25 \times I_{rated}$. The per unit voltage drop u_k of the 400 V transformer is 4 %. If the transformer is loaded with its rated current I_{rated}, the voltage drop across impedance Z_s is 9.2 V (corresponding to 4 % of the phase voltage U_o = 230 V).

$u_k = (Z_s \times I_{rated}) / 230\ V = 0.04$

The following formula applies to the rated line current I_e of the Power Module: $I_e = k \times I_{rated}$

The per unit voltage drop across the transformer when loaded with I_e is thus: $u_k = Z_s \times I_e / U_o = Z_s \times k \times I_{rated} / U_o$

With the specified ratio between I_e and I_{rated}, the per unit voltage drop is calculated as u_k = 1 % or 2.3 V. In relation to the Power Module, this transformer therefore functions like a line impedance in accordance with u_k = 1 %.

The magnitude of system disturbance in converter systems is assessed on the basis of short-circuit power ratio R_{sc}:

$R_{sc} = S_{cv} / P$

According to this definition in accordance with EN 60146-1, P is the fundamental-wave apparent power drawn by the converter. S_{cv} is the short-circuit power drawn from the mains in the event of a short-circuit on the terminals U1, V1, W1. Since the ohmic components of impedances are negligible in practice, $Z_n \approx j\ X_n$ applies

$S_{cv} \approx 3 \times U_o^2 / X_n$

and thus $R_{sc} \approx 3 \times U_o^2 / (X_n \times P)$

The short-circuit power ratio R_{sc} is therefore dependent on the current output power P of the converter and is determined by network impedance X_n.

If we assume the power to be $P \approx 3 \times U_o \times I_e = \sqrt{3} \times U_{rated} \times I_e$

the short-circuit power ratio R_{sc} is in inverse proportion to the per unit voltage drop u_k across the effective line impedance.

$R_{sc} \approx 3 \times U_o^2/(X_n \times P) = 3 \times U_o^2/(X_n \times 3 \times U_o \times I_e) = U_o/(X_n \times I_e) = 1/u_k$

The short-circuit power ratio for example 1 is $R_{sc} \approx 100$ if no line reactor is installed (Z_e = 0).

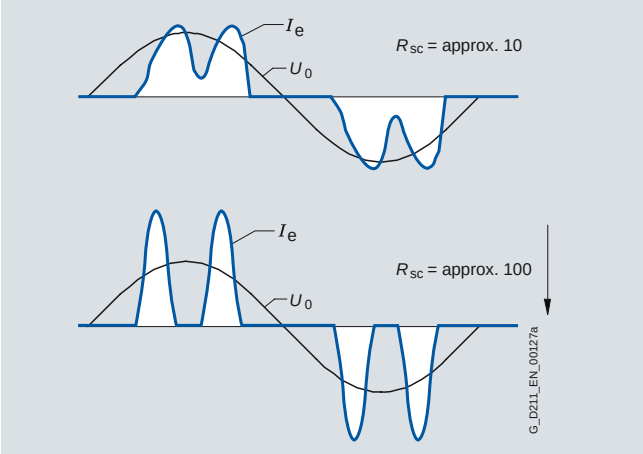
Note:

The term "short-circuit power ratio" as used in technical standards is not a harmonized definition. The short-circuit power ratio R_{sce} defined according to IEC 61000-3-12 is calculated from the short-circuit power S_{SC} at the PCC referred to the power $S_{equ} = 3 \times U_o \times I_e$ consumed by the load.

Basic Line Modules and Power Modules are designed with a rectifier bridge on the line side. An inherent feature of the principle of rectification with load-side capacitance for DC link voltage smoothing are harmonics in the line current which result in a non-sinusoidal power input. The diagram shows the basic current waveform of a Power Module or Basic Line Module as a function of short-circuit power ratio R_{sc}.

Active Line Modules generate virtually no current harmonics (Active Mode) at all and are employed when system disturbance needs to be minimized, e.g. stipulation of IEEE 519 that THD (Total Harmonic Distortion) must be < 10 %.

The SIZER configuring tool calculates the system disturbance on the basis of the supply data entered and lists it against the limit values of relevant standards.



Line current of a Basic Line Module or Power Module as a function of the short-circuit power ratio R_{sc}

The rms of the line current I_e for which the line-side components must be rated comprises fundamental wave I_{e1} and the current harmonics, which increase in relation to the rise in short-circuit power ratio R_{sc}. If the DC link power P_d has been calculated (see Line Modules), the required line-side active power is a known quantity with Line Module efficiency, or the rectifier efficiency in the case of a Power Module. However, this active power is connected only with the current fundamental wave I_{e1}. The rms of the line current I_e is always greater than I_{e1} as a result of the current harmonics. The following applies for a short-circuit power ratio R_{sc} = 100:

$I_e \approx 1.3 \times I_{e1}$

The apparent power of a transformer selected to supply the drive must be greater than the drive power by a factor of about 1.3.

The harmonic currents produce only alternating power, but no active power. The following applies to the apparent power S on the line side:

$S^2 = P^2 + Q_1^2 + D^2$

- with active component
  $P = 3 \times U_o \times I_1 \times \cos \varphi_1$, produced solely by the current fundamental wave
- and apparent component
  $Q_1 = 3 \times U_o \times I_1 \times \sin \varphi_1$
- and the distortion component

$$D = 3 \times U_0 \sqrt{\sum_{\nu=2}^{\infty} I_\nu^2}$$

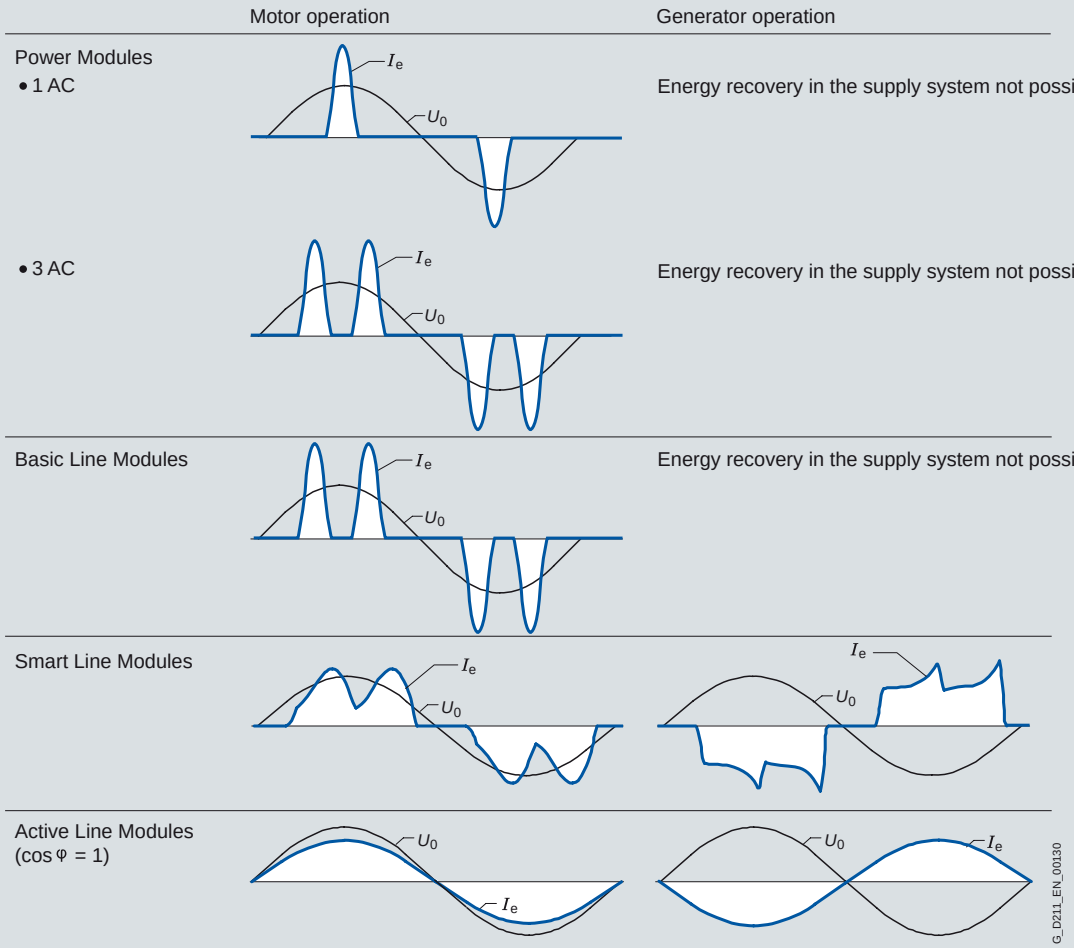
The ratio between active power and apparent power is referred to as power factor λ or total power factor:

$$\lambda = \frac{P}{S} = \frac{P}{\sqrt{P^2 + Q_1^2 + D^2}}$$

13

Power units

Configuration

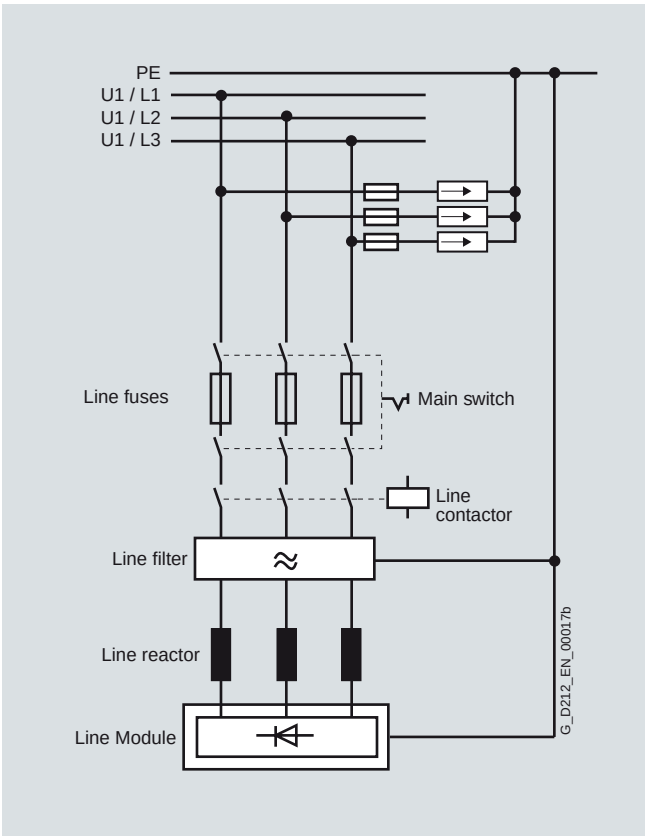


Typical waveform of the line current with Power Modules and Line Modules

Configuration

Line-side options (main switch, fuses, line filters, etc.)

The following line-side options are recommended for the drive configuration:



General overview of line infeed

The main switch may take various formats:

- Main and EMERGENCY STOP switch + fuse switch disconnector (with leading signal via auxiliary contact for trip mode)
- Load interruptor with fuses
- Circuit breaker

To protect the units against line-side surge voltages, it is advisable to install overvoltage protection directly at the infeed point (upcircuit of main switch). Surge protection is essential in order to satisfy the requirements of Canadian standard CSA C22.2 No. 14-05.
For examples of suitable surge voltage arresters, go to www.raycap.com or www.dehn.de

Depending on the performance required, a fuse switch disconnector combined with a contactor or a circuit breaker can be provided as the main switch.

A line contactor can be used, for example, if the drive has to be disconnected from the line supply in the event of a fault or for remote tripping. Follow the instructions in the SINAMICS S120 Configuration Guides to interlock the line contactor in the context of safety functions.

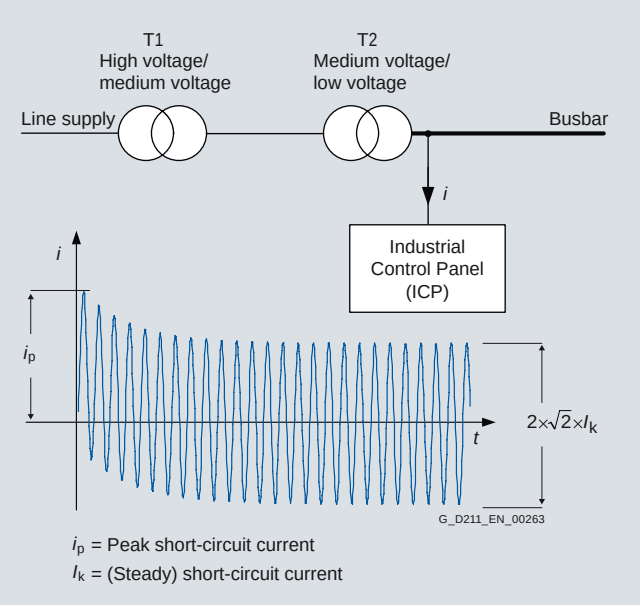
A line filter should be used on TN (grounded) systems to reduce system disturbance.

Power units

Configuration

SCCR (Short Circuit Current Rating)

In the USA, a rating plate must be attached to switchgear (referred to as Industrial Control Panels (ICP) in the USA), which indicates the short-circuit current rating (or overall panel SCCR) of the installation. Specification of the SCCR became essential when the National Electrical Code NEC 2005 came into force. The SCCR is calculated on the basis of UL508A Supplement SB4.



i_p = Peak short-circuit current
I_k = (Steady) short-circuit current

In order to ensure that the switchgear can withstand a short circuit in the main circuit without sustaining serious consequential damage, e.g. defects caused by current effects or fire, the maximum possible short-circuit current may not exceed the SCCR value of the switchgear. The data of the transformer T2 which supplies the switchgear provide an adequate basis for making a rough calculation of the maximum possible short-circuit current at the installation site. Based on the rated current I_{rated} of the transformer and the relative short-circuit voltage u_k, the short-circuit current I_k is calculated according to the following equation:

$I_k = I_{rated}/u_k$

Example:

A transformer for 460 V 3 AC with a rated power of 1 MVA has a rated current of approximately 1255 A. The relative short-circuit voltage u_k of the transformer is 6 %. The maximum possible short-circuit current I_k directly at the output terminals of this transformer (low-voltage busbar) is 1255 A/0.06 ≈ 21 kA.

In order to calculate the short-circuit current, it is necessary to know the effective impedance of the supply cable and the transformers T1 and T2, as well as the short-circuit power of the line supply system. The maximum peak short-circuit current i_p is reached when the short circuit occurs at the voltage zero crossing. For short-circuit current calculation method, refer to IEC 60909-0.

The influence of the high-voltage and medium-voltage levels is minimal for the selected example and can be ignored in most cases. When the effective impedance is taken into account, the maximum possible short-circuit current is lower than the previous value estimated from the data of the supply transformer, especially in the case of units which are not connected directly to busbars but over long cables to the transformer. Calculating the short-circuit current (peak short-circuit current) is complicated for systems which are supplied in parallel by multiple transformers and especially in the case of meshed systems.

The short-circuit current strength of the entire switchgear installation (overall panel SCCR) as specified on its rating plate is determined by the component in the main circuit with the lowest SCCR value.

Standard SCCR values for electrical equipment are specified in UL 508A Supplement SB4.2 (September 2005) and these can be used to calculate the overall panel SCCR. The following values are assumed for electric drives (motor controllers), for example:

Motor controller		SCCR
0 ... 50 hp	0 ... 37.3 kW	5 kA
51 ... 200 hp	38 ... 149 kW	10 kA
201 ... 400 hp	150 ... 298 kW	18 kA
401 ... 600 hp	299 ... 447 kW	30 kA
601 ... 900 hp	448 ... 671 kW	42 kA
901 ... 1500 hp	672 ... 1193 kW	85 kA

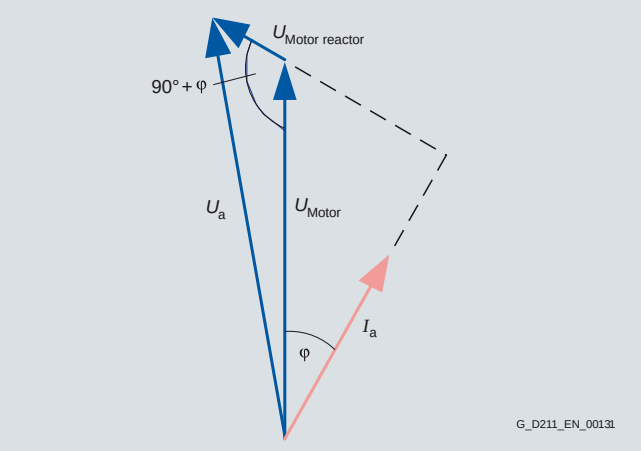
The SCCR values of the Power Modules and Line Modules are higher than the standard SCCR values listed in the table. The higher SCCR values apply only in combination with the fuses and circuit breakers specified in the manual! Fuses or circuit breakers can be exchanged for comparable types provided that the peak let-through current and breaking I^2t value of the replacement type is not higher than those of the recommended type.

Configuration

Motor reactors

High-speed switching of the power transistors causes capacitive charge/discharge currents in the motor cable and motor, as well as steep voltage rises and peak voltages in the motor windings. These currents can be reduced through the installation of a motor reactor.

The voltage drop across the motor reactor is normally negligible at output frequencies of 60 Hz and below. The per unit voltage drop u_k across the reactor is between 1 % and 4 % at rated current and 50 Hz. With a cos ϕ of 0.86 and an output frequency of 50 Hz, the motor voltage across the motor reactor is about 2 % lower than in systems without a motor reactor.



Phasor diagram of motor with motor reactor

Motor reactors are compatible with all modulation types (space vector modulation, edge modulation).

Sine-wave filters

Sine-wave filters are low-pass LC filters which allow easy passage to only the fundamental component of the square-wave, pulse-width-modulation output voltage of a Power Module or Motor Module. The resonant frequency of the sine-wave filter must be significantly lower than the pulse frequency of the Power Module or Motor Module and be dimensioned with a sufficient margin to the maximum permissible output frequency. Sine-wave filters therefore define the choice of pulse frequency and place a limit on the maximum possible output frequency. This type of filter is compatible only with space vector modulation. The output voltage of a Power Module or Motor Module is thus limited to an output voltage (rms value) of approximately 0.67 x DC link voltage. With the voltage drop across the sine-wave filter, the maximum possible output voltage (rms value) is approximately 0.63 x DC link voltage. A sine-wave filter is registered on the Control Unit by a parameter setting. Thus defaults for all the relevant filter-dependent values such as permissible modulation types, maximum output frequency, etc. are stored.

Sine-wave filters can be used only in conjunction with Vector and *V/f* Control modes.

Sensor Modules

Signal conditioning for various encoders (incremental encoder sin/cos 1 V_{pp}, absolute encoder, resolver) takes place remotely, i.e. in the vicinity of the encoder, with customized Sensor Modules. Depending on the measuring system, SMC10, SMC20 or SMC30 Sensor Modules will be used. The Sensor Modules are designed to be mounted on DIN rails. They are also used for the signal conditioning of external (machine) encoders.

Expansion modules

Even the standard version of the CU320-2 Control Unit features interfaces and terminals for communication. SINAMICS S120 offers the following expansion modules:

- TB30 Terminal Board (terminal expansion for plugging into the option slot on the CU320-2 Control Unit)
- TM31 Terminal Module (terminal expansion for connection via DRIVE-CLiQ)

The following criteria regarding the use of expansion modules must be taken into account:

- Only one option board can be plugged into the option slot on the CU320-2 Control Unit.
- A maximum of 8 Terminal Modules may be operated in a drive line-up.

Braking Modules and braking resistors

Braking units comprise of a Braking Module and a braking resistor, which must be attached externally.

Braking units are used when

- regenerative energy occurs occasionally and briefly, for example when the brake is applied to the drive (EMERGENCY STOP) and the drive has no regenerative feedback capability
- the drive features regenerative feedback units but cannot return the energy fast enough to the supply on an "EMERGENCY STOP"
- the drive needs to be shut down after a power failure

The braking units for Power Modules in blocksize format consist of braking resistors only, as they feature a Braking Module as standard.

A number of Braking Modules can be connected in parallel to the DC link in order to increase the braking power. Each Braking Module requires its own braking resistor. It is not permissible to operate a mix of braking units in booksize and chassis format on the same DC link.

The braking power required is calculated from the DC link power P_d of the drive line-up or Power Module in generator operation.

System components

Configuration

Braking Modules and braking resistors for booksize format

To operate booksize format Braking Modules, a minimum capacitance is required in the DC link. This capacitance is determined by the braking resistor used.

Braking resistor 0.3 kW/25 kW → DC link capacitance 220 µF

Braking resistor 1.5 kW/100 kW → DC link capacitance 330 µF

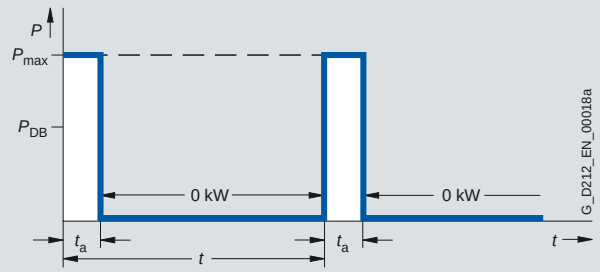
The capacitance of the booksize format Braking Module of 110 µF is included in the total capacitance value. If the DC link capacitance is not sufficient for the use of one or more Braking Modules, a Capacitor Module can be added to increase the effective DC link capacitance of the drive line-up.

When booksize format Braking Modules are connected in parallel, the minimum capacitance specified above must be available for each Braking Module.

Note: Only booksize format modules that are directly connected to each other via the DC link busbar can be included in the total capacitance.

If the DC link capacitance is not sufficient for the operation of a number of Braking Modules, Capacitor Modules can be used to increase the DC link capacitance. The max. permissible DC link capacitance of a drive line-up on a Line Module must be taken into account. The max. DC link capacitances to be taken into account for pre-charging current limiting on the Line Modules are listed in the technical specifications for the Line Modules.

The braking resistor discharges the excess energy from the DC link:



t	Period of braking duty cycle in s
t_a	Load duration in s
P_{DB}	Continuous power of braking resistor in kW
P_{max}	Peak power of braking resistor in kW

Duty cycle for braking resistors

Braking Modules and braking resistors for chassis format

Braking Modules with a braking power of 25 kW (for type FX) and 50 kW (for types GX, HX and JX) are available with matching braking resistors for chassis format units. Braking units can be connected in parallel to obtain higher braking powers. In this case, the units can be installed at the Line Module end or Motor Module end.

When a Braking Module is installed in a Basic Line Module of size GB, the cables supplied for the DC link connection are too short. In this case, the cable harness set 6SL3366-2NG00-0AA0 must be ordered to make the Braking Module connection.

Frame size	Rated power P_{DB} power	Peak power P_{15}	Max. possible mounting locations for Braking Module
FB	25 kW	125 kW	1
GB	50 kW	250 kW	1
FX	25 kW	125 kW	1
GX	50 kW	250 kW	1
HX	50 kW	250 kW	2
JX	50 kW	250 kW	3

The Braking Module features an electronics interface (X21) with monitoring function. The braking resistor housing contains a monitoring thermocontact. Both these monitors can be integrated into the warning or shutdown circuits of the drive system.

Configuration

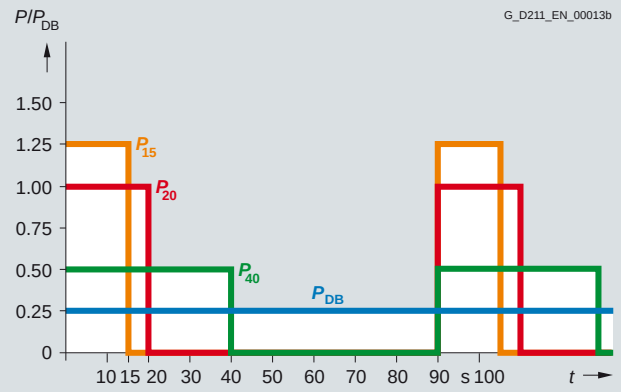
Calculation of Braking Module and braking resistor requirements

- For periodic duty cycles with a cycle duration of ≤ 90 s, the average value of the braking power within this duty cycle must be defined. The relevant cycle duration must be applied as the time base.
- For periodic duty cycles with a cycle duration of ≥ 90 s or for sporadic braking operations, a time interval of 90 s in which the highest average value occurs must be selected. The 90 s period must be applied as the time base.

Apart from the average braking power, the required peak braking power must also be taken into account when braking units are selected (Braking Module and braking resistor).

Basic data

Supply voltage	Power range Motor Modules	**Braking Module continuous power P_{DB}**	**Braking Module power P_{40}**	**Braking Module power P_{20}**	**Braking Module peak power P_{15}**
380 … 480 V	110 … 132 kW (148 … 177 HP)	25 kW (33.5 HP)	50 kW (67.1 HP)	100 kW (134 HP)	125 kW (168 HP)
	160 … 800 kW (215 … 1073 HP)	50 kW (67.1 HP)	100 kW (134 HP)	200 kW (268 HP)	250 kW (335 HP)
660 … 690 V	75 … 132 kW (101 … 177 HP)	25 kW (33.5 HP)	50 kW (67.1 HP)	100 kW (134 HP)	125 kW (168 HP)
	160 … 1200 kW (215 … 1609 HP)	50 kW (67.1 HP)	100 kW (134 HP)	200 kW (268 HP)	250 kW (335 HP)



Load diagram

Braking resistors for Power Modules in blocksize format

The braking resistors for the FSA and FSB frame sizes are designed as substructure components. Braking resistors for frame sizes FSC to FSF should be mounted outside the control cabinet due to their high heat losses.

The Control Unit monitors the pulse/pause ratio (ON time/OFF time) of the braking resistor and shuts it down on faults if it calculates that the resistor is at risk of overheating.

Braking resistors feature a temperature switch with NC contacts that open when the permissible temperature is exceeded. The temperature switch must be evaluated to prevent consequential damage if the braking resistor overheats.

The braking power P_{mech} on the motor shaft is higher than the power loss of the braking resistor, as this only needs to convert the DC link energy into heat. The DC link power P_d of the Power Module in generator mode is calculated from the shaft power P_{mech} of the motor and the power loss in the motor $P_{v\ Motor}$ and in the Power Module $P_{v\ Power\ Module}$ as:

$$P_d = P_{mech} - P_{v\ Motor} - P_{v\ Power\ Module} = P_{braking\ resistor}$$

The power losses can be estimated from the efficiency values of the motor η_m and Power Module η_{wr}:

$$P_{braking\ resistor} = P_d = P_{mech} \times \eta_m \times \eta_{wr}$$

Booksize format Capacitor Module

The Capacitor Module functions as a short-term energy buffer, e.g. for bridging brief power failures or for storing braking energy. The buffered energy W can be calculated with the following formula:

$$W = ½ \times C \times (U_{d1}^2 - U_{d2}^2)$$

C = effective capacity of Capacitor Module 4 mF

U_{d1} = DC link voltage when buffering starts

U_{d2} = DC link voltage when buffering ends

Example:

U_{d1} = 600 V; U_{d2} = 430 V

The resultant energy calculation is W = 350 Ws

With this energy it is, for example, possible to buffer a 3 kW Motor Module for about 100 ms.

Booksize format Control Supply Module

The Control Supply Module provides a 24 V DC power supply via the line or DC link in order to maintain the electronics power supply for the components in the event of a line failure. This makes it possible, for example, to make emergency retraction movements in the event of the failure of the line supply.

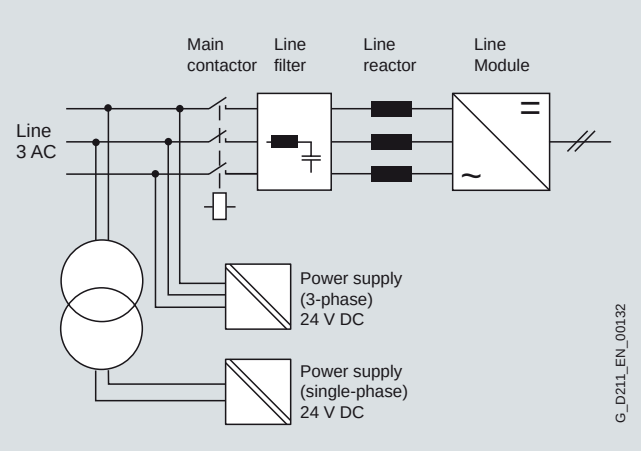
System components

Configuration

External 24 V DC supply of components

Power units (Line Modules and Motor Modules) and other system components must be provided with a 24 V DC voltage via an electronics power supply made available externally.

SITOP devices, which are available as a modular solution, are suggested as the external 24 V DC electronics power supply.



Connecting the external electronics power supply

The current requirement $I_{DC\ ext}$ is calculated with the following formula:

Σ [Control Unit + built-in options (e.g. TB30 + CBC10) + system components + Line Module + Σ (Motor Modules + SMCxx + motor brake control)]

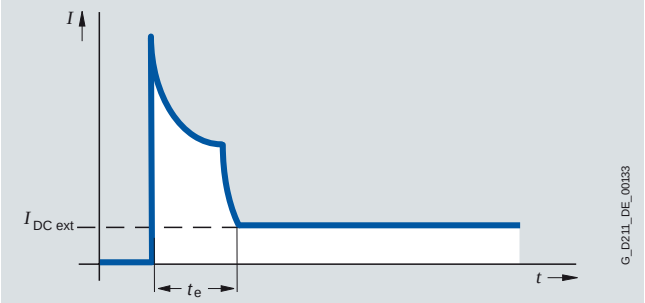
The other system components (e.g. line contactor) must also be taken into account.

The current requirement of individual components can be found in the relevant technical specifications.

Limit values for the configuration:

- The current-carrying capacity of the integrated 24 V DC busbar (featured only in booksize format) is max. 20 A.
- In the event of higher current requirements, a number of 24 V DC power supplies must be provided in one drive line-up. The other infeeds are implemented by means of 24 V terminal adapters (booksize format only).
- Cable cross sections of up to 2.5 mm² may be connected to the Control Units, Terminal Boards, Terminal Modules and Sensor Modules.
- Cable cross sections of up to 6 mm² may be connected to the 24 V terminal adapters (booksize format only) for the Line Modules and Motor Modules.
- The external 24 V DC power supply should only be used for the SINAMICS components and the direct loads.

Capacitors in the electronics supply of most components must be charged when the 24 V DC supply is first switched on. To charge these capacitors, the power supply must first supply a current peak which can be a multiple of the current requirement $I_{DC\ ext}$ calculated above. Allowance must be made for this current peak when selecting protective elements, e.g. miniature circuit breakers, for incorporation in the 24 V DC supply system (types with let-through I^2t values according to characteristic D). The current peak flows for an interval t_e of less than 100 ms. The crest value is determined by the impedance of the 24 V DC supply and its electronically limited maximum current.



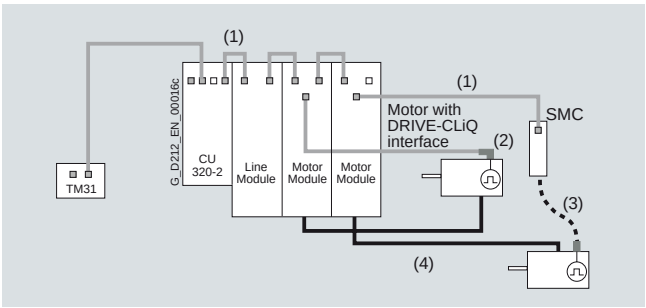
Typical waveform of the switch-on current of the external 24 V DC supply

Configuration

Specification of components for connection system

To complete the drive system, components such as motors and encoders must be connected to it via cables.

On motors with DRIVE-CLiQ interface, the 24 V DC power supply is provided via the DRIVE-CLiQ cables. On all other Sensor Modules, a separate 24 V DC power supply must be provided.



Drive connection system

Legend	Cable	Description
(1)	DRIVE-CLiQ cables	Standard cables for cabinet-internal configuration without 24 V cores
(2)	DRIVE-CLiQ MOTION-CONNECT 500/800 cables	MOTION-CONNECT 500 shielded cables with 24 V cores for fixed installation (e.g. in the cable duct), and MOTION-CONNECT 800 for flexible installation (e.g. in cable carriers)
(3)	MOTION-CONNECT 500/800 signal cables	Suitable for the measuring system in question; in versions MOTION-CONNECT 500 for fixed installation (e.g. in the cable duct), and MOTION-CONNECT 800 for flexible installation (e.g. in cable carriers)
(4)	MOTION-CONNECT 500/800 power cables	MOTION-CONNECT 500 shielded motor cables for fixed installation (e.g. in the cable duct), and MOTION-CONNECT 800 for flexible installation (e.g. in cable carriers)

DRIVE-CLiQ cables are available in various designs and lengths (see Connection system).

The required bending radii apply particularly to short cables. In addition to the distance between the two DRIVE-CLiQ sockets to be connected by the cable, a cable length of at least 60 mm (2.36 in) must be allowed for the bending radii. For definition of lengths of pre-assembled cables, refer to chapter Connection system MOTION-CONNECT.

Unused DRIVE-CLiQ sockets can be protected with a blanking plug. Suitable blanking plugs are supplied in the accessories pack for the units.

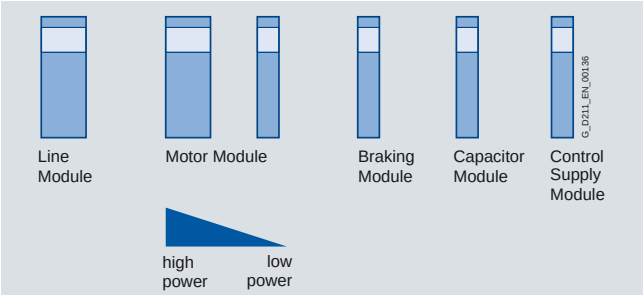
Mechanical configuration of the drive

A SINAMICS S drive line-up comprises a Line Module, Motor Modules, DC link components, a Control Unit, and the optional expansion modules.

Configuration of a drive line-up in booksize format

The following criteria must be taken into account when a drive line-up of booksize format units is configured:

- The Smart Line Modules 5 kW and 10 kW must always be arranged on the left as the first module. All other Line Modules should be arranged on the left as the first module. The CU320-2 Control Unit in this case can be "snapped onto" the left-hand side of the Line Module.
- The DC link busbars can be connected on the right and left with Basic Line Modules, Active Line Modules and Smart Line Modules rated 16 kW and larger. In this case, the drive can be configured in the reverse order (from right to left) or on both sides (see arrangement for chassis format units).
- Only one Line Module is permitted in each drive line-up.
- A number of drive line-ups must be configured for power supplies which cannot be provided by the highest rating.
- The Motor Modules must be arranged beside the Line Module in descending order of the rated currents, that is, the Motor Module with the highest rated current is to be mounted immediately adjacent to the Line Module, and the Motor Module with the lowest rated current is positioned furthest away from the Line Module.
- DC link busbars are integrated into the Line Modules, Motor Modules, Braking Modules, Capacitor Modules, Control Supply Modules and Voltage Clamping Modules for connecting the drive line-up. The current carrying capacity of the integral DC link busbars depends on the power rating of the module and is 100 A or 200 A (see technical specifications). Within the drive line-up, you must ensure that the DC link busbar meets the required current carrying capacity at each point in the drive line-up. When using Motor Modules with high power ratings (DC link busbars 200 A) and Motor Modules with low power ratings (DC link busbars 100 A), the Braking Module (DC link busbars 100 A) must, for example, be installed after the Motor Modules with high power ratings.
- DC link adapters can be used to implement multitier configurations.
- The drive line-ups should be configured such that the total length of all power cables for the motor cables and the line cable, which should preferably be shielded, in each individual line-up does not exceed the permissible total cable length.



Power-oriented arrangement of booksize format Motor Modules

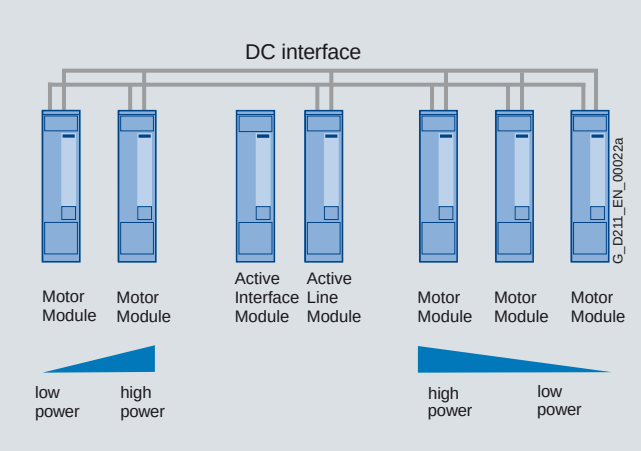
- The Control Unit configuration is flexible. The following configuration options are possible:
  - "Docking" on the left-hand side of the Line Module
  - Direct mounting next to the drive line-up on a mounting plate
  - Mounting in other cabinet areas, taking the permissible DRIVE-CLiQ cable lengths into account

Mechanical configuration of the drive system

Configuration

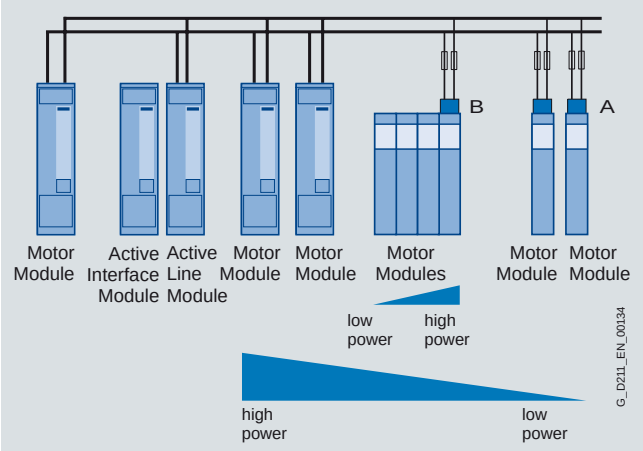
Configuration of a drive line-up in chassis format

- The Motor Modules must be positioned to the left or right of the Line Module with decreasing rated currents (i.e. the Motor Module with the highest rated current is positioned next to the Line Module, while the Motor Module with the lowest rated current is at the end on the left or right). You must ensure that the cables/busbars for the DC link meet the current-carrying capacity requirements for all connected Motor Modules.
- The inductance of the DC link busbars must be low, achieved, for example, by arranging the bars as close as possible in parallel, but observing the required creepage distances and air gaps.
- The Control Unit configuration is flexible. The following configuration options are possible:
  - "Docking" on the left-hand side of the Line Module
  - Direct mounting next to the drive line-up on a mounting plate
  - Mounting in other cabinet areas, taking the permissible DRIVE-CLiQ cable lengths into account



Configuration of a mixed drive line-up in chassis and booksize formats

A mixed drive line-up must be configured according to the rules for chassis format units. The Motor Modules in booksize format can be connected to the higher-level DC link busbars by means of DC link rectifier adapters. There are two possible connection options - A and B. With A, each Motor Module in booksize format is connected using the appropriate DC link rectifier adapter. With B, Motor Modules in booksize format are connected to one another and the internal DC link busbars and a DC link rectifier adapter are used on the last Motor Module to make the connection to the higher-level DC link busbars. In the latter case, the DC link rectifier adapter must be attached to the last Motor Module on the right-hand side of the line. As regards the arrangement of modules with different current ratings, the guidelines specified under "Configuration of a drive line-up in booksize format" also apply to mixed drive line-ups.



Ideally, the entire length of the higher-level DC link busbars can be dimensioned for the rated DC link current of the Line Module. The busbars are then protected by the line fuses at the infeed end.

If the cross section of the DC link busbars or cabling is reduced, this branch must be designed to be short-circuit-proof. The current limiting mechanism of the Motor Modules connected to the branch with reduced cross section then protects it against overloading. It is not advisable to reduce busbars or cables down to the mandatory minimum cross section. No additional overload protection (fuse) is required on the assumption that overloading cannot occur as a result of cable damage on the cable route to the Motor Module and that the circuit branch is protected against overloading by the Motor Module.

Where the cross section has been significantly reduced, or the circuit design is not inherently short-circuit-proof, a branch fuse must be installed at the beginning of the section with reduced cross section in order to protect the DC link connections involved. In the event of a fault, the fuse must be capable of interrupting DC fault currents; other types of miniature circuit breaker are not suitable.

Configuration

Allocation of branch fuses for option (A) in a supply system with grounded neutral (TN system). The calculations are based on the assumption that $\tau = L/R < 10$ ms applies to the time constant τ in the DC fault circuit and that the fault current is interrupted by the fuse after maximum 1 s.

