SIEMENS

SINAMICS Inverters for Single-Axis Drives and SIMOTICS Motors

Motion Control Drives

Catalog D 31

Edition 2015

Answers for industry.

Related catalogs

Motion Control PM 21
SIMOTION, SINAMICS S120 & SIMOTICS
Equipment for Production Machines

E86060-K4921-A101-A3-7600

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

E86060-K5511-A101-A5-7600

SINAMICS Drives D 35
SINAMICS G120P and
SINAMICS G120P Cabinet
pump, fan, compressor converters

E86060-K5535-A101-A1-7600

SIMOTICS Low-Voltage Motors D 81.1
Type series 1LE1, 1MB1 and 1PC1
Frame sizes 71 to 315
Power range 0.18 to 200 kW

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FLENDER couplings MD 10.1
Standard Couplings

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SIMATIC ST 70
Products for
Totally Integrated Automation

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SIMATIC HMI /
PC-based Automation ST 80/ST PC
Human Machine Interface Systems
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E86060-K4680-A101-C2-7600

Industrial Communication IK PI
SIMATIC NET

E86060-K6710-A101-B8-7600

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Training for Industry

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Products for Automation and Drives CA 01
Interactive Catalog, DVD

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Up-to-date information material, such as promotional literature, catalogs or brochures, is always available in the Internet at the following addresses
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under "Information material (Brochures, Catalogs)".

The offered documentation can be ordered or downloaded in common file formats (PDF, ZIP).

NEW New products included in this catalog.

SINAMICS Inverters for Single-Axis Drives and SIMOTICS Motors

Motion Control Drives

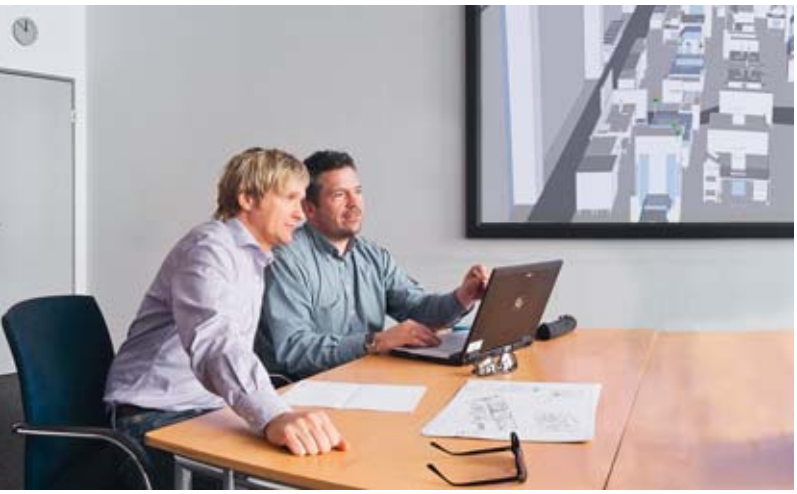
Catalog D 31 · 2015

Supersedes:
Catalog D 31 · 2012
Catalog D 31 N · January 2013

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.
Article No.: E86060-D4001-A510-D4-7600

Please contact your local Siemens branch.



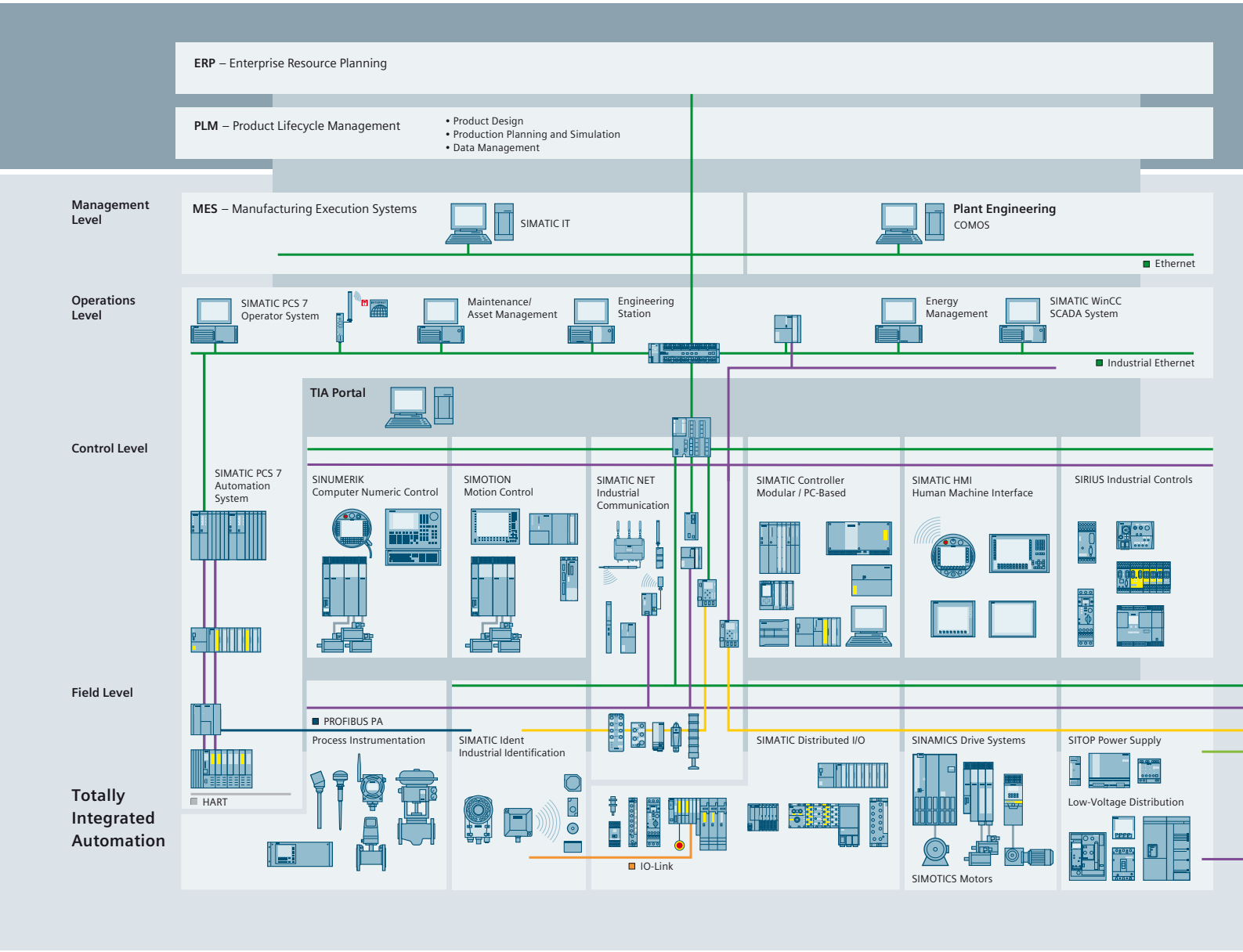
Answers for industry.

Integrated technologies, vertical market expertise and services for greater productivity, energy efficiency, and flexibility.

Siemens is the world's leading supplier of innovative and environmentally friendly products and solutions for industrial companies. End-to-end automation technology and industrial software, solid market expertise, and technology-based services are the levers we use to increase our customers' productivity, efficiency and flexibility.

We consistently rely on integrated technologies and, thanks to our bundled portfolio, we can respond more quickly and flexibly to our customers' wishes. With our globally unmatched range of automation technology, industrial control and drive technology as well as industrial software, we equip companies with exactly what they need over their entire value chain – from product design and development to production, sales and service. Our industrial customers benefit from our comprehensive portfolio, which is tailored to their market and their needs.

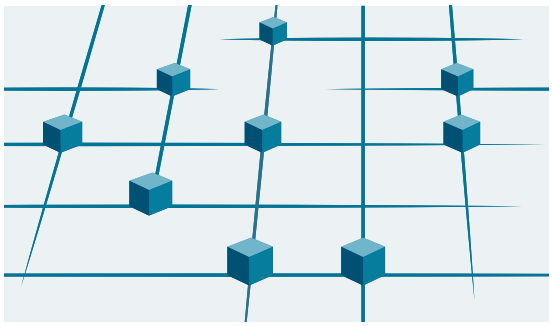
Market launch times can be reduced by up to 50 % due to the combination of powerful automation technology and industrial software from Siemens Industry. At the same time, the costs for energy or waste water for a manufacturing company can be reduced significantly. In this way, we increase our customers' competitive strength and make an important contribution to environmental protection with our energy-efficient products and solutions.



Efficient automation starts with efficient engineering.

Totally Integrated Automation: Efficiency driving productivity.

Efficient engineering is the first step toward better production that is faster, more flexible, and more intelligent. With all components interacting efficiently, Totally Integrated Automation (TIA) delivers enormous time savings right from the engineering phase. The result is lower costs, faster time-to-market, and greater flexibility.



Totally Integrated Automation
Efficient interoperability of all automation components

A unique complete approach for all industries

As one of the world's leading automation suppliers, Siemens provides an integrated, comprehensive portfolio for all requirements in process and manufacturing industries. All components are mutually compatible and system-tested. This ensures that they reliably perform their tasks in industrial use and interact efficiently, and that each automation solution can be implemented with little time and effort based on standard products. The integration of many separate individual engineering tasks into a single engineering environment, for example, provides enormous time and cost savings.

With its comprehensive technology and industry-specific expertise, Siemens is continuously driving progress in manufacturing industries – and Totally Integrated Automation plays a key role.

Totally Integrated Automation creates real value added in all automation tasks, especially for:

- **Integrated engineering**
  Consistent, comprehensive engineering throughout the entire product development and production process
- **Industrial data management**
  Access to all important data occurring in productive operation – along the entire value chain and across all levels
- **Industrial communication**
  Integrated communication based on international cross-vendor standards that are mutually compatible
- **Industrial security**
  Systematic minimization of the risk of an internal or external attack on plants and networks
- **Safety Integrated**
  Reliable protection of personnel, machinery, and the environment thanks to seamless integration of safety technologies into the standard automation

Making things right with Totally Integrated Automation

Totally Integrated Automation, industrial automation from Siemens, stands for the efficient interoperability of all automation components. The open system architecture covers the entire production process and is based on end-to-end shared characteristics: consistent data management, global standards, and uniform hardware and software interfaces.