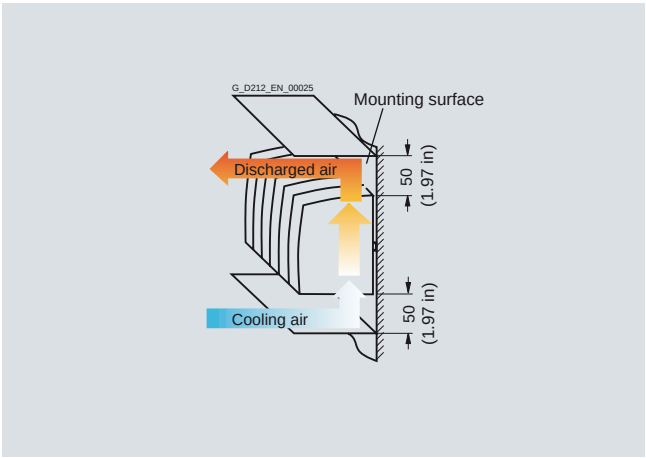
Motor Module booksize format I_{rated}	Recommended cable cross-section for Cu conductors and PVC insulation with a permissible operating temperature of 70 °C (158 °F) on the conductor	**DC link rectifier adapter**	**Branch fuse**	
A	mm^2	Order No.	A	Order No.
3	2.5	**6SL3162-2BD00-0AA0**	16	**3NE1813-0**
5	2.5		16	**3NE1813-0**
9	4		35	**3NE1803-0**
18	10		63	**3NE1818-0**
30	10		80	**3NE1820-0**
45	35	**6SL3162-2BM00-0AA0**	125	**3NE1022-0**
60	70		160	**3NE1224-0**
85	95		200	**3NE1225-0**
132	95		315	**3NE1230-0**
200	95		400	**3NE1332-0**
2 × 3	2.5	**6SL3162-2BD00-0AA0**	20	**3NE1814-0**
2 × 5	4		35	**3NE1803-0**
2 × 9	10		63	**3NE1818-0**
2 × 18	10		125	**3NE1022-0**

Heat dissipation

Configuration

Mandatory minimum installation clearances

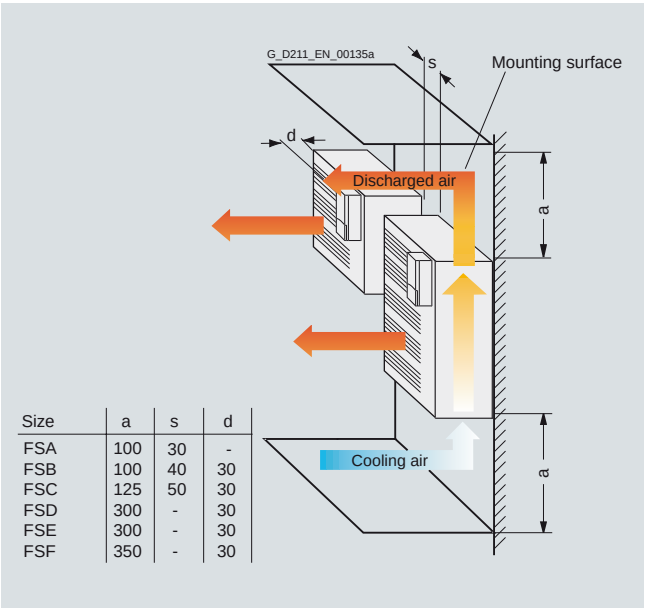
Ventilation clearances for Sensor Modules and Terminal Modules



Sensor Modules and Terminal Modules can be mounted directly adjacent to one another.

When mounted on the wall, line reactors and line filters require a ventilation space of 100 mm (3.94 in) above and below respectively.

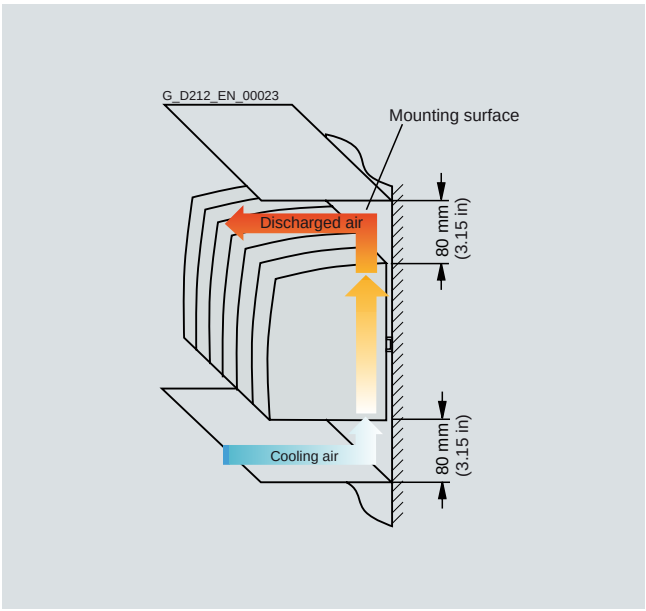
Ventilation clearances for blocksize format components



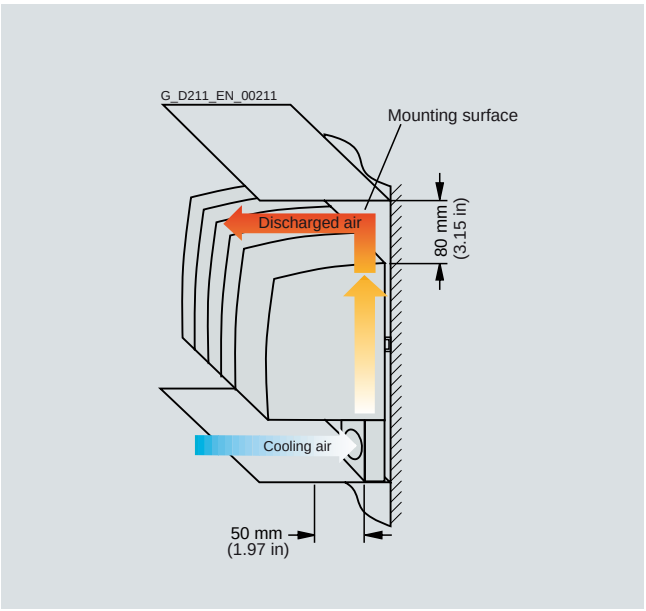
Size	a	s	d
FSA	100	30	-
FSB	100	40	30
FSC	125	50	30
FSD	300	-	30
FSE	300	-	30
FSF	350	-	30

The PM340 Power Modules can be mounted side by side without sub-chassis components up to an ambient temperature of 40 °C (55 °F). In combination with sub-chassis components and at ambient temperatures of > 40 °C (max. 55 °C), the specified lateral minimum clearances must be observed. Where combinations of different frame sizes are concerned, the longer of the two clearances shall apply. A clearance of 30 mm (1.18 in) must be provided at the front and to the left of the mounted Control Unit or Control Unit Adapter on frame sizes FSB to FSF.

Ventilation clearances for booksize format components with internal air cooling



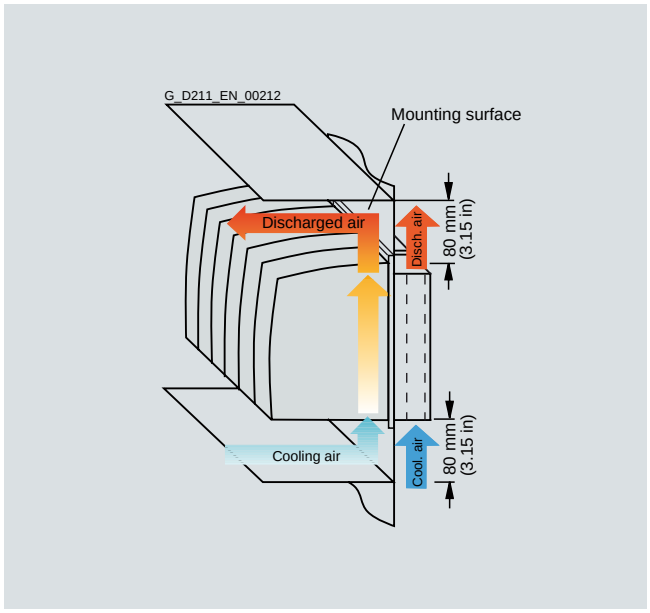
Line Modules 5 kW to 55 kW
Active Interface Modules
Motor Modules up to 85 A



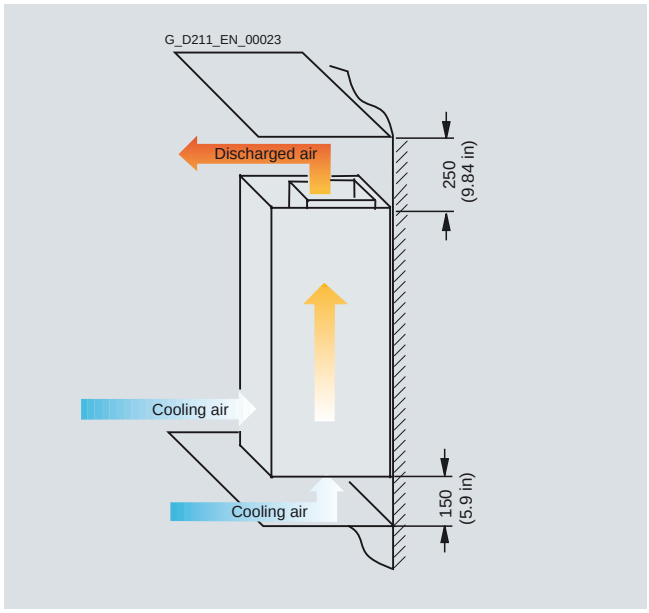
Active Line Modules 80 kW and 120 kW
Motor Modules 132 A and 200 A

Configuration

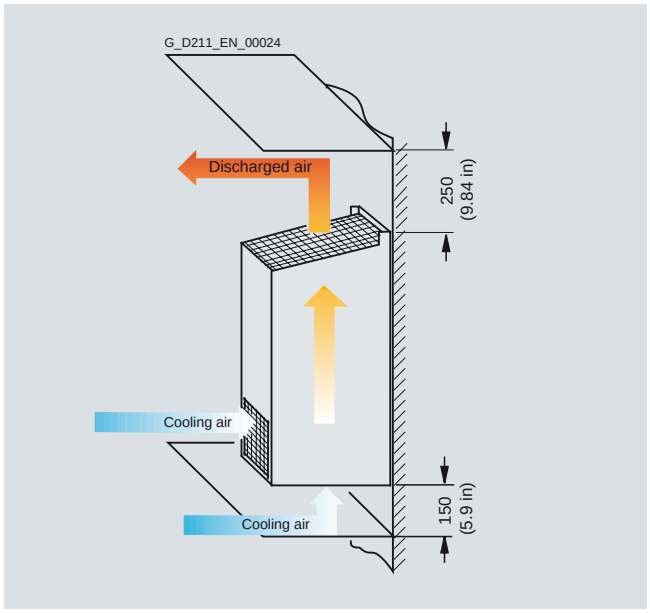
Ventilation clearances for booksize format components with external air cooling



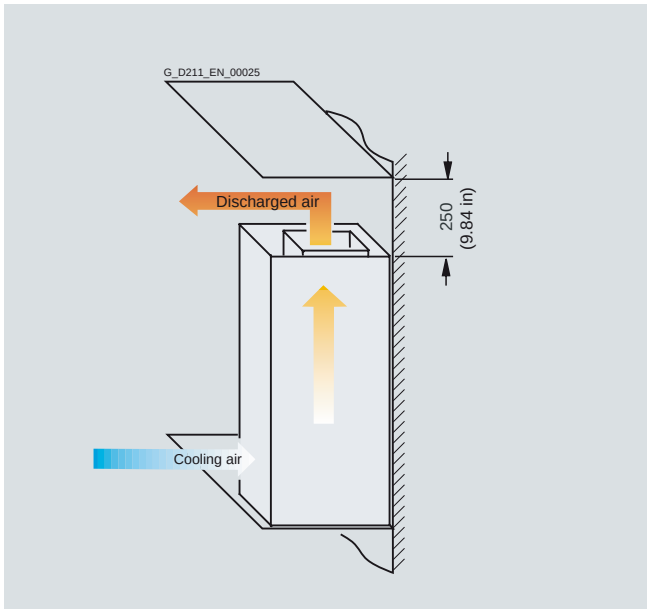
Ventilation clearances for chassis format components Basic Line Modules



Ventilation clearances for chassis format components



Active Interface Modules in frame sizes FI and GI

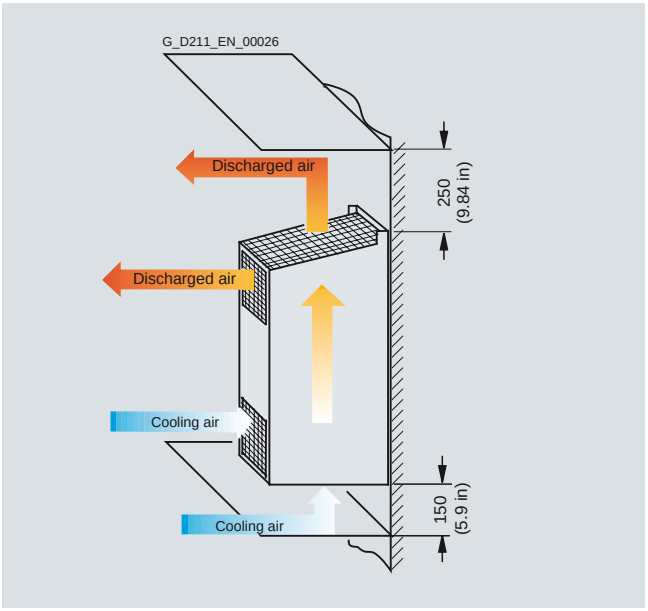


Active Interface Modules in frame sizes HI and JI

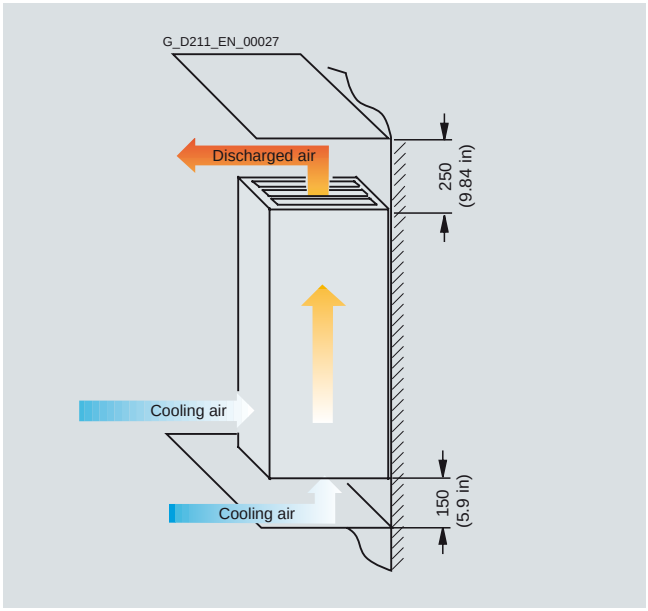
Heat dissipation

Configuration

Ventilation clearances for chassis format components



Power Modules, Motor Modules and Active Line Modules in frame sizes FX and GX



Active Line Modules in frame sizes HX and JX
Motor Modules in frame sizes HX and JX

Calculation of internal control cabinet temperature

Control cabinet with forced ventilation

In a control cabinet with forced ventilation, the heat loss P_V passes to the through-flowing air that then rises in temperature by $\Delta\vartheta$. In the time interval Δt, the air absorbs the heat $Q = c \times m \times \Delta\vartheta = P_V \times \Delta t$, and at the same time the air volume V flows through the control cabinet (c is the specific heat capacity of the air). Mass m and volume V are linked via density ρ. $m = \rho \times V$ applies. Used in the above formula, the following equation results: $P_V = c \times \rho \times (V/\Delta t) \times \Delta\vartheta$

The heat loss P_V, that can be dissipated by forced ventilation, is thus proportional to the volume flow

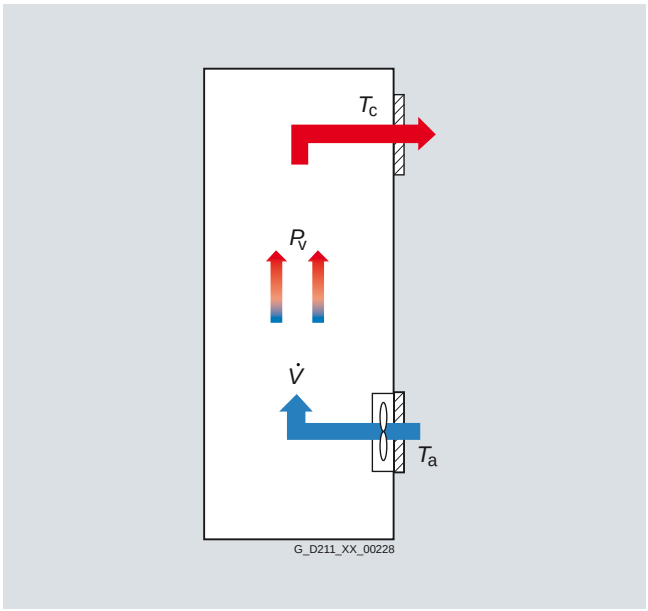
$\dot{V} = V/\Delta t$ that the fan delivers through the control cabinet

and the permissible degree of heating $\Delta\vartheta = T_c - T_a$

The heat capacity and density of the air depend on the humidity level and atmospheric pressure. For this reason, the equation is dependent on other parameters. To estimate the level of control cabinet heating in a typical industrial environment, c = 1 kJ/kg × K and ρ = 1.2 kg/m^3 can be assumed. This results in the following quantity equation:

P_V [W] = 1200 × $\dot{V}$ [m^3/s] × $\Delta\vartheta$ [K]

with $\Delta\vartheta = T_c - T_a$



The temperature T_c as the ambient temperature of the components in the interior of the control cabinet can be estimated with the formula given and must be checked by means of measurements for each application because local hot spots can form, e.g. in close proximity to a heat source or heat accumulation through unfavorable air circulation.

Configuration

Control cabinet without forced ventilation

A control cabinet without forced ventilation conducts the heat loss P_v generated in the interior to the surrounding air (external temperature T_a) via the surface.

For the heat flow $\dot{Q}$ the following applies in the steady state:

$$\dot{Q} = k \times A \times \Delta\vartheta = P_v$$

k is the heat transfer coefficient, A is the effective cooling surface of the control cabinet, and $\Delta\vartheta$ is the temperature difference between the internal cabinet temperature and the external temperature $\Delta\vartheta = T_c - T_a$

The transfer of heat through the walls of the control cabinet is determined by the heat transfer of the interior air to the cabinet wall, heat conduction within the cabinet wall and heat transfer from the cabinet wall to the external air. The heat transfer is to be calculated by the heat transfer coefficient α, and heat conduction by the heat conductivity λ and the thickness d of the cabinet wall. The resulting equation for the possible heat loss P_v is:
$P_v = [1/(1/\alpha_i + d/\lambda + 1/\alpha_a)] \times A \times \Delta\vartheta = k \times A \times \Delta\vartheta$

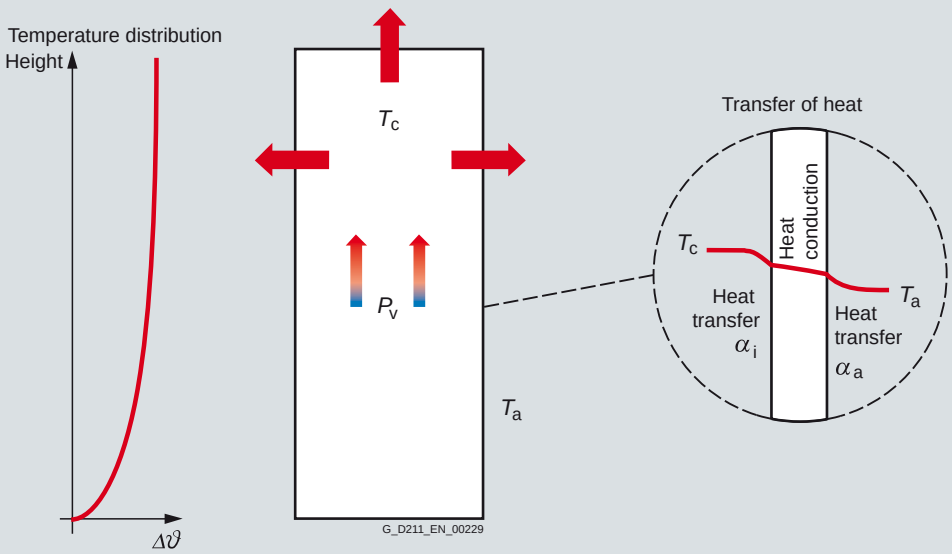
$$\boldsymbol{P_v = k \times A \times \Delta\vartheta}$$

Typical values for the heat transfer coefficient k in the case of control cabinets with walls of painted stainless steel which are up to 2 mm (0.08 in) thick:

	***k* value**
Non-circulating air in the control cabinet and non-circulating external air $\alpha_i = \alpha_a = 6$ W/(m² × K)	approx. 3 W/(m² × K)
Circulating air in the control cabinet and non-circulating external air $\alpha_i = 40$ W/(m² × K); $\alpha_a = 6$ W/(m² × K)	approx. 5.2 W/(m² × K)

The calculating procedures of IEC 60890 (VDE 0660 Part 507) can be used for determining the ambient temperature T_c in the interior of the control cabinet. All heat sources in the control cabinet must be taken into account in the calculation, e.g. Line Modules, Motor Modules, power supplies, filters, reactors. It is important to determine the effective cooling surface dependent on the method of setting up the control cabinet. The standard can also be used for control cabinets with ventilation openings (natural convection).

The estimated temperature T_c and the temperature distribution in the control cabinet must be checked with measurements for every application since local hot spots can form, e.g. in close proximity to a heat source or heat accumulation.



Heat dissipation

Configuration

Control cabinet with air conditioner

The control cabinet emits heat via its surface and the air conditioner.

Manufacturers provide information on the design of the air conditioner, , e.g. Rittal:
www.rittal.de/produkte/system-klimatisierung/index.asp

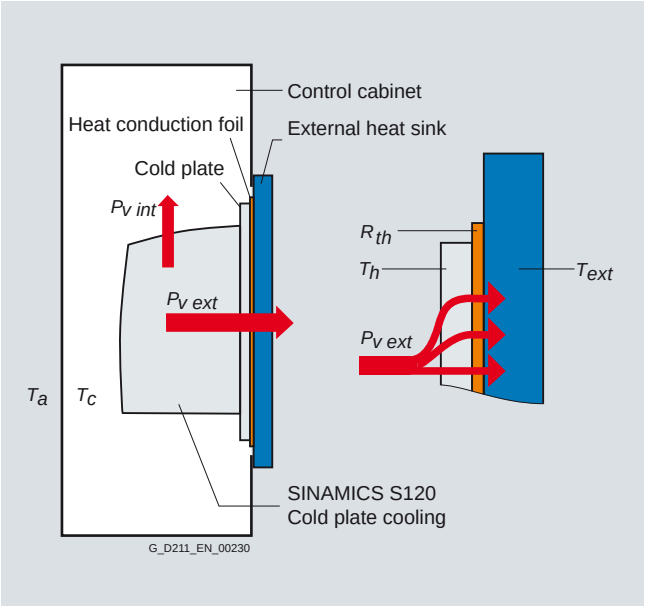
Control cabinet with cold plate cooling

Devices with cold plate cooling dissipate part of the generated heat losses to the surrounding air in the control cabinet ($P_{v\ int}$). However, the greatest part is dissipated as $P_{v\ ext}$ via the backplane designed as a cooling surface – the cold plate – to the external heat sink. The heat losses $P_{v\ ext}$ heat the cold plate to the temperature T_h that is linked via the thermal resistance R_{th} with the temperature T_{ext} of the external heat sink:
$T_h = R_{th} \times P_{v\ ext} + T_{ext}$

To ensure the specified value for the thermal resistance R_{th}, the supplied heat conduction foil must be used between the cold plate and the external heat sink, the device must be screwed together with the specified tightening torque, and the surface finish of the external heat sink must be maintained. The temperature difference between the cold plate and the external heat sink (T_h - T_{ext}) must not exceed 40 K, since otherwise mechanical warping can result. The devices with a width of 300 mm (11.81 in) are preferred in cold plate cooling for clocked applications that only briefly require the full rated current, but run on average with a smaller load, corresponding to the derating or less.

For the heat losses $P_{v\ int}$ given off in the control cabinet, one of the previously named calculation methods can be used for calculating the internal control cabinet temperature T_c.

All calculated maximum temperatures must be ensured by means of measurements under realistic load conditions after setup of the system.



You must ensure that the temperature T_{ext} of the external heat sink does not exceed the defined limit value on the surface contacting the heat conduction foil. Recommended external heat sink, e.g. Rittal DCP – Direct Cooling Package
www.rittal.de

Condensation protection with cold plate cooling

On devices with cold plate cooling, warm surrounding air can condense on the cold surface of the external heat sink. The resulting condensate can cause electrical damage such as leakage current bridges and flashovers. The volume of condensate must be minimized by means of an appropriate temperature of the external heat sink by always maintaining the temperature of the heat sink above the dew point of the surrounding air. This can be achieved either by a permanently set and correspondingly high temperature, or by controlling the temperature of the heat sink in accordance with the surrounding air.

Services and documentation

14

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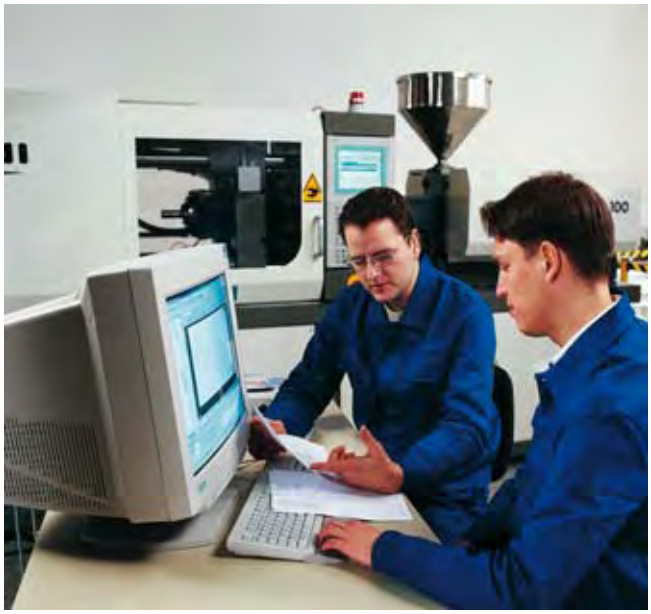
Overview



Our understanding of an application is the customer-specific solution of an automation task based on standard hardware and software components. In this respect, industry knowledge and technological expertise are just as important as expert knowledge about how our products and systems work. We are setting ourselves this challenge with more than 160 application engineers at 20 locations in 13 countries.

Application centers

We currently have application centers in:

- Germany:
  Head Office at Erlangen and 6 German regions, e.g. in Munich, Nuremberg, Stuttgart, Mannheim, Frankfurt, Chemnitz, Cologne, Bielefeld, Bremen, Hanover, Hamburg
- Italy: Bologna, Milan
- USA: Atlanta
- China: Beijing, Shanghai
- France: Paris
- Turkey: Istanbul
- India: Mumbai
- Switzerland: Zurich
- United Kingdom: Manchester
- Brazil: Sao Paulo
- Japan: Tokyo, Osaka
- The Netherlands: The Hague
- Denmark: Ballerup

These application centers specialize in the use of SIMOTION/SINAMICS. You therefore can rely on automation and drive specialists for implementing successful applications. By involving your personnel at an early stage in the process, we can provide a solid basis for rapid knowledge transfer, maintenance and further development of your automation solution.

Advice on applications and implementation

We offer a variety of consultation services to help you find the optimum solution for the SIMOTION/SINAMICS application you want to implement.

The quotation phase includes

- clarification of technical questions
- discussion of machine concepts and customer-specific solutions
- selection of suitable technology and
- suggestions for implementation.

A technical feasibility study is also performed at the outset. In this way, difficult points of the application can be identified and solved early on. We can also configure and implement your application as a complete solution including control cabinet from a single source.

During the implementation phase a number of proven standards can be applied. This saves engineering costs.

The system can be commissioned by experienced, competent personnel, if required. This saves time and trouble.

If servicing is required, we can support you on site or via teleservice. For further information about servicing, please see "Service and Support".

On-site application training

Training for the implemented applications can also be organized and carried out on site. This training for machine manufacturers and their customers does not deal with individual products, but the entire hardware and software system (for example, automation, drives and visualization).

From an initial concept to successful installation and commissioning: We can provide complete support for SIMOTION/SINAMICS! Contact your Siemens representative.

For more information, go to:
www.siemens.com/motioncontrol/apc

Faster and more applicable know-how: Hands-on training from the manufacturer

SITRAIN® – the Siemens Training for Automation and Industrial Solutions – provides you with comprehensive support in solving your tasks.

Training by the market leader in automation and plant engineering enables you to make independent decisions with confidence. Especially where the optimum and efficient use of products and plants are concerned. You can eliminate deficiencies in existing plants, and exclude expensive faulty planning right from the beginning.

First-class know-how directly pays for itself: In shorter commissioning times, high-quality end products, faster troubleshooting and reduced downtimes. In other words, increased profits and lower costs.

Achieve more with SITRAIN

- Shorter times for commissioning, maintenance and servicing
- Optimized production operations
- Reliable configuration and commissioning
- Minimization of plant downtimes
- Flexible plant adaptation to market requirements
- Compliance with quality standards in production
- Increased employee satisfaction and motivation
- Shorter familiarization times following changes in technology and staff

Contact

Visit our site on the Internet at:

www.siemens.com/sitrain

or let us advise you personally. You can request our latest training catalog from:

SITRAIN Customer Support Germany:

Phone: +49 (0)911 / 8 95 75 75

Fax: +49 (0)911 / 8 95 75 76

E-mail: info@sitrain.com

Training office, US

Phone: 1-800-241-44 53

E-mail: sitrain.register.sea@siemens.com

SITRAIN highlights

Top trainers

Our trainers are skilled teachers with direct practical experience. Course developers have close contact with product development, and directly pass on their knowledge to the trainers.

Practical experience

The practical experience of our trainers enables them to teach theory effectively. But since theory can be pretty drab, we attach great importance to practical exercises which can comprise up to half of the course time. You can therefore immediately implement your new knowledge in practice. We train you methodically on state-of-the-art training equipment. This training approach will give you all the confidence you need.

Wide variety

With a total of about 300 local attendance courses, we train the complete range of products from Siemens Industry as well as interaction of the products in systems.

Tailor-made training

We are only a short distance away. You can find us at more than 50 locations in Germany, and in 62 countries worldwide. You wish to have individual training instead of one of our 300 courses? Our solution: We will provide a program tailored exactly to your personal requirements. Training can be carried out in our Training Centers or at your company location.

The right mixture: Blended learning

"Blended learning" means a combination of various training media and sequences. For example, a participant based course in a Training Center can be optimally supplemented by a self-teach program as preparation or follow-up. Additional effect: Reduced traveling costs and periods of absence.

Training courses SINAMICS

Overview

Training courses for SINAMICS S120 drive system

This provides an overview of the training courses available for the SINAMICS S120 drive system.

The courses are modular in design and are intended for a variety of target groups as well as individual customer requirements.

The system overview will acquaint decision-makers and sales personnel with the system very quickly.

The configuration course provides all the information you need to size the drive system.

The basic and follow-up courses are sure to provide all the technical knowledge service engineers will need for servicing/ commissioning motion control applications, communication and extended functions such as DCC and Safety Integrated.

All courses contain as many practical exercises as possible in order to enable intensive and direct training on the drive system and with the tools in small groups.

You will find further information about course contents and dates in Catalog ITC and on the Internet.

Title (all courses are available in English and German)	**Target group** Decision-makers, sales personnel	Project managers, project assistants	Programmers	Commissioning engineers, configuring engineers	Service engineers	Maintenance personnel	**Duration**	**Course code**
Basic courses								
Fundamentals of drive technology		✓	✓	✓	✓	✓	5 days	SD-GAT
SINAMICS System Overview	✓	✓					2 days	DR-SN-UEB
SINAMICS S120 Configuration	✓	✓	✓				5 days	DR-SNS-PRJ
SINAMICS S120 Service and Commissioning			✓	✓	✓	✓	5 days	DR-SNS-SI
Follow-up courses								
SINAMICS S120 Drive Control Chart and Basic Positioner			✓	✓	✓		3 days	DR-SNS-DCC
SINAMICS S120 Chassis Unit Servicing			✓	✓	✓		2 days	DR-SNS-CHA
SINAMICS S120 Safety Integrated			✓	✓	✓	✓	2 days	DR-SNS-SAF
SINAMICS Communication			✓	✓	✓		5 days	DR-SN-COM

Overview

Training courses for SIMOTION Motion Control System

The SITRAIN training courses for SIMOTION offer a broad spectrum of courses that makes users fit for their tasks in project engineering, commissioning and maintenance. The standard courses are offered in our training centers or somewhere close to you. We also offer customer-specific courses in our training centers or at the customer site.

The practical exercises are based on the course content and are performed on specially developed and well-equipped training devices.

You will find further information about course contents and dates in Catalog ITC and on the Internet.

Title	Target group							Duration	Course code
(all courses are available in English and German)	Decision-makers, sales personnel	Project managers, project assistants	Program-mers	Commis-sioning engineers, configur-ing engi-neers	Service engineers	Operators, users	Mainte-nance personnel		
SIMOTION Overview Course	✓	✓						3 days	MC-SMO-UEB
SIMOTION System and Programming Course			✓	✓	✓			5 days	MC-SMO-SYS
SIMOTION Programming Course			✓	✓				5 days	MC-SMO-PRG
SIMOTION with PROFINET – Fundamentals			✓	✓	✓			2 days	MC-SMO-PN1
SIMOTION with PROFINET – Distributed Synchronous Operation			✓	✓	✓			2 days	MC-SMO-PN2
SIMOTION and SINAMICS S120 Maintenance					✓	✓	✓	5 days	MC-SMO-IH
SINAMICS S120 on SIMOTION and T-CPU				✓	✓			4 days	DR-SNS-MC

Overview

Achieve the optimum machine quicker and more efficiently with Mechatronic Support

The Mechatronic Support service ensures that from the design stage of new machines, all the systems involved in mechanics, electronics, and IT are tested and optimized in a simulation environment in terms of their functionality and interaction, before they are actually built.

Mechatronic Support is thus the intelligent alternative to "trial and error". Innovative machine concepts are mutually compared, modified and optimized at the outset – a process which of course also takes account of your ideas for new mechatronic components.

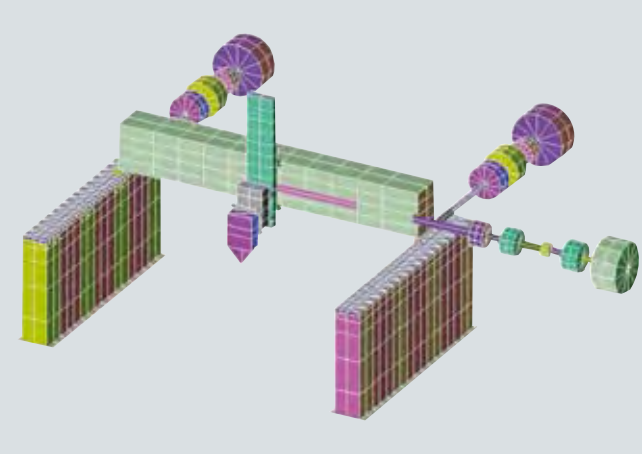
Virtual simulation, real construction

With the help of the Mechatronic Support service, machinery ideas and new developments can be mechatronically tested and modified in a short time at low expense. The first real prototype can be built immediately afterwards as a functioning machine.

As the machine manufacturer, you have the benefit of shorter development phases and faster time-to-market; or as the end customer, you benefit from an optimized high-performance machine solution.

Benefits

- Shorter development times – shorter time to market
- Reliable achievement of development objectives
- Risk-free testing of innovative machine concepts
- Higher quality and productivity from the outset
- Get to the finished machine more quickly with specialist support



Selection and ordering data

Description	Order No.
Consultation Technical consultation with customer	**6FC5088-1....**
Machine optimization Optimum setting of control and drives on the customer's machine	**6FC5088-2....**
Machine analysis and optimization Analysis of the machine and its limits. Recommendations for manufacturer	**6FC5088-3....**
Machine simulation Simulation of individual axes and the dynamic response on the machine	**6FC5088-4....**
Machine simulation with interpolating axes Simulation of interpolating axes	**6FC5088-5....**
Machine simulation with FE model Modeling of machine using the Finite Element method	**6FC5088-6....**

More information

Please contact your local Siemens sales office or representative for more information.

Overview

Complete equipment for machine tools and production systems

Our supplied range of products and services also includes complete equipment for machine tools and production systems with all services in the process chain from consulting through to after-sales service.

We support you in the areas of engineering, production and logistics:

Engineering support

Siemens supports you with advice on design in accordance with standards and concepts for drive systems, control, operation and safety.

Our engineers configure for you in EPLAN P8 and other commonly used CAD systems, execute projects designed to cost and adapt your documents where necessary to UL or new systems.

Our Technical Competence Center Cabinets in Chemnitz supports you with selecting and optimizing the suitable control cabinet air-conditioning system. Apart from calculation and simulation, we also use instrumentation testing in our heat laboratory with load simulation.

We also offer the following services:

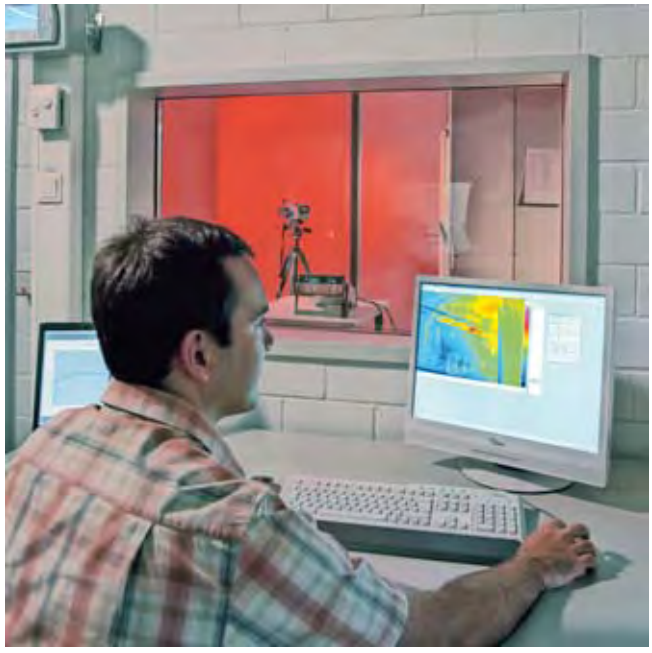
- Vibration measurements and control cabinet certification in the field
- Measurement of conducted interference voltages in our laboratory

Production at a high level of quality

Complete equipment is manufactured at a high industrial level. This means:

- Examining consistency of the job documentation
- Checking for adherence to current regulations
- Collision check in 3D layout, taking into account the free space required thermally and electrically
- Automatic preparation of enclosures, cables and cable bundles
- Automated inspection and shipment free of faults
- Documentation and traceability
- Declaration of conformity regarding the Low-Voltage Directive and manufacturer's declaration on machinery directive
- UL label on request

Control cabinet engineering



Testing in the heat laboratory

Overview (continued)

Superior logistics

Everything from a single source offers you the following advantages:

- Cost savings for procurement, stockkeeping, financing
- Reduction in throughput times
- Delivery just in time

Individual support and maximum flexibility

Our technical consultants for complete equipment support customers and sales departments in the various regions. Our control cabinet customers are supported in the Systems Engineering Plant Chemnitz (WKC) by ordering centers and production teams that are permanently assigned to customers.

Distance does not present a problem, we also use web cams for consulting our customers.

Customer-specific logistics models, flexible production capacity and production areas as well as change management in all process phases ensure maximum flexibility.

Customized supplementary products

In the framework of complete equipment, Siemens also offers the development and construction of customized supplementary products, e.g. special operator panels and power supply systems.

Liability of product nonconformance

Of course we accept the same liability for defects for our complete equipment as for our SINUMERIK, SIMODRIVE and SINAMICS products.

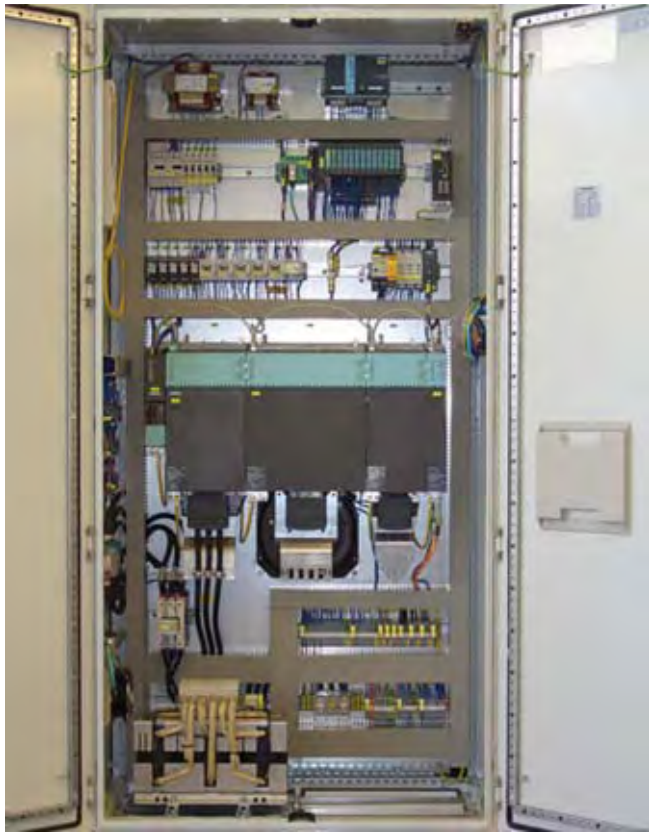
Furthermore, you can use our worldwide repair service anywhere and at any time.