Totally Integrated Automation lays the foundation for comprehensive optimization of the production process:

- Time and cost savings due to efficient engineering
- Minimized downtime due to integrated diagnostic functions
- Simplified implementation of automation solutions due to global standards
- Better performance due to interoperability of system-tested components

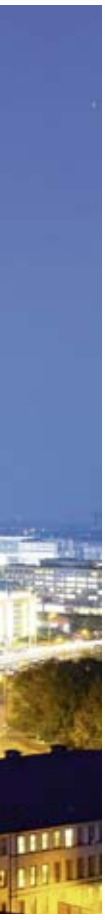
Totally Integrated Power
We bring power to the point – safely and reliably.

Comprehensive answers for power distribution in complex energy systems – from Siemens

Efficient, reliable, safe: These are the demands placed on electrification and especially power distribution. And our answer – for all application areas of the energy system – is Totally Integrated Power (TIP). It's based on our comprehensive range of products, systems, and solutions for low and medium voltage, rounded out by our support throughout the entire lifecycle – from planning with our own software tools to installation, operation, and services.

Smart interfaces allow linking to industrial or building automation, making it possible to fully exploit all the optimization potential of an integrated solution. This is how we provide our customers around the world with answers to their challenges. With highly efficient, reliable, and safe power distribution, we lay the foundation for sustainable infrastructure and cities, buildings, and industrial plants. We bring power to the point – wherever and whenever it is needed.

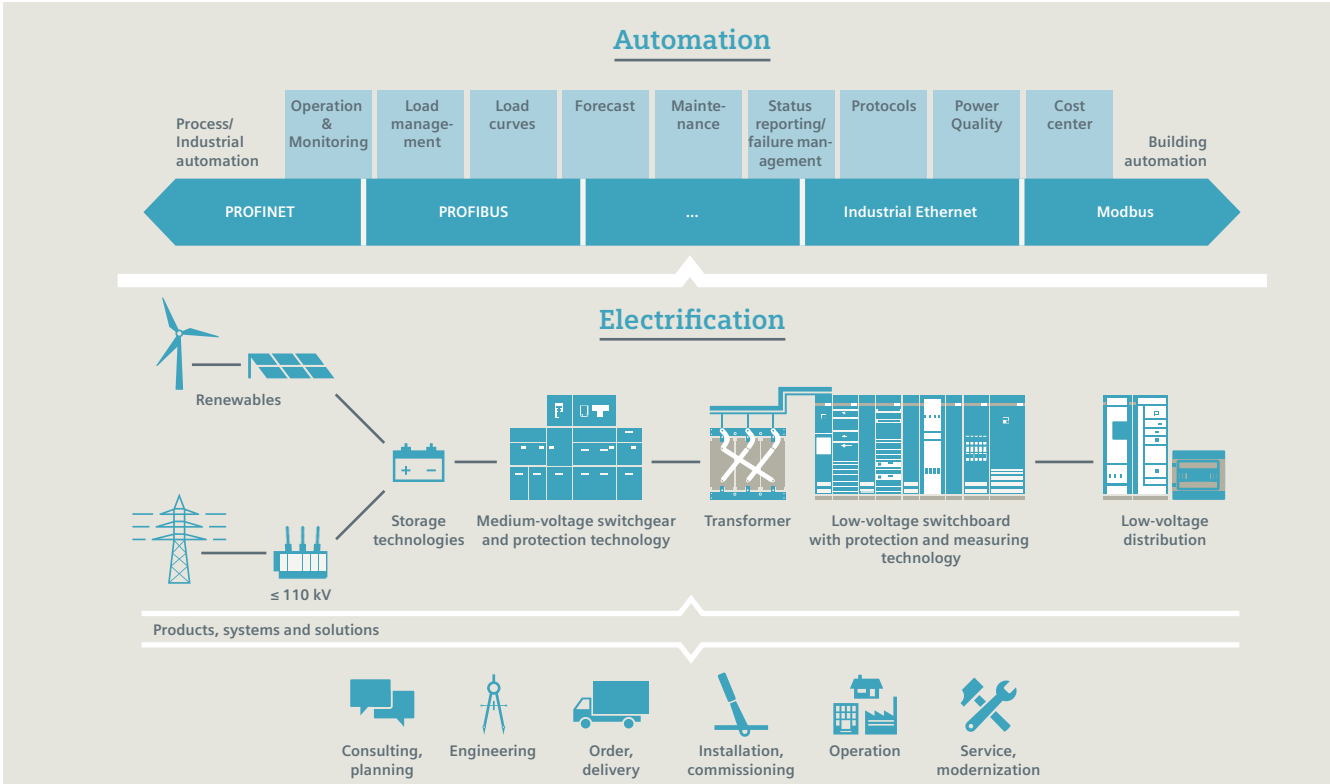
More information: www.siemens.com/tip



Totally Integrated Power offers more:

- **Consistency**:
  For simplified plant engineering and commissioning as well as smooth integration into automation solutions for building or production processes
- **One-stop-shop**:
  A reliable partner with a complete portfolio for the entire process and lifecycle – from the initial idea to after-sales service
- **Safety**:
  A comprehensive range of protection components for personnel safety and line and fire protection, safety by means of type testing
- **Reliability**:
  A reliable partner who works with customers to develop long-lasting solutions that meet the highest quality standards
- **Efficiency**:
  Bringing power to the point means greater plant availability and maximum energy efficiency in power distribution
- **Flexibility**:
  End-to-end consistency and modular design of Totally Integrated Power for any desired expansions and adaptation to future requirements
- **Advanced technology**:
  Reliable power distribution especially for applications in which supply is critical, continuous refinement of the technology

Challenges are our speciality



Integrated Drive Systems

Faster on the market and in the black with Integrated Drive Systems

SINAMICS is an important element of a Siemens Integrated Drive System, contributing significantly to increased efficiency, productivity, and availability in industrial production processes.

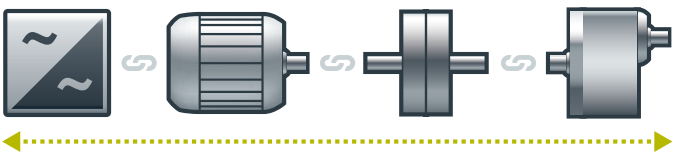
Integrated Drive Systems are Siemens' trendsetting answer to the high degree of complexity that characterizes drive and automation technology today. The world's only true one-stop solution for entire drive systems is characterized in particular by its threefold integration:

Horizontal, vertical, and lifecycle integration ensure that every drive system component fits seamlessly into the whole system, into any automation environment, and even into the entire lifecycle of a plant.

The outcome is an optimal workflow – from engineering all the way to service that entails more productivity, increased efficiency, and better availability. That's how Integrated Drive Systems reduce time to market and time to profit.

Horizontal integration

Integrated drive portfolio: The core elements of a fully integrated drive portfolio are frequency converters, motors, couplings, and gear units. At Siemens, they're all available from a single source. Perfectly integrated, perfectly interacting. For all power and performance classes. As standard solutions or fully customized. No other player in the market can offer a comparable portfolio. Moreover, all Siemens drive components are perfectly matched, so they are optimally interacting.



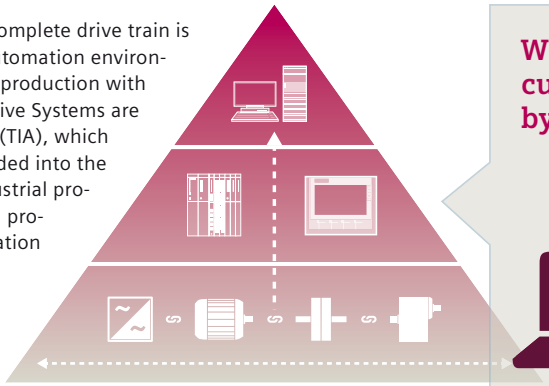
You can boost the availability of your application or plant to up to

99%*

*e.g., conveyor application

Vertical integration

Thanks to **vertical integration**, the complete drive train is seamlessly integrated in the entire automation environment – an important prerequisite for production with maximum value added. Integrated Drive Systems are part of Totally Integrated Automation (TIA), which means that they are perfectly embedded into the system architecture of the entire industrial production process. This enables optimal processes through maximum communication and control.



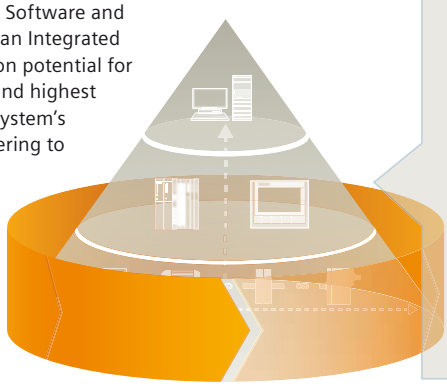
With TIA Portal you can cut your engineering time by up to

30%

Lifecycle integration

Lifecycle integration adds the factor of time: Software and service are available for the entire lifecycle of an Integrated Drive System. That way, important optimization potential for maximum productivity, increased efficiency, and highest availability can be leveraged throughout the system's lifecycle – from planning, design, and engineering to operation, maintenance, and all the way even to modernization.

With Integrated Drive Systems, assets become important success factors. They ensure shorter time to market, maximum productivity and efficiency in operation, and shorter time to profit.



With Integrated Drive Systems you can reduce your maintenance costs by up to

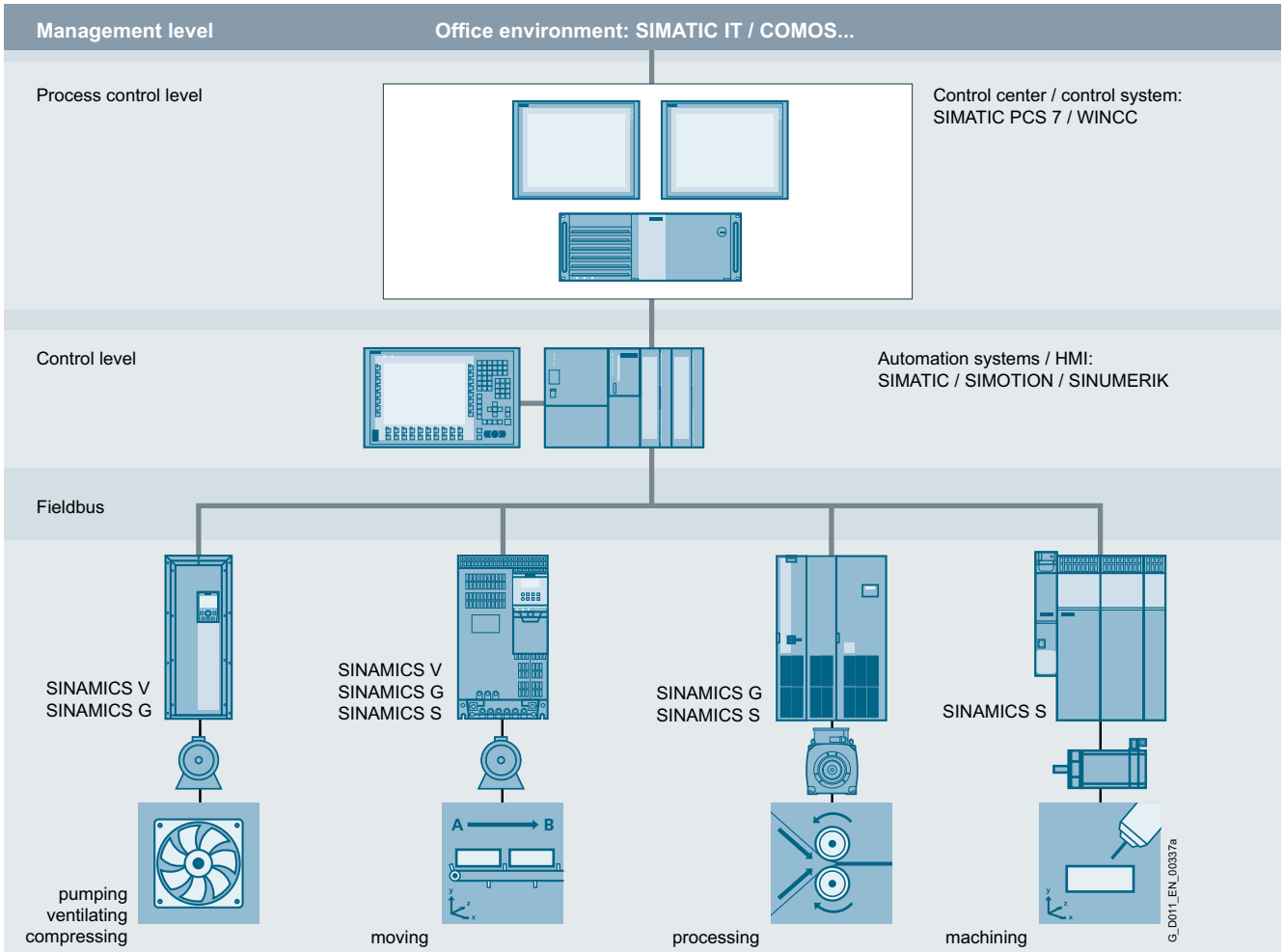
15%

www.siemens.com/ids

System overview

Overview

Integration in automation



SINAMICS in automation

Totally Integrated Automation and communication

SINAMICS is an integral component of the Siemens "Totally Integrated Automation" concept. Integrated SINAMICS systems covering configuration, data storage, and communication at automation level ensure low-maintenance solutions with the SIMATIC, SIMOTION and SINUMERIK control systems.

Depending on the application, the appropriate variable frequency drives can be selected and incorporated in the automation concept. With this in mind, the drives are clearly subdivided into their different applications. A wide range of communication options (depending on the drive type) are available for establishing a communication link to the automation system:

- PROFINET
- EtherNet/IP
- PROFIBUS
- AS-Interface
- USS
- CANopen
- Modbus RTU
- BACnet MS/TP

Applications

SINAMICS is the comprehensive 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
- Demanding 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.
- Highly dynamic servo drives for machine tools, as well as packaging and printing machines

Overview

SINAMICS as part of the Siemens modular automation system

Innovative, energy-efficient and reliable drive systems and applications as well as services for the entire drive train

The solutions for drive technology place great emphasis on the highest productivity, energy efficiency and reliability for all torque ranges, performance and voltage classes.

Siemens offers not only the right innovative variable frequency drive for every drive application, but also a wide range of energy-efficient low voltage motors, geared motors, explosion-protected motors and high-voltage motors for combination with SINAMICS.

Furthermore, Siemens supports its customers with global pre-sales and after-sales services, with over 295 service points in 130 countries – and with special services e.g. application consulting or motion control solutions.

Energy efficiency

Energy management process

Efficient energy management consultancy identifies the energy flows, determines the potential for making savings and implements them with focused activities.

Almost two thirds of the industrial power requirement is from electric motors. This makes it all the more important to use drive technology permitting energy consumption to be reduced effectively even in the configuration phase, and consequently to optimize plant availability and process stability. With SINAMICS, Siemens offers powerful energy efficient solutions which, depending on the application, enable a significant reduction in electricity costs.

Up to 70 % potential for savings using variable speed operation

SINAMICS enables great potential for savings to be realized by controlling the motor speed. In particular, huge potential savings can be recovered from pumps, fans and compressors which are operated with mechanical throttle and valves. Here, changing to variable-speed drives brings enormous economic advantages: In contrast to mechanical control systems, the power consumption at partial load operation is always immediately adjusted to the demand at that time. So energy is no longer wasted, permitting savings of up to 60 % – in exceptional cases even up to 70 %. Variable-speed drives also offer clear advantages over mechanical control systems when it comes to maintenance and repair. Current spikes when powering up the motor and strong torque surges become things of the past – and the same goes for pressure waves in pipelines, cavitation or vibrations which cause sustainable damage to the plant. Smooth starting and ramp-down relieve the load on the mechanical system, ensuring a significantly longer service life of the entire drive train.

Regenerative feedback of braking energy

In conventional drive systems, the energy produced during braking is converted to heat using braking resistors. Energy produced during braking is efficiently recovered to the supply system by versions of SINAMICS G and SINAMICS S inverters with regenerative feedback capability and these devices do not therefore need a braking resistor. This permits up to 60 % of the energy requirement to be saved, e.g. in lifting applications. Energy which can be reused at other locations on a machine. Furthermore, this reduced power loss simplifies the cooling of the system, enabling a more compact design.

Overview

Energy efficiency (continued)

Energy transparency in all configuration phases

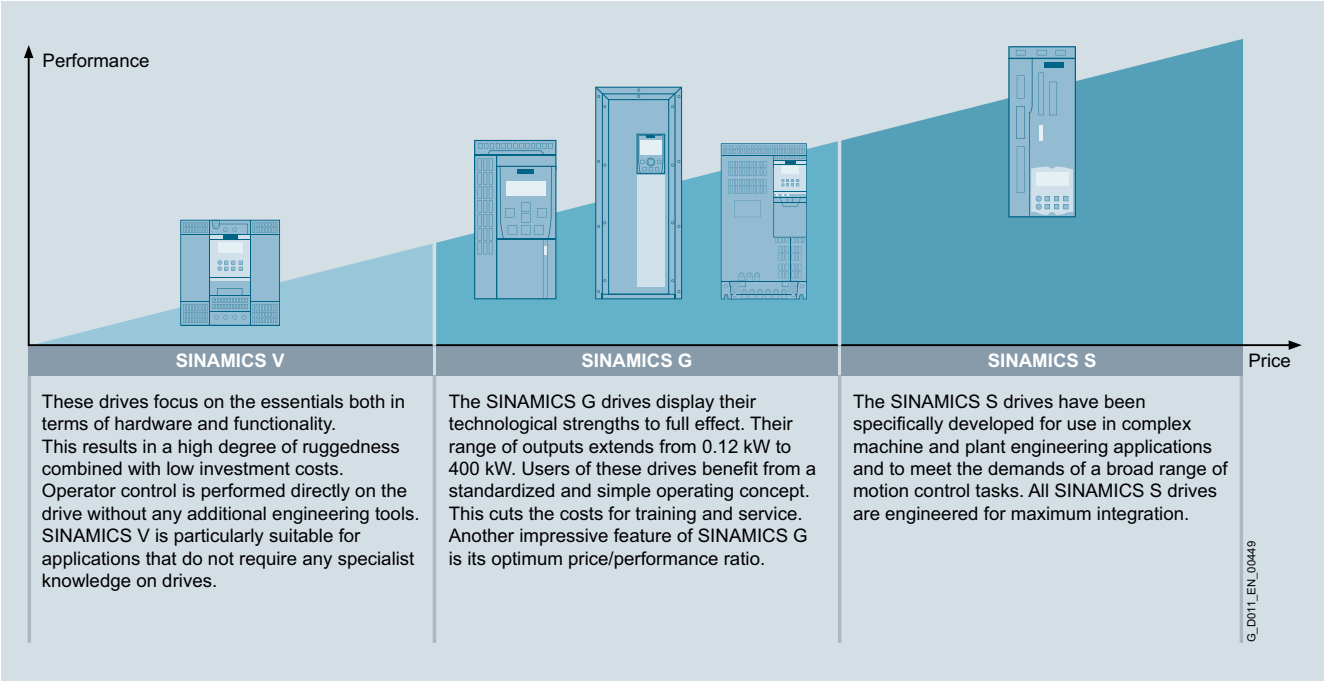
Early on, in the configuration phase, the SIZER for Siemens Drives engineering tool provides information on the specific energy requirement. The energy consumption across the entire drive train is visualized and compared with different plant concepts.

SINAMICS in combination with energy-saving motors

Engineering integration stretches beyond the SINAMICS drive family to higher-level automation systems, and to a broad spectrum of energy-efficient motors with a wide range of performance classes, which, compared to previous motors, are able to demonstrate up to 10 % greater efficiency.