Your benefits

One partner, one quotation, one order, one delivery, one invoice, and one contact partner for liability of defects.

For series production or individual items, Siemens is your competent partner for complete equipment.

Worldwide repair service



Control cabinet with SINAMICS S120 in booksize format

Overview

RSC description of performance

In the context of the repair service contract (RSC), Siemens eliminates faults on the Siemens Industry Sector, I IA&DT components specified in the contract (with the exception of complete motor spindles) at the machine location on behalf of the machine tool manufacturer and dealer.

RSC services

- Provision of servicing personnel
- Fault diagnostics on site
- Fault correction on site
- Proof of fault correction

Fault diagnostics refers to the components specified in the parts list of the final destination memo. Diagnostics is carried out on the basis of a technical fault message clarified in advance by the manufacturer or dealer with specification of the contract number.

Fault correction is carried out by repairing and/or replacing faulty components. In the event of a machine standstill, fault correction is carried out with the response time specified for the country group.

Siemens provides qualified personnel for fault diagnostics and fault correction on our products. If mechanical work is also necessary, this must be provided or arranged by the manufacturer/dealer. Example: dismounting/mounting of motors or other mechanical components.

The services are provided during the usual working hours in the country of installation.

Spare parts are provided either from our central spare parts warehouse or from regional spare parts warehouses using our worldwide spare parts logistic infrastructure. Our central spare parts warehouses contain all important spare parts. Regional spare parts warehouses are adapted to include the components specified in the final destination memo[1)].

The following components are not defined as spare parts:

- Motors[2)]
- Cables[3)]
- Special or customer-specific modules and components not available from Siemens as spare parts.

Faulty components[4)] are replaced free-of-charge within the agreed contract period. See under "Service exclusions".

Contract prerequisites

- Final destination memo
- Data backup at the user
- Parts lists for the individual components

The manufacturer/dealer provides the final destination memo in good time prior to commencement of the contract, and ensures that all machine data is backed up and available at the user. Particular data for the final destination memo are: machine number, machine type, processing technology, control system, drive system, number of measuring circuits, data for OEM application, date of commissioning at end user, country of end user, complete address of end user (if possible), parts list of components used.

For the purpose of simplicity, this data should be stored on the CNC (identSNAPSHOT) from SINUMERIK operate and transferred to Siemens by an online registration.
www.siemens.com/sinumerik/register

RSC certificate

The RSC contract partner (manufacturer or dealer) is provided with a certificate once the final destination memo has been handed over (prerequisite for provision of services at the end customer site). This certificate contains the contract number and essential contract data such as machine number, machine type, contract start date, contract end date, and address for the provision of services.

Period of validity

The RSC commences on the date registered with us for completion of the second commissioning procedure at the end customer site, and ends on expiry of the RSC period[5)].

Contract periods

The RSC is offered for the limitation period (warranty period) that our customers (manufacturers/dealers) provide to their end customers. Various RSC periods permit you to satisfy different market requirements. In the case of RSC periods exceeding the limitation period originally granted for Siemens I IA&DT components, the limitation period is extended with respect to claims for subsequent performance, with the exception of further rights and claims, in line with the extended RSC period. An existing RSC can be extended once by six months or one year. The extension must be ordered during the period of the basic RSC.

Contract versions

Two versions of the RSC are available.

- The master contract is for machine manufacturers who agree to order one RSC for all machines with Siemens equipment.
- The individual contract is for machine manufacturers who order an RSC only for certain machines equipped by Siemens.

Service exclusions

The contract shall not be deemed to have been performed in all cases of subclause VIII./7 quality defects of the "General conditions of supply and delivery for the electrical industry"[4)]. In the case of parts subject to wear (e.g., motor bearings and fans or cables), replacements will be provided free-of-charge within 12 months of commencement of the RSC in the case of proper use, irrespective of the actual duration of the RSC.

Export license

Fulfillment of the service call may be subject to authorization due to the application or the type of replacement parts, equipment and documentation required. The service call is, therefore, subject to the granting of the necessary export licenses and the absence of any other obstacles relating to German or other applicable export regulations.

1) Since the export of standard versions (components/system) is subject to a time-consuming official approval procedure, which applies in equal measure to the supply of such components for the purpose of servicing and spare parts supply, we recommend supply of the export version wherever possible. This applies in particular in cases where the control can be exported without official approval after the machine manufacturer has installed it in a machine tool. Please also observe the paragraph Export control information.

2) For selected motors, we centrally stock components for fast delivery within Germany and the USA. These motors can be manufactured and delivered within a few working days. You can obtain the current list from your Siemens partner.

3) The delivery times known to you usually apply.

4) Examples of service exclusions:
- Non-compliance with the Siemens project engineering and user guidelines
- Function-critical fouling, e.g. oil, conductive substances, rust
- Mechanical damage
- External electrical influence
- Intentional destruction.

5) For example, in the case of a RSC with a 1 year contract period, max. 24 months from the transfer of risk (delivery of the components).

Overview (continued)

Response time

As a rule, the following response times apply when the RSC is implemented in the case of a machine standstill:

Country groups	
CG 1	Next working day
CG 2	Within two working days
CG 3	Depending on country-specific conditions
CG 4	Depending on country-specific conditions, only for customers with master contract for the price of the individual contract

We define the response time as the time from when your clarified order is placed until our service engineer begins the journey to the site stated in the order, or until troubleshooting commences using teleservice. The listed response times apply to "technically clarified fault messages" within the usual working hours of the region (e.g., Mon. to Fri. 8 a.m. to 5 p.m.) excluding public holidays.

Country list

The repair service is offered for the following countries:

Continent	Country/region
Country group 1	
America	Brazil, Canada, Mexico, USA
Asia	China, India, Indonesia, Japan, Malaysia, Singapore, South Korea, Taiwan, Thailand
Australia	Australia
Europe	Andorra, Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Great Britain, Hungary, Italy, Liechtenstein, Luxembourg, Monaco, the Netherlands, Poland, Portugal, Romania, Slovakia, Spain, Sweden, Switzerland, Turkey
Country group 2	
Africa	South Africa
America	Argentina
Australia	New Zealand
Europe	Bulgaria, Estonia, Ireland, Latvia, Lithuania, Norway, Slovenia
Country group 3	
Africa	Egypt, Morocco
America	Bolivia, Chile, Columbia, Costa Rica, Ecuador, El Salvador, Guatemala, Honduras, Nicaragua, Panama, Paraguay, Peru, Uruguay, Venezuela
Asia	Bahrain, Israel, Kuwait, Oman, Pakistan, Philippines, Qatar, Saudi Arabia, United Arab Emirates (Dubai), Vietnam
Europe	Belarus, Bosnia-Herzegovina, Croatia, Greece, Malta, Macedonia, Russia, Serbia and Montenegro, Ukraine
Country group 4	
	Remaining countries

OEM service levels

To ensure repair service for OEM applications, an assessment is necessary based on the OEM service guideline. The assessment grades the OEM application from 0 to 4. A surcharge will be levied for OEM service levels 1 to 4.

Selection and ordering data

Description	Order No.
Repair service contract RSC	
For Siemens I IA&DT components on machine tools for countries in country groups 1 to 3	
• 1 year contract period[1]	**6FC8506-1■X0■-0AA0**
• 2 year contract period[2]	**6FC8506-2■X0■-0AA0**
• Master contract	**R**
• Individual contract	**E**
• 0 to 4 measurement circuits[4]	**1**
• 5 to 6 measurement circuits[4]	**2**
• 7 to 8 measurement circuits[4]	**3**
• = 9 measurement circuits[4] (basic RSC for = 9 measurement circuits[4])	**8**
• > 9 measurement circuits[4] (measurement circuit suppl. for RSC > 9 measurement circuits[3])	**0**
Repair service contract RSC Extension of contract by 6 or 12 months	
For Siemens I DT components on machine tools for countries in country groups 1 to 3	
• Basic RSC for 1 year	**6FC8506-0■X0■-■AA1**
• Basic RSC for 2 years	**6FC8506-0■X0■-■AA2**
• Master contract	**R**
• Individual contract	**E**
• 0 to 4 measurement circuits[4]	**1**
• 5 to 6 measurement circuits[4]	**2**
• 7 to 8 measurement circuits[4]	**3**
• = 9 measurement circuits[4] (basic RSC for = 9 measurement circ.)	**8**
• > 9 measurement circuits[4] (measurement circuit suppl. for RSC > 9 measurement circuits[3])	**0**
Contract extension (possible once per RSC)	
• By 6 months	**6**
• By 1 year	**1**
OEM service levels	
Surcharge for repair service contract for Siemens components on machine tools with OEM applications. Measurement circuits 1 to n for countries in groups 1 to 4	
• Surcharge for OEM service level 1	**6FC8506-3SX01-0AA0**
• Surcharge for OEM service level 2	**6FC8506-3SX02-0AA0**
• Surcharge for OEM service level 3	**6FC8506-3SX03-0AA0**
• Surcharge for OEM service level 4	**6FC8506-3SX04-0AA0**

[1] Maximum of 24 months starting from transfer of risk (delivery of components).

[2] Maximum of 36 months starting from transfer of risk (delivery of components).

[3] Example for 17 measurement circuits: (basic RSC for = 9 measurement circuits) plus 8 times (measurement circuit suppl. for RSC > 9 measurement circuits).

[4] Physical axes and spindles are the measurement circuits.

The unmatched complete service for the entire life cycle

For machine constructors, solution providers and plant operators: The service offering from Siemens Industry, Automation and Drive Technologies includes comprehensive services for a wide range of different users in all sectors of the manufacturing and process industry.

To accompany our products and systems, we offer integrated and structured services that provide valuable support in every phase of the life cycle of your machine or plant - from planning and implementation through commissioning as far as maintenance and modernization.

Our Service & Support accompanies you worldwide in all matters concerning automation and drives from Siemens. We provide direct on-site support in more than 100 countries through all phases of the life cycle of your machines and plants.

You have an experienced team of specialists at your side to provide active support and bundled know-how. Regular training courses and intensive contact among our employees - even across continents - ensure reliable service in the most diverse areas.

Online Support

The comprehensive online information platform supports you in all aspects of our Service & Support at any time and from any location in the world.

www.siemens.com/automation/service&support

Technical Consulting

Support in planning and designing your project: From detailed actual-state analysis, definition of the goal and consulting on product and system questions right through to the creation of the automation solution.

Technical Support

Expert advice on technical questions with a wide range of demand-optimized services for all our products and systems.

www.siemens.com/automation/support-request

In Germany:
Phone: +49 (0)911 8 95 72 22

In the United States, call:
Phone: 1-800 333 7421

In Canada, call:
Phone: 1-888 303 3353

Training

Extend your competitive edge - through practical know-how directly from the manufacturer.

www.siemens.com/sitrain

Training office, US
Phone: 1-800 241 4453

Contact information is available in the Internet at:
www.siemens.com/automation/partner

The unmatched complete service for the entire life cycle

Engineering Support

Support during project engineering and development with services fine-tuned to your requirements, from configuration through to implementation of an automation project.

Field Service

Our Field Service offers you services for commissioning and maintenance - to ensure that your machines and plants are always available.

In the United States, call:
Phone: 1-800 333 7421
In Canada, call:
Phone: 1-888 303 3353

Spare parts

In every sector worldwide, plants and systems are required to operate with constantly increasing reliability. We will provide you with the support you need to prevent a standstill from occurring in the first place: with a worldwide network and optimum logistics chains.

In the United States, call:
Phone: 1-800 241 4453
In Canada, call:
Phone: 1-888 303 3353

Repairs

Downtimes cause problems in the plant as well as unnecessary costs. We can help you to reduce both to a minimum - with our worldwide repair facilities.

In the United States, call:
Phone: 1-800 241 4453
In Canada, call:
Phone: 1-888 303 3353

Optimization

During the service life of machines and plants, there is often a great potential for increasing productivity or reducing costs. To help you achieve this potential, we are offering a complete range of optimization services.

Modernization

You can also rely on our support when it comes to modernization - with comprehensive services from the planning phase all the way to commissioning.

Service programs

Our service programs are selected service packages for an automation and drives system or product group. The individual services are coordinated with each over to ensure smooth coverage of the entire life cycle and support optimum use of your products and systems.

The services of a Service Program can be flexibly adapted at any time and used separately.

Examples of service programs:

- Service contracts
- Plant IT Security Services
- Life Cycle Services for Drive Engineering
- SIMATIC PCS 7 Life Cycle Services
- SINUMERIK Manufacturing Excellence
- SIMATIC Remote Support Servicess

Advantages at a glance:

- Reduced downtimes for increased productivity
- Optimized maintenance costs due to a tailored scope of services
- Costs that can be calculated and therefore planned
- Service reliability due to guaranteed response times and spare part delivery times
- Customer service personnel will be supported and relieved of additional tasks
- Comprehensive service from a single source: fewer interfaces and greater expertise

Contact information is available in the Internet at:
www.siemens.com/automation/partner

Overview

SPARESonWeb – Online spare parts catalog

SPARESonWeb is a web-based tool for selecting the spare parts available for the SINAMICS system. After you have registered and entered the serial number and order number, the spare parts available for the relevant unit are displayed.

The delivery state for specific orders can be displayed for all shipped SINAMICS products.

http://workplace.automation.siemens.com/sparesonweb

My Documentation Manager

Overview

Compile customized documentation

My Documentation Manager – Customizing information

My Documentation Manager offers all Motion Control customers an innovation with extended usability: Machine manufacturers and end customers are not only able to assemble their own customized technical documents for a specific product or system, they can also generate complete libraries with individually configured contents. The content that matches your topic can be found from the full range of I IA&DT documentation stored under Service & Support using the operator interface and assembled using Drag & Drop into application-based libraries, generated and even combined with your own documentation. The self-generated collections can be saved in the commonly used RTF and PDF formats or even in XML format.

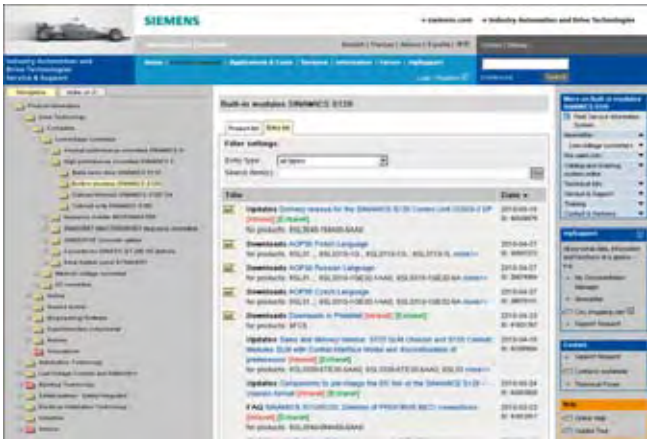
You must register for configuring and generating/managing (the existing login can be used, e.g. Industry Mall www.siemens.com/industrymall)

Benefits

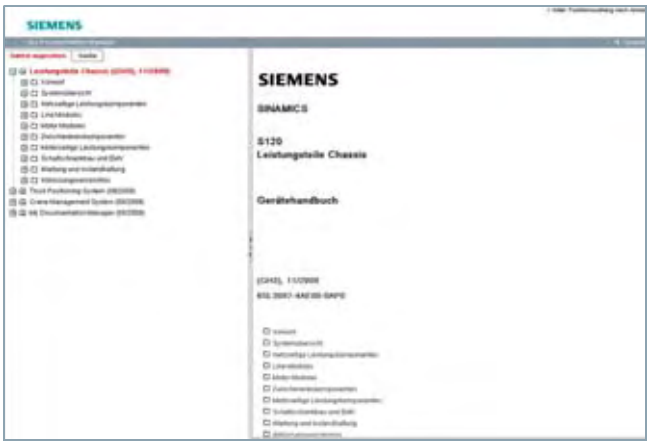
- Display
  View, print or download standard documents or personalized documents
- Configure
  Transfer standard documents or parts of them to personalized documents
- Generate/Manage
  Produce and manage personalized documents in the formats PDF, RTF or XML

Design

My Documentation Manager is the web-based system to generate personalized documentation based on standard documents. It is part of the Service & Support portal.



Search in the Service & Support portal



Document in My Documentation Manager

Function

Opening My Documentation Manager

My Documentation Manager opens in two ways

- Search in the Service & Support portal
  www.siemens.com/automation/service&support
  The appropriate manuals are designated by "configurable". My Documentation Manager opens by clicking on "Display and configure". The selected document is displayed as the current document.
- Using the direct link from the Service & Support portal
  www.automation.siemens.com/docconf/
  After logon/registration, the online help is displayed as current document.

More information

Further information can be found on the Internet at:

www.siemens.com/mdm

Overview

A high-quality programmable control or drive system can be used to maximum effect only if the user is aware of the performance of the products used as a result of intensive training and good technical documentation.

This is becoming more important due to the shorter innovation cycles of modern automation products and the convergence of electronics and mechanical engineering.

Comprehensive documentation is available for SIMOTION and the SINAMICS S120 drive system, including the Operating Manual, Programming Manual or Configuration Manual, as well as the Commissioning Manual.

Information is available in the following formats:

- Paper version, printed copy
- PDF file available on Internet as DOConWEB application with 'search all documents' function
  www.siemens.com/automation/doconweb

You can find further information on the Internet at:
www.siemens.com/motioncontrol/docu

Information and documentation relating to SIMOTION are available in the form of:

- Windows Help in conjunction with the SCOUT engineering system
- Documentation (PDF) on the product CD-ROM
- Documents/documentation at:
  http://support.automation.siemens.com/WW/view/en/10805436/133300

Application

Explanations of manuals:

- **Manual/Configuration Manual**
  containing all necessary information about the intended use of the components of a system, e.g. technical data, interfaces, dimension drawings, characteristics and possible applications.
  Phases of use: Cabinet configuration/setup, circuit diagram configuration/drawing.
- **Commissioning Manual**
  containing all information relevant to commissioning after installation and wiring. It also contains all safety and warning notices relevant to commissioning in addition to overview drawings.
  Phases of use: Commissioning of components that have already been connected, configuration of system functions.
- **List Manual**
  containing all parameters, function charts, and faults/warnings for the product/system as well as their meanings and setting options. It contains parameter data and fault/warning descriptions with functional correlations.
  Phases of use: Commissioning of components that have already been connected, configuration of system functions, fault cause/diagnosis.
- **Getting Started**
  providing information about getting started for the first-time user as well as references to additional information. It contains information about the basic steps to be taken during commissioning. The information in the other documentation should be carefully observed for all of the other work required.
  Phases of use: Commissioning of components that have already been connected.
- **Function Manual Drive Functions**
  containing all the relevant information about individual drive functions: Description, commissioning and integration in the drive system.
  Phases of use: Commissioning of components that have already been connected, configuration of system functions.

General documentation

Selection and ordering data

Description	Order No.
Catalog PM 21 · 2011	
• German	**E86060-K4921-A101-A2**
• English	**E86060-K4921-A101-A2-7600**
• Italian	**E86060-K4921-A101-A2-7200**
Catalog ST 70 · 2009	
• German	**E86060-K4670-A101-B2**
• English	**E86060-K4670-A101-B2-7600**
• French	**E86060-K4670-A101-B2-7700**
• Italian	**E86060-K4670-A101-B2-7200**
• Spanish	**E86060-K4670-A101-B2-7800**
Catalog ST 80/ST PC · 2010	
• German	**E86060-K4680-A101-B7**
• English	**E86060-K4680-A101-B7-7600**
• French	**E86060-K4680-A101-B7-7700**
• Italian	**E86060-K4680-A101-B7-7200**
• Spanish	**E86060-K4680-A101-B7-7800**
Decentralizing with PROFIBUS DP	**ISBN 3-89578-074-X**

Description	Order No.
User/Manufacturer Documentation	
DOConCD SINAMICS S120 User and Manufacturer Documentation on CD-ROM with Help Tool Edition: 11/2009 Languages: English, German	**6SL3097-2CA00-0YG6**
Manufacturer and service documentation	
EMC Installation Guidelines	
• German	**6FC5297-0AD30-0AP2**
• English	**6FC5297-0AD30-0BP2**

More information

Please send any queries or suggestions to:

docu.motioncontrol@siemens.com

Selection and ordering data

Description	Order No.
Manufacturer and service documentation	
Manual SINAMICS S120 Control Units and Additional System Components	
• German	**6SL3097-4AH00-0AP0**
• English	**6SL3097-4AH00-0BP0**
• French	**6SL3097-4AH00-0DP0**
• Italian	**6SL3097-4AH00-0CP0**
Manual SINAMICS S120 Booksize Power Units	
• German	**6SL3097-4AC00-0AP2**
• English	**6SL3097-4AC00-0BP2**
• French	**6SL3097-4AC00-0DP2**
• Italian	**6SL3097-4AC00-0CP2**
Manual SINAMICS S120 Chassis Power Units	
• German	**6SL3097-4AE00-0AP0**
• English	**6SL3097-4AE00-0BP0**
• French	**6SL3097-4AE00-0DP0**
• Italian	**6SL3097-4AE00-0CP0**
Manual Liquid Cooled Chassis Power Units	
• German	**6SL3097-4AM00-0AP0**
• English	**6SL3097-4AM00-0BP0**
• French	**6SL3097-4AM00-0DP0**
• Italian	**6SL3097-4AM00-0CP0**
Function Manual SINAMICS S120 Drive Functions	
• German	**6SL3097-4AB00-0AP0**
• English	**6SL3097-4AB00-0BP0**
• French	**6SL3097-4AB00-0DP0**
• Italian	**6SL3097-4AB00-0CP0**

Description	Order No.
Manufacturer and service documentation	
Commissioning Manual SINAMICS S120	
• German	**6SL3097-4AF00-0AP0**
• English	**6SL3097-4AF00-0BP0**
• French	**6SL3097-4AF00-0DP0**
• Italian	**6SL3097-4AF00-0CP0**
Function Manual SINAMICS S120 Safety Integrated	
• German	**6SL3097-4AR00-0AP1**
• English	**6SL3097-4AR00-0BP1**
• French	**6SL3097-4AR00-0DP1**
• Italian	**6SL3097-4AR00-0CP1**
Manual SINAMICS S120 AC Drive	
• German	**6SL3097-4AL00-0AP0**
• English	**6SL3097-4AL00-0BP0**
• French	**6SL3097-4AL00-0DP0**
• Italian	**6SL3097-4AL00-0CP0**
List Manual SINAMICS S120/150	
• German	**6SL3097-4AP00-0AP0**
• English	**6SL3097-4AP00-0BP0**
• French	**6SL3097-4AP00-0DP0**
• Italian	**6SL3097-4AP00-0CP0**
Getting Started SINAMICS S120	
• German	**6SL3097-4AG00-0AP0**
• English	**6SL3097-4AG00-0BP0**
• French	**6SL3097-4AG00-0DP0**
• Italian	**6SL3097-4AG00-0CP0**

Motors for SINAMICS

Selection and ordering data

Description	Order No.
Manufacturer and service documentation	
Configuration Manual 1FT7 Synchronous Motors	
• German	**6SN1197-0AD13-0AP3**
• English	**6SN1197-0AD13-0BP3**
Configuration Manual 1FK7 Synchronous Motors	
• German	**6SN1197-0AD16-0AP1**
• English	**6SN1197-0AD16-0BP1**
• French	**6SN1197-0AD16-0DP1**
• Italian	**6SN1197-0AD16-0CP1**
• Spanish	**6SN1197-0AD16-0EP1**
Configuration Manual 1PH7 Asynchronous Motors	
• German	**6SN1197-0AC71-0AP0**
• English	**6SN1197-0AC71-0BP0**
• French	**6SN1197-0AC71-0DP0**
• Italian	**6SN1197-0AC71-0CP0**
• Spanish	**6SN1197-0AC71-0EP0**
Configuration Manual 1PH8 synchronous/asynchronous motors	
• German	**6SN1197-0AD74-0AP0**
• English	**6SN1197-0AD74-0BP0**
Configuration Manual 1PL6 Motors	
• German	**6SN1197-0AC67-0AP1**
• English	**6SN1197-0AC67-0BP1**
Configuration Manual 1FN3 Linear Motors Peak Load and Continuous Load	
• German	**6SN1197-0AB86-0AP0**
• English	**6SN1197-0AB86-0BP0**
Configuration Manual 1FN6 Linear Motors	
• German	**6SN1197-0AB78-0AP3**
• English	**6SN1197-0AB78-0BP3**
Configuration Manual 1FW3 Complete Torque Motors	
• German	**6SN1197-0AD70-0AP4**
• English	**6SN1197-0AD70-0BP4**
• French	**6SN1197-0AD70-0DP4**
• Italian	**6SN1197-0AD70-0CP4**
• Spanish	**6SN1197-0AD70-0EP4**
Configuration Manual 1FW6 Built-In Torque Motors	
• German	**6SN1197-0AE00-0AP3**
• English	**6SN1197-0AE00-0BP3**
• French	**6SN1197-0AE00-0DP3**
• Italian	**6SN1197-0AE00-0CP3**
• Spanish	**6SN1197-0AE00-0EP3**

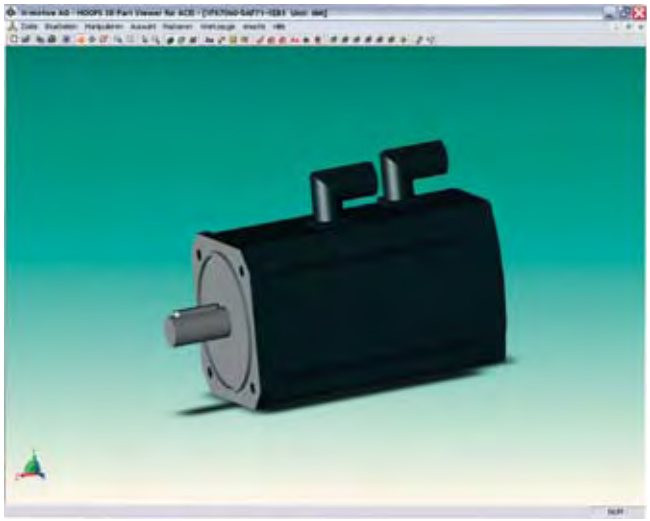
Measuring systems

Selection and ordering data

Description	Order No.
Manufacturer and service documentation	
User Manual SIMODRIVE sensor Absolute Encoder with PROFIBUS Encoder	
• English/German	**6SN1197-0AB10-0YP4**

Overview

CAD CREATOR –
Dimension drawing and 2D/3D CAD generator



Thanks to the user-friendly operator interface of the CAD CREATOR, it is easy to configure controls, drives and motors. With the support of the CAD CREATOR, product-specific dimension drawings and 2D/3D CAD models can be created quickly. The CAD CREATOR assists the machine manufacturer's designers, offer drafting engineers and project engineers.

Benefits

- Provision of dimension drawings as 2D/3D CAD models in mm and inches
- Display of CAD models and dimension drawings by integrated viewers
- Support for all general geometry interfaces STEP, IGES, Parasolid, SAT, VDA, and for special interfaces such as Ideas, NX, Solid Edge, Pro/Engineer, Autocad, Inventor, Mechanical Desktop, Catia and Solidworks
- Multilingual operator interface in English, French, German, Italian and Spanish
- Dimension drawings and 2D/3D CAD models for
  - Motors
    - 1FT6/1FT7/1FK7 synchronous motors
    - 1FE1 built-in synchronous motors
    - 1FW3 torque motors
    - 1FW6 built-in torque motors
    - 1FT6/1FT7/1FK7/1FK7 DYA geared motors
    - 1PH8 synchronous/asynchronous motors
    - 1PH7/1PH4/1PL6/1PM4/1PM6 asynchronous motors
    - 2SP1 motor spindles
    - 1FN3 linear motors
  - SINAMICS S120
    - Control Units
    - Power Modules (Booksize/Chassis)
    - Line Modules (Booksize/Chassis)
    - Line-side components
    - Motor Modules (Booksize/Chassis)
    - DC link components
    - Supplementary system components
    - Load-side power components
    - Encoder system connection
    - Connection system MOTION-CONNECT

Benefits (continued)

- SINUMERIK solution line
  - CNC controls
  - Operator components for CNC controls
- SIMOTION
  - SIMOTION D
  - SIMOTION C

The CAD CREATOR offers a variety of options for configuring, as well as different methods for searching for a product:

- According to order number
- According to technical description

After successful configuration of the product, the dimension drawings (2D/3D CAD models) are displayed with the integrated viewers and made available for export.

Selection and ordering data

Description	Order No.
CAD CREATOR Dimension drawing and 2D/3D CAD generator on DVD-ROM Languages: English, French, German, Italian, Spanish	**6SL3075-0AA00-0AG0**

More information

The CAD CREATOR is available on DVD-ROM and as an Internet application.

You can find additional information on the Internet at:
www.siemens.com/cadcreator

Notes

Sector-specific solutions

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15/4	SIMOTION Baggers & Wrappers
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15/21	Rotogravure package printing
15/23	**Textile machines**
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15/27	Weaving machine
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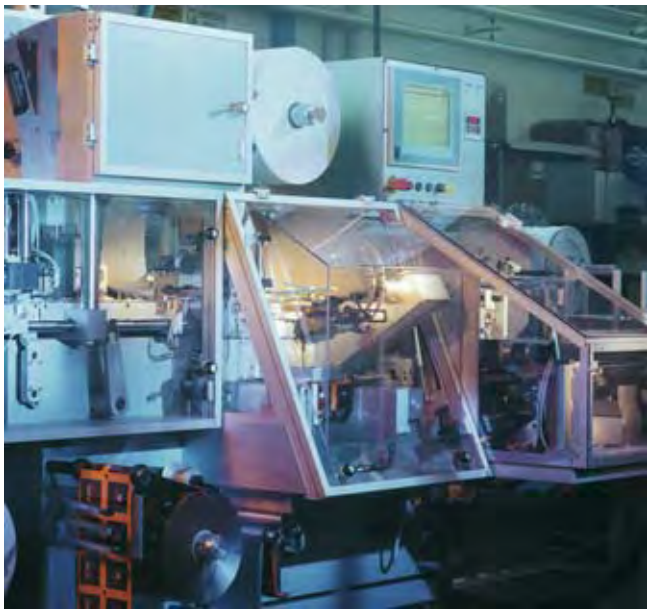
Summary

Overview



Siemens offers a completely unique spectrum of products for machine construction: Integrated, energy-efficient and flexible automation and drive systems for any task – in any sector. With our innovative products, systems and integrated solutions, we help you to build a better machine – faster and cheaper.

The ability to innovate and to directly address the interests of customers is more important today than ever. Products alone, as innovative as they may be, do not suffice any longer. To recognize trends and respond to them, that is the key – whether in the form of innovative systems, intelligent solutions or the provision of unique services.

Innovative systems and intelligent solutions

One of the most important trends is toward modular machines and plants. One-off solutions are being gradually replaced by modular systems and distributed automation concepts. This offers advantages especially with regard to project runtimes and enhanced quality through the use of tried and tested modules in the hardware and software. Siemens is offering an integrated solution here with distributed automation concepts in combination with a drive system.

Our extremely wide range of powerful and innovative standard components for automation technology and drive systems has a uniform system basis and supports integrated programming, data management and communication. This prevents problems with interfaces. Holistic, integrated solutions are created with uniform handling and uniform engineering and yet considerable scope remains for implementing your individual solutions.

Using our SIMOTION and SINAMICS system platforms, on the one hand you have ready-to-use solutions such as SIMOTION Baggers & Wrappers and on the other hand thanks to the openness you have plenty of freedom for your special expertise. Our solutions and components are open for you to integrate your own developments, because we use open standards. You can access an application database, which is supplied with information from around the world, containing ready-to-apply, provenly successful solutions created by Siemens application engineers. These are not finished applications, but modules for typical subtasks on machines. A project can be implemented faster by using them. These modules can be adapted very rationally to the requirements of individual applications. Your special expertise is neither changed nor revealed.

Our specialists, however, will also be happy to help you to create individual complete solutions, either for new projects or for the modernization of existing plants. Our application centers can offer reliable system selection, a system concept optimized according to customer specifications, short development time, budget security, certainty that the required performance and scope of functions will be delivered by deadline and on budget, and the flexibility afforded by Motion Control solutions which are modular and mechatronic in design. In a Siemens technology and application center, it is possible (machine size and material flow permitting) to precisely measure and optimize the machine performance that can be achieved with the Motion Control solution under real conditions with the help of high-speed cameras, digital storage oscilloscopes, FFT analyzers, balance and vibration detectors, accelerometers, load cells and laser measuring instruments.

Our technology is as long-lived as your machines. Expansions are still possible after many years, you can therefore rely on a system expansion capability that is assured for the long term.

Overview (continued)

Provision of unique services

Innovative services such as mechatronic support and application support round off Siemens' range of products, systems and services. With "Mechatronic support", for example, the generally costly construction of a prototype can become considerably less risky and faster by using virtual prototypes – the first real prototype is then final. The time to market and construction costs are therefore drastically reduced. The range of complete solutions offers potential for rationalization, e.g. a completely assembled, tested and customized control cabinet that can practically be delivered to the production line of the end customer with plug and play functionality.

Another emerging trend is the transformation into a "full supplier". In this case, the end customer requests everything from a single source for the new production line with vertical and horizontal integration throughout the complete process. To satisfy these and further future requirements and to open up new markets at the same time, machine manufacturers need strong partners at their side. With Siemens, you have an experienced partner that focuses on a wide range of different sectors and that will support you with individual solutions, powerful systems and innovative services and which, as a global player, maintains an all-encompassing, worldwide service network. Wherever your machine may be one day: our technology complies with the applicable standards – and is supported locally. If you wish, round the clock, every day of the year. Always exactly what you want.

All types of references

Our extensive experience in various sectors helps us to concentrate on the important aspects. This is one of the reasons for the considerable amount of positive feedback concerning our complete range of products and services.

Investment in the future

We are competent and reliable partners for Motion Control solutions in machine construction. We will be happy to work out future-oriented solutions with you for many different sectors. Partnership with Siemens secures your future.

The following are examples of various sector solutions implemented with SIMOTION. We make a distinction here between system-tested packages that can be ordered and applications in the form of ordering examples that we will be happy to adapt to your specific machine.

More information

You will find further information about reference projects and sector-specific solutions with SIMOTION on the Internet at

www.siemens.com/simotion and
www.siemens.com/machinebuilding

or get in touch with your contact at your local Siemens office.

SIMOTION Baggers & Wrappers

Overview

Baggers & Wrappers is a software library for the automation of tubular bag machines. The technological basis of the packages is the SIMOTION Motion Control System.

As an option, Siemens offers you support with tasks ranging from hardware adaptation to your machines through to delivery of a control cabinet that is ready for operation.

The software library contains expandable software modules for standard tasks and a pre-configured user interface. This significantly simplifies program development and commissioning.

SIMOTION Baggers & Wrappers software library

The Baggers & Wrappers software library contains the following components:

- Function blocks for automating the machine functions of tubular bag machines
- SIMOTION application examples for the various machine types
  - intermittent, vertical tubular bag machine
  - continuous, vertical tubular bag machine
  - horizontal tubular bag machine
- Standard user interfaces
- Electronic manual on CD-ROM (German/English)

SIMOTION Baggers & Wrappers support package

- For easy familiarization with SIMOTION Baggers & Wrappers, Siemens offers a support package for first commissioning. This package comprises the following freely selectable services:
- Hardware and software instructions
- Support with:
  - creation and modification of software
  - expansion with customized machine functionality
  - commissioning of the machine

Please direct all enquiries to your local Siemens contact.

Benefits

The intense competition in packaging machine manufacture means that new applications must be created quickly and easily. The Siemens response to this is: SIMOTION Baggers & Wrappers reduces the outlay for creating the basic functionality of the packaging machine. This gives you more time to prepare customer-specific functions.

Using SIMOTION Baggers & Wrappers has the following advantages:

- Significant reduction of the time required for program creation and commissioning
- Increased program reliability through standardized and comprehensively tested software modules
- Simple expansion with customer-specific software functions
- Reduced costs for the configuration and commissioning phase by more than 50 %

Application

Tubular bag machines form, fill and seal bags made of strips of packaging material which is pulled off a packaging material reel.

Tubular bag machines are categorized as intermittent (clocked) and continuous tubular bag machines according to the motion of the foil, and as machines with vertical or horizontal motion in accordance with the filling method of the tubular bags:

- Vertical tubular bag machines are used to package bulk solids, pasty solids and liquids in bags. Bag sizes vary from a few cubic centimeters up to several liters. The cycle time depends on the size of the package and its contents. Depending on the actual application, up to 200 bags per minute can be achieved.
- Horizontal tubular bag machines are used to package individual items. Depending on the application, cycle times of up to 1500 bags per minute can be achieved.

The following machine functions can be automated with the help of SIMOTION Baggers & Wrappers:

- Intermittent (clocked packaging material extraction) or continuous operation
- Use of synchronous servomotors, asynchronous motors or linear drives
- Operating mode management and data acquisition acc. to the OMAC Standard (OMAC = Open Modular Architecture Controls), see www.omac.org
- Coordination of the movements of the packaging material extractor, cross-sealer, dosing device or infeed unit
- No Product – No Bag
- No Gap – No Seal
- Optimization of the parallel movement of the aggregates to increase the cycle time
- Packaging material extractor with print-mark correction and/or slip compensation
- Pre-extractor with dancer control
- Web aligner
- Control of marking devices
  - By means of high-speed cam outputs
  - Via PROFIBUS
- Different designs of cross-sealing tools, e.g.
  - Rotating cross-sealers
  - Coupled-motion cross-sealers (box motion)
- Lagging cross-sealer opposite to packaging material extractor (compress factor)
- Temperature control for continuously heated seal plates with autotuning function
- Connection of external impulse welding devices
- Interfacing to different dosing and counting devices, e.g.
  - Multihead scale
  - Auger filler
  - Cup filler
- Automatic product feed unit with accumulating conveyors for horizontal tubular bag machines
- Recipe management
- Linking higher-level controllers on the management level (operating data, messages) in accordance with OMAC standard

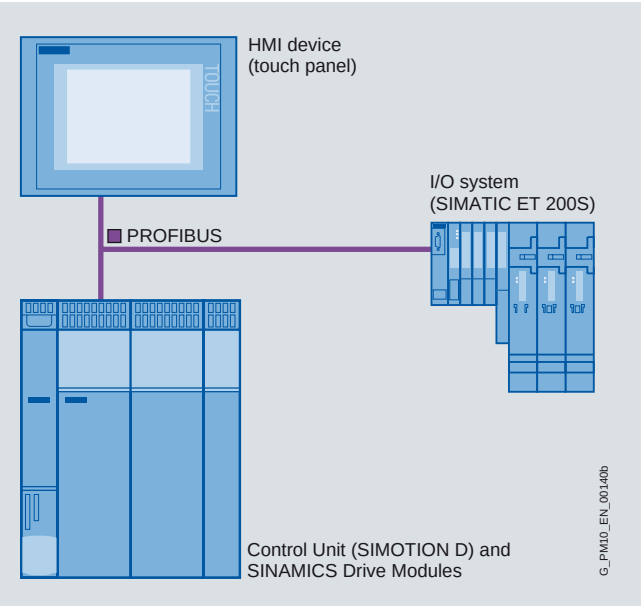
In addition, other aggregates can be integrated or created depending on the application, for example,

- Side gusset, block bottom, punching and zipping unit
- Edge sealing (Quattro Seal)
- Vacuum chamber
- Gassing units (MAP)
- Sidelay control
- Detection of trapped products in sealing seams

Design

Hardware structure

The automation components communicate with each other over PROFIBUS or alternatively over PROFINET. The hardware must be configured to meet the requirements of the machine.



Example of automation solution with SIMOTION D

Software structure

Automating with pre-configured software modules

With the help of the SIMOTION Baggers & Wrappers open software library, all machine functions of tubular bag machines that are listed under "Function" can be automated. The software modules offer capabilities for the different functions of a tubular bag machine, for example, for cross-sealers, foil extractors, temperature control with self-adjustment.

The modular software concept makes it easier to automate different machine types. When different cross-sealers are used, the corresponding software module from the library is selected. In addition, the software modules can be expanded and adapted to individual machine requirements. Special know-how of the machine manufacturer can therefore be implemented.