Variants

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



Platform concept

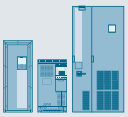
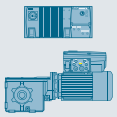
All SINAMICS variants are based on a platform concept. Joint hardware and software components, as well as standardized tools for dimensioning, configuration, and commissioning tasks ensure high-level integration across all components. SINAMICS handles a wide variety of drive tasks with no system gaps.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

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 EN ISO 9001.

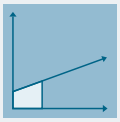
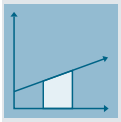
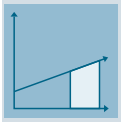
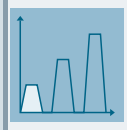
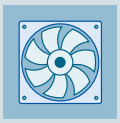
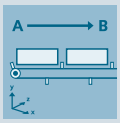
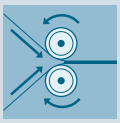
Overview

Low voltage								Direct voltage	Medium voltage
Basic performance	General performance				Basic servo applications	High performance		DC applications	Applications with high outputs
									
V20	G120C/G120/ G120P/G120P Cabinet	G110D/ G120D/ G110M	G130/G150	G180	S110	S120	S150	DCM	GH180/GM150/ SM150/GL150/ SL150
0.12 ... 30 kW	0.37 ... 400 kW	0.37 ... 7.5 kW	75 ... 2700 kW	2.2 ... 6600 kW	0.12 ... 90 kW	0.12 ... 5700 kW	75 ... 1200 kW	6 kW … 3 MW	0.15 ... 85 MW
Pumps, fans, compres-sors, conveyor belts, mixers, mills, textile machines	Pumps, fans, compressors, conveyor technology, mixers, mills and extruders G120: single-axis positioning applications	G120D conveyor technology: single-axis positioning applications	Pumps, fans, conveyor belts, compressors, mixers, mills, extruders	Industry-specific for pumps, fans, compressors, extruders, mixers, mills, kneaders, centrifuges, separators	Single-axis positioning applications for machine and plant engineering	Packaging and textile machines, printing presses, machine tools, plants, process lines, rolling mills	Test stands, cross cutters, centrifuges	Rolling mill drives, wire-drawing machines, extruders and kneaders, cableways and elevators, test stand drives	Pumps, fans, mills, rolling mills, mine hoist drives, excavators, test stands, marine drives, conveyer belts, blast furnace blowers
Brochure V20	Catalogs D 31, D 35	Catalog D 31	Catalog D 11	Catalog D 18.1	Catalog D 31	Catalogs D 21.3 PM 21, NC 62	Catalog D 21.3	Catalogs D 23.1, D 23.2	Catalogs D 15.1, D 12
Engineering tools (e.g. Drive Technology Configurator, SIZER for Siemens Drives, STARTER and SINAMICS Startdrive)									

G_D011_EN_00450b

Overview

SINAMICS selection guide – typical applications

Application	Requirements for torque accuracy/speed accuracy/position accuracy/coordination of axes/functionality					
	Continuous motion			Non-continuous motion		
	Basic	Medium	High	Basic	Medium	High
						
Pumping, ventilating, compressing	Centrifugal pumps Radial / axial fans Compressors	Centrifugal pumps Radial / axial fans Compressors	Eccentric screw pumps	Hydraulic pumps Metering pumps	Hydraulic pumps Metering pumps	Descaling pumps Hydraulic pumps
	V20 **G110** **G120C** G120P	G120P G130/G150 G180 [1]	**S120**	**G120**	**S110**	**S120**
Moving 	Conveyor belts Roller conveyors Chain conveyors	Conveyor belts Roller conveyors Chain conveyors Lifting/lowering devices Elevators Escalators/moving walkways Indoor cranes Marine drives Cable railways	Elevators Container cranes Mining hoists Excavators for open-cast mining Test bays	Acceleration conveyors Storage and retrieval machines	Acceleration conveyors Storage and retrieval machines Cross cutters Reel changers	Storage and retrieval machines Robotics Pick & place Rotary indexing tables Cross cutters Roll feeds Engagers/ disengagers
	V20 **G110** **G110D** **G110M** **G120C**	**G120** **G120D** G130/G150 G180 [1]	**S120** S150 DCM	**G120** **G120D**	**S110** DCM	**S120** DCM
Processing 	Mills Mixers Kneaders Crushers Agitators Centrifuges	Mills Mixers Kneaders Crushers Agitators Centrifuges Extruders Rotary furnaces	Extruders Winders/unwinders Lead/follower drives Calenders Main press drives Printing machines	Tubular bagging machines Single-axis motion control such as • Position profile • Path profile	Tubular bagging machines Single-axis motion control such as • Position profile • Path profile	Servo presses Rolling mill drives Multi-axis motion control such as • Multi-axis positioning • Cams • Interpolations
	V20 **G120C**	**G120** G130/G150 G180 [1]	**S120** S150 DCM	**G120**	**S110**	**S120** DCM
Machining 	Main drives for • Turning • Milling • Drilling	Main drives for • Drilling • Sawing	Main drives for • Turning • Milling • Drilling • Gear cutting • Grinding	Axis drives for • Turning • Milling • Drilling	Axis drives for • Drilling • Sawing	Axis drives for • Turning • Milling • Drilling • Lasering • Gear cutting • Grinding • Nibbling and punching
	S110	**S110** **S120**	**S120**	**S110**	**S110** **S120**	**S120**

[1] Industry-specific inverters.

Overview

Using the SINAMICS selection guide

The varying range of demands on modern variable frequency drives requires a large number of different types. Selecting the optimum drive has become a significantly more complex process. The application matrix shown simplifies this selection process considerably, by suggesting the ideal SINAMICS drive for examples of typical applications and requirements.

- The relevant type of use can be found on the vertical axis (supply, movement, processing or machining).
- What type of movement should be realized with what level of quality (basic, medium, high)? Find this using the relevant fields on the horizontal axis.

To make orientation easier, an example selection of typical applications is shown.

SINAMICS drives can be used to implement all types of applications. Just a part of the SINAMICS family is described here:

- SINAMICS G110
- SINAMICS G120C
- SINAMICS G120P
- SINAMICS G120
- SINAMICS G110M
- SINAMICS G110D
- SINAMICS G120D
- SINAMICS S110
- SINAMICS S120 (single-axis AC drive)

The SINAMICS drive family contains numerous other inverters which can be found in the following catalogs if required:

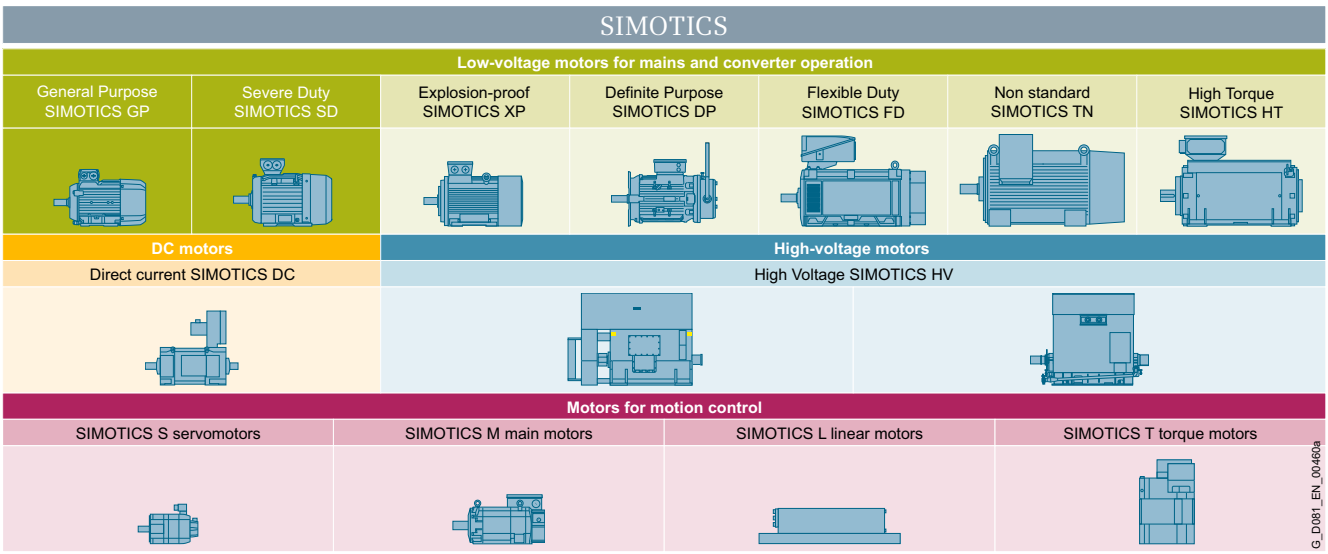
- Basic drive:
  SINAMICS V20 ⇒ currently in the Industry Mall and the product brochure
- Motion Control low-voltage inverters:
  SINAMICS S120 and SIMOTION ⇒ Catalog PM 21
- Low-voltage inverters with powers > 250 kW (400 hp):
  SINAMICS G130, SINAMICS G150 ⇒ Catalog D 11
  SINAMICS S150 ⇒ Catalog D 21.3
- Inverters - Compact units, cabinet systems, cabinet units air-cooled and liquid-cooled:
  SINAMICS G180 ⇒ Catalog D 18.1
- Medium-voltage inverters:
  SINAMICS GM150, SINAMICS SM150 ⇒ Catalog D 12
- SINAMICS DC drives ⇒ Catalog D 23.1
- Solutions for machine tools:
  SINUMERIK & SINAMICS ⇒ Catalogs NC 62 and NC 82

More information

Further information about SINAMICS can be found at
www.siemens.com/sinamics

Specific application examples and descriptions can be found on the Internet at
www.siemens.com/sinamics-applications

Overview



SIMOTICS overview

Further information can be found in Catalogs D 81.1, D 81.8, D 83.1, D 84.1 and PM 21.

SIMOTICS stands for

- 125 years of experience in building electric motors
- The most comprehensive range of motors worldwide
- Optimum solutions in all industries, regions and power/ performance classes
- Innovative motor technologies of the highest quality and reliability
- Highest dynamic performance, precision and efficiency together with the optimum degree of compactness
- Our motors can be integrated into the drive train as part of the overall system
- A global network of skill sets and worldwide service around the clock

A clearly structured portfolio

The entire SIMOTICS product portfolio is transparently organized according to application-specific criteria in order to help users select the optimum motor for their application.