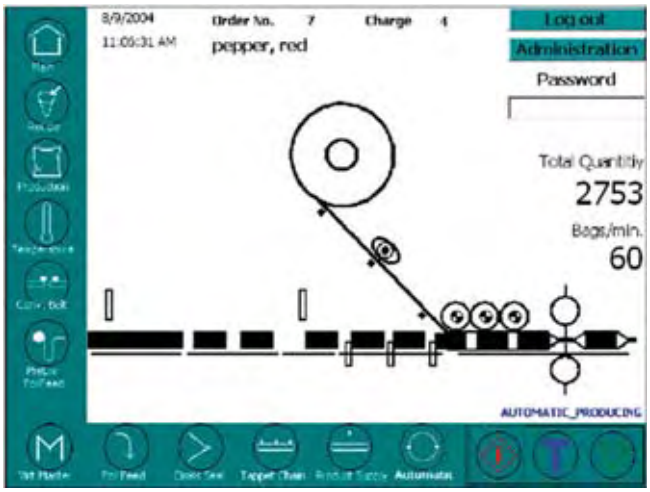
The operating modes of the machine are coordinated clearly in an OMAC PACK ML-compatible operating mode manager (OMAC = Open Modular Architecture Controls). The coordination of the continuous tubular bag machine aggregates can be checked visually with the "Jog in synchronous operation group" function.

Sample project as starting point

The Baggers & Wrappers software library contains a SIMOTION project example. This sample project can be the starting point for individual expansions and adaptations to actual machines. The modules of the software library can be changed and expanded by customer-specific functions with the help of the SCOUT engineering system.

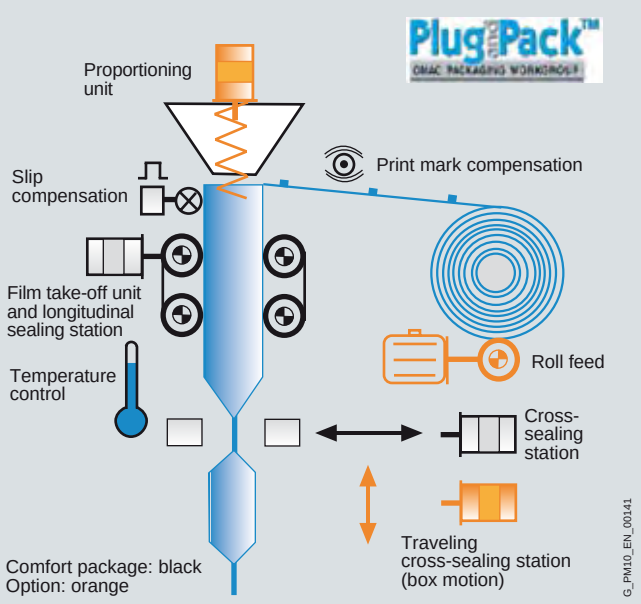
Adaptable user interface

The SIMOTION Baggers & Wrappers software library also contains a standard configuration for the user interface. This configuration is usually optimized for 10" Touch Panels of the SIMATIC MP 277 type and covers standard machine control tasks such as jogging drives, setting the temperature control or displaying diagnostic information. The user interface can be changed and adapted to the individual requirements of the machine manufacturer and to the panels used with the help of the SIMATIC WinCC flexible HMI software.



Function

Description of function of vertical tubular bag machines



Vertical tubular bag machine

Note:

This functional description explains the functional relationships in a simplified manner. It explains the ordering options for the comfort packages. The detailed description can be found in the function manual on the CD "Software Library SIMOTION Baggers & Wrappers".

For up-to-date information, visit
www.siemens.com/packaging

Film take-off unit

The film take-off unit pulls the film over the forming part. It consists of take-down rollers which are powered by a servomotor. The SINAMICS Motor Module required for film take-off is included in the comfort package.

Print-mark compensation/slip compensation

These functions are used to compensate the slip between the take-down rollers and film. The position of the film is determined with a print-mark sensor or measuring wheel with position encoder which runs on the film. Both software functions influence the film take-off unit and are contained in the comfort package.

Cross-sealer

The cross-sealer seals the film bag in the transverse direction. The cross-sealer is powered by a servomotor.

The SINAMICS Motor Module required for the cross-sealer is included in the comfort package.

Temperature control

The temperature control for 8 heating elements is included in the comfort package. The controller parameters are set with an autotuning function.

Traveling cross-sealer option

In continuous machines the sealing jaws are moved with the film. In box motion systems this motion is achieved with a second servomotor. The SINAMICS Motor Module required for the traveling cross-sealer is included in this option.

Pre-extractor option (Roll feed)

The pre-extractor supports film take-off with an asynchronous motor at the packaging material reel. The MICROMASTER frequency converter required for this purpose is included in this option.

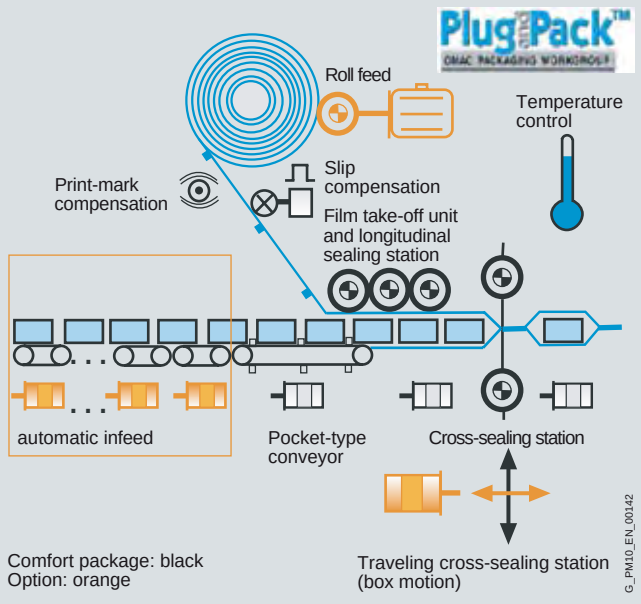
Proportioning unit option

The proportioning unit fills the product to be packaged into the tubular bag. The comfort package includes a controller for an external proportioning unit (e.g. multihead scale) which uses the handshake procedure.

An additional servomotor is required when using an auger filler or cup filling device. The required SINAMICS Motor Module is included in this option.

Function (continued)

Description of function of horizontal tubular bag machines



Horizontal tubular bag machine

Note:

This functional description explains the functional relationships in a simplified manner. It explains the ordering options for the comfort packages. The detailed description can be found in the function manual on the CD "Software Library SIMOTION Baggers & Wrappers".

For up-to-date information, visit www.siemens.com/packaging

Film take-off unit

The film take-off unit guides the film over the forming shaft. It consists of take-down rollers which are powered by a servo-motor.

The SINAMICS Motor Module required for film take-off is included in the comfort package.

Print-mark compensation/slip compensation

These functions are used to compensate the slip between the take-down rollers and film. The position of the film is determined with a print-mark sensor or measuring wheel with position encoder which runs on the film. Both software functions influence the film take-off unit and are contained in the comfort package.

Flighted chain (Pocket-type conveyer)

The flighted chain pushes the products into the film bag and is powered by a servomotor. The SINAMICS Motor Module required is included in the comfort package.

Cross-sealer

The cross-sealer seals the film bag in the transverse direction. The rotating cross-sealer is powered by a servomotor.

The SINAMICS Motor Module required for the rotating cross-sealer is included in the comfort package.

Temperature control

The temperature control for 8 heating elements is included in the comfort package. The controller parameters are set with an autotuning function.

Traveling cross-sealer option

In box motion systems this coupled motion of the cross-sealer jaws is achieved with a second servomotor. The required SINAMICS Motor Module is included in this option.

Pre-extractor option (Roll feed)

The pre-extractor supports film take-off with an asynchronous motor at the packaging material reel. The MICROMASTER frequency converter required for this purpose is included in this option.

Automatic infeed option

When the tubular bag machine is coupled with an upstream automatic production plant, the products must be correctly spaced and positioned for the flighted chain. For this purpose, the products are aligned on 4 infeed belts and synchronized with the flighted chain. The infeed belts can be powered with servo or asynchronous motors. The required SINAMICS Motor Modules are included in this option.

For information about contact-free product infeed, visit www.siemens.com/packaging

More information

I DT MC Technical Support in Germany:

Phone: +49 180 50 50 222

Fax: +49 180 50 50 223

Further information is available on the Internet at

www.siemens.com/packaging

For US support, contact:

Phone: 1(800) 241-4453

Overview

Machine requirements

Automatic product infeeds play a central role when intermittently operating production machines have to be coupled with packaging machines. Until now the distances between the individual products could only be equalized by calculating and setting the acceleration and speed individually for all motors. With SIMOTION Intelligent Infeed, costly programming of the motor movements is a thing of the past. Instead of this, an innovative technology package automatically calculates and controls the appropriate accelerations and velocities of the products and therefore equalizes the spacing between them. This is achieved without contact, so SIMOTION Intelligent Infeed is also recommended for particularly sensitive products.

Benefits

SIMOTION Intelligent Infeed transfers the concept of programming robots to the product infeed of production machines. This means that: The programmer determines the motion of the products – and the controller automatically calculates the necessary speeds and acceleration values for the motors.

The intelligent technology package, Direct Product Motion (DPM), operates on the basis of speed-controlled axes. Both servomotors (high dynamic response) and asynchronous motors (low dynamic response) can be used. For the product infeed drives, apart from the DPM runtime license, no other licenses are necessary. The mechanical structure of the product infeed – e.g. the number and length of conveyors, position of sensors, etc. – is parameterized. The connection to the subsequent machine can be implemented, for example, using distributed synchronous operation.

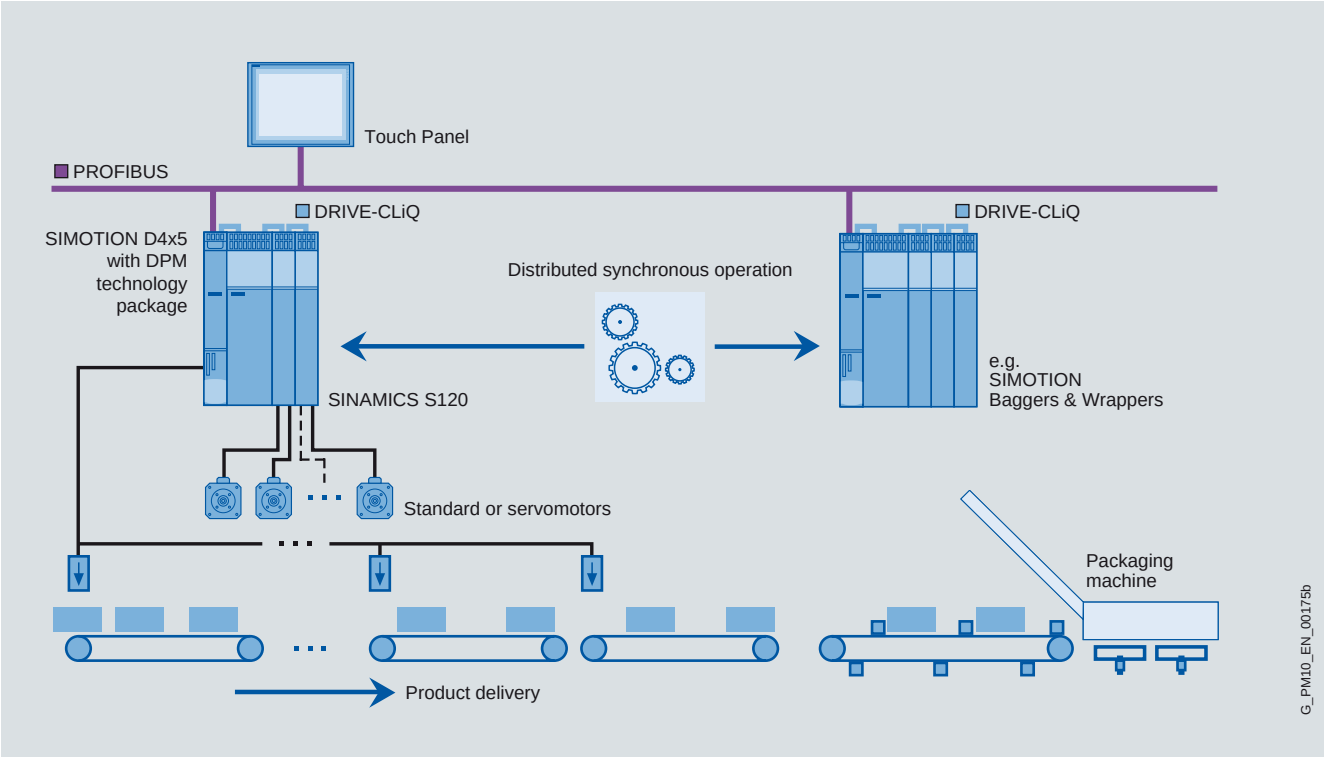
SIMOTION Intelligent Infeed provides the basic functions required for aligning the product.

The application

- Calculates where the products are located in the conveyor system based on the sensor signals
- Assigns a separate ID to each product and therefore provides information about the number of products in the conveyor system
- Sorts the product list according to position within the conveyor system
- Adjusts the velocity of the product
- Sets the distance between two neighboring products
- Ensures that the product is transferred from the conveyor system to the infeed chain of a subsequent system correctly aligned

SIMOTION Intelligent Infeed

Design



Automation solution

The SIMOTION Motion Control system offers, in combination with the SINAMICS S120 drive system and our highly dynamic motors (e.g. the 1FK series), sophisticated complete solutions for demanding and highly dynamic drive tasks.

PROFIBUS DP or PROFINET IO is used isochronously for communication with packaging machines and for "distributed synchronous operation".

More information

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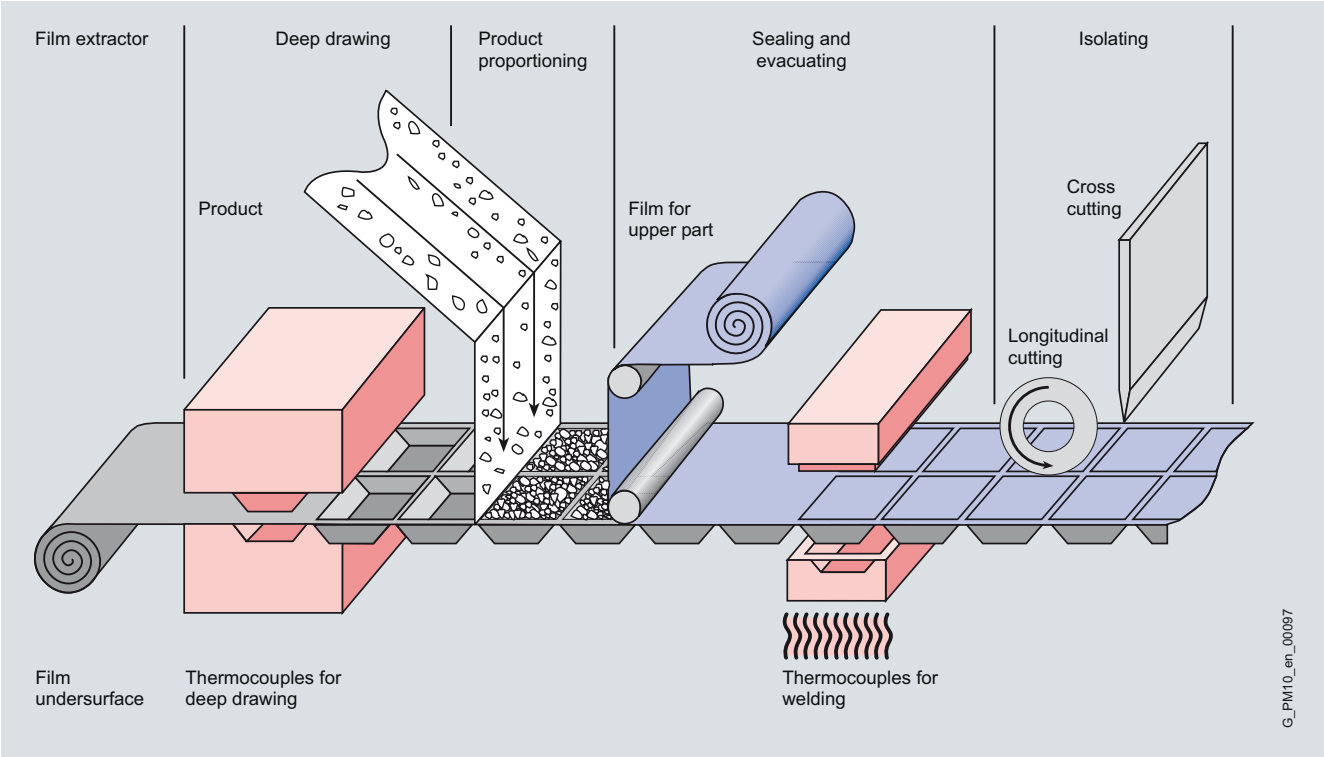
Overview



Principle of the molding, filling and sealing machine

Machine requirements

With the molding, filing and sealing machine, the film for the underparts is transferred from station to station by a main drive.

The film is molded to suitable containers in accordance with the product that is to be packed. The mold that is submerged in the film is guided with different velocity levels that depend on the path of the tool and with the appropriate heating temperature.

The product must be filled into the container accurately in terms of clock cycle and quantity.

To prevent deterioration of the product and to seal it, the covering film must be drawn off by a second coil. The heated surface is then placed on the container from the top and the container is sealed due to the effect of the heat.

The sealed packages are then cut into smaller units and removed for further packaging.

The cross-cutter is moved pneumatically or electrically. The objective is to control the procedure such that as many parts as possible pass through the machine per unit of time. Foil-specific parameters have to be taken into account on accelerating and braking.

High clock rates and changes in format at the press of a button are the main requirements.

The following Motion Control and technology functions were used for the implementation of the machine:

- Position
- Cam
- Output cam
- Longitudinal cutter
- Temperature control

Benefits

The SIMOTION automation solution described below offers the following advantages:

- ONE system for the logic, Motion Control and technology functions. The engineering is considerably simplified and the hardware outlay is minimized.
- Intuitively operable SCOUT engineering system for creating applications quickly and easily.
- Comprehensive diagnostic functions with SIMOTION, such as trace functions, Alarm S concept and teleservice reduce the commissioning times, increase the availability of the machine and its flexibility.
- Smooth running of the machine due to cams and servo drives
- High productivity
- Machine parameters can be easily and flexibly adjusted on the operator panel: e.g. shifting the print pattern, sealing time
- TIA integration simplifies integration of HMI, I/O and drives

Molding, filling and sealing machine

Design

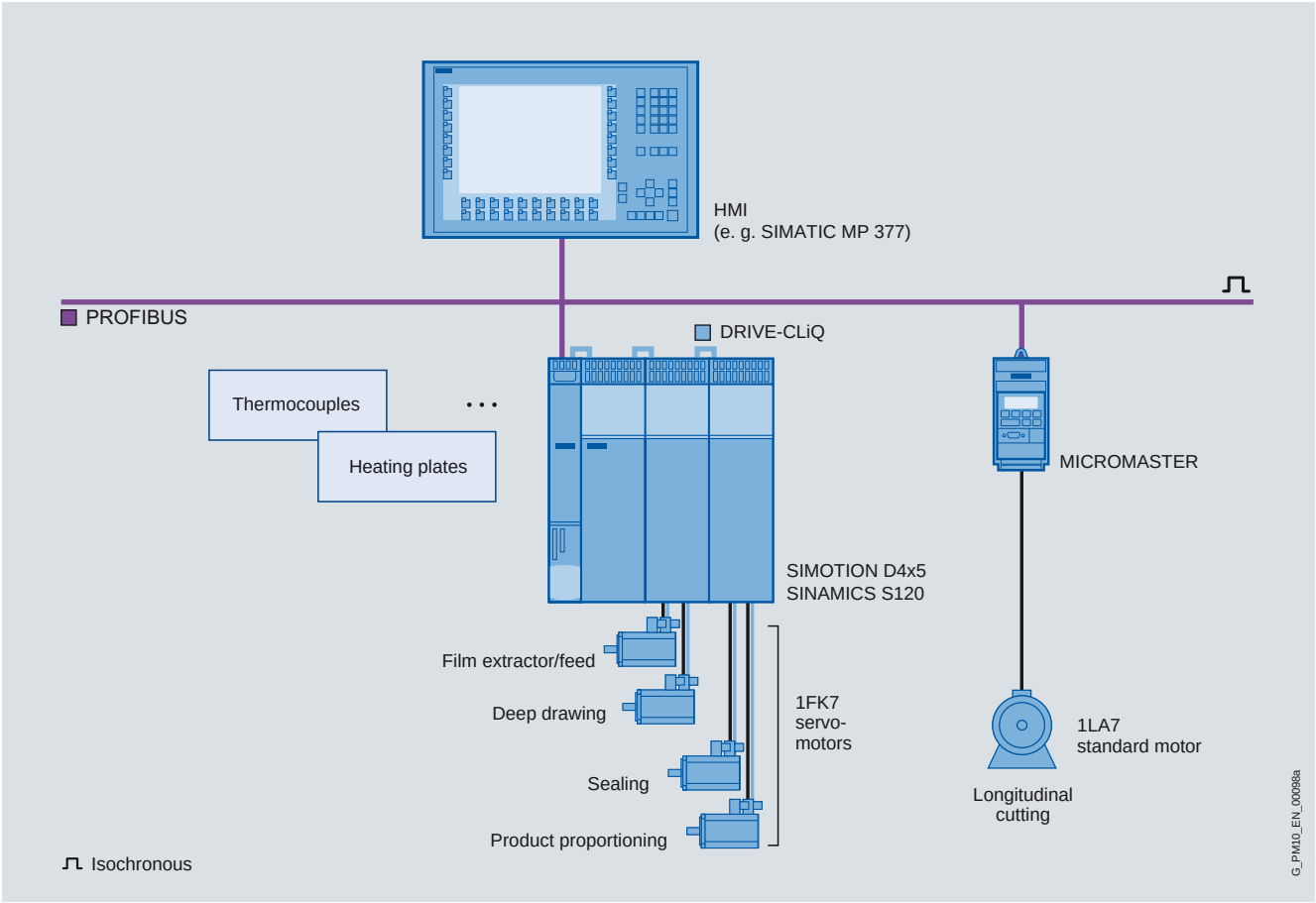
Automation solution

The drive-based version of SIMOTION for multiple-axes solutions, SIMOTION D4x5, is selected. In this manner, control logic, Motion Control, drive functionality and HMI functions are combined in a single hardware and software system.

Technology functions such as temperature control and cam controller are available in the form of software.

The SINAMICS S120 drive system in combination with 1FK7 servomotors offers optimized interfacing to SIMOTION D. It resolves demanding drive tasks and provides an accurate, highly dynamic response.

The isochronous PROFIBUS DP is used for communication.



Example of automation solution with SIMOTION D4x5

More information

I DT MC Technical Support in Germany:

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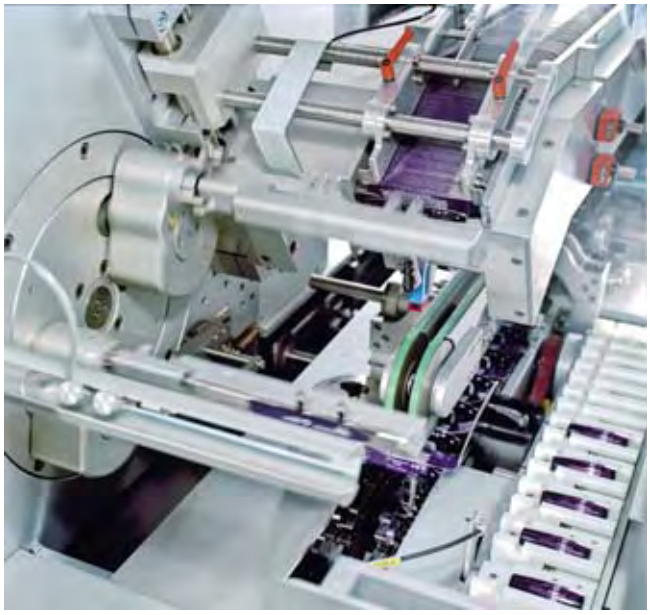
Further information is available on the Internet at

www.siemens.com/packaging

For US support, contact:

Phone: 1(800) 241-4453

Overview



Machine requirements

A cartoner packs products or unit packages into cartons. During this stage, the process is divided into the following phases:

- Forming the packaging
- Filling
- Sealing

In the case of the cartoner, a distinction is made between two types, depending on the packaging material used:

- Blank box erecting machine
- Folding box erecting machine

Basic process structure:

- The product is pushed onto the flat carton and both parts are pressed through the folding duct by a ram.
- The blank box is erected by folding baffles and guides.
- The glued connecting pieces are then pressed against the side walls.
- After folding, the carton is transported to another station when the lid is glued.
- Preassembled folding cartons are erected from a flat blank box.
- Independent synchronism of products and erected folding cartons
- Product and carton are brought together by so-called product infeed
- At this point, the product is pushed from the product conveyor belt into the box on the second conveyor belt.

Benefits

In order to pack products like bottles, bags or other very small products like lipsticks into folding boxes, it is necessary to precisely coordinate a variety of steps and motional sequences, sometimes in a seconds cycle.

Crucial to success with applications of this type are the drive-based SIMOTION Motion Control System and SINAMICS, compact systems into which the necessary performance and functionality are integrated. The recently developed, tailor-made "Cartoner" software library is also essential to easy implementation.

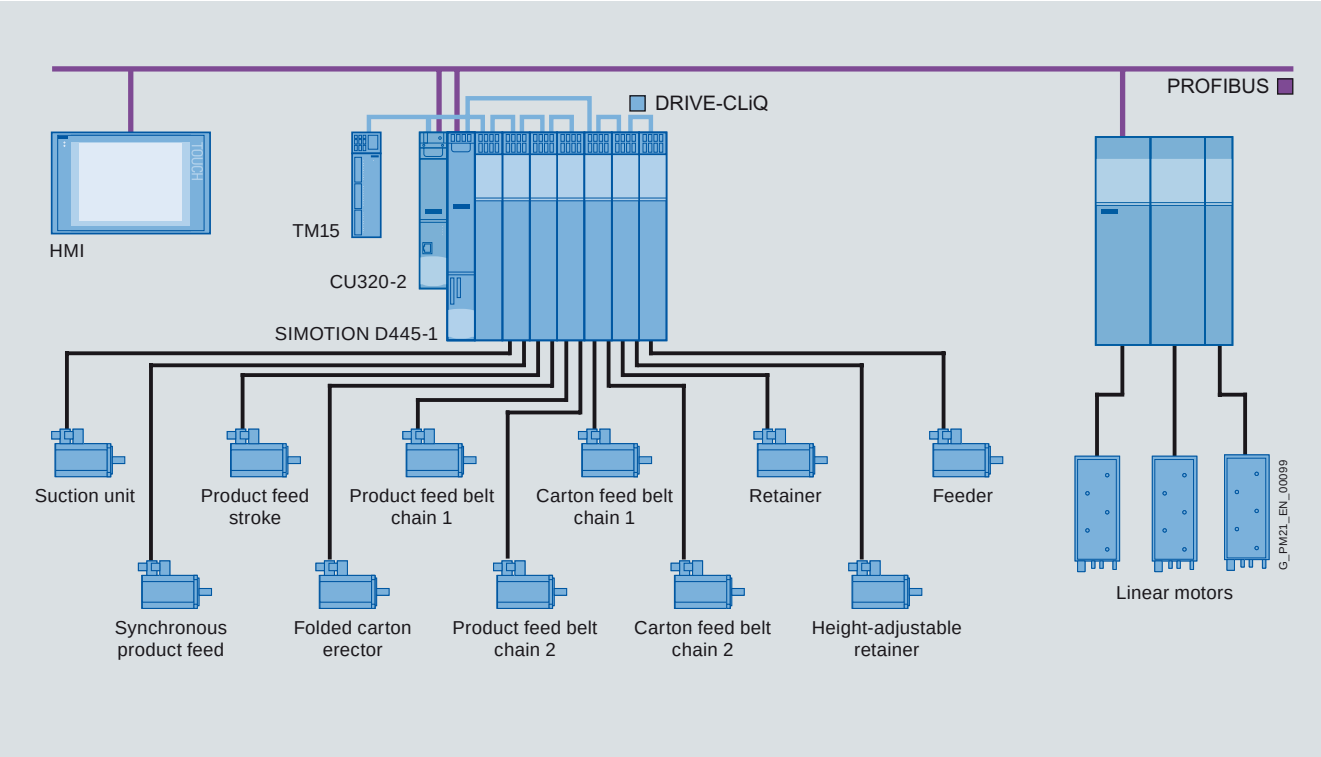
- Simple, successful commissioning thanks to preconfigured, tested software elements
- Compatibility with all drives and encoder types reduces engineering costs
- All functions can be configured – programming has been reduced to a minimum – resulting in fast integration into the user program.
- Remote diagnostics, commissioning and configuring tools that are integrated into the uniform and scalable SCOUT engineering system reduce servicing and configuring times.

The application:

- The library comprises four function blocks.
  - Suction
  - Ram
  - Conveyor belt
  - Product infeed
- These function blocks contain basic functions, automatic mode which can be configured in detail, and expansion functions in manual operation (return to initial state, jogging, homing)
- All functions can be configured – programming by the user has been reduced to a minimum – resulting in fast integration into the user program.
- The blocks are instantiatable and can be used in the project more than once.

SIMOTION carton packer

Design



Example application of a cartoner

Automation solution

With the newest machine types, the flexible automation architecture is implemented in accordance with the technological requirements for the machine.

The performance characteristics are harmonized in accordance with process engineering requirements:

- Operator control, visualization and diagnostics
- Process control
- Motion control
- Drive-related control

Machine control

The machine control is implemented with SIMOTION D4x5. It performs the following PLC and motion control functions:

- Logic
- Operating mode manager
- Setpoint input
- Closed-loop controls (tension, gluing)
- Machine monitoring
- Synchronous operation
- Cams
- Communication with upstream and downstream installations
- Interfacing of higher-level systems

Operator control and monitoring (HMI)

Operator control and monitoring of the machine is performed, for example, using a Multi Panel with the WinCC flexible runtime and configuring software. The following functions are implemented using the Multi Panel:

- Machine module selection
- Process data management
- Speed specification
- Presetting of technology values
- Diagnostics/remote diagnostics

Drives

The integrated automation and drives structure is rounded off by the bus-coupled dynamic converter system SINAMICS S120 and 1FT6/1FK7 motors.

More information

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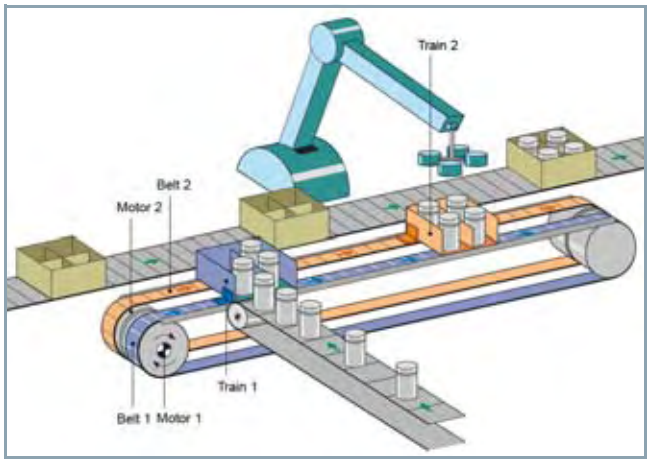
Further information is available on the Internet at

www.siemens.com/packaging

For US support, contact:

Phone: 1(800) 241-4453

Overview



Machine requirements

An "Intelligent Belt" is used to pick up multiple products arriving irregularly one after another and making them available together at an unloading location. The most important feature is how the loading and unloading phases are decoupled in terms of time. Scalable hardware platforms based on SIMOTION, SINAMICS and PROFINET are available to meet the requirements of different machines.

A function block for automatic operation of an intelligent belt (two-train) is provided in addition to expanded functions such as homing, positioning and jogging.

Benefits

Intelligent Belt is a software library for the automation of conveyor belts for decoupling production and packaging. The technological basis of the packages is the SIMOTION Motion Control System.

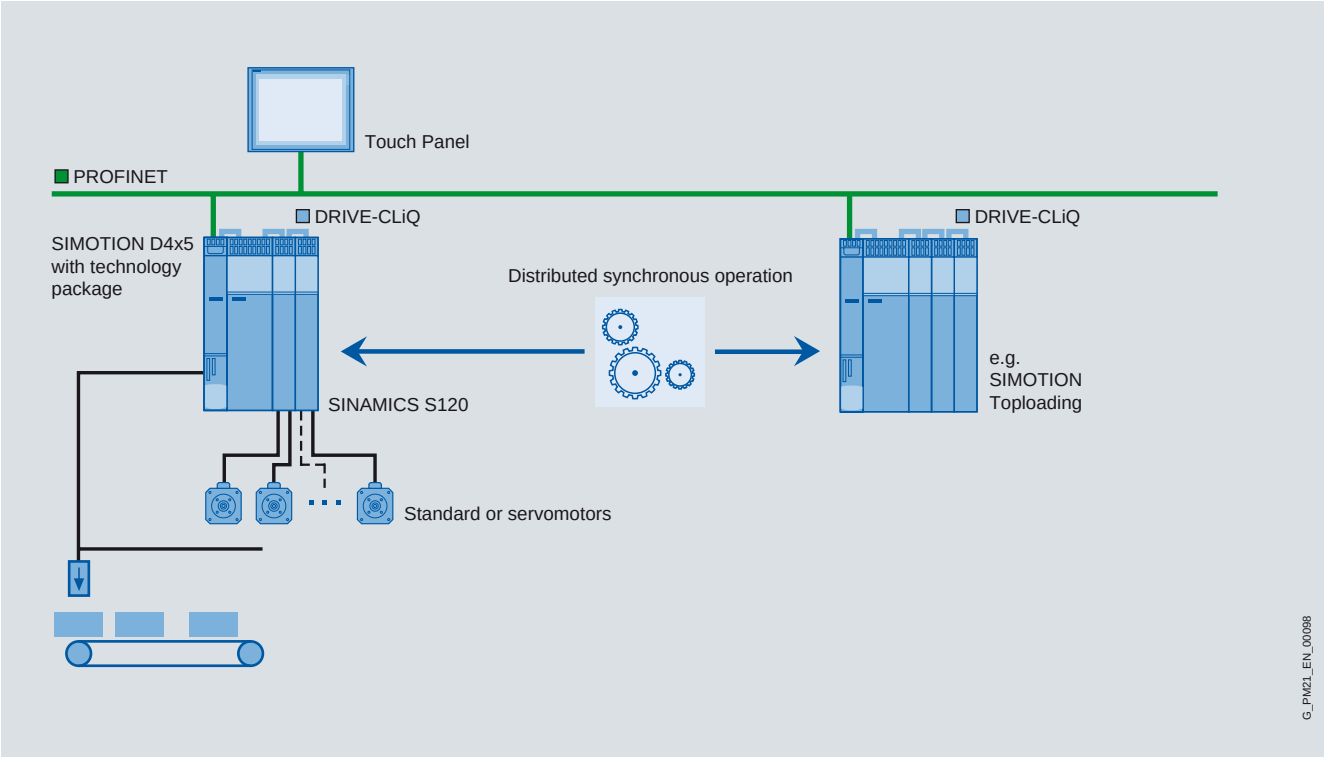
- Simple, successful commissioning thanks to preconfigured, tested software elements
- Compatibility with all drives and encoder types reduces engineering costs
- All functions can be configured – programming has been reduced to a minimum – resulting in fast integration into the user program.
- Remote diagnostics, commissioning and configuring tools that are integrated into the uniform and scalable SCOUT engineering system reduce the servicing and configuring times.

The application

- The function block contains basic functions (controller enables, monitors), manual operating modes (jogging, positioning, homing and return to initial state) as well as automatic mode which can be configured in detail.
- An Intelligent Belt comprises at least two trains which can be moved independently of one another on a shared track. Each train in turn comprises several pockets. The trains cannot pass one another.
- The belts or chains are run only in a positive direction. Once unloaded, the empty train is moved by the belt or chain to the underside of the mechanism and back to the loading position.
- The software library can be instantiated, which means that further belts can easily be added.

SIMOTION Intelligent Belt

Design



Example application with separate controls. (Can also be integrated into a single control.)

Automation solution

With the newest machine types, the flexible automation architecture is implemented in accordance with the technological requirements for the machine.

The performance characteristics are harmonized in accordance with process engineering requirements.

- Operator control, visualization and diagnostics
- Process control
- Motion control
- Drive-related control

Machine control

The machine control is implemented with SIMOTION D4x5. It performs the following PLC and motion control functions:

- Logic
- Operating mode manager
- Setpoint input
- Closed-loop controls (tension)
- Machine monitoring
- Synchronous operation
- Cams
- Homing
- Communication with upstream and downstream plant sections
- Interfacing of higher-level systems

Operator control and monitoring (HMI)

Operator control and monitoring of the machine is performed, for example, using a Multi Panel with the WinCC flexible runtime and configuring software. The following functions are implemented using the Multi Panel:

- Machine module selection
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Drives

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Overview

Whether simple stack-type presses, sophisticated multicylinder presses in unit design or high-quality central impression cylinder presses: We always offer you optimum, perfectly tuned solutions for your flexo printing presses.

Innovative and proven solutions for flexo printing

These solutions consist of the SIMOTION Motion Control System, the highly dynamic SINAMICS drive series and a wide range of servomotors. You can choose from a variety of proven components and standard applications for motion control of all electric axes on your machine. Both, machine-level modular automation structure and centralized configuration are possible.

For expanded machine and process automation and operation, we offer proven SIMATIC components. Furthermore, you benefit from our comprehensive mechatronic expertise as a leading provider of direct drive systems for competent support throughout the entire process – from the design phase to commissioning.

Benefits

Advantages at a glance

- Integrated, drive-based SIMOTION Motion Control System
- Highly dynamic SINAMICS drives in various designs
- Large selection of synchronous and asynchronous motors
- Expansion capability based on SIMATIC operator and control components
- Open and tested application Print Standard for printing, winding and positioning axes
- Software for temperature regulation for dryer and temperature controlled cylinder
- Standardized communication via PROFIBUS and PROFINET
- Comprehensive mechatronic expertise
- Integrated register control
- Integrated safety technology for manual sleeve change on the fly

Application

SIMOTION with the software package Print Standard features open, scalable and implemented motion control application software for all required axes of a flexo printing press in one uniform system:

- Virtual master function with ramp generator
- Real master function for external encoder – e.g. for the central impression
- Continuous format adjustment and electronic circumferential register
- Positioning of the form cylinder for cylinder change or cylinder sleeve change
- Continued electronic run of anilox cylinder
- Engaging of the form cylinder and anilox cylinder with format-dependent calculation
- Web winding with positioning functionality and integrated autopaster
- Web storage for mechanic standstill splicer

This speeds up configuration and commissioning times, cutting the time to market.

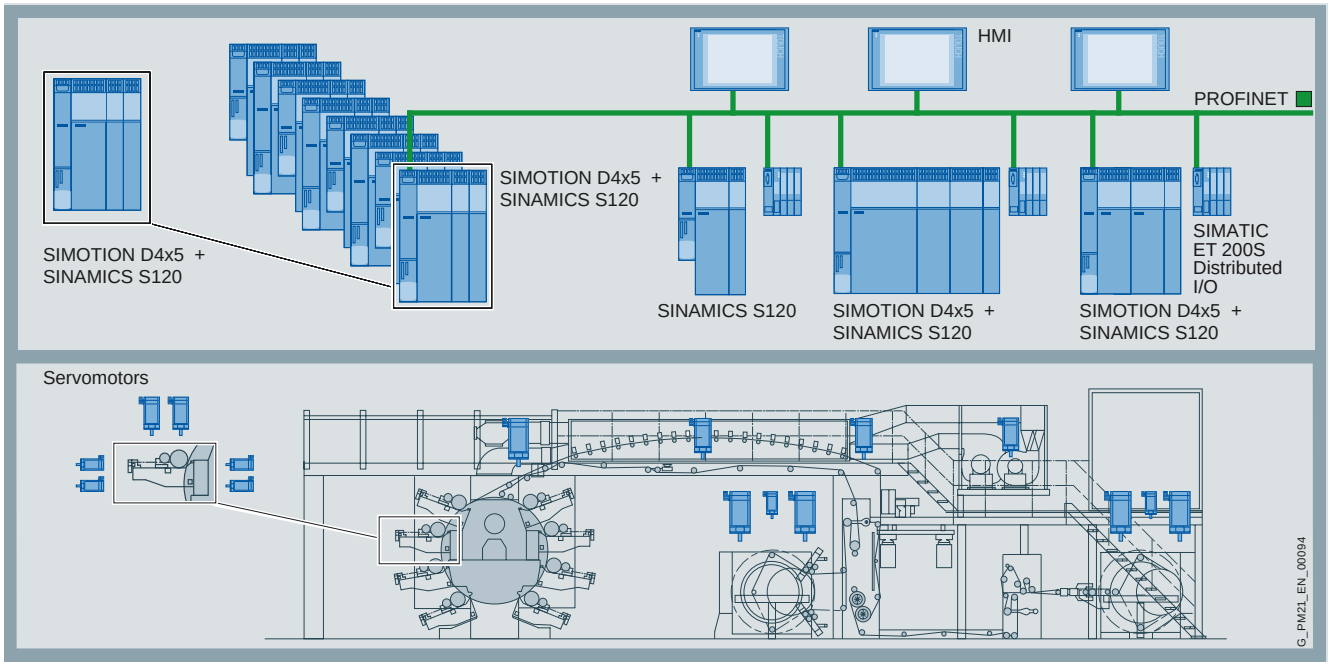
Flexo printing

Design

Ultimate flexibility and adaptability

The highly dynamic and compact SINAMICS S120 drive series are used for all machine axes. The high dynamics and precise encoder evaluation enable easy adaptation of the closed loop control to variable-size cylinder circumferences and masses. Compact drive systems can be realized by utilizing double axis motor modules.