The product range extends from standard motors for pumps, fans and compressors to highly dynamic, precise motion control motors for positioning tasks and motion control in handling applications, as well as production machinery and machine tools, to DC motors and powerful high-voltage motors. Whatever it is that you want to move – we can supply the right motor for the task.

An outstanding performance for any job

A key characteristic of all SIMOTICS motors is their quality. They are robust, reliable, dynamic and precise to assure the requisite performance level for any process and deliver exactly the capabilities demanded by the application in hand. Thanks to their compact design, they can be integrated as space-saving units into installations. Furthermore, their impressive energy efficiency makes them effective as a means of reducing operating costs and protecting the environment.

A dense network of skill sets and servicing expertise around the world

SIMOTICS offers not only a wealth of sound experience gleaned from a development history which stretches back over around 150 years, but also the know-how of hundreds of engineers. This knowledge and our worldwide presence form the basis for a unique proximity to industries which feeds through in tangible terms to the specific motor configuration which is tailored to suit your application.

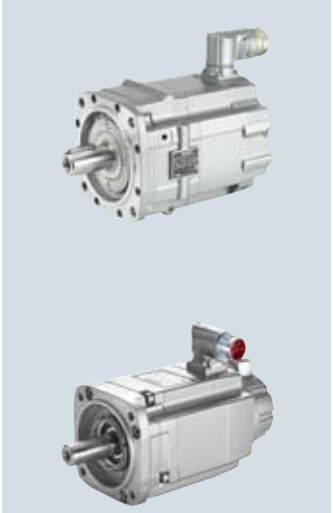
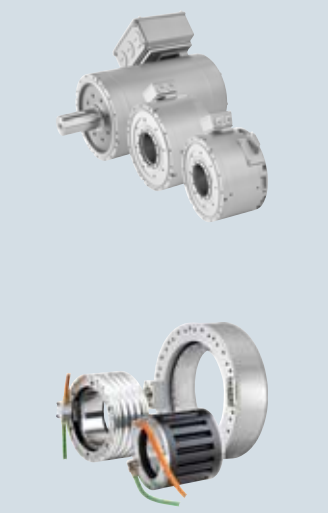
Our specialists are available to answer all your queries regarding any aspect of motor technology. At any time - wherever you are in the world. When you choose SIMOTICS, therefore, you reap the benefits of a global service network which is continuously accessible, thereby helping to optimize response times and minimize downtimes.

Perfection of the complete drive train

SIMOTICS is perfectly coordinated with other Siemens product families. In combination with the SINAMICS integrated inverter family and the SIRIUS complete portfolio of industrial controls, SIMOTICS fits seamlessly as part of the complete drive train into automation solutions which are based on the SIMATIC, SIMOTION and SINUMERIK control systems.

Overview

Overview of motors for Motion Control applications

SIMOTICS – the largest motor portfolio worldwide			
Motors for Motion Control applications			
Servo motors	**Main motors**	**Linear motors**	**Torque motors**
SIMOTICS S-1FK/S-1FT	SIMOTICS M-1PH/M-1FE	SIMOTICS L-1FN	SIMOTICS T-1FW
			
Rated power 0.05 ... 34.2 kW (0.05 ... 45.9 hp)	Rated power 2.8 ... 1340 kW (3.75 ... 1797 hp)	Rated power 1.29 ... 81.9 kW (1.73 ... 110 hp)	Rated power 1.7 ... 380 kW (2.28 ... 510 hp)
Rated torque 0.08 … 125 Nm (0.06 ... 92.2 lbf-ft)	Rated torque 13 … 12435 Nm (9.59 ... 9172 lbf-ft)	Rated force 150 … 10375 N (33.72 ... 2332 lbf) Maximum force 260 … 20700 N (58.5 ... 4654 lbf)	Rated torque 10 … 7000 Nm (7.4 ... 5159 lbf-ft)
Rated speed 1500 … 6000 rpm	Rated speed 400 … 40000 rpm	Velocity 105 … 836 m/min (344 … 2743 ft/min)	Rated speed 38 … 1200 rpm
Application examples			
Robotic and handling systems, wood, glass, ceramics and stone working, packaging, plastics and textile machines, machine tool applications	Main drives in presses/extruders, converting applications, machine tools, rotating axes in the paper and print industry, use in crane systems	Milling, turning and grinding machines, laser machining centers, handling, production machines	Extruder main drives, winders, servo presses, roller and cylinder drives, rotary axes in machine tools, rotary tables and dividing heads, tool magazines
Highlights			
Servomotors for highly dynamic, exact positioning and precise motion control – including motors with planetary and bevel gears	Main motors for precise concentricity in rotary axes and main drives	Linear motors for outstanding dynamic response and precision for linear traversing motions	Torque motors for the gearless direct drive of rotary axes
Degrees of protection			
IP64 ... IP67	IP23 ... IP65	IP65	IP23 ... IP55
Catalog			
PM 21, D 31, NC 62, NC 82	PM 21, D 31, NC 62, NC 82	PM 21, NC 62	PM 21, NC 62

Optimally coordinated system solutions

SIMOTICS motors are perfectly coordinated with the drive systems of the SINAMICS family. They provide you with precisely tailored, state-of-the-art motion control solutions in all performance classes created using globally available standard components. Electronic rating plates and the ability to integrate the motors via the DRIVE-CLiQ system interface ensure quick commissioning as well as problem-free operation. Thanks to the integral encoders with redundant encoder tracks and safety functions which are integrated in the drive, modern safety concepts are easy to implement. As a result, external safety components are completely unnecessary. All components can be interconnected simply and reliably by means of pre-assembled MOTION-CONNECT signal and power cables.

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.

- Engineering tool SIZER for Siemens Drives
  - User-friendly support in dimensioning motor and gear unit
    www.siemens.com/sizer
- CAD CREATOR
  - Dimensional drawing and 2D/3D CAD generator
    www.siemens.com/cadcreator

SIMOTICS motors for Motion Control applications

Overview

Whether it is a servomotor, a main motor, a torque motor or a linear motor – no other manufacturer anywhere in the world offers such an extensive portfolio of motors for motion control applications. Perfectly coordinated for operation with SINAMICS inverters, all products in the portfolio impress with their compact dimensions, precision and dynamic response.

SIMOTICS S servomotors
Highly dynamic and extremely compact

Whether they are used for positioning in pick and place applications, as cyclic drives in packaging machines or for path control in handling systems and machine tools: Our permanent-magnet, highly energy efficient SIMOTICS servomotors are the first choice for any application which demands **highly dynamic and precise motional sequences**. Depending on the application, they are available with various different built-in encoders – from the simple resolver to the high-resolution absolute encoder. SIMOTICS S motors are also available optionally with gearing.

SIMOTICS M main motors
Exact rotation at up to 40000 rpm

For applications where **continuous, precise rotation** of the axes is the primary concern. Thus they are ideally suited for the main drives for presses, as roller drives in printing and paper-making machines, textiles and plastics-processing machines. They can also be deployed as winder drives and in machine tool spindles and hoisting gear. With a power spectrum ranging from 2.8 kW to 1340 kW, they cover virtually every application.

SIMOTICS L linear motors
Improved dynamic response all along the line

The ideal solution for any application which requires linear movements to be performed with **maximum dynamic response and precision**. The reason: The effects of elasticity, backlash and friction as well as natural oscillation in the drive train are largely eliminated because no mechanical transmission elements such as ball screw, coupling and belt are needed when linear motors are used. This simplifies the machine design and also reduces wear which means that fewer outages for maintenance are required.

SIMOTICS T torque motors
Outstanding precision for rotary axes

Optimized **for high torques at low rated speeds**. With their excellent precision and dynamic response, these motors have all the right credentials for use as built-in motors in rotary indexing machines, rotary tables or swivel and rotary axes, e.g. on machine tools. The same also applies to complete torque motors which are typically used as a roller and winder drive in converting applications. Thanks to the omission of mechanical transmission elements such as gear units, the number of components susceptible to wear is reduced.

Connection system MOTION-CONNECT

Overview

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, and provides the highest quality as well as system-tested reliability.

MOTION-CONNECT power cable and signal cable

MOTION-CONNECT cables are available as ready-to-connect power and signal cables as well as cables sold by the meter. The pre-assembled cables can be ordered in length units of 10 cm (3.94 in) and can be extended, if necessary.

Whatever your machine requirements, MOTION-CONNECT offers the solution.

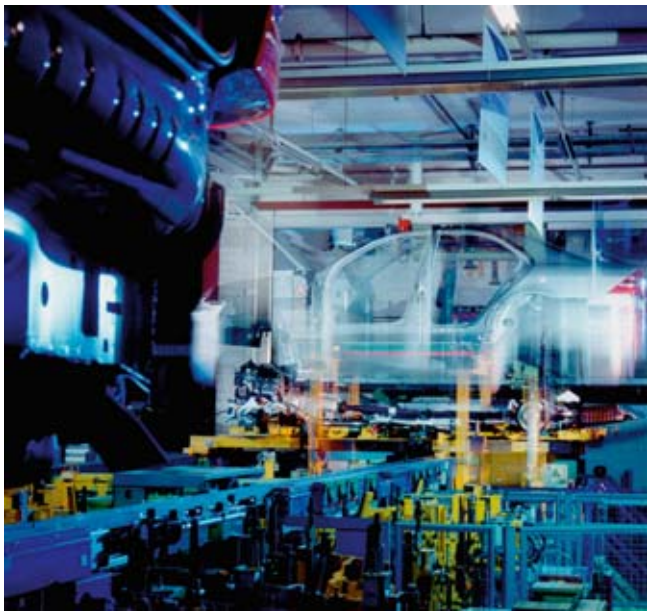
- **Robust, high-performance and easy to use**
  thanks to pre-assembled cables with a rugged metal connector in degree of protection IP67 and reliable SPEED-CONNECT quick-release lock
- **Outstanding and proven quality**
  achieved by consistent quality management and system-tested cables

Cables are available in two different qualities – MOTION-CONNECT 500 and MOTION-CONNECT 800PLUS.

MOTION-CONNECT 500	MOTION-CONNECT 800PLUS
• Cost-effective solution for predominantly fixed installation • Tested for travel distances of up to 5 m (16.4 ft)	• Meets requirements for use in cable carriers • Oil-resistant • Tested for travel distances of up to 50 m (164 ft)

Highlights

Overview



Legal framework

Machine manufacturers and manufacturing plants must ensure that their machines or plants cannot cause danger due to malfunctions in addition to the general risks of electric shock, heat or radiation.

In Europe, for example, compliance with the machinery directive is required by law by the EC occupational health and safety directive. In order to ensure compliance with this directive, it is recommended that the corresponding harmonized European standards are applied. This triggers the "assumption of conformity" and gives manufacturers and operators the legal security 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. For example, EN ISO 12100 specifies standards pertaining to machine safety (risk assessment and risk reduction). Fundamental requirements of electrical, electronic and programmable electronic safety-related systems are defined by IEC 61508. Functional and safety-relevant requirements of safety-related control systems are specified in EN 62061 (applicable only to electrical and electronic control systems), and EN ISO 13849-1, the successor standard to EN 954-1 which has since been withdrawn.

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 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 higher modularity of machines has seen a shift in safety functions away from the classical central safety functions (for example, shutdown of the complete machine using a main disconnecting means) and into the machine control system and the drives. This is often accompanied by a significant increase in productivity because the equipping times are shortened. Depending on the type of machine, it may even be possible to continue manufacturing other parts while equipping is in progress.

Integrated safety functions act much faster than those of a conventional design. The safety of a machine is increased further with Safety Integrated. Furthermore, thanks to the faster method of operation, safety measures controlled by integrated safety systems are perceived as less of a hindrance by the machine operator, therefore significantly reducing the motivation to consciously bypass safety functions.

Function

Safety functions integral to the SINAMICS drives

SINAMICS drives are characterized by a large number of integrated safety functions. In combination with the sensors and safety control required for the safety functionality, they ensure that highly-effective protection for persons and machines is implemented in a practice-oriented manner.

They fulfill the following equipment requirements:

- SIL 2 according to IEC 61508
- PL d and Category 3 according to EN ISO 13849-1

The Safety Integrated functions of SINAMICS drives are certified by independent institutions. You can obtain the corresponding test certificates and manufacturer's declarations from your Siemens contacts.

The integrated safety functions that are currently available in the SINAMICS drive system are described below. The functional safety of all of the functions satisfies the requirements defined in the international standard IEC 61800-5-2 for variable-speed drive systems.

The safety functions integrated into the SINAMICS drive system can be roughly divided into four categories:

- **Functions for safely stopping a drive**
  - Safe Torque Off (STO)
  - Safe Stop 1 (SS1)
  - Safe Stop 2 (SS2)
  - Safe Operating Stop (SOS)
- **Functions for safe brake management**
  - Safe Brake Control (SBC)
  - Safe Brake Test (SBT) (this function exceeds the scope of IEC 61800-5-2)
- **Functions for safely monitoring the motion of a drive**
  - Safely-Limited Speed (SLS)
  - Safe Speed Monitor (SSM)
  - Safe Direction (SDI)
- **Functions for safely monitoring the position of a drive**
  - Safely Limited Position (SLP)
  - Safe Position (SP) (this function exceeds the scope of IEC 61800-5-2)

The Safety Integrated Function Manual contains detailed information about the safety functions.
http://support.automation.siemens.com/WW/view/en/27103700/133300

Further information about Safety Integrated can be found on the Internet at
www.siemens.com/safety-drives

Safe Torque Off (STO)

The STO function is the most common and basic drive-integrated safety function. It ensures that no torque-generating energy can continue to affect a motor and prevents unintentional start-ups.

Activation

This function is a mechanism that prevents the drive from restarting unexpectedly, in accordance with EN 60204-1, Section 5.4. Safe Torque Off suppresses the drive pulses (corresponds to Stop Category 0 of EN 60204-1). The drive is reliably torque-free. This state is monitored internally in the drive.

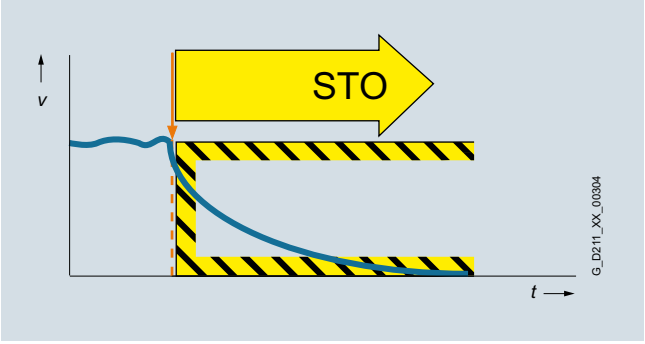
Application

STO has the immediate effect that the drive cannot supply any torque-generating energy. STO can be used wherever the drive will naturally reach a standstill due to load torque or friction in a sufficiently short time or when "coasting down" of the drive will not have any relevance for safety.

STO makes it possible for persons to work safely when the protective door is open (restart interlock) and is used on machines/installations with moving axes, e.g. on handling or conveyor systems.

Customer benefits

The advantage of the integrated STO safety function compared to standard safety technology using electromechanical switchgear is the elimination of separate components and the effort that would be required to wire and service them. Because of the fast electronic switching times, the function provides a shorter reaction time than the conventional solution comprising electromechanical components.



Function

Safe Stop 1 (SS1)

The SS1 function causes a motor to stop rapidly and safely and switches the motor to torque-free mode after coming to a standstill, i.e. STO is activated.

Activation

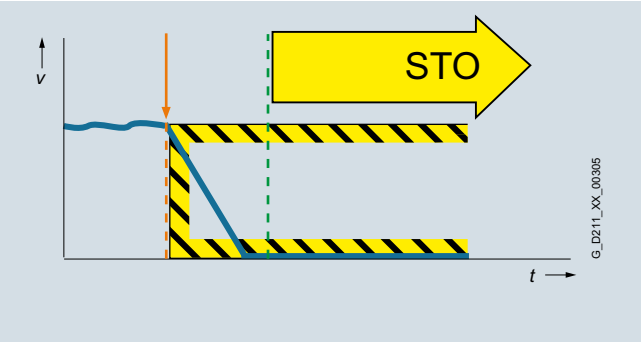
The SS1 function can safely stop the drive in accordance with EN 60204-1, Stop Category 1. When the SS1 function is selected, the drive brakes autonomously along a quick-stop ramp and automatically activates the Safe Torque Off and Safe Brake Control functions (if configured) when the parameterized safety delay time expires.

Application

The SS1 function is used when, in the event of a safety-relevant incident, the drive must stop as quickly as possible with a subsequent transition into the STO state (e.g. EMERGENCY STOP). It is thus used to bring large centrifugal masses to a stop as quickly as possible for the safety of the operating personnel, or to brake motors at high speeds as quickly as possible. Examples of typical application are saws, grinding machine spindles, centrifuges, winders and storage and retrieval machines.

Customer benefits

The targeted stopping of a drive by means of SS1 reduces the risk of danger, increases the productivity of a machine, and allows the safety clearances in a machine to be reduced. The principle is to bring the drive actively to a standstill, compared with just using the STO function. Complex mechanical brakes that are susceptible to wear are not normally required to brake the motor.



Safe Stop 2 (SS2)

The SS2 function brings the motor to a standstill quickly and safely and then activates the SOS function once the motor has stopped.

Activation

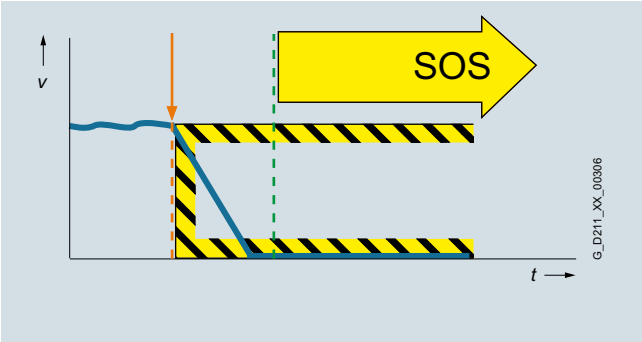
The Safe Stop 2 function can safely stop the drive in accordance with EN 60204-1, Stop Category 2. When the SS2 function is selected, the drive brakes autonomously along a quick stop ramp. In contrast to SS1, the drive control remains operational afterwards, i.e. the motor can supply the full torque required to maintain zero speed. Standstill is safely monitored (Safe Operating Stop function).

Application

As with SS1, the SS2 function ensures the quickest possible deceleration of the motor. However, the motor power is not switched off. Instead, a control system prevents it from leaving the standstill position – even if it is affected by external forces. Typical applications for SS2 include machine tools, for example.

Customer benefits

The SS2 function ensures a rapid axis stop. Because the control remains active, after the safety function is deselected, productive operation can continue without referencing. This ensures short setup and standstill times and high productivity.



Function

Safe Operating Stop (SOS)

With the SOS function, the stopped motor is held in position and monitored by drive control.

Activation

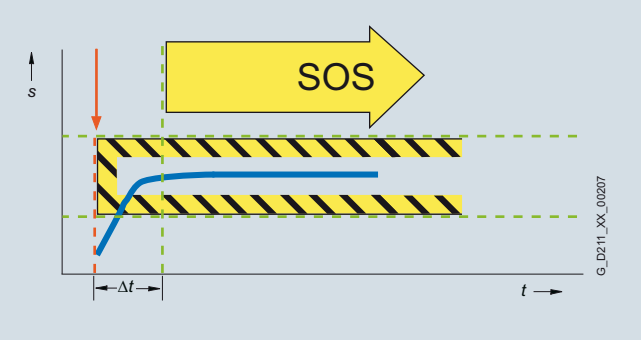
The SOS function constitutes safe standstill monitoring. The drive control remains in operation. The motor can therefore deliver the full torque to hold the current position. The actual position is reliably monitored. In contrast to safety functions SS1 and SS2, the speed setpoint is not influenced autonomously. After SOS has been activated, the higher-level control must bring the drive to a standstill within a parameterized time and then hold the position setpoint.