From low-cost, non-regulated line infeeds to regulated infeeds without any phase effect, you can choose the appropriate technology for the respective machine models and line conditions, for both distributed, modular configurations and centralized infeeds. With the right configuration, you can even operate the positioning drives on the same DC-bus as the central impression cylinder. This way, in the event of a power loss you can use the braking energy from the emergency stop to set the cylinder to impression off position.



Automation solution for a flexo printing press

Function

A comprehensive range of motors

From standard, servo and torque motors to linear motors for innovative direct drives in synchronous and asynchronous design: our range features the right motor for any type of machine. Slow turning motors demand less current, thus smaller drives and lower costs. Adapted asynchronous servomotors are especially useful for form cylinders and winder applications which are operated at a constant power range. In contrast, synchronous servomotors are used for small positioning drives – due to the high overload capability in positioning mode.

The register control optionally integrated in the drive system improves the register accuracy according to a patented algorithm and reduces wiring. Process controls such as temperature regulation for the temperature-controlled cylinder and hot-air dryer are implemented by software functions, making them easy to scale, adapt and put into operation.

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For US support, contact:

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E-mail: MCS_Printing.industry@siemens.com

Further information is available on the Internet at

www.sea.siemens.com/motioncontrol

Overview

The market for commercial printing presses demands wider and faster presses with the emphasis on quick plate changeovers with minimum waste. At the same time, machine manufacturers and users require a higher automation level and greater number of axes. With our SIMOTION Motion Control system, SINAMICS drives, the open Print Standard software and SIMATIC automation system, we can perfectly meet all of these challenges.

Flexible and efficient – for present-day and future machine generations

Our broad product range forms a perfect basis for integrated solutions in commercial printing – for all applications: from line shaft drives to electronic line shafts with multiple drives on each printing unit and electronic cam profiles in the folder. All stations can be designed as one integrated system – reel stand, printing unit, dryer, folder and post press along with an integrated register control.

Benefits

Advantages at a glance

- Modular, scalable hardware and software
- Open Print Standard
- High-precision and reliable synchronization of individual drives
- Integrated system platform for all units of the printing press
- With PROFINET, one bus system for synchronization and communications
- Safety Integrated in SINAMICS and SIMATIC
- Standard components from the system families SIMOTION, SINAMICS and SIMATIC
- Wide product and performance range of synchronous and asynchronous motors as well as SINAMICS drives
- Comprehensive mechatronic and printing press expertise, experience with the design of a wide range of different drive concepts for printing presses

Application

SINAMICS and SIMOTION: a perfect team

In combination with Siemens AC motors, SINAMICS drives cover the entire performance range of commercial printing presses. Motion control and axes coordination is handled by the SIMOTION Motion Control system.

The drive system is ideally suited for the high, specialized requirements – particularly the electronic line shaft. Our modular hardware supports a wide range of different drive concepts: such as a distributed, modular configuration with AC/AC devices or a centralized configuration via DC-bus, DC/AC devices and regulated or non-regulated power supply infeed.

Print Standard: the open software for your application

Print Standard is a comprehensive software package for commercial printing. It includes:

- Virtual and real master with ramp generator
- Plate cylinder positioning
- Color register and cut-off register adjustment
- Unwinder with flying splice

Easier and more efficient communication with PROFINET

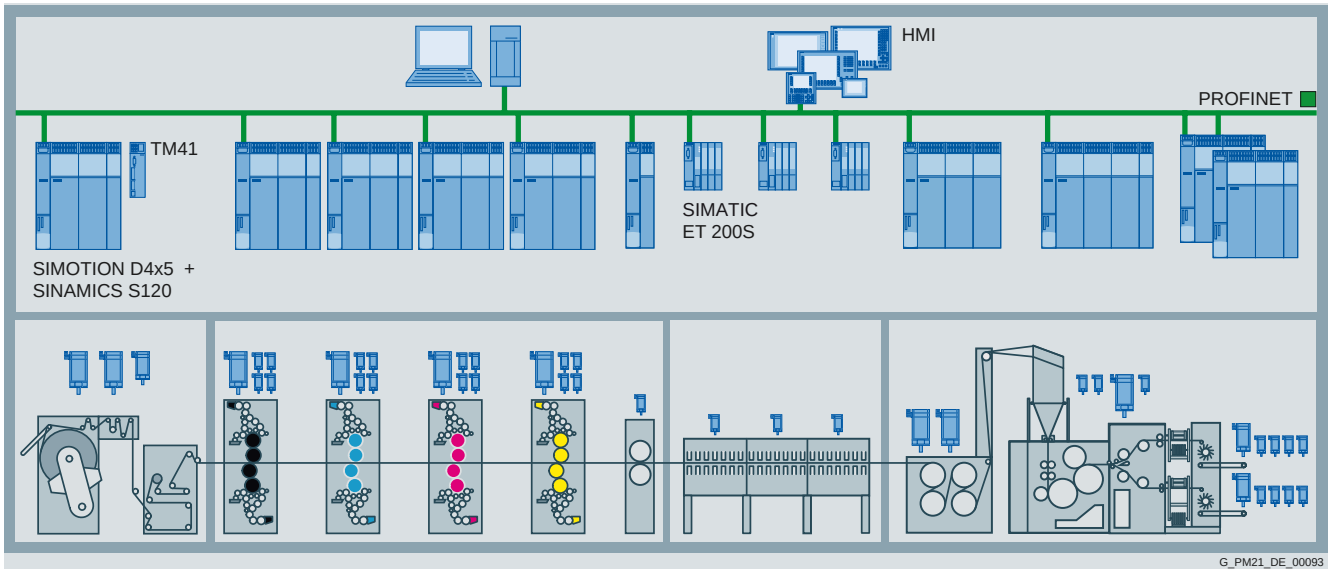
The open industry standard PROFINET enables parallel use of automation data via standard Ethernet and isochronous drive axis data for distributed synchronous operation on one bus system. In this configuration a separate drive bus is not necessary. Your machine features a uniform network structure and cabling.

The Mechatronic Team – your partner for innovations

The development of high-speed and large-format printing presses places maximum technological demands on mechanical and electronic design. Our Mechatronic Team provides support in developing an optimum solution with their outstanding expertise. Through the simulation of the electromechanical system, it is possible to estimate the dynamic performance of a printing unit in the design phase.

Commercial printing

Design



Automation solution for a commercial offset printing press

Commercial offset printing press

A commercial offset printing press generally consists of a reel stand, feeder, printing units, catching device, dryer, cooler and folder.

All these units are driven by 1FT/1FK/1PH series motors. The motors are controlled by SINAMICS S120 drives which in turn are synchronized by SIMOTION and PROFINET IRT. SIMOTION generates virtual master setpoints and is also capable of running full machine automation programs. Synchronization functions ensure exact print color and cutoff registration.

More information

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Further information is available on the Internet at

www.sea.siemens.com/motioncontrol

Overview

Rotogravure printing presses feature a variable format length, different form cylinder diameters, different printing materials and finishing stations. Based on our well proven drive technology and automation expertise, you can optimally meet this wide variety of demands.

Application

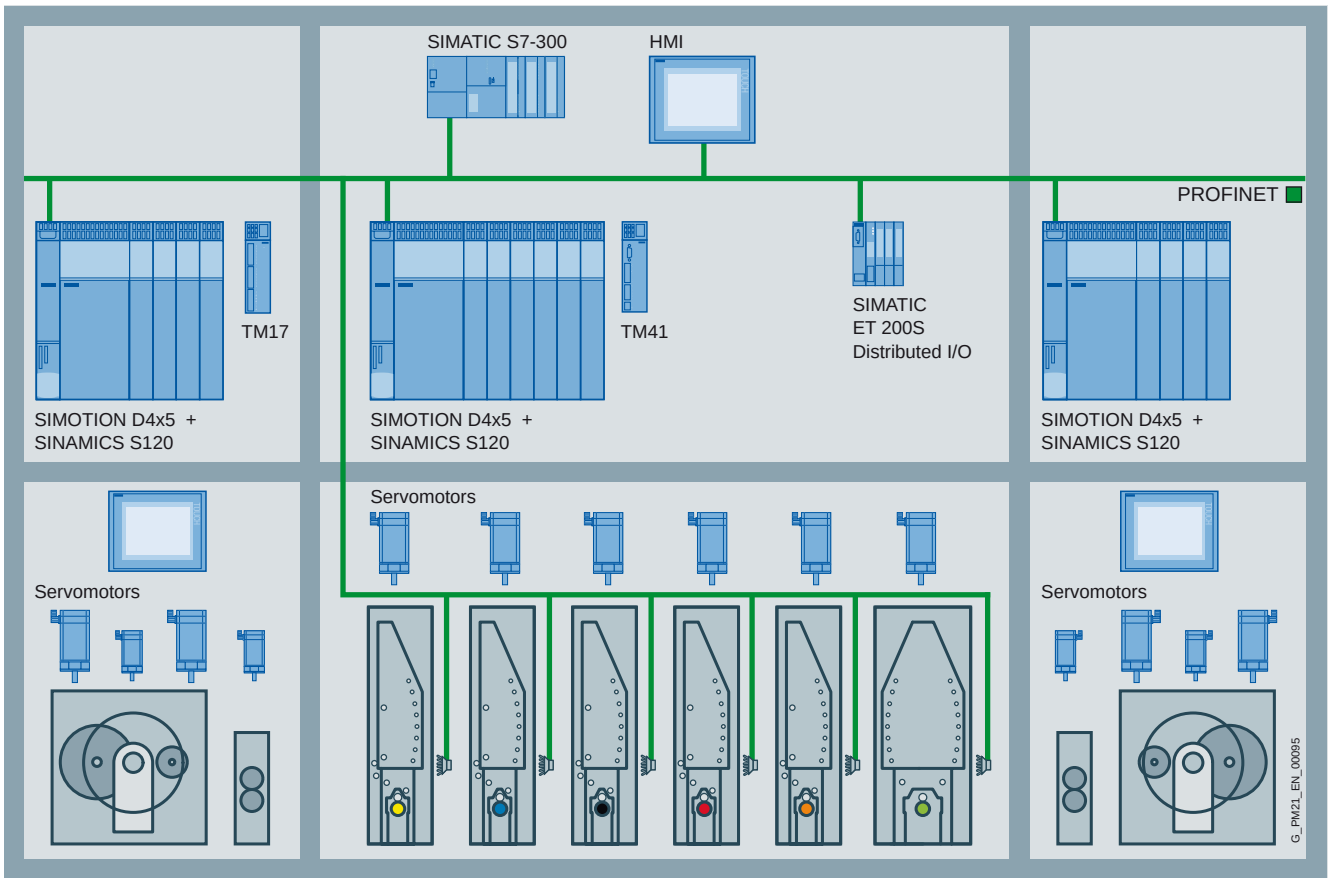
Ready-to-use and proven modules

The flexible hardware and software configuration enables easy implementation of various plant concepts. Choose from either a centralized control cabinet concept or integration of the drive components into the press stations. Ready-to use proven software modules enable effective plant engineering and quick machine commissioning. Everything you need is included in SIMOTION with the software package Print Standard – from the unwinder to the printing and feed units and cross cutter. All modules can be adapted to any individual requirements.

The dynamic register decoupling (DRD) specially developed for rotogravure printing presses increases register stability. This means you can even operate presses with a high number of printing units without register problems. In combination with our specially developed register control integrated into the drive, you can achieve an even higher level of register quality and productivity within your press.

Rotogravure package printing

Design



Automation solution for a rotogravure printing press for packaging

Rotogravure printing press for packaging

A rotogravure printing press for packaging generally consists of an unwinder, feeder, rotogravure printing units with dryers, extraction mechanism and rewinder.

All these units are driven by 1FT/1PH series motors, often equipped with Ex option. The motors are controlled by SINAMICS S120 drives which in turn are synchronized by SIMOTION D and PROFINET IRT. Furthermore, virtual master setpoint generation, the machine automation program and the machine register control are processed in the SIMOTION D. These are the functions which ensure that the colors are printed in exactly the right position on the paper.

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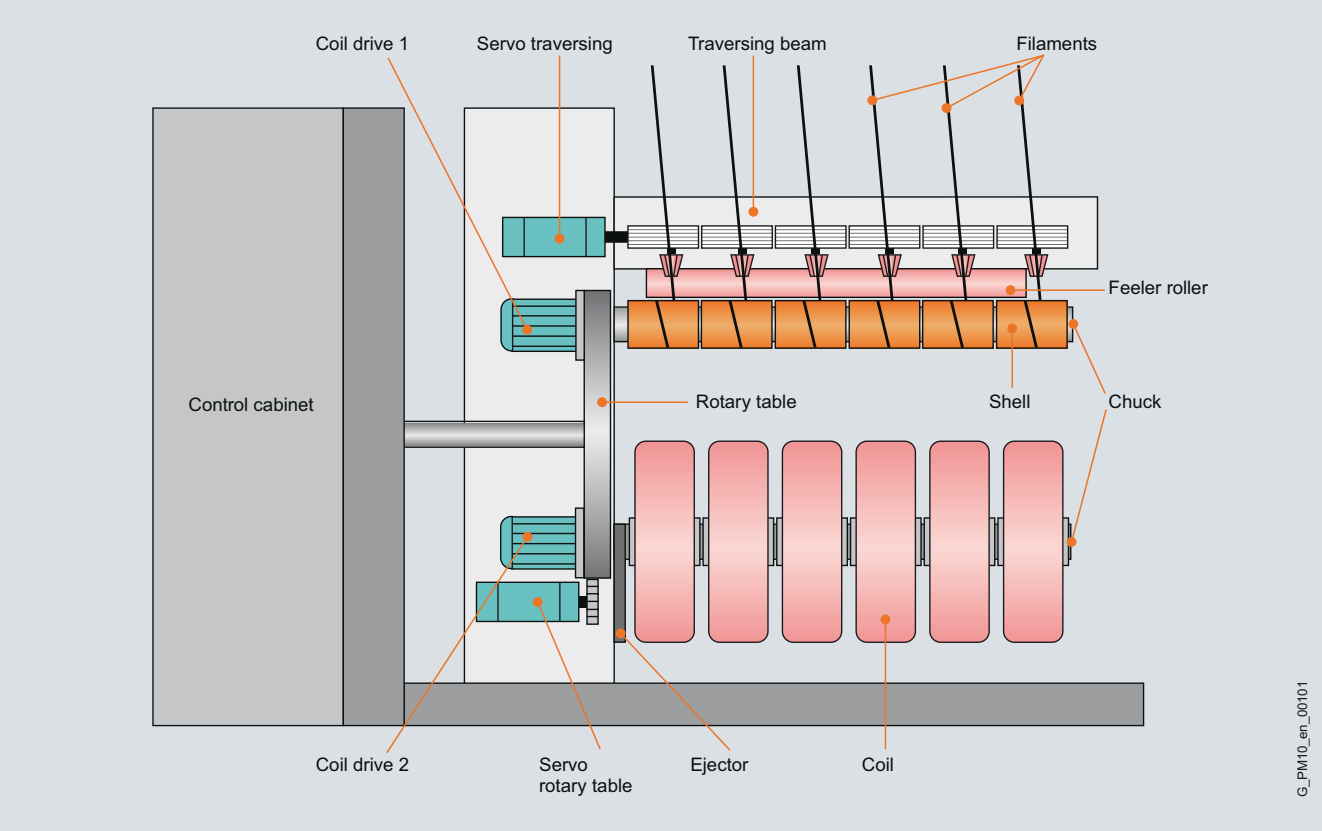
Overview



Principle of a filament winder

Machine requirements

In a synthetic fiber spinning plant, the winder represents the last step in the process.

In modern synthetic fiber spinning plants, spinning speeds can reach up to 8000 m/min (26248 ft/min). This means that the winder draws off and spools between 2 to 12 filament chains at this velocity. The finished spools are then changed on-the-fly to ensure a continuous spinning process.

A spool weighs up to 35 kg (77 lb) and can hold several million meters of filament. There are different requirements for the structure of the coil due to the different technological values of the various filaments, as well as the subsequent processes. The type of coil structure determines the draw-off behavior of the filament from the coil and the ability to further process the filament in subsequent processes.

Filament winders today are usually center winders (in the past perimeter winders were used), i.e. the spool carriers are directly driven. A synchronous motor creates the overlaid changing movement.

The single drives for winding cylinders and traversing ensure the maximum possible degree of freedom for the interaction of the units and for the coil structure.

The peripheral speed of the coils is taken from the feeler roller and reported to the calculator for diameter. The increase in diameter of the coils is compensated by the rotation of the rotary table.

When the coils are changed on the fly, the mandrel is accelerated with the empty reels to spin speed, the full coils swivel from the feeler roller, the filaments are cut and caught by the new reels. If the new (empty) coils butt against the feeler roller, the change is completed.

Essential requirements for the automation and drive system:

- During the production process, defective winders must be replaced very quickly, which requires a modular automation and drive concept for spinning plants.
- The new winders must be automatically addressed and parameterized.

Benefits

The SIMOTION automation solution described below offers you the following advantages:

- One system for *V/f*, vector and servo drives, logic and technology
- Transparency due to comprehensive diagnostic tools and dialog control via SIMOTION SCOUT
- Maximum flexibility thanks to the open programmability of the winding modes
- High flexibility and short resetting times when changing products
- Reproducibility of lots thanks to recipe memory (compensation value tables)

Filament winder

Design

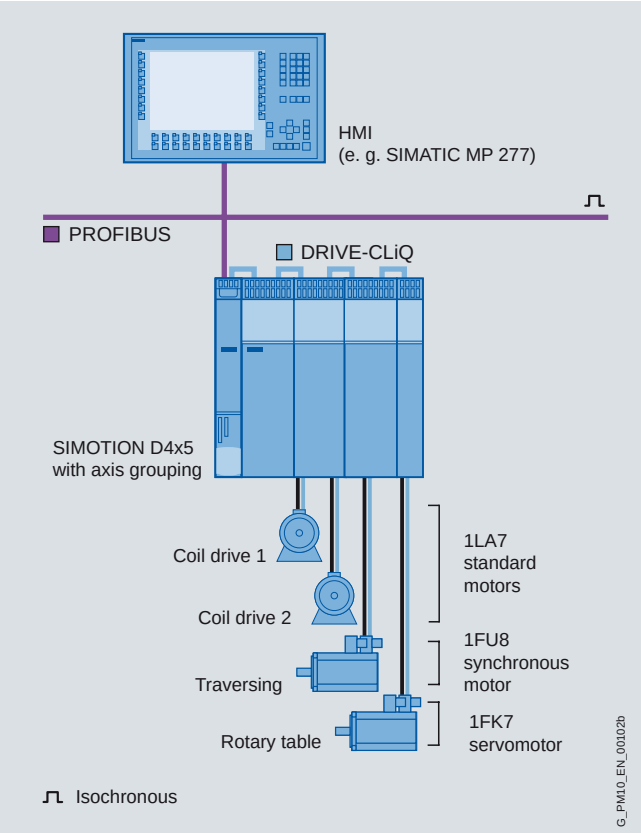
Automation solution

The drive-based Motion Control variant SIMOTION D is used with a 4-axis closed-loop control. Control, motion control, technology and drive functions are combined in a hardware and software solution.

Technological functions for calculating the transversing procedure, wobble generator and coil diameter, as well as motion control functions such as positioning of the rotary table and the sequential control (setpoint cascade, logic PLC) are covered with SIMOTION D. The central operation of several winders can be implemented, for example, with the SIMATIC MP 277 as an option. All implementations of filament winders can be covered.

Further features of the automation solution:

- Selectable winding modes (wild, precision and stepped precision winding)
- Coupling the drive via the DRIVE-CLiQ system interface
- Scalable and open software menus for integrating software parameters



Example of automation solution with SIMOTION D4x5

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Overview

Machine requirements

The fleece folding or cross folding machine is arranged in a non-woven textile machine between the carding machine and the needle loom. The web arriving from the carding machine rarely has the weight per unit area required for the application. The cross folding machine therefore lays the number of web layers on top of each other that are required for the application.

The task to be resolved is to intermittently layer the web that is fed in at constant speed while achieving a constant weight per unit area. The material is transported to the actual laying position between the feeding conveyor and covering conveyor. Two traversing carriages layer the web in zigzag form on a conveyor belt that is arranged perpendicular to the machine axis.

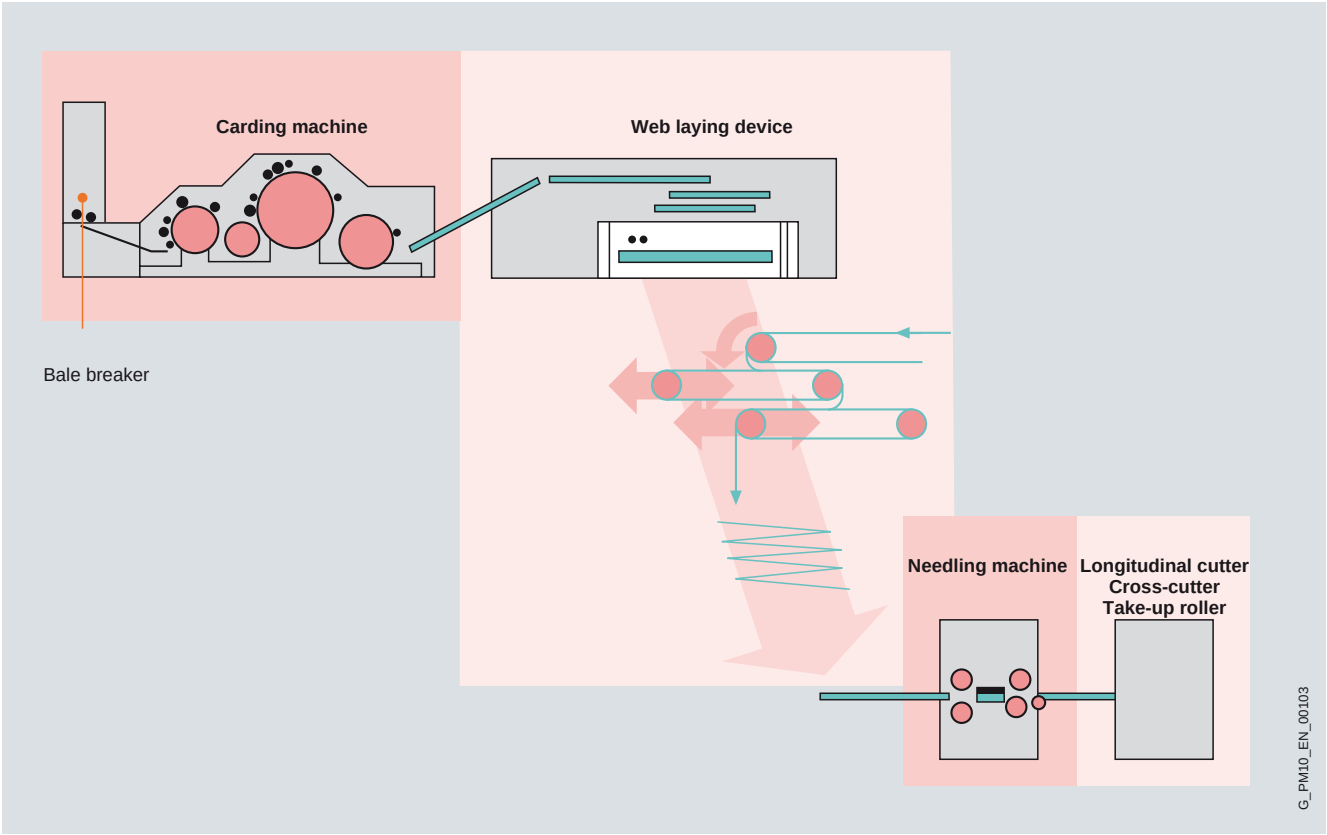
The motion of the lower carriage determines the width of the product and the upper carriage acts as a material buffer that compensates for the difference in velocity between the feeding conveyor and layering carriage.

The motion relationship between the two carriages is also influenced by process parameters, such as the web delay at the edges, also referred to as profiling. The highly dynamic reversing movements of the carriages are implemented with servomotors without additional gearing.

The required number of layers in the material cross-section and therefore the fleece strength (measured in g/m^2) is determined by the velocity ratio between the infeed and output.

The machine has the following automation requirements:

- High dynamic response
  in the reversing motion for exact web edges
- Flexible traversing profiles
  for different material requirements
- Draft-free layering of the fibrous web
  at high velocity



Principle of the fleece folding machine

Fleece folding machine

Benefits

The SIMOTION automation solution described below offers you the following advantages:

- Memory space is saved due to cam calculation in real time
- Faster and more convenient set-up due to flexible parameters adjustment
- Scalable and open software menus for integrating software parameters
- High flexibility and short resetting times when changing products
- Reproducibility of lots due to recipe memory
- Higher degree of user-friendliness due to graphics-based programming
- Transparency due to comprehensive diagnostic tools and dialog control via SIMOTION SCOUT
- All machines that are involved in the process, e.g. carding machines and needle looms, can be easily automated using SIMOTION and SIMATIC S7 programmable logic controllers and networked to form a line.
- The machine data that are relevant to the process are available on a SIMATIC Panel MP 277 with WinCC/ProTool/Pro and can be supplied to an operating data management system through an OPC interface (Industrial Ethernet).

Design

Automation solution

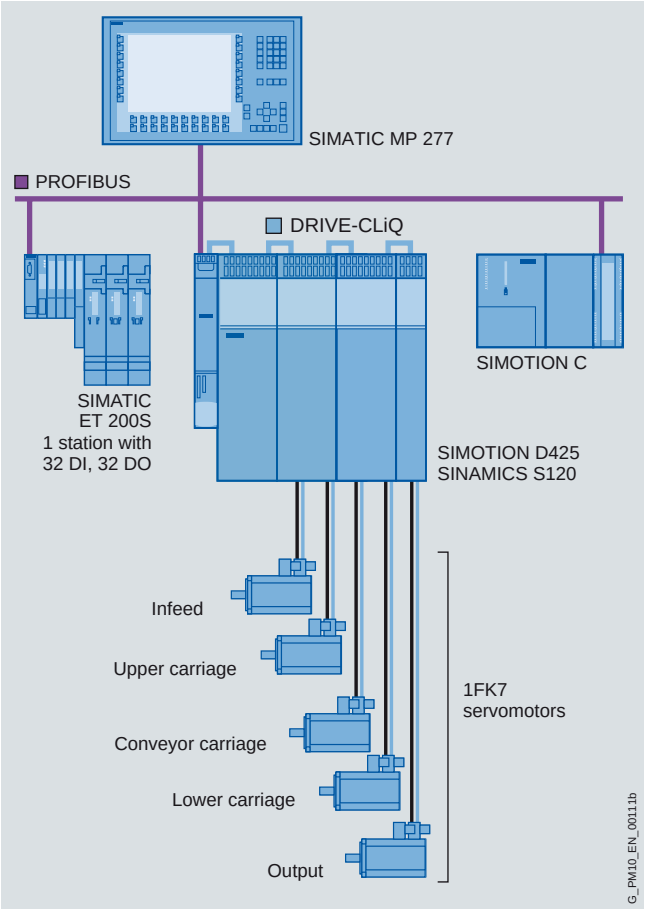
The SINAMICS S120 is used in combination with the 1FK7 High Dynamic servomotors as a drive system. SIMOTION as an open-loop and closed-loop control system allows motion control, PLC and technology tasks to be executed fully in a single system.

Even with a high volume of process data, this means that short cycle times can be achieved.

The complex motional sequences within individual cycles are programmed with the SCOUT engineering system using cams, for example. SCOUT supports graphical programming (Motion Control Chart) as well as more familiar PLC features such as ladder logic, function block diagram or high-level language (Structured Text).

Features of the automation solution:

- Calculation of the traversing curve profiles of the laying trolleys and adaptation of the curve profile in real time
- Transfer of data to the drives over PROFIBUS
- Following error offsets are scaled or the whole profile is extrapolated and applied in the relevant laying trolley tour
- Panels are available for visualization and operation, operated either by touch or keyboard, which can be linked via PROFIBUS to the automation system
- SIMOTION and the data acquisition system communicate via OPC server, guaranteeing data exchange for Windows-based systems with browser quality.



Example of automation solution with SIMOTION D and SINAMICS S120

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Overview

Machine requirements

Weaving is the most widely used method of fabric production for the decoration, clothing and home furnishing textile sectors. However, technical textiles, including wire cloth, are also produced on modern weaving machines.

Irrespective of the weft insertion method used, very high cycle and acceleration rates are essential for weaving machines. Furthermore, weaving machines are characterized by a large number of nonlinear motion sequences and time-critical starting times. Mechatronic solutions devised from a combination of mechanical cams and servo drives for warp let-off and fabric take-up are the modern state of the art. More recently, harness motion and weft insertion have also been implemented with individual electric drives in some instances.

The requirements of the automation system are as follows:

- Constant velocity relation between warp let-off and fabric take-up as a function of the main drive
- Constant thread tension during the process (uniform fabric quality)
- Weft insertion synchronized precisely with cycle times
- Fast position-oriented supply of weft threads corresponding to the color selection
- Increase in machine cycle times
- Different weft insertion processes using a projectile, airjet, or picker
- Short resetting times for lot changes
- Reproducibility of process data
- Pattern data management and preparation

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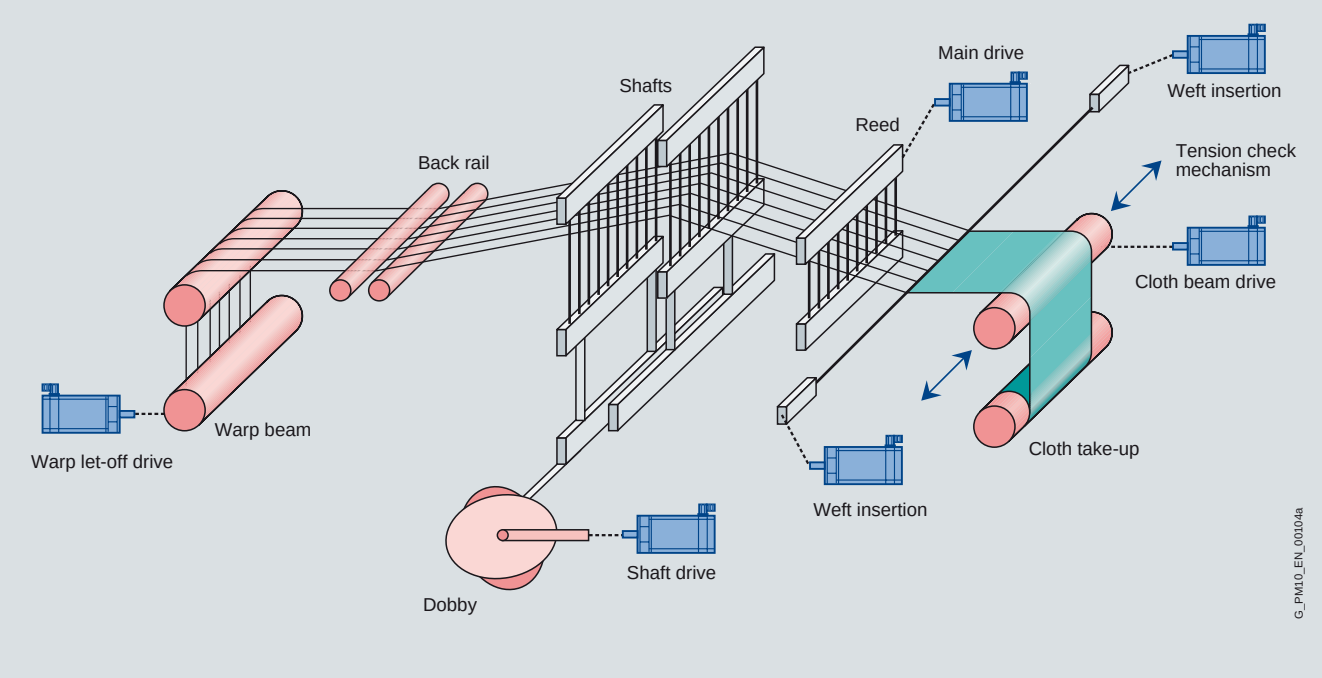
Benefits

The SIMOTION automation solution described below offers the following advantages:

- To attain even faster resetting times, the mechanical cam can be replaced by a high resolution SIMOTION cam function for harness motions.
- The technology functions integrated in SIMOTION, particularly the electronic cam, make it easy to implement the required motion control easily and safely for the process. Furthermore, where necessary, they allow motion profiles to be modified flexibly and with minimum effort.
- Variable user interfaces enable process parameters to be quickly adapted to the execution system.
  These data can be reproduced at any time and assigned according to process technology. A lot change no longer requires you to make manual adjustments.
- Tools for commissioning, configuration and diagnostics integrated in the uniform, scalable SCOUT engineering system reduce service and configuration times.



Principle of operation of weaving machines

Weaving machine

Design

Automation solution

With the newest machine types, the flexible automation architecture is implemented in accordance with the technological requirements for the weaving machine.

The performance features for

- Operator control/visualization/diagnostics/pattern
- Process control
- Motion control and
- Drive-related control

are matched in accordance with process engineering requirements.

The solution model is determined by preprocessing the process data and their implementation as a Motion Control process.

Machine control, implemented by SIMOTION C/D/P:

- Setpoint input
- Control of warp let-off and cloth take-off
- Weft insertion control
- Machine monitoring
- Harness control

Operator control and monitoring (HMI)

Using a Touch Panel (e.g. SIMATIC TP 177B) or a multi panel (e.g. SIMATIC MP 277B) based on the runtime and configuring software SIMATIC WinCC flexible:

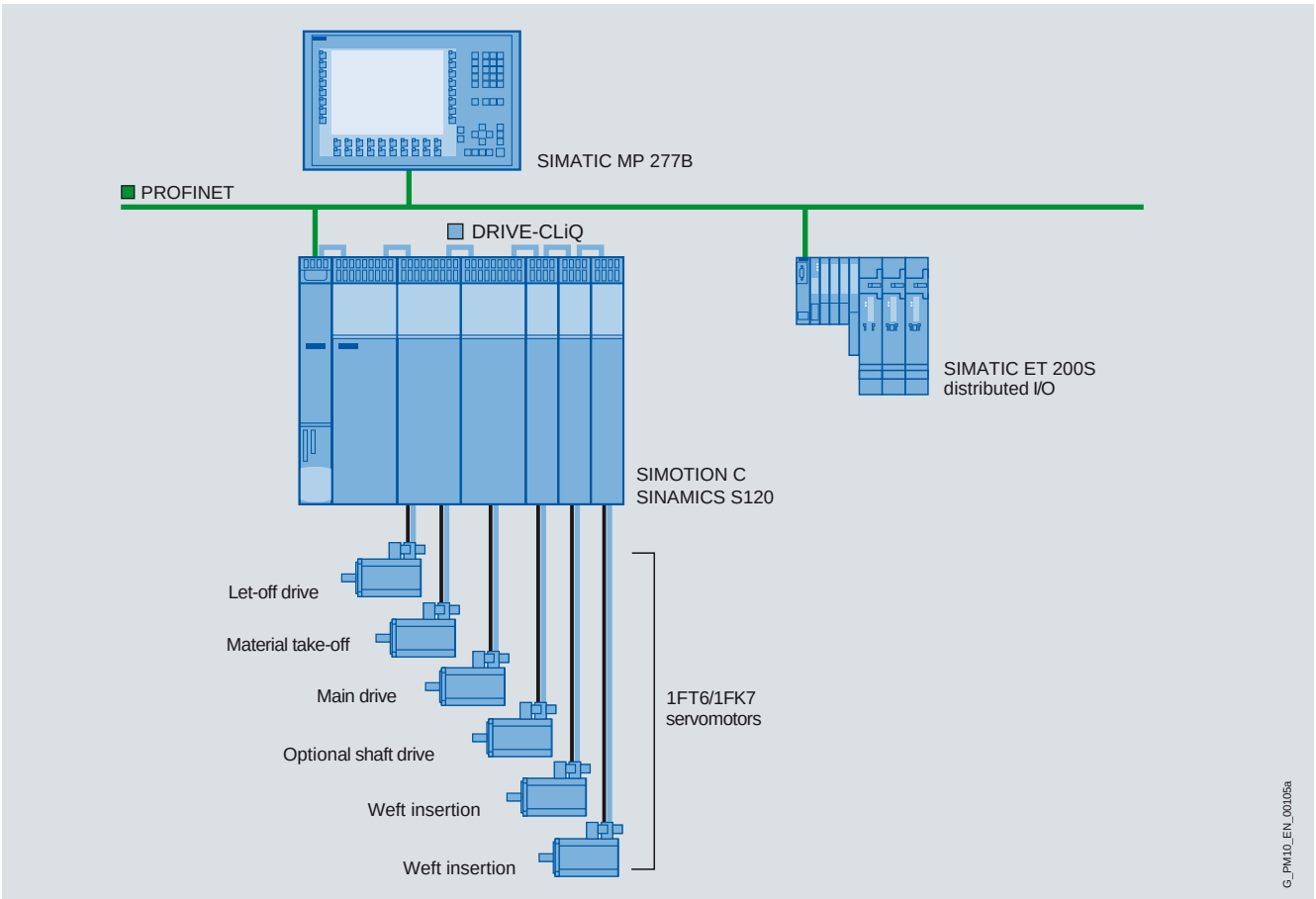
- Process data management, e.g.:
  - Speed specification
  - Presetting of weft density
  - Presetting of technology values
- Pattern management
- Diagnostics/remote diagnostics

Drives

The integrated automation and drives structure is rounded off by the bus-coupled dynamic SINAMICS S120 drive system and 1FT7/1FK7 motors.

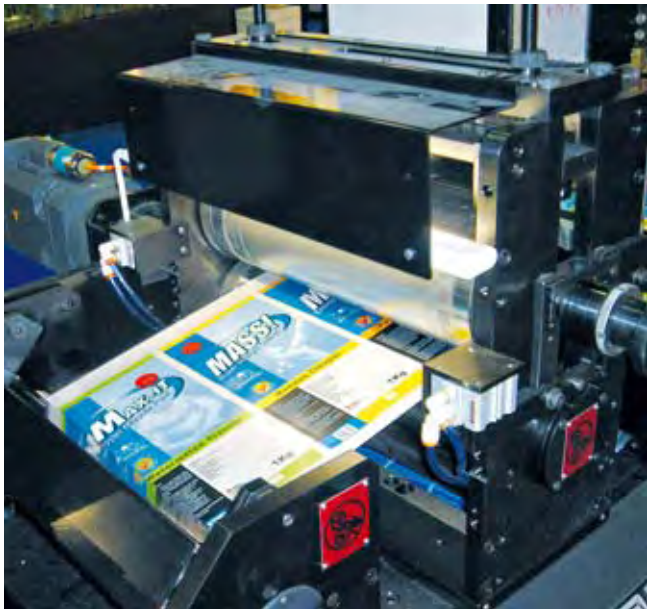
Features of the automation solution:

- Constant thread tension control during the winding and unwinding process, correct provision of thread and accurate positioning when entering the weft are closely coupled to the process control and are processed synchronously with the machine cycle. SIMOTION D445-1 must be used for this purpose.
- A master that obtains its actual values from an encoder mounted on the main shaft, outputs appropriate setpoint signals to the slaves of the drive and control system.
- Coupling through an OPC interface (Ethernet) ensures operating data management and coupling to a pattern system (CAD systems).



Example of automation solution with SIMOTION D445-1

Overview



Machine requirements

Printing, stamping and embossing machines are used, for example, in the manufacture of labels and tickets. The material to be processed ranges from paper through plastic to metal foil, depending on the product.

The original material is usually on a roll. The end product comprises either rolls (endless material) or sheets which are cut to a specified format by cross cutters.

Printing, stamping and embossing machines are constructed in modular form which demands a flexible automation concept with regard to hardware and functionality.

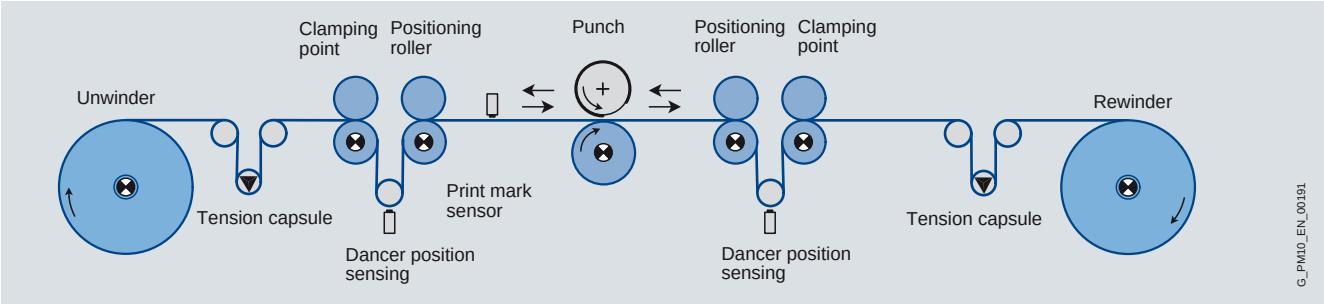
The function modules can, for example, be:

- Winder and unwinder
- Punching module
- Print module
- Coating module
- Laminating module
- Cross cutter module

Apart from the velocity of the machine, the accuracy and repeatability of product processing are also important. The required accuracy is < ±0.1 mm (0.0004 in).