Application

SOS is an ideal solution for all those applications for which the machine or parts of the machine must be at a safe standstill for certain steps, but the drive must also supply a holding torque. It is ensured that despite counter torque the drive remains in its current position. In contrast to SS1 and SS2, the drive does not brake autonomously in this case. It expects the higher-level controller to ramp down the relevant axes as a coordinated group within an adjustable delay time. This can be used to prevent any damage to the machine or product. Typical applications for SOS include winders, converting and packaging machines and machine tools.

Customer benefits

No mechanical components are necessary to keep the axis in position despite any counterforce that may occur. Due to the short switching times and the fact that the drive control always remains active, setup and downtimes are reduced. Recalibration of the axis after exiting the SOS function is not necessary. The axis can immediately be moved again after deactivation of the SOS function.



Safe Brake Control (SBC)

The SBC function permits the safe control of a holding brake. SBC is always activated in parallel with STO.

Activation

A holding brake which is active in a de-energized state is controlled and monitored using safe two-channel technology. Due to the two-channel control, the brake may still be activated in the event of an insulation fault in the control cable. Errors of this kind are detected early by means of test pulses.

Notes

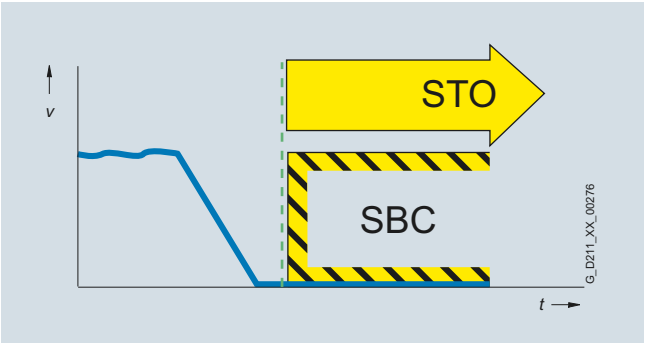
An additional Safe Brake Relay is required for power units in blocksize format. An additional Safe Brake Adapter is necessary for power units in chassis format.

Application

The SBC function is used in conjunction with the functions STO or SS1 to prevent the movement of an axis in the torque-free state, e.g. because of gravity.

Customer benefits

Again, the function saves the use of external hardware and the associated wiring.



Function

Safe Brake Test (SBT)

The SBT function carries out a brake function test at regular intervals.

Activation

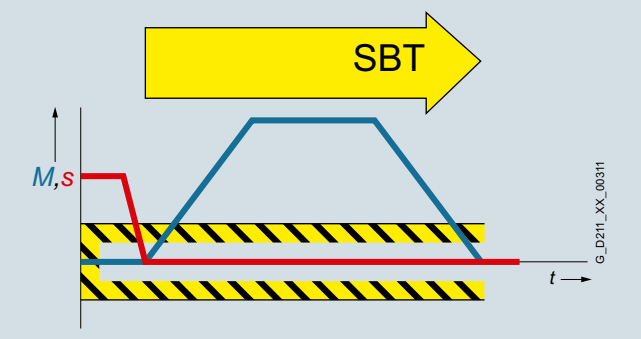
A good way to check the proper functioning of brakes that have become worn is to apply a torque to the closed brake. Drive systems that have two brakes, e.g. motor brake and external brake, can be tested with different torque values.

Application

The SBT function is suitable for implementing a safe brake in combination with the SBC function.

Customer benefits

The function detects faults or wear in the brake mechanics. Automatically testing the effectiveness of brakes reduces maintenance costs and increases the safety and availability of plants/machines.



Safely-Limited Speed (SLS)

The SLS function ensures that the drive does not exceed a preset speed limit.

Activation

The SLS function monitors the drive against a parameterized speed limit. Four different limit values can be selected. As in the case of SOS, the speed setpoint is not influenced independently. After SLS has been selected, the higher-level control must bring the drive down below the selected speed limit within a parameterizable time. If the speed limit is exceeded, a customizable drive-integrated fault reaction occurs.

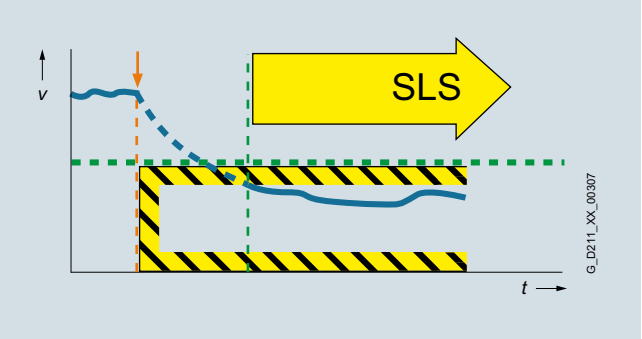
The SLS limit stage 1 can be multiplied by a factor that is transferred in 16-bit resolution via PROFIsafe. This allows an almost unlimited number of limits to be specified.

Application

The SLS function is used if people are in the danger zone of a machine and their safety can only be guaranteed by reduced speed. Typical application cases include those in which an operator must enter the danger zone of the machine for the purposes of maintenance or setting up, such as a winder in which the material is manually threaded by the operator. To prevent injury to the operator, the roller may only spin at a safely reduced speed. SLS is often also used as part of a two-stage safety concept. While a person is in a less critical zone, the SLS function is activated, and the drives are only stopped in a smaller area with higher potential risk. SLS can be used not only for operator protection, but also for machinery protection, e.g. if a maximum speed must not be exceeded.

Customer benefits

The SLS function can contribute to a significant reduction in downtime, or greatly simplify or even accelerate setup. The overall effect achieved is a higher availability of the plant. Moreover, external components such as speed monitors can be omitted.



Function

Safe Speed Monitor (SSM)

The SSM function warns when a drive is working below an adjustable speed limit. As long as it remains below the threshold, the function issues a safety-related signal.

Activation

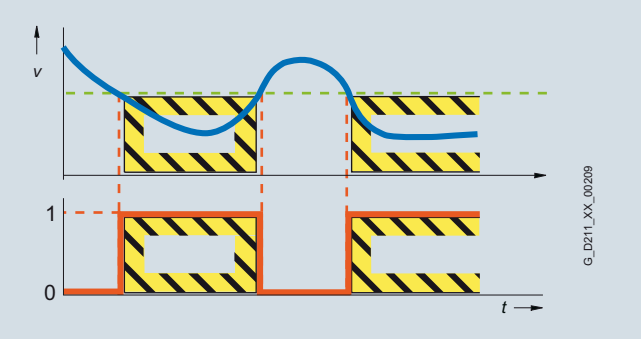
If a speed value drops below a parameterized limit, a safety-related signal is generated. This can, for example, be processed in a safety controller to respond to the event by programming, depending on the situation.

Application

With the SSM function, in the simplest case, a safety door can be unlocked if the speed drops below a non-critical level. Another typical example is that of a centrifuge that may be filled only when it is operating below a configured speed limit.

Customer benefits

Unlike SLS, there is no drive-integrated fault reaction when the speed limit is exceeded. The safe feedback can be evaluated in a safety control unit, allowing the user to respond appropriately to the situation.



Safe Direction (SDI)

The SDI function ensures that the drive can only move in the selected direction.

Activation

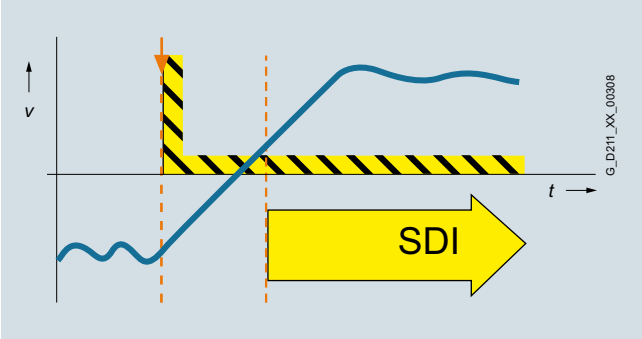
Deviation from the direction of motion currently being monitored is detected reliably and the configured drive-integrated fault reaction is initiated. It is possible to select which direction of rotation is to be monitored.

Application

The SDI function is used when the drive may only move in one direction. A typical application is to permit the operator access to a danger zone, as long as the machine is rotating in the safe direction, i.e. away from the operator. In this state, the operator can feed material into the work zone / remove material from the work zone without danger.

Customer benefits

The function saves the use of external components such as speed monitors and the associated wiring. The release of a danger zone while the machine is moving away from the operator increases productivity. Without the SDI function, the machine must be safely stopped during material loading and removal.



Function

Safely Limited Position (SLP)

The SLP function monitors the axis to ensure that it remains within the permissible traversing range.

Activation

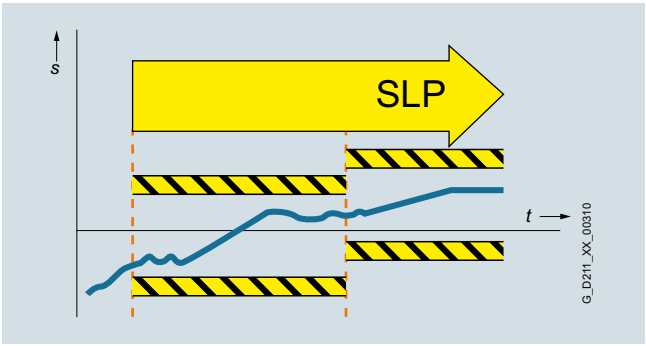
When SLP is activated, the traversing range limited by the configured software limit switches is safely monitored. If the permitted traversing range is exited, a customizable fault reaction occurs. It is possible to toggle between two traversing ranges, even when the machine is in operation.

Application

SLP is used for applications in which machine operators have to enter a protection area, e.g. for feeding in and removing material. Safe monitoring of the axis position ensures that the axis cannot move into the protection area released for operators and so place them in danger, for example, on storage and retrieval machines, gantry cranes or machining centers.