The demands on the automation are:

- Constant velocity ratio between the machine modules through geared synchronous motion or velocity ratio
- Constant tension during the process (tension and dancer roll control)
- Cam disks for motion control (punch and cross cutter)
- Winder control
- Print mark correction
- Modular software and hardware structure for implementing customized machine configurations
- Parameterizable software for adaptation to different materials and products



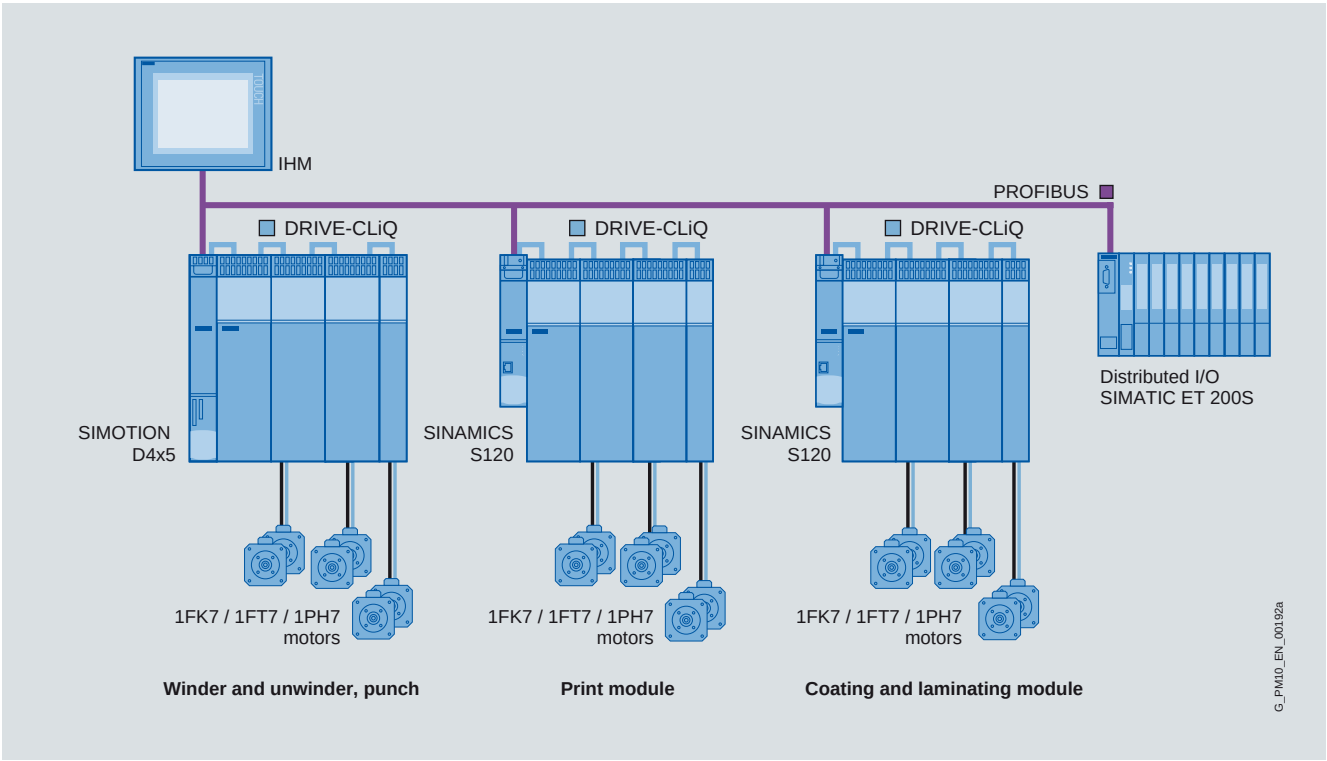
Basic structure of a punching machine

Benefits

The SIMOTION automation solution described below offers you the following advantages:

- Adaptation of the configuration to the structure of the machine thanks to the modular software and hardware concept
- The SIMOTION controller combines functions such as logic, synchronous operation and cams as well as technology functions such as winder controls, print mark synchronization and cross cutters, so that the complete machine functionality can be implemented on the same controller hardware.
- Variable user interfaces enable process parameters to be quickly adapted to the execution system.
- Scalable hardware platform for different machine requirements
- Prepared software elements for simplifying commissioning from the Converting Toolbox and SIMOTION Easy Basics, e.g. operating mode manager, winder, axis control, cross cutter, etc.
- Remote diagnostics, commissioning and configuring tools that are integrated into the uniform and scalable SCOUT engineering system reduce the servicing and configuring times.

Design



Example of automation solution with SIMOTION D4x5

Automation solution

With the newest machine types, the flexible automation architecture is implemented in accordance with the technological requirements for the machine.

The performance features for

- Operator control/visualization/diagnostics
- Process control
- Motion control
- Drive-related control

are matched in accordance with process engineering requirements.

Machine control

The machine control is implemented with SIMOTION D4x5. It performs the following PLC and motion control functions:

- Logic
- Operating mode manager
- Setpoint input
- Closed-loop controls (winder, tensioner, dancer roll)
- Cross cutters
- Machine monitoring
- Synchronous operation
- Cams
- Print mark correction

Operator control and monitoring (HMI)

Operator control and monitoring of the machine is performed, for example, using a Multi Panel with the WinCC flexible runtime and configuring software. The following functions are implemented using the Multi Panel:

- Machine module selection
- Process data management
- Speed specification
- Presetting of technology values
- Diagnostics/remote diagnostics

Drives

The integrated automation and drives structure is rounded off by the bus-coupled dynamic converter system SINAMICS S120 and 1FT7/1FK7 motors.

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Overview

Continuous web coating is a technology applied to many different types of basic materials and end products. As a result of this broad range of applications, coating technology involves a vast array of different machine types, ranging from standard series machines to customized coating plants, while the requirements of the automation and drive systems themselves vary greatly. In all cases, the ultimate objective is to confer additional functional properties on a substrate by coating or lamination.

Benefits

Requirements of the machine automation and drive systems

- Improved productivity through increased machine speeds
- Time saving on machine setup times for product changes, e.g. different material width or application method
- Shorter ramp times (ramp-up, emergency stop) to avoid scrap material
- Higher machine speed on automatic roll change to improve productivity
- Reduction in process energy by implementation of energy-saving concept for all machines and energy regeneration
- Enhanced machine availability achieved by reliable automation and drive system components, faster spare parts supplies, quick detection, localization and elimination of faults, preventive maintenance
- Constancy of tension through efficient, robust and adaptive tension control during the production process (tension or dancer control)
- Modular software and hardware structure for the implementation of customized machine configurations
- Software which can be parameterized and adapted for different materials and processes
- Less maintenance and more dynamic control through the use of direct drive technology

Application

Typical areas of application for coating technology are, for example, the manufacture of self-adhesive labels, electrical film barriers, electrode material for batteries, packaging material, building materials or technical textiles.

Coating machines/plants

Webs of material are coated and laminated in a coating machine. This is done by uncoiling the substrate from the unwinder, then guiding it, for example, via a surface treatment unit to the applicator unit, and finally onto the dryer. The substrate can be coated on both sides in the applicator unit. Before further processing, the coated material is cooled and subsequently laminated, e.g. with an additional material. In many cases, several coats are applied in succession, or the laminating material is also coated before the substrate is laminated. The coated and laminated end product is then wound onto a rewinder for further processing.

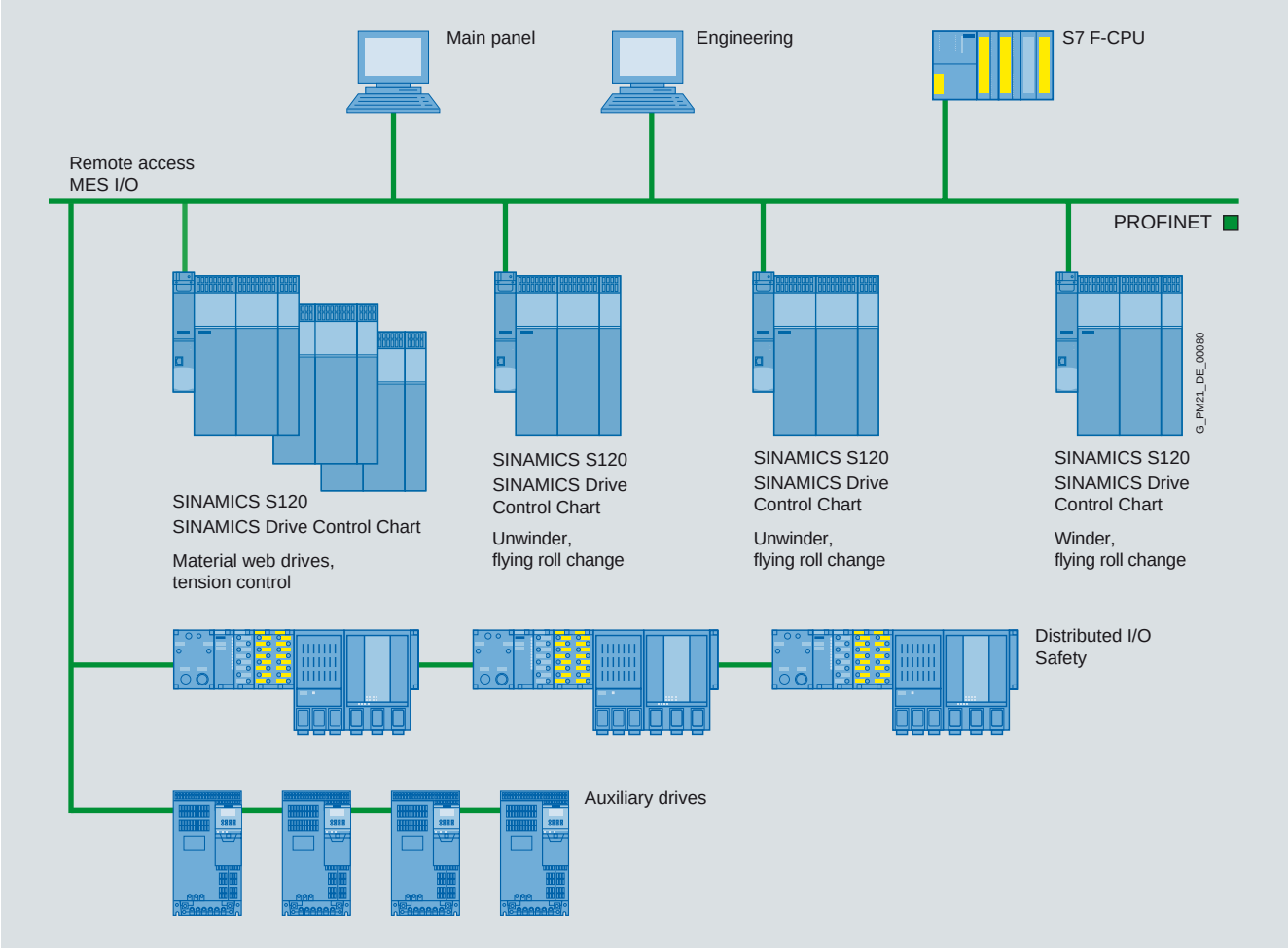
A variety of different coating methods are employed in a coating machine depending on the type of substrate and coating mass, e.g. curtain coating, scraper technique, multi-roller application method or extrusion coating.

Design

Depending on requirements, a coating machine comprises a variety of machine modules, including, for example:

- Unwinder and rewinder, or reversing winder if desired
- Applicator units
- Laminating units
- Surface treatment, e.g. UV, corona
- Tension and/or dancer control
- Cooling systems, e.g. by means of cooling rollers
- Dryers, e.g. guide roller dryer, floatation dryer
- Perforation, stamping, punching
- Intermittent coating

Automation solution



Example of automation solution for a coating machine

The topology illustrated above shows an example of a distributed automation system for a medium-sized coating machine based on a machine control solution, e.g. a SIMATIC S7.

In this case, the control performs general machine logic functions such as operating mode management, interfacing of I/O systems, (optional) safety technology (SIMATIC S7 F-CPU) and auxiliary drives.

The web-guiding drives receive a master velocity setpoint from the machine control and operate by this method at synchronized velocity.

The internal machine network, i.e. the networking between central control, drives, I/O modules and peripheral systems is created with PROFINET. The network can thus also be provided with an interface to machine management level.

The process-oriented closed-loop control in the SINAMICS S120 drive system is implemented by means of SINAMICS Drive Control Chart, thereby minimizing processing times in the process-oriented control and reducing the load on the machine control.

Process-oriented applications can be solved with modules from the Converting Toolbox, e.g. for the winder control, flying roll change and higher-level tension and/or dancer control.

A SIMATIC Panel with WinCC or WinCC flexible are provided as machine visualization equipment, i.e. as the HMI.

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Overview

Disposable diapers for both children and adults consist of a polyester fleece and an absorbent core made of cellulose material. Most modern diapers are fastened with velcro or press studs. To manufacture them cost-effectively requires not only high-precision machines, but also a high degree of flexibility.

Machine requirements

The manufacturing process requires a variety of different technological functions, for example:

- Synchronous operation
- Cam
- Winders
- Punching
- Stamping
- Automatic roll change

These can be implemented by using a high-performance Motion Control System in combination with dynamic drives. A combination of the SIMOTION Motion Control System, SINAMICS S120 and the highly dynamic 1FK7 motors are the ideal answer to applications of this type. The solution is rounded off by the comprehensive range of HMI products and distributed I/O components.

The entire process can be implemented by a single system, from uncoiling the substrate, to punching different diaper formats, filling diapers with cellulose material and transferring them to a packaging machine.

Examples of function modules are:

- Winder control with material store for automatic roll change without braking the machine
- Adhesion devices
- Cross cutter module
- Longitudinal cutter
- Tension or dancer control for constant web tension
- Stamping module
- Printing module, print-mark compensation
- Quality inspection for detecting, tracking and rejecting faulty products

The requirements of the automation system are as follows:

- Improved productivity through increased cycle times
- Time saving on machine setup times for product changes
- Inclusive diagnostic concept for all machines to prevent downtimes
- Modular software and hardware structure for the implementation of customized machine configurations and machine adaptation
- Integrated networking and synchronization of all drives to improve product quality
- Software which can be parameterized and adapted for different materials and processes
- Parameterizable and modular software and hardware plus automated engineering in order to cut the time and cost of engineering and commissioning
- User-friendly operation and visualization
- Scalable hardware to reduce component variety

Benefits

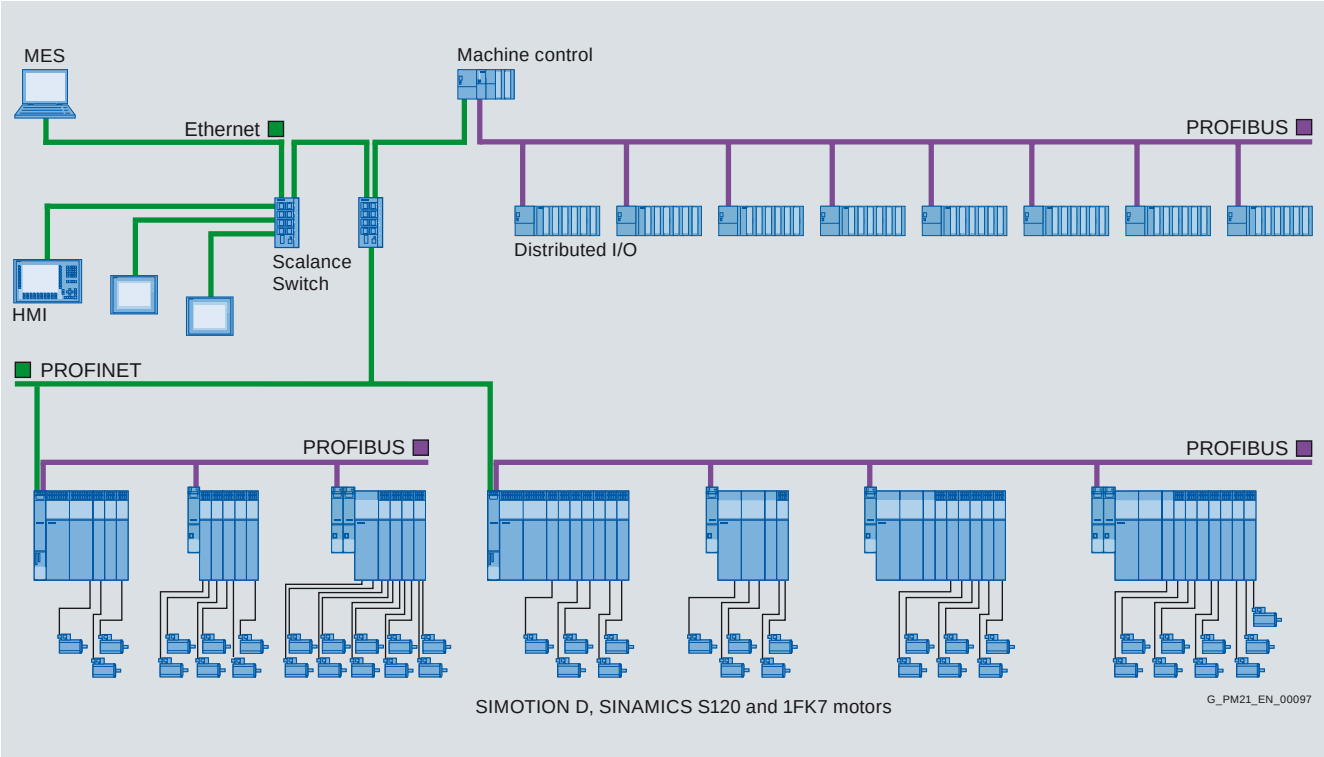
An optimized automation and drive concept makes it possible to create highly flexible machines which can improve productivity by cutting machine setup times for product changes as well as fulfill the growing market requirements of the end product. By selecting to use a uniform motion control system, it is also possible to reduce material rejects and thus increase the cost effectiveness of the machine overall.

By using PROFINET, it is possible

- to exchange data efficiently between the automation and drive components, and
- to integrate the network into the higher-level Manufacturing Execution System (MES)

Diaper processing machines

Design



Example of topology of a diaper processing machine

Topology of a diaper processing machine

An optimized automation and drive concept makes it possible to implement highly flexible machines. By selecting to use the high-performance SIMOTION Motion Control System in combination with dynamic drives from the SINAMICS S120 range with highly dynamic 1FK7 motors for all function modules, e.g. winder control, adhesion device, cross cutter module, stamping or printing module, it is possible to increase the cost effectiveness of the machine overall. Using PROFINET offers the advantage of efficient data exchange between the automation and drive components and the option of integrating the network into the higher-level Manufacturing Execution System (MES).

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Overview

Machine requirements

Continuous material made of plastic is made into pipes, profiles, sheets and film on extrusion lines. During this process, the plastic in granule form is continuously fed to a screw conveyor which is rotating in a heated metal cylinder. The frictional heat works together with the heat applied over the heating zones to melt the granules. The plasticized mass is distributed and formed in the extrusion die so as to produce the correct product contour at the die outlet. The product is then shaped into its exact, final form by calibration and cooling units.

Requirements

- Scalable system for adaptation to the machine configuration
- Simple, intuitive operator interface
- Multilingual operator interface
- Various password levels which can be freely configured
- High-quality temperature control (heating and cooling)
- Recipe management
- Monitoring and documentation of process and quality data
- Integration of external ancillary equipment such as proportioning unit and melt pump

Benefits

The SIMATIC automation solution described below offers the following advantages:

- Significant cost savings on engineering through provision of preconfigured, typical basic functions
- Simple operation of the extruder based on simple, clear operating screens
- Easy expansion of system thanks to open software structure
- Optimum scaling of the control unit
- Easy to expand by Siemens drive systems

Automation for extruders

Design

Automation solution

The SIMATIC automation system provides a high-quality solution for extruders and extruder lines. It is designed as an open standard. The user can employ the basic functions of the standard, but also add or adapt functions to suit an individual machine configuration.

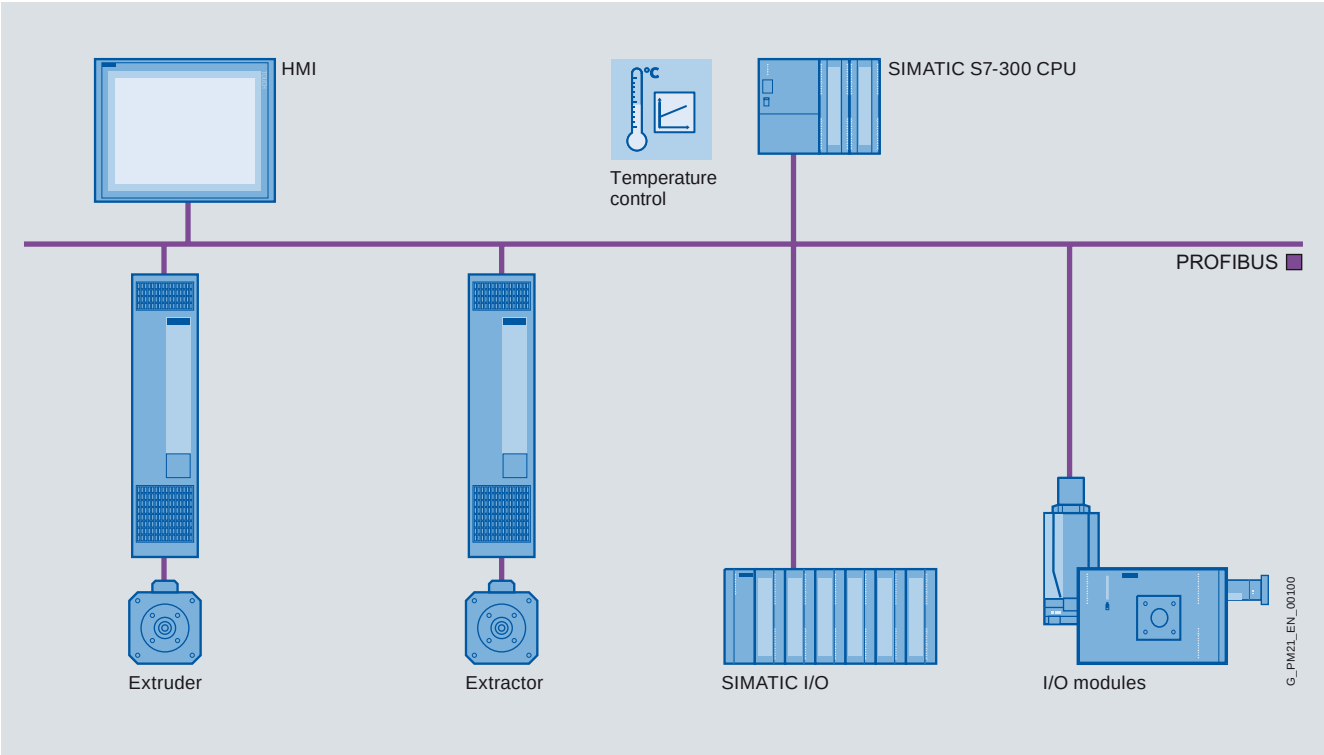
The SINAMICS drive system and Siemens motors round off the solution perfectly.

SIMATIC EXT 3370 application

- **Supports** the complete machine control
- **Comprises** all the technology functions for controlling a pipe/profile extruder
- **Scope of implementation:**
  - Drive-based control for up to 6 drives
  - Temperature control for up to 16 temperature zones
- **Executes** on:
  - Conventional SIMATIC controller with CPU, or
  - Soft PLC SIMATIC controller WinAC, PC-based, or
  - Soft PLC SIMATIC controller WinAC, MP-based
- **Extended by** SIMATIC MP 277 or MP 377 Multipanels in the desired display size
- **Prerequisite** for using the application SIMATIC EXT 3370 is a software license

Software functions

- Operating screens created with WinCC flexible
- Temperature control
  - Self adjustment of control parameters
  - Separate controllers for heating and cooling zones
  - Integrated multi-zone autotuning
  - Heating current monitoring
  - Seven-day timer
- Drive control
  - Starting function
  - Cold start function
- Mass pressure control
- Diagnostics, messages and trend graphs
- Recipe management



SIMATIC EXT 3370 automation solution

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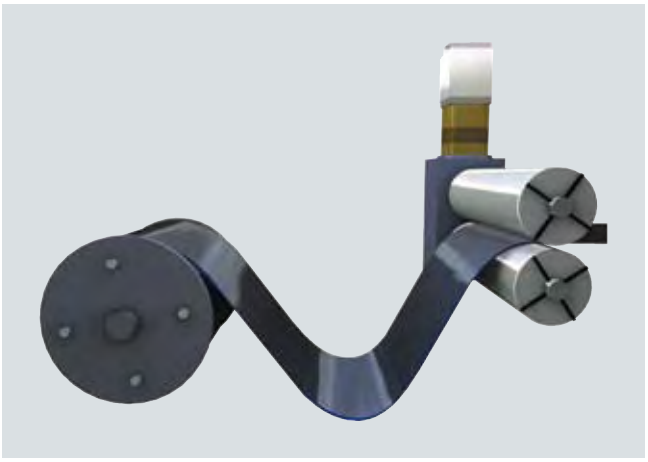
Overview



Machine requirements

The electronic roll feed is an integral part of almost every modern coil-fed press and punch and is frequently implemented as a stand-alone, electrically driven machine unit. The flexible feed automation replaces expensive mechanical designs. This increases the flexibility of production and in most cases the productivity of the plant.

The production stroke rate of the press or punch directly depends upon the positioning time of the roll feed. Thus, the feed distances must be covered in a time optimized manner. The sheet metal is transported between two rollers. In order to reduce the risk of impairing the surface of the sheet metal, the material must be reliably prevented from slipping. For this reason, the motion control system must be highly dynamic and particular attention must be paid to jerk and shock characteristics.

The automation system must provide the following functions:

- Relative positioning to permit cycle-exact feeding of the material
- Special positioning algorithms to prevent slipping and for simultaneous time-optimization of the feed movement

Benefits

The SIMOTION automation solution offers the following advantages:

- Maximum flexibility due to scalable products, systems and solutions
- Transparency in the process due to comprehensive diagnostic tools
- Special positioning algorithms to prevent slips during simultaneous position time optimization and measurement of the capacity utilization
- Roll Diameter compensation
- Open, application-based solution which can be individually adapted by the OEM
- Feed length changed on the fly

Roll feeds

Design

Automation solution

The modular Motion Control system SIMOTION in combination with the SINAMICS S120 drive system as well as highly dynamic servomotors provide a precise and highly dynamic response and therefore create a high-quality roll feed solution for optimized adaptation to the specific field of application.

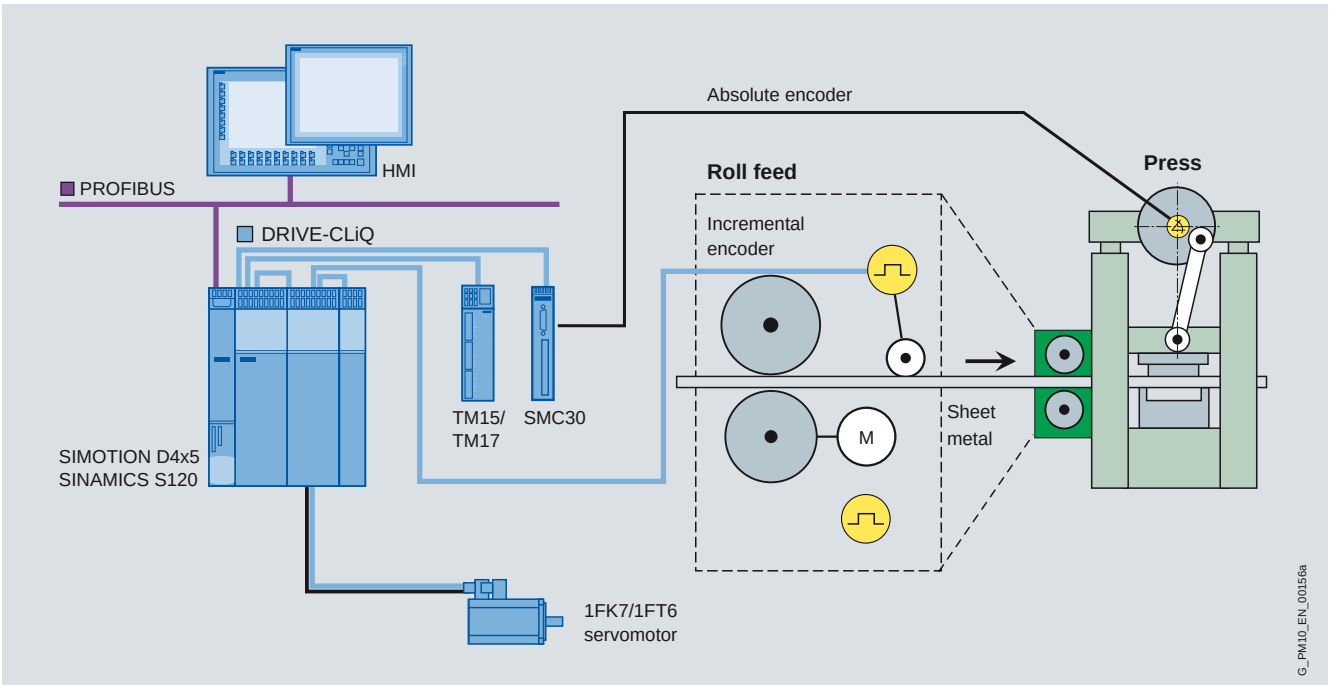
Due to the independence of the SIMOTION platform from the drives to be controlled, the SIMOTION application SimoRoll is also ideally suited for retrofitting of an existing plant.

The following options are covered by the SIMOTION application SimoRoll:

- Single-axis roll feed
- Two-axis roll feed in the versions:
  - Double-axis roll feed comprising one roller pair in front and another roller pair behind the press or punch
  - Zig-zag roll feed comprising a roll feed in the direction of travel and a cross motion matched to the feed motion. (optional)

To promote a highly dynamic traversing response and the resulting maximization of productivity, a number of process-oriented functions are provided:

- Specification of the traversing motion over position and velocity
- Specification of the speed profile
  - Acceleration and delay ramps can be adjusted separately
  - Separately adjustable initial and final rounding
  - Presetting of maximum velocity
  - Override parameter can be adjusted during operation
- Operating modes:
  - Jog
  - Set-up
  - Reference point approach
  - Single traversing block
  - Automatic single block and program processing
- Discharge rollers
- Actual value switch-over from measuring wheel encoder to motor encoder
- Calculation of the maximum number of strokes for the specified dynamics and feed data
- Messages and monitoring functions:
  - Slip monitoring
  - Approach position reached (VPE)
  - Position reached and stop (PEH)
  - Difference between direct and indirect measuring system
  - Load ratio
- Documented sample project



Example of automation solution with SIMOTION D4x5 and SINAMICS S120

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Overview

Machine requirements

Transfer systems are used to transport workpieces within a press or with large-component transfer presses. Transfer systems are employed in the sheet metal processing industry, in punching and metal forming, and in forging plants for cold, semi-cold and warm forming processes.

The ongoing trend to increase the degree of automation in industrial production processes is encouraging an ever growing number of machine manufacturers to replace the conventional, mechanically coupled transfer systems (cams coupled with the ram) by freely parameterizable, electronic transfer controls, with electrical position controlled drives. The modern electronic transfer has far fewer mechanical drive elements than the mechanical transfer system. The newer transfer systems are almost entirely replaced by electrical positioning drives that operate synchronously with the main motion of the press.

Transfer systems generally are comprised of gripper rails which are controlled in three directions of motion and which transport workpieces in the press cycle time. These rails are equipped with either pneumatically operated active pinchers or scoops (depending on the geometry of the sheet metal part) which hold the part during transport. At the same time, the axes are traversed continuously by means of electrical positioning drives in such a way that they follow a predefined traversing profile in accordance with the master setpoint of the ram encoder. Transfers thus offer a high flexibility with regards to the motion sequence to be implemented and therefore offer considerable advantages when changing tools.

Benefits

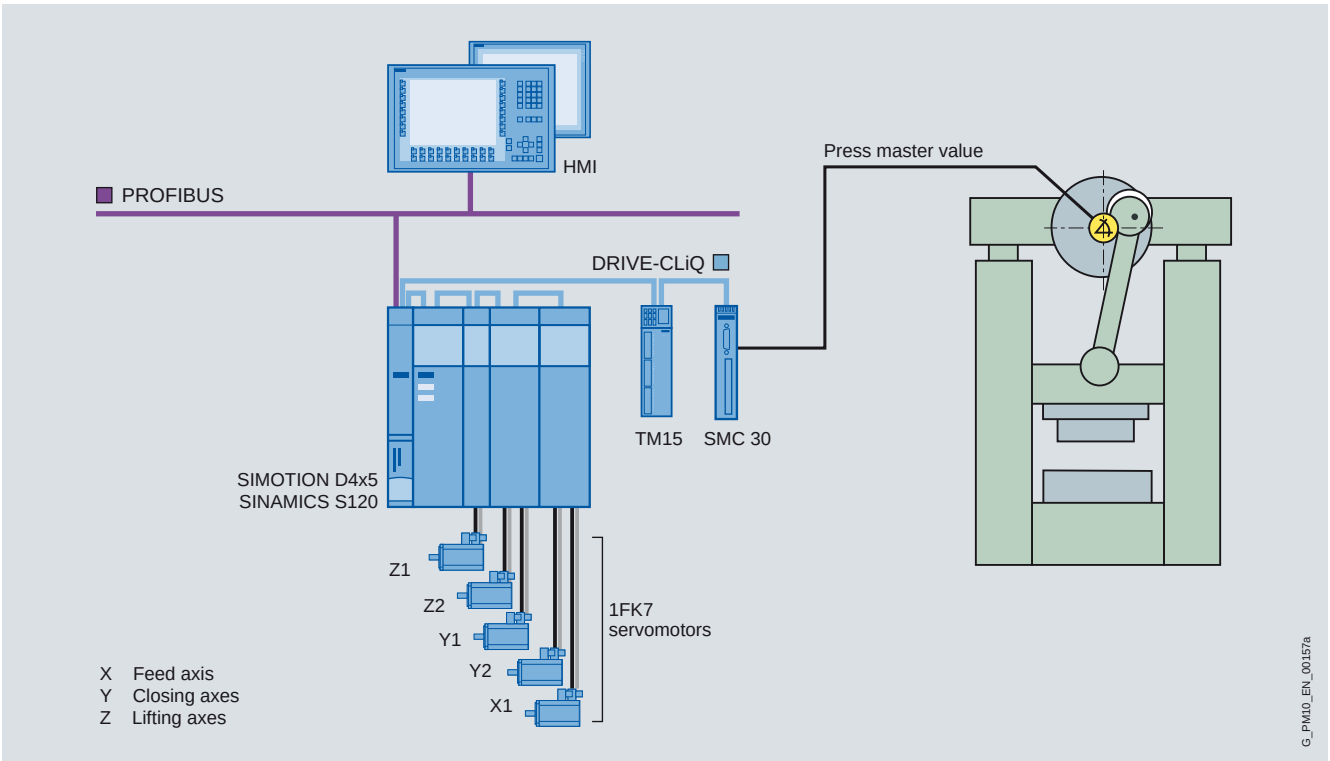
The SIMOTION automation solution offers the following advantages:

- Maximum flexibility due to scalable products, systems and solutions
- Transparency in the process due to comprehensive diagnostic tools
- Special positioning algorithms to prevent slips during simultaneous position time optimization and measurement of the capacity utilization
- Roll Diameter compensation
- Open, application-based solution which can be individually adapted by the OEM
- Feed length changed on the fly

Electronic transfer

Design

A variable number of drives is supported for transfer presses depending on the machine construction. For fast and flexible adaptation to current as well as future production requirements, the electronic transfer application SIMOTION SimoTrans is based on the universal Motion Control System SIMOTION and the SINAMICS drive platform. In accordance with the general SIMOTION concept, the SIMOTION application SimoTrans has access to high-dynamic Motion Control and PLC functionality in the same environment; time-critical communications interfaces are not used. The master value coupling to the presses allows all drives of a motion axis to be traversed synchronously with the press master value.



Example of automation solution with SIMOTION D4x5

Apart from a highly dynamic traversing response and the resulting maximization of productivity, further process-oriented functions are provided by the SIMOTION application SIMOTION SimoTrans:

- Coupling of the motion system to a higher-level master value
- Traversing in accordance with standardized motion principles (5th-order polynomials) resulting in favorable jerk and bump conditions
- Tool data management
- Master value encoder changeover on the fly for adaptation to the mechanical conditions
- Modular, parameterizable program structure supports press variations
- Sequence parameterization using tables
- Operating modes: service mode, setup, single stroke and automatic
- Openness for customization by the OEM
- Calculation of the maximum possible stroke number
- Encoder functionality can be monitored through redundant master value coupling
- Plausibility check of entered traversing data
- Additional functions, such as master value filter, collision monitoring can be optionally implemented

The transfer application SIMOTION SimoTrans can be used either separately or in addition to the press control SIMOTION SimoPress, in which case synergies can be effectively utilized along the complete press line.

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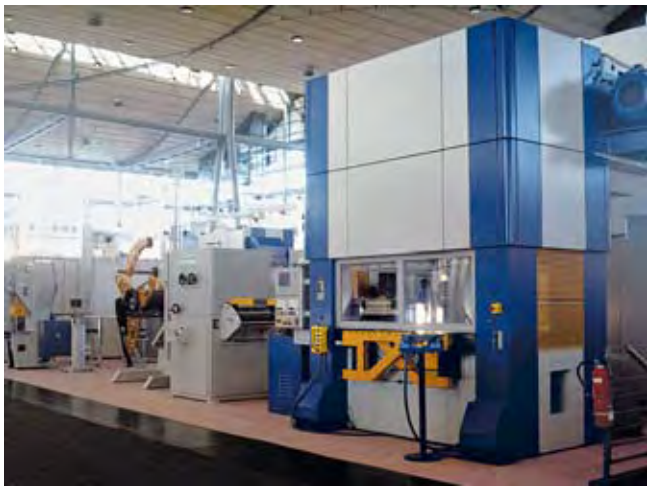
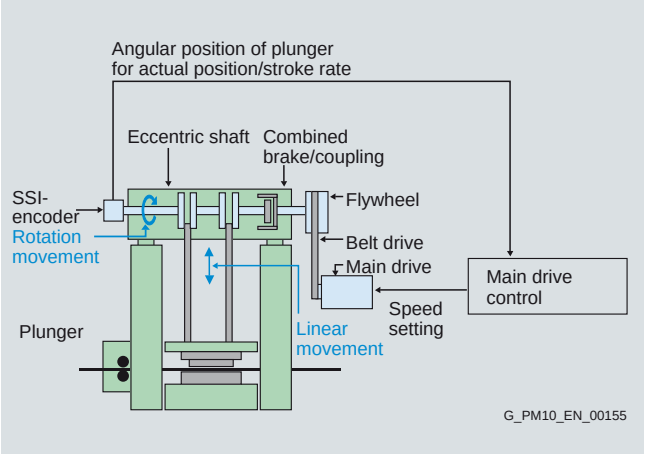
Overview



Mechanical universal press



Principle of the mechanical universal press

Machine requirements

Mechanical universal presses are characterized by high flexibility since they are suitable both for cutting and forming. In combination with single, follow-on and progressive tools, small to medium-sized parts can be manufactured. In these machines, the drive concept of the main press drive is identical. The press ram complete with tool is driven via a mechanical transmission device (eccentric) using an electrical drive and flywheel. The ram movement is initiated by the clutch-brake combination.

Material can be fed manually or continuously from a coil on automated presses (punching and forming machines). For automated presses with progressive dies, the workpieces will be moved along by roll or gripper feed to the press. The press control performs a variety of tasks such as operator control and monitoring general machine control, operating mode and main drive control, tool management, cam controller, process control and positioning.

Automatic forming and punching machines place exacting demands on the sampling time for time-critical functions (cam controller, process control, etc.). Universal presses with stroke numbers up to 100, max. 200 strokes/min are mostly simple presses with a low degree of automation. Stroke numbers ranging from 200 to 500 strokes/min., even increasing to 2000 strokes/min. in the case of punching presses, require more complex solutions and place higher demands on reaction times and degree of automation.

Benefits

The automation task demands almost complete integration of sequencing (logic) functions, motion functions and technology functions. With SIMOTION, it has been possible to resolve the different tasks with one system concept.

Sequence programming can be implemented in the familiar LAD or FBD languages.

Technology-specific programs are programmed wherever possible in Structured Text (similar to a high-level language) and the motion tasks are programmed with the graphical tool Motion Control Chart (MCC).

Different tasks are, for example:

- Operating mode control
- Main drive control with stroke number preset and ramp up
- Positioning of the main drive for stroke depth adjustment or tool changing
- Cam control with dynamic deceleration angle calculation for OT Stop
- Process monitoring functions such as tool position securing and press force monitoring

All these tasks can be programmed using the same engineering system and finally implemented with a machine-specific hardware platform.

Consequently,

- the number of interfaces is reduced,
- engineering and commissioning costs are optimized,
- and standardization is made easier.

Mechanical universal press

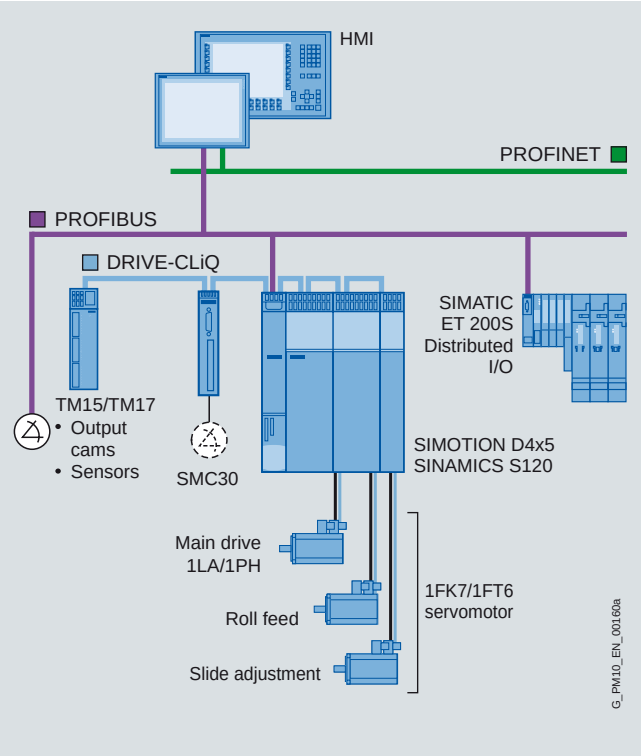
Design

Automation solution

In the represented automation concept of mechanical universal presses, the tested application solutions are summed up under the designation SIMOTION SimoPress. With this technology software, we offer finished press functions for the main drive control, cam controller, tool position securing and pressing force monitoring. SIMOTION D4x5 with the SINAMICS S120 drive system has been selected as the hardware platform.

Both the machine control and the SIMOTION SimoPress technology functions are programmed on SIMOTION D4x5 and they control and monitor the machine through the distributed SIMATIC ET 200 I/O. The cam signals are output or sensor signals are acquired for process control over the drive-related, high-speed I/O modules TM15 or TM17 High Feature.

The motors are controlled via the SINAMICS S120 Motor Modules. The SIMOTION SimoPress technology software covers all main properties for a mechanical universal press. The software together with the SIMOTION SimoRoll and SIMOTION SimoTrans solutions provides a complete press package.



Example of automation solution with SIMOTION D4x5

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Overview

Machine requirements

In pipe bending, round stock (pipe, rod, wire, conduit, etc) is actively reformed using a bending head. In this case, the bending head guides the material around a bending roller or die. The bending angle is determined by the end position of the bending head. The bending radius depends on the die and, therefore, cannot be changed during machining.

The bending programs are frequently created on the PC using special programs. The respective bending program comprising positions, angles, speed and pressure is selected via the operator panel and loaded into the controller. A bending machine typically has 3 to 5 positioning axes that are often implemented electrically, but the bending axes for large pipe diameters are frequently implemented hydraulically.

The pipe is inserted manually up to the end stop in the clamping chuck on the rotary axis. On starting, the pipe is clamped hydraulically and the transport unit moves the pipe to the first bending point. The sliding rails or jaws are then hydraulically positioned. Clamping force and contact pressure values are set according to the material. The bending head is then rotated by a defined angle and the first bend is formed. The bending axis automatically tracks the pipe in the Y direction (follow-up mode) or is positioned by means of a cam. The bending radius is defined by the bending roller (tool) and cannot be changed. The sliding rail is then opened, the pipe is positioned at the next bending point and also rotated if necessary. Multi-dimensional structures can be created in this manner. Different radii are achieved by means of different dies of various heights, also referred to as "multi-groove dies". For this purpose, the pipe is moved using a mandrel and transport unit in the X direction away from the contour of the roller, then in the Z direction to the next roller and then positioned in X direction on the roller again before it is moved to the next bending position. The sliding rails are then repositioned and the pipe is bent. This procedure is repeated until the bending program has been executed and the pipe can be removed manually.

In order to ensure the shortest possible bending procedures and reproducible quality, it is important to be able to adapt the various parameters, such as acceleration, speed and pressure, to suit the respective product.

The SIMOTION Motion Control System provides the following functions to perform these tasks:

- Positioning of electric and hydraulic axes
- Follow-up mode
- Cam
- Axis-dependent starting
- Output cam

Benefits

The automation concept with SIMOTION/SINAMICS combines the following advantages:

- Reduced engineering overhead due to configuration, programming and commissioning with one system, the SCOUT engineering system
- Fewer interfaces, since different tasks are performed on the same hardware
- Simplified commissioning of drives by means of an electronic motor rating plate
- Optimized machine operation due to user-friendly, flexibly adjustable and reproducible process parameters on the operator panel, e.g. pressure, positions
- Higher availability of the machine through wide-ranging diagnostic functions in SIMOTION in the case of a plant failure
- TIA integration simplifies integration of HMI, I/O and drives

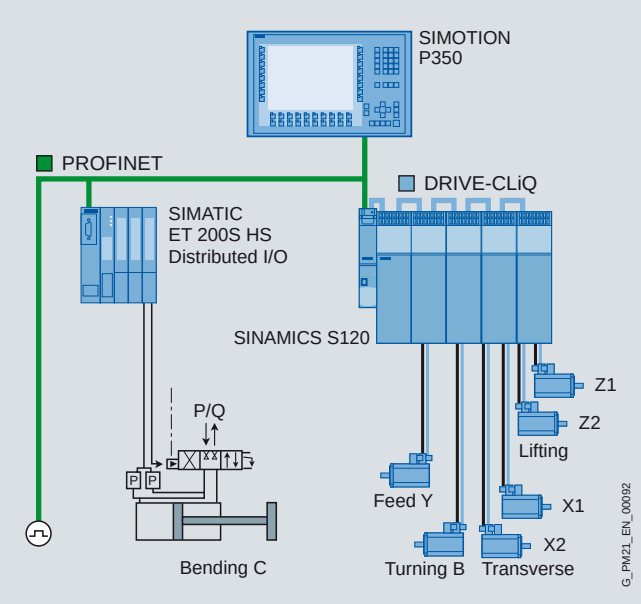
Pipe bending

Design

Automation solution

As the system platform, SIMOTION P, the PC-based version with touch panel is a good choice. Without additional interfaces, the PC bending program, the Touch HMI functions and the control logic and motion control can execute on a hardware platform.

SINAMICS S120 and 1FK7 motors are used for the electrical drives and provide highly dynamic and reproducible positioning. In the case of a hydraulic bending axis, the hydraulic servo valve can be activated via SIMATIC ET 200S HS (High Speed) with analog inputs and outputs. SSI encoders with interface to SIMATIC ET 200S HS or PROFINET encoders are available for sensing the bending axis position.



Example of automation solution with SIMOTION P and SINAMICS S120

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Overview

Machine requirements

A hydraulic universal press is characterized by its piston mechanism in the form of one or more hydraulic cylinders. It is used for tasks such as punching, deep-drawing or pressing to internal high-pressure forming.

A machine comprises not just the hydraulic press itself, the tool can also include hydraulic actuators and control loops, especially in the case of internal high-pressure forming. A distinction is made between single or multiple-action drawing presses, depending on the number of axes acting on the metal sheet (plungers, die cushions, sheet metal holders, ejectors).

In the case of hydraulic universal presses, a distinction is made between closed-loop and open-loop controlled axis motion. With complex workpieces and molding processes such as internal high-pressure forming, intervention of the tool at the workpiece must be precisely controlled.

The seamless transition of the die cushion from position to pressure control and back to position control is essential. Also the exact press forces in the individual axes must be accurately controlled.

Benefits

The SIMOTION Motion Control System is the best possible way of achieving automation and drive technology in a complex hydraulic press. The SIMOTION platform is ideally suited for use with modular machines. Due to its open and modular structure, this motion control system combines all the necessary subareas of the overall machine control system: motion control, PLC functionality and technology functions.

An automation solution based on SIMOTION and PROFINET therefore offers the following advantages:

- Implementation of motion control, PLC and technology functions in one integrated system
- Optimized machine cycles due to deterministic real time and short cycle times result in high product quality and productivity
- Combination of any number of electric and hydraulic axes
- Prefabricated Functional Modules (hydraulic control, synchronization, cams, cam control, etc.)
- Synchronized axes can be distributed between several control systems
- On-the-fly switchover between position and pressure control
- Automatic acquisition of the valve characteristic/controlled system
- Valve curves can be graphically edited and adapted using the CAM tool
- Press force measurement and tool protection with scanning rates significantly lower than 1 ms due to fast signal acquisition/signal output via the SIMATIC ET 200S High-Speed I/O
- Open, application-based solution, can be individually adapted by the OEM

Flexible selection of the hardware platform

An application created using the SIMOTION SCOUT engineering system can be implemented on different hardware platforms. You can, therefore, always select the platform that suits your machine best:

- SIMOTION C, the compact controller in SIMATIC S7-300 design with interfaces for four position-controlled hydraulic drives (4 analog outputs and 4 encoder interfaces for SSI absolute encoders or RS422 incremental encoders)
- SIMOTION D, the solution integrated into the drive based on SINAMICS S120, for applications that require electrical drives in addition to hydraulic drives
- SIMOTION P, the open PC-based solution for applications with demanding performance requirements or when, for example, visualization functions are required

Design

Automation solution

With SIMOTION P and the new SIMATIC ET 200S High Speed I/O, cycle times down to 250 µs can be achieved over PROFINET with IRT (Isochronous Real Time).

Highly dynamic control loops can therefore be achieved for hydraulic applications with position and pressure control.

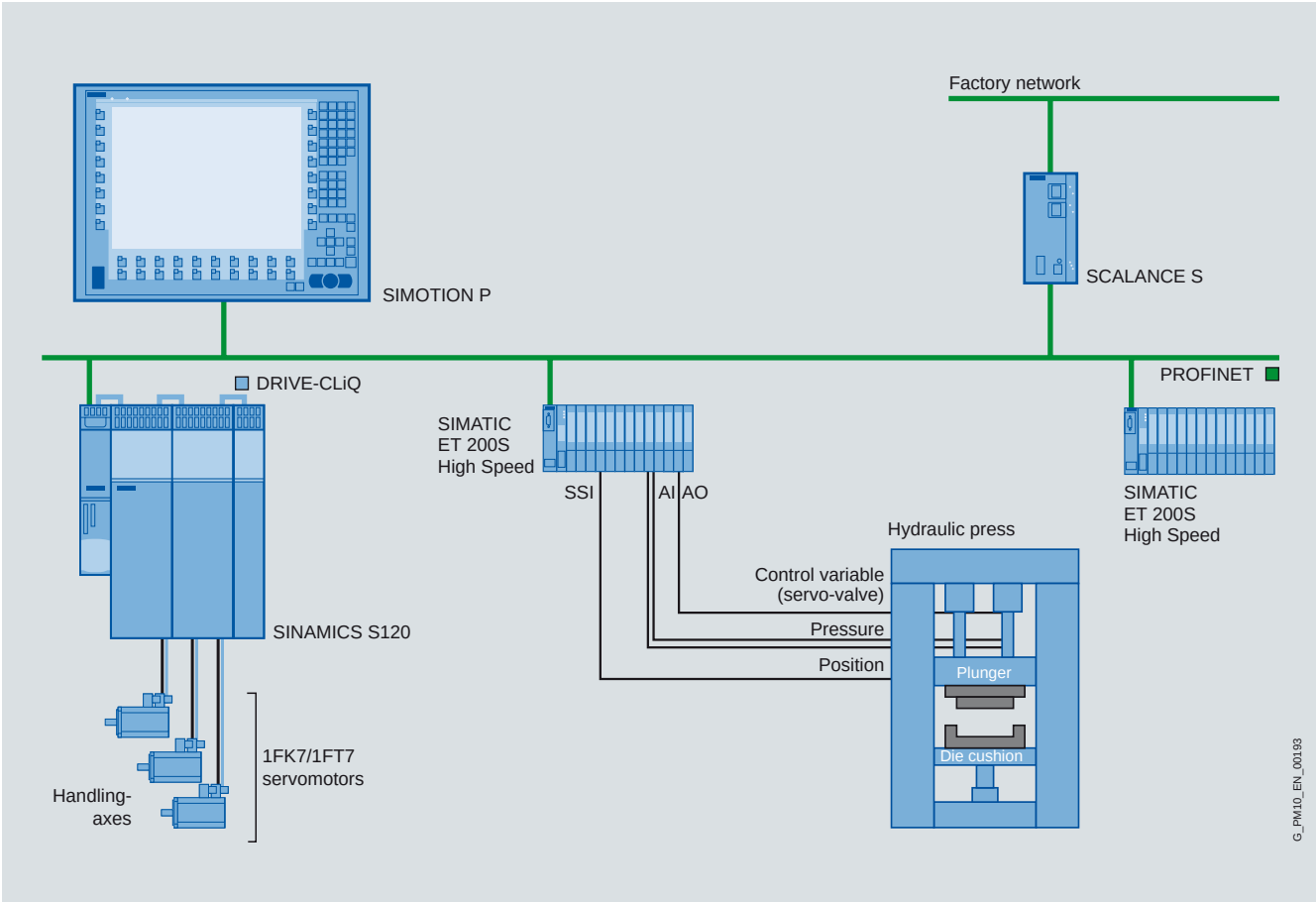
The necessary sensors and actuators, such as

- position encoders connected through the SSI interface,
- pressure sensors connected through analog inputs (AI),
- servo valves connected through analog outputs (AO) and
- digital I/O for tool safety and cam signal output

are connected over the SIMATIC ET 200S distributed I/O system, which was equipped with the necessary high-speed I/O modules beforehand to suit the application.

On the basis of PROFINET, it is therefore possible to synchronize hydraulic drives as well as electrical drives.

In conveyor systems and press lines in the automotive industry or domestic appliance industry, uniform automation solutions can be implemented in this manner in which both electrical drives (roll feeders, electronic transfer, feeders) and hydraulic drives (e.g. deep-drawing presses) are used.



Automation example for SIMOTION P350-3 and SIMATIC ET 200S High-Speed

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Overview

Because it is easy to form, wire can be used in many ways, as electrical conductor in cables or as cord, and much more. Wire-drawing allows the material structure and surface to be influenced positively; this makes even the drawing of formed parts (bar material) cost-effective and thus economical. We encounter cables continually in daily life. As feeder cable for electrical devices or as high-voltage cable, etc. The properties of data or power cables can be determined during the cable manufacturing process. Related areas are the manufacturing of bent parts or springs.

Wire-drawing machines

In a wire-drawing machine, the surface and the structure of rolled or drawn wires is improved by reducing the cross-section (using a drawing die). Wire-drawing is a common and cost-effective procedure for this purpose.

Straight drawing machine

The wire to be drawn is taken from a wire roll or a drum, and fed to the first drawing block of several successively ordered drawing blocks. It is cold-formed and brought successively to the required final diameter. The finished wire is coiled using a spooler (the reel turns) or with a coiler (a rotating bell lays the wire in coil form, e.g. in a drum).

A controller, e.g. SIMATIC S7, calculates the setpoints for the drives, and performs the process data monitoring and the fault evaluation. PROFIBUS DP handles the data exchange of the systems with each other. Until 2008, MASTERDRIVES VC units have been used primarily for the drawing blocks. A conversion to SINAMICS S120 has been taking place since 2008. Although the 1PH7 or 1PL6 and the successor model 1PH8 have been chosen as preferred motors, 1LG4 and 1LG6 standard motors with high energy efficiency are also used.

Cable machines

From the wire of a wire-drawing machine, extrusion produces a sheathed conductor. In a cable machine (stranding machine), this conductor is stranded with other conductors to form a bundle or a cable.

Depending on the traveled path of the capstan, the stranding curve $\alpha = f(s)$ is followed. This can affect the electrical properties of the cable. High production speeds necessitate highly-dynamic stranding drives. Reversing times of 30 ms must be mastered here.

In this case, the stranding curve is specified by the SIMATIC or SIMOTION and transferred via PROFIBUS (or PROFINET) to the drives. The cam technology software allows individual requirements to be placed on the form of the stranding curve.

The motors are inertia-optimized, permanently excited 1FK7/1FT7 synchronous motors or 1P motors.

Ready-to-use applications for SINAMICS S120 are available in DCC (Drive Control Chart) for winding and laying tasks and the appropriate programs in ST (Structured Text) for SIMOTION for cable and stranding machines.

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SIMOTION Top Loading

Overview

Machine requirements

The level of automation in production plants is steadily increasing. The challenges call for flexible automation solutions and plants of a modular design which can maintain productivity with ever shorter product changeover times. From a simple feed axis in an assembly system through to complex mechanical systems, such as Delta Pickers in the solar or packaging industries – handling tasks are assuming greater significance in all sectors and applications.

Controlled motional sequences with functional solutions

The interoperation of production machines and handling units is becoming more and more important. Where previously robot manipulators were used in "end-of-line" applications, handling modules are now increasingly being implemented even in primary and secondary processes. The advantage is clear: The machine and materials handling can be controlled with a single system.

For these handling applications, Siemens offers SIMOTION Top Loading, a standardized software library for handling modules for all SIMOTION platforms. The software is standardized and tested. This significantly reduces engineering outlay and prevents programming errors. It allows multiple kinematics and the software modules of other machines to be programmed on a single control system. Synchronization with proprietary control architectures is then no longer necessary. Real-time synchronization as well as uniform data storage is now possible without any problems. Familiarization time for programming languages for robot controls can be completely discounted because the system supports uniform programming of all functionalities according to IEC 61131-3.

Benefits

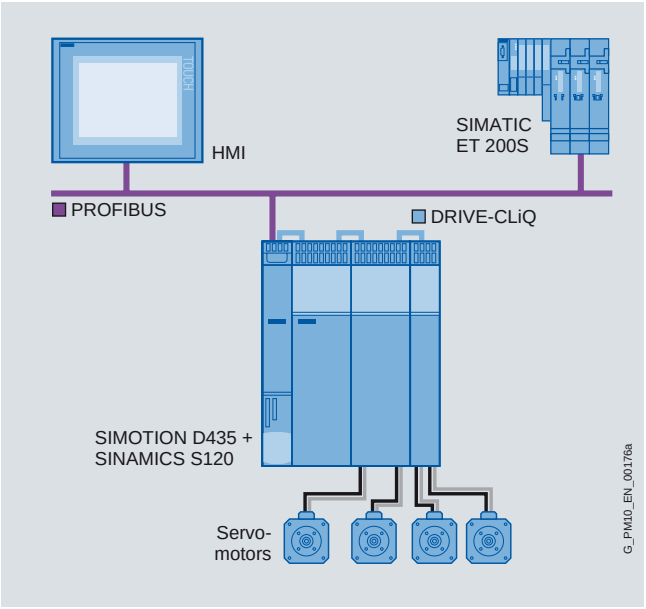
The SIMOTION automation solution offers the following advantages:

- Faster and better quality engineering through standardized and tested software and previously implemented kinematics
- Simpler implementation and data storage because a uniform control and development environment is used
- Total flexibility through the integration of new kinematics using transformation equations
- Optimized curves due to flexible specification of the path velocity
- Ideal for any application due to free selection of the SIMOTION platform
- Three-dimensional definition of work areas, 1 to n inhibit zones, alarm zones or product zones that can be individually activated
- Standardized interfacing of camera systems

Design

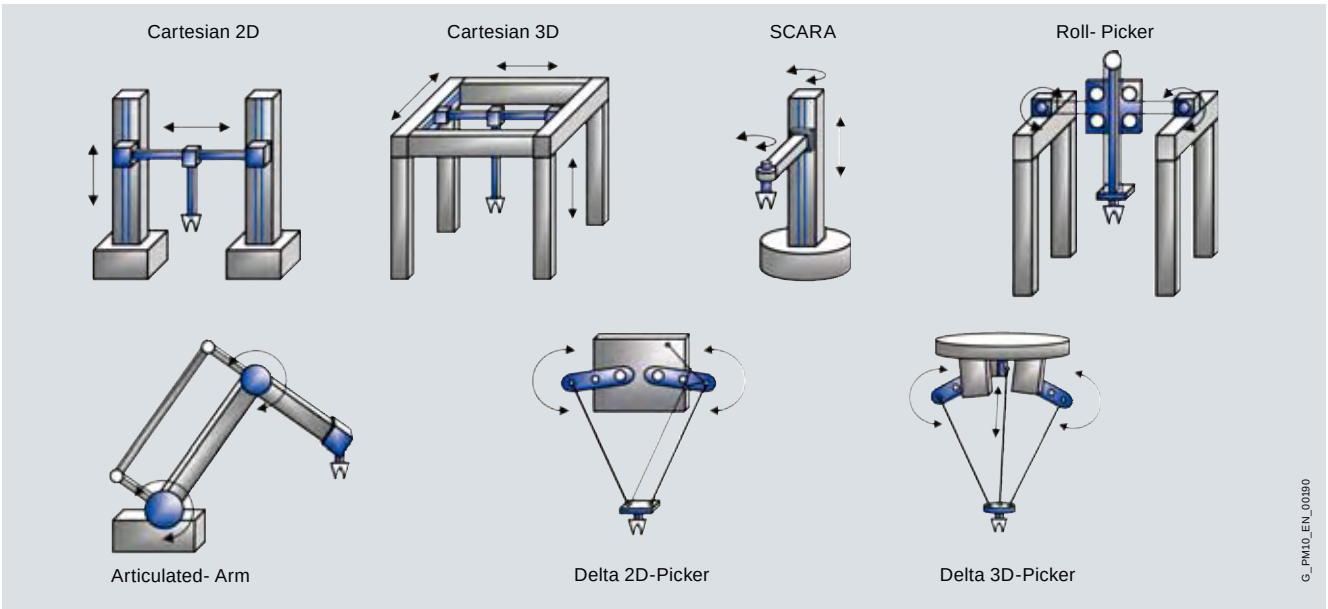
Automation solution

The automation concept shown is an example of a gantry robot with 3 servo drives as well as one additional drive for the infeed conveyor. It is easy to see the advantage that direct coupling of the gantry robot with the infeed axis is possible thanks to integration of the handling functionality in the SIMOTION Motion Control System. Costly interfaces and separate control units for the robots can be omitted. It can be controlled by a machine HMI, in this case a SIMATIC TP 177B Touch Panel.



Standard kinematics integrated in the system

The figure shows the kinematics already integrated into SIMOTION. Other kinematics can be linked to the control over a free transformation interface using the appropriate mathematical transformation equations.



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Optimized Packaging Line

Overview

Machine requirements

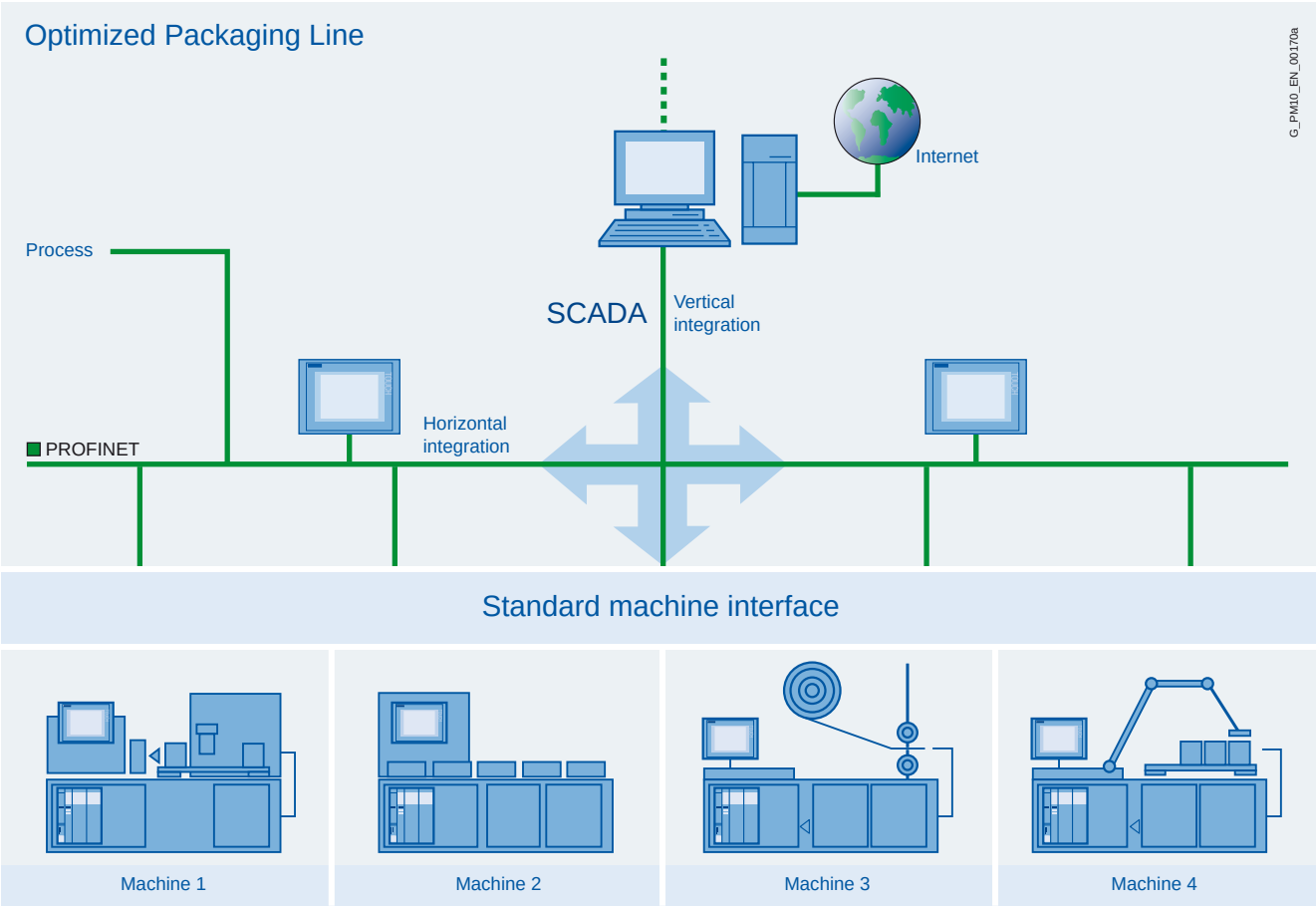
The packaging industry requires greater flexibility than almost any other industrial sector: new types and sizes of packaging, new markets and new drive technologies – requirements change quickly.

This opens up many opportunities and presents sectors such as food & beverages or pharmaceuticals with considerable challenges. In these sectors, only those who act flexibly on the one hand and cost-consciously, efficiently and productively on the other hand, will be successful in the long term. With a holistic concept, we as your automation partner will support you in this. With the Optimized Packaging Line, we offer machine users and machine manufacturers integrated automation solutions for packaging lines and machines.

With components that can be freely selected to solve the specific task. These include SIMOTION, SIMATIC, SINAMICS and PROFINET – reliable standards which will support the implementation of any system solution.
Automate packaging lines from a single source. With components that can be freely selected to solve the specific task – and which do not limit the modularity of the packaging machine.

Automating packaging machines and lines uniformly and system-wide – this is the concept of the Optimized Packaging Line. As an automation partner, we have developed a concept that is based on Totally Integrated Automation (TIA), which offers maximum benefits for machine users and machine manufacturers through standardization of interfaces, software modules and hardware components. The automation architecture is horizontally and vertically standardized. Based on international standards – such as OMAC – solutions with a high potential for innovation can be implemented in this manner.

The technology comes from a company that masters everything – from initial consultation through engineering as far as the finished solution and servicing. An all-in-one solution.



Overview of a packaging line

Benefits

The uniform and system-wide integration of components on the basis of standards reduces their number. This reduces the integration, engineering and fixed costs and increases productivity.

The standardization of components and interfaces reduces the number of different types and increases the line efficiency through:

- Reduced complexity
- Reduced spare parts inventories

Software blocks such as SIMOTION Technology Objects for technology functions lead to:

- Less engineering outlay for the application
- More reliable functioning due to pretested software

The OPL architecture also optimizes energy consumption, taking all electrical loads into account. With this concept, the machine architectures and energy distribution network right up to the medium-voltage transformer are viewed as an integral system. The advantages of this approach are:

- Reduction in energy losses in the installation
- Reduction in carbon footprint of the installation

Interface data blocks simplify the acquisition and presentation of production data, resulting in:

- Less engineering outlay during line integration
- Greater cost-effectiveness due to the easy addition of machines
- Less risk on plant start-up

Increase in efficiency and reduction in downtimes due to:

- Uniform overview of the complete line or plant
- Integrated diagnostics and alarm concept
- Identical user interfaces for all machines

Higher productivity results in:

- Better availability of the bottling line
- Less training

Design

Automation solution

The packaging world has become more transparent and simpler with the Optimized Packaging Line: The components are optimally tuned to each other and the software structures are standardized. A uniform operating concept with totally integrated diagnostics ensures high availability.

Due to consistent implementation of the specified components, high productivity and availability is ensured over the entire service life of the packaging plant.

The components

SIMOTION, SIMATIC, SINAMICS, PROFINET … reliable standards which will support the implementation of any system solution. From the control of simple auxiliary aggregates through to complex, high-velocity packaging machines.

The concept

Uniformity, integration, simplicity – due to identical design of the hardware, identical software modules and user interfaces, and due to using the same tools for simulation, configuration, programming, commissioning and diagnostics.

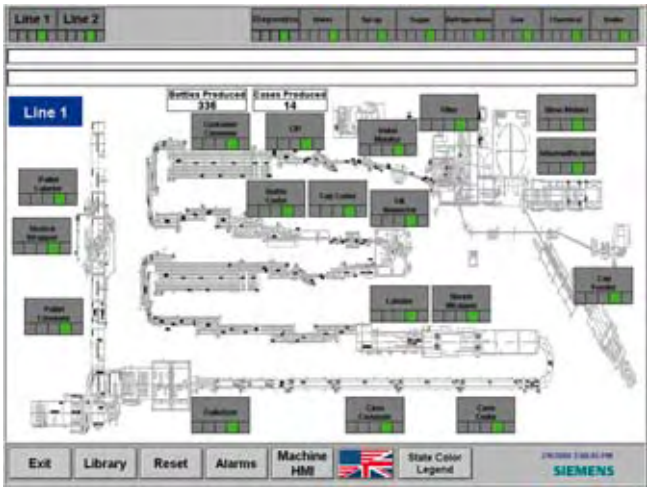
Machine manufacturers and operators benefit consistently from the synergy effects – starting with configuration, simulation and commissioning and continuing through staff training, maintenance and service.

Flexibility

Our customers are able, at any time, to introduce further modifications on the basis of these standards. The design of our technology is determined by the task, not vice-versa.

Our project service

Our solutions are building blocks integrated into a seamless system. This includes the planning phase with advice about system architecture, energy optimization and interfaces, as well as active support through the entire adjustment and commissioning process which continues into the operating phase – with training and application/commissioning support as key features of the service. This is why automation solutions from Siemens stand for maximum availability and productivity in packaging lines throughout the world.



Line overview with status indicator

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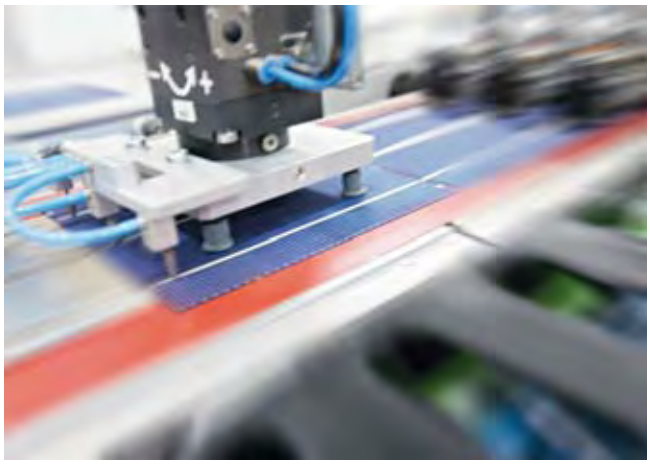
Overview



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Siemens is offering drive and automation solutions for the rapidly growing segment of the solar industry.

Solar cells can be manufactured by a variety of methods. The crystalline cell manufacturing process is the most common, but there is a growing trend in favor of thin-film solar modules. Siemens can provide optimized machine solutions for the entire production chain of both manufacturing processes. These include, for example, concepts and solutions for:

- Silicon ingot cutting, squarers, wire saws
- Wafer processing lines
- Antireflection coating machines
- Wafers, cells: Transport and sorting
- Machines for manufacturing solar cells and modules (e.g. tabbers, stringers, lay-up stations)
- Thin-film coating plants (TCO, CVD, PVD)
- Laser structuring
- Laminators, framing and test systems

The wafer, cell and module manufacturing process demands short cycle times in order to ensure a high throughput. Siemens can provide suitable solutions based on the SIMOTION control system with pre-configured software elements. Handling kinematics, e.g. Cartesian gantry systems, roll pickers, Scara robots, Delta2 and Delta3 pickers with interpolation functionality, are included in the handling toolbox. Additional functions such as conveyor synchronization and camera integration are available.

Example: Wire saw application

Wire saws are used to cut silicon ingots into razor-thin, round or square wafers for the photovoltaics and semiconductor industries. In this process, rollers guide a long spool of wire over a wire web. The wire is moved back and forth between the unwinder and rewinder at a speed of up to 20 m/s (65 ft/s), a dancer control ensuring that the wire tension remains constant.

The silicon ingots are then lowered from above at a slow, constant speed onto the wire web and cut into razor-thin wafers in a process lasting several hours. In one of the more common techniques applied today, it is not the wire itself which cuts the silicon, but a continuous supply of an abrasive liquid known as "slurry". Another technique utilizes diamond coated wire to make the cut. In either case there is a growing trend to use ever thinner wires in order to minimize the width of cut and thus produce more wafers from a single ingot.

At the same time, machine builders are attempting to achieve faster cutting speeds and thus improved productivity. Their main focus is on avoiding wire breaks which would in most cases damage the expensive silicon ingot.

Benefits

The highlights of the Siemens wire saw solution are:

- High-precision Motion Control functionality guarantees high-quality manufacture of razor-thin wafers
- Smart Energy Management ensures reliable operation even during brief power supply failures
- Cost savings thanks to efficient engineering and technology functions integrated in the drive
- Safety functions in the drive, thus avoiding complex, conventional protective circuitry
- Less installation space required thanks to compact, flexible drive solutions with SINAMICS S120

Application

Smart Energy Management prevents wire breaks

The automation and drive solution which has been specially optimized for wire saws includes a Smart Energy Management function which monitors and bridges supply fluctuations or brief supply failures. The combination of capacitor power modules and the SINAMICS Active Line Module ensures that the risk of wire breaks is effectively eliminated. The capacitor back-up is dimensioned to allow controlled shutdown of the machine, so that wire breaks are also avoided in the event of a Safe Operating Stop. The integrated Safety functions are yet another advantage of the SINAMICS S120 converter system.

Design

Automation solution

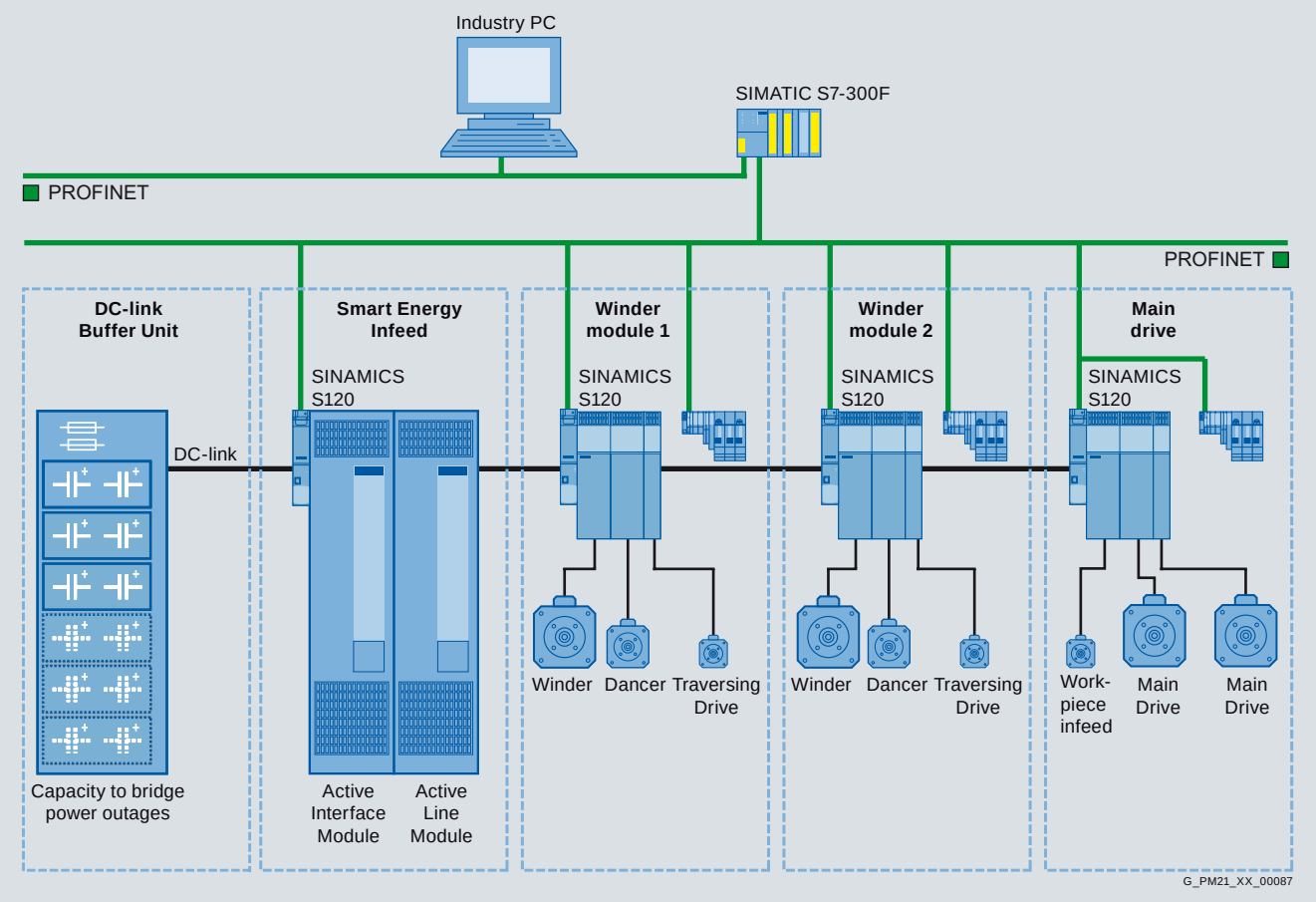
The compact converters in the SINAMICS S120 product range are used as a drive system for wire saws. Their modular design makes these converters scalable and flexible in terms of performance and functionality. As a result, they offer a technically and economically optimum solution to the requirements of wire-sawing processes.

An Active Line Module is employed as the infeed for the multi-axis system. The entire drive intelligence (including interfaces to higher-level controls) is housed in the Control Unit.

The CU320-2 Control Unit provides high-speed control for a multi-axis system and contains a memory card on which the firmware and all parameters for the drive line-up are stored. The central diagnostics capability for closed-loop control, infeed, inverters, motors and encoders is also supplied by the Control Unit (CU). The CU is linked to other components of the drive system via the digital system bus DRIVE-CLiQ.

The 1PH8 water-cooled motors are ideally suited to the role of winder motors, while the compact 1FK7 servomotors are employed for laying devices and dancers. The high-precision ingot feed function is performed by a high-performance 1FT7 motor.

A fail-safe SIMATIC S7 CPU is employed as the higher-level control system. This communicates with the drives or distributed SIMATIC ET200 I/O modules by means of PROFINET/ PROFIsafe.



Automation configuration for saws

Function

Efficient engineering (with Drive Control Chart DCC)

Using DCC technology reduces engineering time and therefore cuts costs. DCC offers modern, scalable drive technology with simple, graphics-based programming procedures. A comprehensive library with pre-configured, multi-instance-capable Drive Control Blocks (DCB) is available, including closed-loop control/arithmetic and logic blocks. These are quick and easy to combine into individual drive solutions using a drag and drop process. The scope of functions needed for the wire saw application, for example, unwinder and rewinder functions, closed-loop dancer controls and laying devices, can be solved completely with DCC technology. Configurations can be expanded and modified easily with the graphical DCC editor. DCC technology offers a drive-oriented, high-speed closed-loop control, thereby relieving the load on the higher-level control system.

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Appendix

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Absolute encoder

After switching on the supply voltage, this position encoder immediately provides the position of the drive as an absolute actual value. For single-turn encoders, the detection range is one revolution, whereas multi-turn encoders have a detection range of several revolutions (a typical number is, for example, 4096 revolutions). If an absolute encoder is used as a position encoder, no search for reference is required after the switch-on and the reference switch (e.g. BERO) which could normally be required is not necessary in this case.

There are rotary and linear absolute encoders.

Example of an absolute encoder:

1FK and 1FT motors can be delivered with integrated multi-turn absolute encoders with 2048 sinusoidal/cosinusoidal signals per revolution, over 4096 revolutions absolute and → EnDat protocol.

Active Infeed

Overall functionality of an infeed with → Active Line Module, including the required additional components (filters, switching devices, computing power portion of a → Control Unit, voltage detection, etc.).

Active Interface Module

This module includes the line-side components required for an → Active Line Module like, for example, the pre-charging input circuit (pre-charging contactors and bypass connector).

Active Line Module

A controlled, self-commutating feed/feedback unit (with IGBTs in feed/feedback direction) which supplies a constant DC link voltage for the → Motor Modules. The Active Line Module operates together with the → Line reactor as a step-up converter.

Asynchronous (induction) motor

The asynchronous motor is an AC motor whose speed runs "behind" the synchronous speed.

Asynchronous motors can be connected to the three-phase system either directly in a star or delta connection or via a converter.

In combination with a converter, the asynchronous motor becomes a variable-speed drive system.

Other commonly used terms: squirrel-cage motor, cage motor.

See also → Synchronous motor.

Automatic restart

Upon power recovery after a mains failure, the Automatic restart function switches a converter automatically ON without requiring an acknowledgement of the power failure error. The automatic restart function e.g. minimizes drive standstill times and production failures.

However, operators must be aware of the danger situation which can occur when a drive recovers automatically after a longer power failure period without any operator action. If required, safe behaviour in such a danger situation must be insured by external control actions (e.g. withdrawal of the ON command).

Typical applications of the automatic restart: pump/fan/compressor drives working as single drives and often do not provide local control options. The automatic restart function is not used for coordinated drives for continuous material webs and motion control.

The following variants of this function can be set by means of parameters for SINAMICS:

- restart after a power failure if the 24-V electronic supply does not yet exist
- restart after a failure of the 24 V electronic supply
- restart after any shut down on fault

The following actions can be specified via parameters:

- only acknowledgement of the mains failure message (e.g. for multi-motor drives, DC compound)
- ON command upon expiry of the parameterized delay time
- ON command with flying restart

The number of possible restart trials within a parameterizable time can be specified.

It is also possible to activate the → Flying restart function in addition to the automatic restart function to ensure a bumpless switching to a possibly still rotating motor.

Basic Line Filter

In combination with a line reactor, line filters limit the conducted electromagnetic interference emission in accordance with EMC legislation.

Basic Line Module

Unregulated infeed unit (diode bridge or thyristor bridge, without power feedback) for rectifying the line voltage of the → DC link.

Basic Operator Panel

Simple small operator panel for plugging on a SINAMICS → Control Unit with numeric display and some keys.

BOP20 is part of the SINAMICS product range.

Blocksize

Volume-optimized, cubic construction of a drive unit. Mostly used for operating a motor.

See → Booksize, → Chassis unit.

Booksize

Book-shaped construction of the components of a drive group appropriate for back-mounting. Designed primarily for operating several → Motors.

Brake control

Software function specifying the instant when an existing mechanical holding brake or operational brake has to be applied; either within the framework of a load cycle in the case of a momentary standstill, or in the case of a fault.

Brake Relay

Component with a 24 V relay for brake control. Brakes can be switched using this relay with a rating of 24 V DC/12 A or 440 V AC/12 A.

Braking Module

Electronic switch or chopper (brake chopper), which connects a → Braking resistor with a specific pulse/pause ratio to the DC link voltage to convert regenerative (braking) energy to heat energy and to finally restrict the DC link voltage to permissible values. For SINAMICS, no braking resistor is incorporated in the braking module. It must be mounted outside the braking module.

Braking power

Regenerative power injected into the → DC link by one or several → Motor Modules, e.g. when lowering a load or decelerating a motor.

See → Braking resistor.

Braking resistor

Resistor which reduces the excess energy in the → DC link. The resistor is connected to a → Braking Module.

In this way, the resulting thermal loss is displaced outside the cabinet.

See → Braking power.

Capacitor Module

The module is used for increasing and buffering the DC link capacity.

It can be used for compensating a short-time power failure or for intermediate storage of the braking energy.

Chassis unit

In the upper output power range, chassis units are mostly used for incorporation in control panels. The components are mounted on supporting panels or frames.

See → Booksize → Blocksize.

Cold plate

The cold plate is a flat aluminum plate that is used as a thermal interface by the SINAMICS power modules with the → Cooling method → Cold plate cooling.

Cold plate cooling

Cold plate cooling is a → Cooling method for SINAMICS power modules that is only available currently for the → Booksize units. The cold plate is fixed to the rear of the unit instead of the normal ribbed heat sink.

Command data set

Parameter data set consisting of the binector inputs (e.g. for control commands) and the connector inputs (e.g. for setpoints).

The individual data sets are represented as indexed parameters. The changeover is performed via input signals.

The appropriate parameterization of several command data sets and the changeover of the data sets allows the optional operation of the drive with different preconfigured signal sources.

Communication Board

A module for external communication, e.g. → PROFIBUS, → PROFINET, CAN or Ethernet. It is plugged into the option slot of a → Control Unit.

Communication Board Ethernet 20

A module for operation with → PROFINET (the open Industrial Ethernet standard of PROFIBUS International for automation systems).

PROFINET IO with IRT (Isochronous Real Time) and PROFINET IO with RT (Real Time) are supported. It is plugged into the option slot of a → Control Unit.

CompactFlash card

Memory card for non-volatile storing of the drive software and of the corresponding parameters. The memory card can be plugged into the → Control Unit from outside.

Control Supply Module

24 V power supply module for the electronic circuitry of components in a SINAMICS drive group.

The Control Supply Module is supplied via two inputs: The incoming supply and the → DC link. The DC link connection ensures that the electronics power supply is buffered in the event of a power failure or voltage dip, thereby enabling emergency retraction and kinetic buffering.

Control Unit

Central control module: the feedforward and feedback control functions for several SINAMICS → Line Modules and/or → Motor Modules are implemented in this module.

Control Unit Adapter

A module for → DRIVE-CLiQ communication between a → Power Module in blocksize format (PM340) and a → Control Unit for several drives (e.g. CU320).

The Control Unit Adapter is connected through the → Power Module interface (PM-IF) to the → Power Module and through → DRIVE-CLiQ to the → Control Unit.

DC link

The component of the converter (or converter system) that connects the input current converter (rectifier) and the output current converter (one or more converters).

With voltage source DC link converters like SINAMICS, a constant DC voltage is present in the DC link (rectified line voltage).

Direct measuring system

Position encoder which is connected directly to the moving machine part as well as to the associated evaluation electronics. In the case of linear axes, it is also possible to use linear scales for this purpose.

In many cases, a direct measuring system must be used because the → Motor encoder for position sensing and control does not suit this purpose, e.g. due to excessive elasticity and backlash in the drive train.

Double Motor Module

Two motors can be connected to and operated with a Double Motor Module.

See → Motor Module, → Single Motor Module.

DRIVE-CLiQ

Abbreviation of Drive Component Link with IQ.

Communication system for connecting the various components of a SINAMICS drive system, such as the → Control Unit, the → Line Modules, the → Motor Modules, the → Motors and speed/position encoders.

The DRIVE-CLiQ hardware is based on the Industrial Ethernet standard and uses twisted-pair lines. The DRIVE-CLiQ line provides the transmitted and received signals and also the +24 V power supply.

Drive system

A drive system includes all components of a family of products (e.g. SINAMICS) belonging to a drive. A drive system includes components such as → Line Modules, → Motor Modules, → Encoders, → Motors, → Terminal Modules and → Sensor Modules, as well as complementary components such as reactors, filters, lines, etc.

Droop

Droop involves making the speed controller artificially "soft" by entering an adjustable percentage of the speed controller output signal with negative sign at the speed controller input. This means that the speed is slightly reduced at higher load torques. The droop function is used to reduce the response to load surges and for certain variations of load sharing control for drives which are coupled with one another through a continuous material web. The *I* component or the summed output signal can be used as speed output signal. The droop can be switched on and switched off using a control command.

Dynamic Servo Control

Dynamic Servo Control (DSC) allows the position actual value to be evaluated in a fast speed control clock cycle directly in the drive. The position reference value (position setpoint) is entered in the position controller clock cycle from the higher-level control via the isochronous → PROFIBUS with → PROFIdrive telegrams.

With sophisticated signal filtering and pre-control, DSC ensures optimum dynamics in the position control loop with a low bus bandwidth load.

DSC allows high control gains to be achieved and therefore a high level of stiffness - for instance to quickly compensate and correct load-related track/path deviations.

Edge modulation

Type of modulation for a drive converter gating unit, where the pulses "chopped" from the DC link voltage do not appear in a fixed time grid. The edges of the output voltage which is generated are formed by several short pulses near the zero crossing, while a wide pulse is generated at the center of every half-wave. This allows a high output voltage roughly approximating to 100 % of the line connection voltage and therefore ensuring good motor utilization.

Electronic rating plate

Each component of the SINAMICS drive system, which is connected via → DRIVE-CLiQ has an electronic rating plate.

This plate can be read out via the → STARTER commissioning tool and provides the following information: type, order number, version, manufacturer, serial number and rated technical data.

Encoder

An encoder is a measuring system capturing actual values for the speed and/or angular/position values and provides them for electronic processing. Depending on the mechanical construction, encoders can be incorporated in the → Motors (→ Motor encoder) or mounted on the external mechanics. Depending on the individual type of movement, we distinguish between rotary encoders and translatory encoders (e.g. linear encoder). In terms of measured-value provision, we distinguish between → Absolute encoders (code sensors) and → Incremental encoders.

See → Incremental encoder TTL/HTL, → Incremental encoder sin/cos 1 V_{pp}, → Resolver.

EnDat protocol

Serial transmission protocol for transmitting position/angular actual values from an → Absolute encoder to the drive or positioning control.

The EnDat protocol also allows parameterization and diagnostics of the encoder.

Fault buffer

Once a fault has occurred, the drive enters it in a fault buffer. The fault buffer can be read out via parameters.

Field weakening

The term field weakening designates the reduction of the magnetizing current of an electric motor to further increase the speed upon reaching the rated current.

Flexible response

With this function, the converter can be operated even in case of a voltage dip up to a minimum DC link voltage of approx. 50 % of the rated value (or of the parameterized line connection voltage value). In case of a voltage dip, the maximum output power of the converter decreases analogous to the current line voltage.

In contrast to kinetic buffering, a significant speed decrease can be avoided as long as the remaining power is sufficient for operating the drive with the required torque.

Flying measurement

When a hardware signal is received, the instantaneous position actual value is saved and, for example, is made available via PROFIBUS. The hardware signal can, for instance, be received from a measuring probe or a print index sensor (mechanical switch, BERO proximity switch or optical sensor). The active edge of the hardware signal can be parameterized (rising, falling or both).

Flying restart

After Power on, the "flying restart" function automatically switches a converter to a possibly coasting motor. When switching to the rotating motor, the motor first needs to be magnetized by an → Asynchronous motor. For drives not equipped with an encoder, a search for the current speed is carried out. The current speed setpoint in the ramp-function generator is then set to the current actual speed value. Ramp-up to the definitive speed setpoint starts out at this value. The flying restart function can help to shorten the ramp-up procedure following power-up when the load is still coasting down.

Application example:

After a power failure, a fan drive can be quickly reconnected to the running fan impeller by means of the flying restart function.

See → Automatic restart.

Heat dissipation

The thermal losses are conducted away from the converter and/or motor so that the permissible temperatures are not exceeded.

Hub

Central connecting element in a network based on star connection technology. A hub distributes arriving data packages to all devices connected.

Incremental encoder

Incremental position and speed encoder. In contrast to the → Absolute encoder, this encoder does not output an actual position value signal corresponding to the absolute path, but outputs incremental "delta position or angular signals" instead.

The following three types of incremental encoders are available → Incremental encoder TTL/HTL, → Incremental encoder sin/cos 1 V_{pp} or → Resolver.

Incremental encoder sin/cos 1 V_{pp}

An incremental encoder sin/cos 1 V_{pp} is defined as a high-resolution optical sine/cosine encoder which can, for example, be incorporated in 1FK motors as a → Motor encoder.

As a rule, the following signals are output:

- Two signals displaced by 90 degrees, with respectively 2048 sinusoidal signal periods per revolution as differential signals with a 1 V_{pp} amplitude (A/B sinusoidal encoder tracks).
- A reference signal (zero pulse) per revolution as a differential signal with a 0.5 V_{pp} amplitude.
- For some types, additionally two sinusoidal signal periods displaced by 90 degrees as differential signals with a 1 V_{pp} amplitude (C/D tracks).

For determining the actual position or angular value, the zero crossings of the sinusoidal encoder tracks are evaluated first (rough evaluation, e.g. totally 4 x 2048 = 8192 zero crossings per revolution). In addition to this, a fine evaluation can be performed by means of an analog detection of the amplitude. By combining the rough and fine evaluation, resolutions of more than 1 million increments can be achieved per encoder revolution.

Examples of typical sin/cos encoders: ERN1387, ERN1381.

Incremental encoder TTL/HTL

Incremental position and speed measuring encoder (→ Incremental encoder). In most cases, it outputs two pulse chains (tracks) displaced by 90 degrees with rectangular output signals and often additionally one zero pulse per revolution, respectively. The output signals feature TTL levels (in most cases +5 V RS422 differential signals; TTL = Transistor-Transistor Logic) or HTL levels (+15 or +24 V logic level; HTL = High Level Transistor Logic).

Line filter

Line filters are filters in the converter input which protect the network from harmonic loads and/or interference voltages created in the converter.

Line filters can be passive or active filters, for the lower-frequency harmonics (designated with the term line feedback) with 5, 7, 11, 13, etc. times the line frequency, and also filters for high frequency interference voltages from 10 kHz onward (i.e. RFI suppression filters).

With SINAMICS, the term line filter only designates passive RFI suppression filters.

Line Module

A Line Module is a power component which creates the DC link voltage for one or several → Motor Modules from a three-phase line voltage.

The following three Line Module types are used for SINAMICS:

→ Basic Line Module, → Smart Line Module and → Active Line Module.

Line reactor

Line reactors are used for reducing the line-side harmonic currents and harmonic effects. With the → Active Line Modules, line reactors are used as an additional energy storage.

Line-side power components

Power components arranged between the line and the converter unit, such as line reactors, line filters, line contactors.

Liquid cooling

Liquid cooling is a cooling method for SINAMICS power modules and is only available for the → Chassis units. For this cooling method, a liquid cooler with inlet and outlet nozzles is permanently integrated. The specifications quoted by Siemens AG are applicable to the liquid quality, volumetric flow (quantity of liquid per time unit) and liquid pressure. Liquid cooling can also be retrofitted by the customer in the case of the → Cold plate cooling method.

Motor

For the electric motors which can be driven by SINAMICS, a principle distinction is made between rotary and linear motors with regard to their moving direction, and between synchronous and asynchronous (induction) motors with regard to their electromagnetic operating principle. For SINAMICS, the motors are connected to a → Motor Module.

See → Synchronous motor, → Asynchronous (induction) motor, → Motor encoder.

Motor with DRIVE-CLiQ

The motors with → DRIVE-CLiQ comprise of a motor, encoder and an integrated encoder evaluation system. To operate these motors, a power cable and a → DRIVE-CLiQ cable must be connected to the → Motor Module.

Motor encoder

An → Encoder integrated in the motor or built on the motor, e.g. → Resolver, → Incremental encoder TTL/HTL or → Incremental encoder sin/cos 1 V_{pp}.

The encoder detects the motor speed and, in the case of synchronous motors, also the rotor position angle (of the commutation angle for the motor currents).

For drives without an additional → Direct measuring system, it is also used as a position encoder for position controlling.

Motor Module

A Motor Module is a power unit (DC-AC inverter) ensuring the power supply for the connected motor.

Power is supplied through the → DC link of the drive group.

A Motor Module must be connected to a → Control Unit via → DRIVE-CLiQ. The open-loop and closed-loop control functions of the Motor Module are stored in the Control Unit.

There are → Single Motor Modules and → Double Motor Modules.

Motor potentiometer

This function is used to simulate an electromechanical motor potentiometer for setpoint input. The setpoint is adjusted via one control command for "higher" and one for "lower".

Motor-side power components

Power components arranged between the converter unit and the motor, e.g. output filters, output reactors, etc.

Optimized pulse patterns

Complicated modulation procedure of a converter gating unit, where the voltage pulses are arranged in such a way that the output current has a sinusoidal curve at an optimum aproximation. This is of primary importance for achieving a high gate factor and a particularly slow torque ripple.

Output reactor

Reactor (inductance) in the converter or inverter output for reducing the capacitive charge/discharge currents of long power cables.

Power Module

A Power Module is an AC-AC converter, which does not have a built-in → Control Unit.

Power supply unit

This component provides electric energy for electric and electronic components.

For SINAMICS, all components are internally connected via 24 V terminals or rails.

The power supply can be ensured by a power supply unit available on the market (e.g. SITOP power) or via a conventional → Control Supply Module.

PROFIBUS

Field bus in accordance with the IEC 61158 standard, sections 2 to 6.

PROFIdrive

This PROFIBUS profile was specified for speed-controlled and position-controlled drives by PNO (PROFIBUS user organisation).

The PROFIdrive V3 profile is the latest version.

PROFINET

This is an open component-based industrial communication system using → Ethernet for distributed automation systems.

Resolver

Mechanically and electrically very robust and cost-efficient → Motor encoder which does not require any incorporated electronics and which operates according to a fully electromagnetic principle: one sine and cosine signal, respectively, are induced in two coils displaced by 90 degrees. The resolver delivers all signals required for speed-controlled operation of the converter or for position control. The number of sine and cosine periods per revolution is equal to the number of pole pairs of the resolver. In the case of a 2-pole resolver, the evaluation electronics may output an additional zero pulse per encoder revolution. This zero pulse ensures a unique assignment of the position information in relation to an encoder revolution. A 2-pole resolver can be used as a single-turn encoder.

2-pole resolvers are suitable for motors with any pole number. In the case of multi-pole resolvers, the pole pair number of the motor and of the resolver are always identical. For this reason, multi-pole resolvers ensure a higher resolution than 2-pole resolvers.

Safe Brake Control

Function associated with → Safety Integrated.

For SINAMICS → Booksize units the motor holding brake is controlled through two channels each with an electronic switch in the +24 V channel and in the ground channel. Both of these channels are monitored. If one of the two channels fails, then this is detected and signaled. For the Booksize drive units, the braking cables are integrated into the power cable.

See → Brake control.

Safe Brake Relay

Certified components for the safe control of a 24 V brake coil.

See → Brake Relay.

Safe standstill

Function of → Safety Integrated.

In case of an error or in combination with a machine function, this function is used to safely disconnect the torque-generating energy flow to the motor. This procedure is executed drive-specific and contactless. See → Safety Integrated.

Safety Integrated

These safety functions are integrated into the products and ensure efficient personal and machine protection in accordance with the EC 98/37/EG machinery directive.

By means of the integrated safety functions, the requirements of safety class 3 in accordance with EN 954-1 can be met in a simple and efficient way.

Sensor Module

Hardware module for evaluating speed/position encoder signals.

Single Motor Module

A Single Motor Module is a → Motor Module to which one single motor can be connected and operated.

See also → Double Motor Module.

Sine-wave filter

The sine-wave filter is connected to the converter or inverter output on the motor side. This filter has been designed for the generation of a converter output voltage with an almost sinusoidal shape.

This method protects motors whose isolation system could be damaged by voltage peaks.

In addition to this, a shielded → Power cable is not required in many cases.

Sine-wave filters are often required in the chemical industry, e.g. to ensure that the permissible insulation voltage in the motor terminal box is not exceeded.

SIZER

SIZER is a tool for configuring the SINAMICS and MICROMASTER drive systems. SIZER assists with the correct technical specifications for the drive systems and selection of the drive components required for the system.

See → STARTER.

Smart Line Module

Unregulated line infeed/feedback unit with a diode bridge for feeding; stall-protected, line-commutated feedback via IGBTs (Insulated Gate Bipolar Transistor).

The Smart Line Modules provides the DC link voltage for the → Motor Module.

STARTER

The STARTER commissioning tool has been designed for the startup and parameterization of drive units. Moreover, diagnostic functions required for service tasks (e.g. PROFIBUS diagnostics, function generator, trace) can be executed.

See → SIZER.

Skip frequency band

A skip frequency band is a speed/frequency setpoint range in which the drive must not be operated. The upper and lower limits of the skip frequency band can be parameterized. If a signal value is entered from an external or internal setpoint source within the skip frequency band, this signal value is replaced by one of the skip frequency limits. This function allows for the suppression of undesirable mechanical resonant oscillation by suppressing those speeds which could possibly excite this type of resonant oscillation.

Synchronous motor

Synchronous motors run at the same frequency with which they are operated. They do not have a slip (like → Asynchronous (induction) motors). Synchronous motors require different feed forward and feedback control concepts depending on their design to ensure that they can be operated with converters.

Synchronous motors are distinguished by the following features:

- Permanent-magnet/separately excited
- With/without damping cage
- With/without position encoder

Synchronous motors are used for different reasons:

- High drive dynamic response (→ Synchronous servomotors)
- High overload capability
- High speed accuracy with exactly specified frequency (SIEMOSYN motors)

Synchronous servomotor

Synchronous servomotors (e.g. 1FK, 1FT) are permanent-magnet → Synchronous motors with position encoders such as an → Absolute encoder. As the moments of self-inertia are low, the drive is extremely dynamic, e.g. because there are no power losses due to the electric resistance of copper in the rotor, a high power density is achieved with a low construction volume. Synchronous servomotors can only be operated in combination with converters. Due to the servo control required for this purpose, the motor current is moment-dependent. The momentary phase relation of the motor current is derived from the (mechanical) rotor position detected by the position encoder.

Terminal Board

Terminal extension module for plugging into a → Control Unit.

With SINAMICS, the Terminal Board TB30 is available with analog and digital I/O terminals.

Terminal Module

Terminal expansion module that snaps onto the installation rail, for installation in the control cabinet.

With SINAMICS, there is, for example, the Terminal Module TM31 available with analog and digital I/O terminals.

Third-party motor

A motor is designated as a third-party motor if its motor data is not known to the drive line-up and it cannot be identified by means of its order number.

The motor data of an external motor is required for commissioning. It must be manually entered in the corresponding parameters.

Topology

The topology describes the structure of a drive system with → Control Unit, → Motor Modules, → Motors, → Encoders, → Terminal Modules, including the connection system.

Travel to a fixed stop

With this function, a motor can be travelled to a fixed stop with a defined torque/force, without any fault message. As soon as the fixed stop is reached, the torque/force defined via paramaters is built up and persists.

Vector control

Vector control (field-oriented control) is a high-performance control type for induction machines. It is based on an exact model calculation of the motor and of two current components which control the flow and the torque by means of software algorithms. In this way, the predefined speeds and torques to be respected and limited accurately and with a good dynamic response.

There are two vector control types:

- Frequency control (sensorless vector control)
- Speed-torque control with speed feedback (→ Encoder).

Voltage Clamping Module

Component which limits the → DC link voltage and therefore also the motor voltages to permissible values in the case of resonance.

With power cables of excessive length, excitation of the system's resonant frequency under adverse conditions can cause overvoltages to develop in the DC link. In such cases, the insulation systems of the connected motors are particularly at risk and partial discharges can occur.

This component must be used if the total length of all power cables exceeds 350 m (shielded cables) and 500 m (unshielded cables).

Voltage Sensing Module

Component which measures the actual line voltage and makes the measured data available via → DRIVE-CLiQ. Used in conjunction with an → Active Line Module for feeding back the actual line voltage value.

It can be mounted on a top-hat rail and also features 2 analog inputs and a connection for a temperature sensor.

Overview

Many products in this catalog are in compliance with UL/CSA requirements and are labeled with the appropriate certification markings.

All certifications, certificates, declarations of conformance, test certificates, e.g. CE, UL, Safety Integrated have been performed with the associated system components as they are described in the Catalogs and Configuration Manuals.

The certificates are only valid if the products are used with the described system components, are installed according to the Installation Guidelines and are used for their intended purpose.

For cases that deviate from these conditions, the company or person marketing these products is responsible in having the certificates appropriately re-issued.

UL: Underwriters Laboratories
Independent public testing institution in North America

Approval marks:

- **UL** for end products, tested by UL in accordance with UL standard
- **cUL** for end products, tested by UL in accordance with CSA standard
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- **UR** for mounting parts in end products, tested by UL in accordance with UL standard
- **cUR** for mounting parts in end products, tested by UL in accordance with CSA standard
- **cURus** for mounting parts in end-products, tested by UL in accordance with UL and CSA standards

Test standards:

- SIMOTION: Standard UL 508
- SINAMICS: Standard UL 508C
- Motors: Standard UL 547

Product category/File No.:

- SIMOTION: E164110
- SINAMICS: E192450
- Motors: E93429

TUV: TUV Rheinland of North America Inc.
Independent public testing institution in North America
National recognized testing laboratory (NRTL)

Approval mark:

- **cTUVus** tested by TUV in accordance with UL and CSA standards

CSA: Canadian Standards Association
Independent public testing institution in Canada

Approval mark:

- **CSA** tested by CSA in accordance with CSA standard

Test standard:

- Standard CAN/CSA-C22.2/No. 0-M91/No. 14-05/No. 142-M1987

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Software licenses

Overview

Software types

Software requiring a license is categorized into types.
The following software types have been defined:

- Engineering software
- Runtime software

Engineering software

This includes all software products for creating (engineering) user software, e.g. for configuring, programming, parameterizing, testing, commissioning or servicing.

Data generated with engineering software and executable programs can be duplicated for your own use or for use by third-parties free-of-charge.

Runtime software

This includes all software products required for plant/machine operation, e.g. operating system, basic system, system expansions, drivers, etc.

The duplication of the runtime software and executable programs created with the runtime software for your own use or for use by third-parties is subject to a charge.

You can find information about license fees according to use in the ordering data (e.g. in the catalog). Examples of categories of use include per CPU, per installation, per channel, per instance, per axis, per control loop, per variable, etc.

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- Floating license
- Single license
- Rental license
- Trial license
- Factory license

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A license is required for each concurrent user.

Single license

Unlike the floating license, a single license permits only one installation of the software.

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One single license is required for each type of use defined.

Rental license

A rental license supports the "sporadic use" of engineering software. Once the license key has been installed, the software can be used for a specific number of hours (the operating hours do not have to be consecutive).
One license is required for each installation of the software.

Trial license

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It can be transferred to another license.

Factory license

With the Factory License the user has the right to install and use the software at one permanent establishment only. The permanent establishment is defined by one address only.The number of hardware devices on which the software may be installed results from the order data or the Certificate of License (CoL).

Certificate of license

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Downgrading

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The following delivery versions

- PowerPack
- Upgrade

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Overview

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Software update services

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To order the software update service, an order number must be specified. The software update service can be ordered when the software products are ordered or at a later date. Subsequent orders require that the ordering party is in posession at least of a single license.

Note:
It is recommended that the software update service is ordered as early as possible. If a new software version of a software product is released for delivery by Siemens, only those customers will receive it automatically who are entered in the appropriate delivery list at Siemens at this time. Previous software versions, or the current software version are not supplied when the software update service is ordered. The software update service requires that the software product is up-to-date at the time of completion of the contract for the software update service.

Delivery
When a software update service is ordered, you will be sent the contractual conditions of this service and the price is due for payment. At the same time, you will be included in a delivery list for the software product to be updated. If Siemens releases a new software version for the corresponding software product for general sale (function version or product version), it will be delivered automatically to the goods recipient specified in the delivery address within the contract period.

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Rotary inertia (to convert from A to B, multiply by entry in table)

A \ B	lb-in^2	lb-ft^2	lb-in-s^2	lb-ft-s^2 slug-ft^2	kg-cm^2	kg-cm-s^2	gm-cm^2	gm-cm-s^2	oz-in^2	oz-in-s^2
lb-in^2	1	6.94×10^{-3}	2.59×10^{-3}	2.15×10^{-4}	2.926	2.98×10^{-3}	2.92×10^{3}	2.984	16	4.14×10^{-2}
lb-ft^2	144	1	0.3729	3.10×10^{-2}	421.40	0.4297	4.21×10^{5}	429.71	2304	5.967
lb-in-s^2	386.08	2.681	1	8.33×10^{-2}	1.129×10^{3}	1.152	1.129×10^{6}	1.152×10^{3}	6.177×10^{3}	16
lb-ft-s^2 slug-ft^2	4.63×10^{3}	32.17	12	1	1.35×10^{4}	13.825	1.355×10^{7}	1.38×10^{4}	7.41×10^{4}	192
kg-cm^2	0.3417	2.37×10^{-3}	8.85×10^{-4}	7.37×10^{-5}	1	1.019×10^{-3}	1000	1.019	5.46	1.41×10^{-2}
kg-cm-s^2	335.1	2.327	0.8679	7.23×10^{-2}	980.66	1	9.8×10^{5}	1000	5.36×10^{3}	13.887
gm-cm^2	3.417×10^{-4}	2.37×10^{-6}	8.85×10^{-7}	7.37×10^{-8}	1×10^{-3}	1.01×10^{-6}	1	1.01×10^{-3}	5.46×10^{-3}	1.41×10^{-5}
gm-cm-s^2	0.335	2.32×10^{-3}	8.67×10^{-4}	7.23×10^{-5}	0.9806	1×10^{-3}	980.6	1	5.36	1.38×10^{-2}
oz-in^2	0.0625	4.34×10^{-4}	1.61×10^{-4}	1.34×10^{-5}	0.182	1.86×10^{-4}	182.9	0.186	1	2.59×10^{-3}
oz-in-s^2	24.13	0.1675	6.25×10^{-2}	5.20×10^{-3}	70.615	7.20×10^{-2}	7.09×10^{4}	72.0	386.08	1

Torque (to convert from A to B, multiply by entry in table)

A \ B	lb-in	lb-ft	oz-in	N-m	kg-cm	kg-m	gm-cm	dyne-cm
lb-in	1	8.333×10^{-2}	16	0.113	1.152	1.152×10^{-2}	1.152×10^{3}	1.129×10^{6}
lb-ft	12	1	192	1.355	13.825	0.138	1.382×10^{4}	1.355×10^{7}
oz-in	6.25×10^{-2}	5.208×10^{-3}	1	7.061×10^{-3}	7.200×10^{-2}	7.200×10^{-4}	72.007	7.061×10^{4}
N-m	8.850	0.737	141.612	1	10.197	0.102	1.019×10^{4}	1×10^{7}
kg-cm	0.8679	7.233×10^{-2}	13.877	9.806×10^{-2}	1	10^{-2}	1000	9.806×10^{5}
kg-m	86.796	7.233	1.388×10^{3}	9.806	100	1	1×10^{5}	9.806×10^{7}
gm-cm	8.679×10^{-4}	7.233×10^{-5}	1.388×10^{-2}	9.806×10^{-5}	1×10^{-3}	1×10^{-5}	1	980.665
dyne-cm	8.850×10^{-7}	7.375×10^{-8}	1.416×10^{-5}	10^{-7}	1.0197×10^{-6}	1.019×10^{-8}	1.019×10^{-3}	1

Length (to convert from A to B, multiply by entry in table)

A \ B	inches	feet	cm	yd	mm	m
inches	1	0.0833	2.54	0.028	25.4	0.0254
feet	12	1	30.48	0.333	304.8	0.3048
cm	0.3937	0.03281	1	1.09×10^{-2}	10	0.01
yd	36	3	91.44	1	914.4	0.914
mm	0.03937	0.00328	0.1	1.09×10^{-3}	1	0.001
m	39.37	3.281	100	1.09	1000	1

Power (to convert from A to B, multiply by entry in table)

A \ B	HP	Watts
HP (English)	1	745.7
(lb-in) (deg./s)	2.645×10^{-6}	1.972×10^{-3}
(lb-in) (rpm)	1.587×10^{-5}	1.183×10^{-2}
(lb-ft) (deg./s)	3.173×10^{-5}	2.366×10^{-2}
(lb-ft) (rpm)	1.904×10^{-4}	0.1420
Watts	1.341×10^{-3}	1

Force (to convert from A to B, multiply by entry in table)

A \ B	lb	oz	gm	dyne	N
lb	1	16	453.6	4.448×10^{5}	4.4482
oz	0.0625	1	28.35	2.780×10^{4}	0.27801
gm	2.205×10^{-3}	0.03527	1	1.02×10^{-3}	N.A.
dyne	2.248×10^{-6}	3.59×10^{-5}	980.7	1	0.00001
N	0.22481	3.5967	N.A.	100000	1

Mass (to convert from A to B, multiply by entry in table)

A \ B	lb	oz	gm	kg	slug
lb	1	16	453.6	0.4536	0.0311
oz	6.25×10^{-2}	1	28.35	0.02835	1.93×10^{-3}
gm	2.205×10^{-3}	3.527×10^{-2}	1	10^{-3}	6.852×10^{-5}
kg	2.205	35.27	10^{3}	1	6.852×10^{-2}
slug	32.17	514.8	1.459×10^{4}	14.59	1

Rotation (to convert from A to B, multiply by entry in table)

A \ B	rpm	rad/s	degrees/s
rpm	1	0.105	6.0
rad/s	9.55	1	57.30
degrees/s	0.167	1.745×10^{-2}	1

Temperature Conversion

°F	°C	°C	°F
0	–17.8	–10	14
32	0	0	32
50	10	10	50
70	21.1	20	68
90	32.2	30	86
98.4	37	37	98.4
212	100	100	212
subtract 32 and multiply by $^5/_9$		multiply by $^9/_5$ and add 32	

Mechanism Efficiencies

Acme-screw with brass nut	~0.35–0.65
Acme-screw with plastic nut	~0.50–0.85
Ball-screw	~0.85–0.95
Chain and sprocket	~0.95–0.98
Preloaded ball-screw	~0.75–0.85
Spur or bevel-gears	~0.90
Timing belts	~0.96–0.98
Worm gears	~0.45–0.85
Helical gear (1 reduction)	~0.92

Friction Coefficients

Materials	μ
Steel on steel (greased)	~0.15
Plastic on steel	~0.15–0.25
Copper on steel	~0.30
Brass on steel	~0.35
Aluminum on steel	~0.45
Steel on steel	~0.58

Mechanism	μ
Ball bushings	<0.001
Linear bearings	<0.001
Dove-tail slides	~0.2++
Gibb ways	~0.5++

Material Densities

Material	lb-in^3	gm-cm^3
Aluminum	0.096	2.66
Brass	0.299	8.30
Bronze	0.295	8.17
Copper	0.322	8.91
Hard wood	0.029	0.80
Soft wood	0.018	0.48
Plastic	0.040	1.11
Glass	0.079–0.090	2.2–2.5
Titanium	0.163	4.51
Paper	0.025–0.043	0.7–1.2
Polyvinyl chloride	0.047–0.050	1.3–1.4
Rubber	0.033–0.036	0.92–0.99
Silicone rubber, without filler	0.043	1.2
Cast iron, gray	0.274	7.6
Steel	0.280	7.75

Wire Gauges[1)]

Cross-section mm^2	Standard Wire Gauge (SWG)	American Wire Gauge (AWG)
0.2	25	24
0.3	23	22
0.5	21	20
0.75	20	19
1.0	19	18
1.5	17	16
2.5	15	13
4	13	11
6	12	9
10	9	7
16	7	6
25	5	3
35	3	2
50	0	1/0
70	000	2/0
95	00000	3/0
120	0000000	4/0
150	–	6/0
185	–	7/0

1) The table shows approximate SWG/AWG sizes nearest to standard metric sizes; the cross-sections do not match exactly.

Explanation of the metal factor

Surcharges will be added to the prices of products that contain silver, copper, aluminum, lead and/or gold if the respective basic official prices for these metals are exceeded.

The surcharges will be determined based on the following criteria:

- Official price of the metal
- Official price on the day prior to receipt of the order or prior to the release order (=daily price) for
  - silver (sale price of the processed material),
  - gold (sale price of the processed material)

  Source: Umicore, Hanau (www.metalsmanagement.umicore.com)

  and for
  - copper (low DEL notation + 1 %),
  - aluminum (aluminum in cables) and
  - lead (lead in cables)

  Source: German Trade Association for Cables and Conductors (www.kabelverband.org)
- Metal factor of the products
- Certain products are assigned a metal factor. The metal factor determines the official price as of which the metal surcharges are charged and the calculation method used (weight or percentage method). An exact explanation is given below.

Structure of the metal factor

The metal factor consists of several digits; the first digit indicates whether the method of calculation refers to the list price or a discounted price (customer net price)
(L = list price / N = customer net price).

The remaining digits indicate the method of calculation used for the respective metal. If no surcharge is added, a "-" is used.

1st digit	List or customer net price using the percentage method
2nd digit	for silver (AG)
3rd digit	for copper (CU)
4th digit	for aluminum (AL)
5th digit	for lead (PB)
6th digit	for gold (AU)

Weight method

The weight method uses the basic official price, the daily price and the raw material weight. In order to calculate the surcharge, the basic official price must be subtracted from the daily price. The result is then multiplied by the raw material weight.

The basic official price can be found in the table below using the number (2 to 9) of the respective digit of the metal factor. The raw material weight can be found in the respective product descriptions.

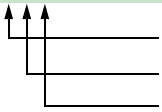
Percentage method

Use of the percentage method is indicated by the letters A-Z at the respective digit of the metal factor.

The surcharge is increased - dependent on the deviation of the daily price compared with the basic official price - using the percentage method in "steps" and consequently offers surcharges that remain constant within the framework of this "step range". A higher percentage rate is charged for each new step. The respective percentage level can be found in the table below.

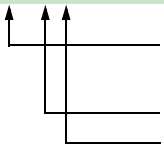
Metal factor examples

L E A – – –



Basis for % surcharge: List price
Silver: basis 150 €, step range 50 €, 0.5 %
Copper: basis 150 €, step range 50 €, 0.1 %
No surcharge for aluminum
No surcharge for lead
No surcharge for gold

N – A 6 – –



Basis for % surcharge: Customer net price
No surcharge for silver
Copper: basis 150 €, step range 50 €, 0.1 %
Aluminum acc. to weight, basic offic. price 225 €
No surcharge for lead
No surcharge for gold

– – 3 – – –

No basis necessary
No surcharge for silver
Copper acc. to weight, basic official price150 €
No surcharge for aluminum
No surcharge for lead
No surcharge for gold

Values of the metal factor

Percentage method	Basic official price	Step range	% surcharge 1st step	% surcharge 2nd step	% surcharge 3rd step	% surcharge 4th step	% surcharge per additional step
			Official price 151 € – 200 €	Official price 201 € – 250 €	Official price 251 € – 300 €	Official price 301 € – 350 €	
A	150	50	0.1	0.2	0.3	0.4	0.1
B	150	50	0.2	0.4	0.6	0.8	0.2
C	150	50	0.3	0.6	0.9	1.2	0.3
D	150	50	0.4	0.8	1.2	1.6	0.4
E	150	50	0.5	1.0	1.5	2.0	0.5
F	150	50	0.6	1.2	1.8	2.4	0.6
H	150	50	1.2	2.4	3.6	4.8	1.2
J	150	50	1.8	3.6	5.4	7.2	1.8
			176 € – 225 €	226 € – 275 €	276 € – 325 €	326 € – 375 €	
O	175	50	0.1	0.2	0.3	0.4	0.1
P	175	50	0.2	0.4	0.6	0.8	0.2
R	175	50	0.5	1.0	1.5	2.0	0.5
			226 € – 275 €	276 € – 325 €	326 € – 375 €	376 € – 425 €	
S	225	50	0.2	0.4	0.6	0.8	0.2
U	225	50	1.0	2.0	3.0	4.0	1.0
V	225	50	1.0	1.5	2.0	3.0	1.0
W	225	50	1.2	2.5	3.5	4.5	1.0
			151 € – 175 €	176 € – 200 €	201 € – 225 €	226 € – 250 €	
Y	150	25	0.3	0.6	0.9	1.2	0.3
			401 € – 425 €	426 € – 450 €	451 € – 475 €	476 € – 500 €	
Z	400	25	0.1	0.2	0.3	0.4	0.1
	Price basis (1st digit)						
L	Charged on the list price						
N	Charged on the customer net price or discounted list price						

Weight method	Basic official price	
2	100	Calculation based on raw material weight
3	150	
4	175	
5	200	
6	225	
7	300	
8	400	
9	555	
Misc.		
-	No metal surcharge	

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