Customer benefits

SLP can be used for highly-effective protection area monitoring. The function does away with the use of external components such as hardware limit switches and the associated wiring expense. Due to the short reaction time following a limit overshoot, safety clearances can be reduced.



Safe Position (SP)

The SP function transfers the actual position values determined safely in the drive over safe PROFIsafe communication to a safety control.

Activation

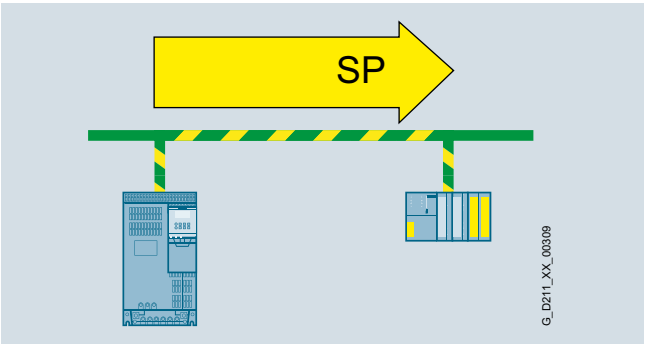
In contrast to the SLP function that monitors the current actual position value against a limit and, in the case of an overshoot, activates a drive-integrated fault reaction, SP transfers the current actual position values to the safety control. Position monitoring is implemented in the safety program of the control. Extended PROFIsafe telegrams are available for transferring the position values. The position values can be transferred in 16-bit or 32-bit resolution, as required. A time stamp is also transferred with the position values.

Application

Tailor-made safety concepts can be created using the SP function. It is ideal for use on machines that require flexible safety functions. It is extremely versatile and can be used, for example, to implement safe, axis-specific range detection by means of the Safe Cams (SCA) function. The SP function can also be used to implement multi-axis safety concepts, multi-dimensional protection areas and zone concepts.

Customer benefits

Position monitoring or speed monitoring is implemented in the safety program of the control, so the user has the flexibility for implementing tailor-made safety functions. The reaction to a limit overshoot must also be specified in the safety program. This means a higher initial programming outlay, but it does offer the opportunity for initiating different fault reactions.



Function

Basic Functions and Extended Functions

The Safety Integrated functions of the SINAMICS drive system are grouped into Basic Functions and Extended Functions.

- Basic Functions
  - Safe Torque Off (STO)
  - Safe Brake Control (SBC)
  - Safe Stop 1 (SS1)
- Extended Functions
  - Safe Stop 1 (SS1) with SBR or SAM
  - Safe Stop 2 (SS2) with SAM
  - Safe Operating Stop (SOS)
  - Safely Limited Speed (SLS)
  - Safe Speed Monitor (SSM)
  - Safe Direction (SDI)
  - Safely-Limited Position (SLP)
  - Safe Position (SP)
  - Safe Brake Test (SBT)

For the Extended Functions Safe Stop 1 (SS1) and Safe Stop 2 (SS2) with SAM, safe acceleration monitoring (SAM) is performed during braking to identify any faults already during the braking phase.

If Safe Stop 1 is used as an encoderless function, a Safe Brake Ramp (SBR) can be configured as an alternative.

The Basic Functions – activated via on-board terminals on the device or via PROFIsafe – do not require an encoder.

Activation of the integrated safety functions

The safety functions for SINAMICS drives can be activated via terminals, e.g. for use of a conventional safety circuit.

For standalone safety solutions for small to medium sized applications, it is frequently sufficient that the various sensing components are directly hardwired to the drive.

For integrated safety solutions, the safety-relevant sequences are generally processed and coordinated in the fail-safe SIMATIC controller. Here, the system components communicate via the PROFINET or PROFIBUS fieldbus. The safety functions are controlled via the safe PROFIsafe communication protocol.

SINAMICS drives can be easily integrated into the plant or system topology.

PROFIsafe

SINAMICS drives support the PROFIsafe profile based on PROFIBUS as well as on PROFINET.

PROFIsafe is an open communications standard that supports standard and safety-related communication over the same communication path (wired or wireless). A second, separate bus system is therefore not necessary. The telegrams that are sent are continually monitored to ensure safety-relevant communication.

Possible errors such as telegrams that have been lost, repeated or received in the incorrect sequence are avoided. This is done by consecutively numbering the telegrams in a safety-relevant fashion, monitoring their reception within a defined time and transferring an ID for transmitter and receiver of a telegram. A CRC (cyclic redundancy check) data security mechanism is also used.

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. This ensures that the system is always switched to a safe state 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) 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 state 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 period to establish whether they are working properly in order to meet the requirements of EN ISO 13849-1 and IEC 61508 in terms of timely error detection. This must be implemented either in cyclic manual mode or the test stop must be automatically initiated as part of the process. The test stop cycle is monitored, and after a specific time has been exceeded, an alarm is output. A test stop does not require a power on. The acknowledgment is set by canceling the test stop request.

Examples of when forced dormant error detection must be performed:

- 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, time and event-driven

Safe actual value sensing with or without encoders

A drive monitor with encoder is necessary for operation of a series of safety functions.

For applications with encoderless mode or with encoders that have no safety capability, the safety functions can also be implemented without encoder. It is not possible to use all safety functions in this case.

In operation without encoder, the actual speed values are calculated from the measured electrical actual values. Therefore, speed monitoring is also possible during operation without encoder.

Safety Integrated Extended Functions "without encoder" must not be used if the motor, after it has been switched off, can still be accelerated by the mechanical elements of the connected machine component.

In the hoisting gear of a crane, for example, the suspended load can accelerate the motor as soon as the motor is switched off. In this case, the safety functions "without encoder" are not permitted.

A horizontal conveyor, on the other hand, is always braked to a standstill due to friction as soon as the motor is switched off. In this case, the safety functions "without encoder" can be used without any restriction.

Function

The Safety Integrated Function Manual contains additional information about the encoderless safety functions.
http://support.automation.siemens.com/WW/view/en/27103700/133300

The safety functions are listed below with criteria for actual value sensing.

	Functions	Abbreviation	With encoder	Without encoder	Description
Basic Functions	Safe Torque Off	STO	Yes	Yes	Safe Torque Off
	Safe Stop 1	SS1	Yes	Yes	Safe stopping process according to stop category 1
	Safe Brake Control	SBC	Yes	Yes	Safe Brake Control
Extended Functions	Safe Torque Off	STO	Yes	Yes[1)]	Safe Torque Off
	Safe Stop 1	SS1	Yes	Yes[1)]	Safe stopping process according to stop category 1
	Safe Brake Control	SBC	Yes	Yes[1)]	Safe Brake Control
	Safe Operating Stop	SOS	Yes	No	Safe monitoring of the standstill position
	Safe Stop 2	SS2	Yes	No	Safe stopping process according to stop category 2
	Safely Limited Speed	SLS	Yes	Yes[1)]	Safe monitoring of the maximum speed
	Safe Speed Monitor	SSM	Yes	Yes[1)]	Safe monitoring of the minimum speed
	Safe Direction	SDI	Yes	Yes[1)]	Safe monitoring of the direction of motion
	Safely Limited Position	SLP	Yes	No	Safely Limited Position
	Safe Position	SP	Yes	Yes	Safe transfer of position values
	Safe Brake Test	SBT	Yes	No	Safe test of the required holding torque of a brake

Safe speed/position sensing with encoder

Incremental encoders or absolute encoders with photoelectric sampling are permitted for safe sensing of the position values on a drive. HTL/TTL incremental encoders may also be used.

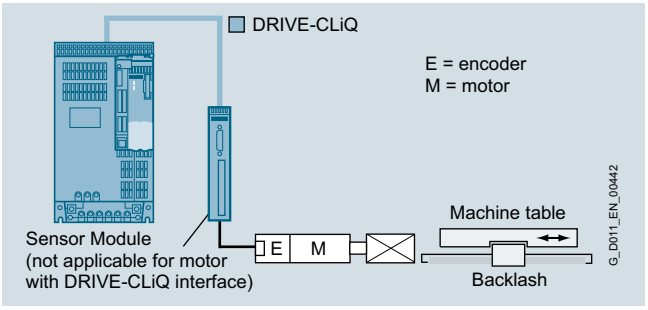
Safe actual value sensing relies on redundant evaluation of the incremental tracks A/B that supply sin/cos signals of 1 V_{pp}. Only encoders of the type whose A/B track signals are created and processed using purely analog techniques can be used.

For HTL/TTL incremental encoders, safe actual value sensing is achieved by using two independent encoders.

When motors with a DRIVE-CLiQ interface are used, the speed/position actual values are generated directly in the motor as safe values and transferred to the Control Unit over a safe DRIVE-CLiQ communication link.

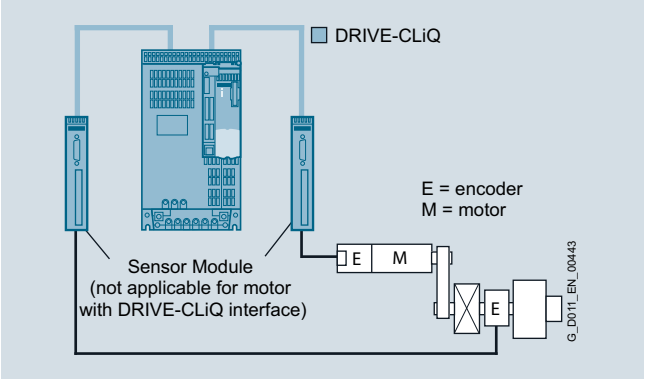
The following can be used for safe speed/position sensing:

- Single-encoder systems or
- 2-encoder systems



Example: Single-encoder system

In a single-encoder system, the motor encoder is used exclusively for safe actual value sensing. An incremental encoder or absolute encoder with photoelectric sampling must be used in this case.



Example: 2-encoder system

In the case of the 2-encoder system, 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 (SMC20/30, SME20/25/120/125) must be provided. Each measuring system requires a separate DRIVE-CLiQ connection.

For this configuration, either two HTL/TTL encoders, one dual-HTL/TTL encoder or one HTL/TTL encoder and one sin/cos encoder can be used.

[1)] The use of this safety function without encoder is permitted only for induction motors or synchronous motors of the SIEMOSYN series.

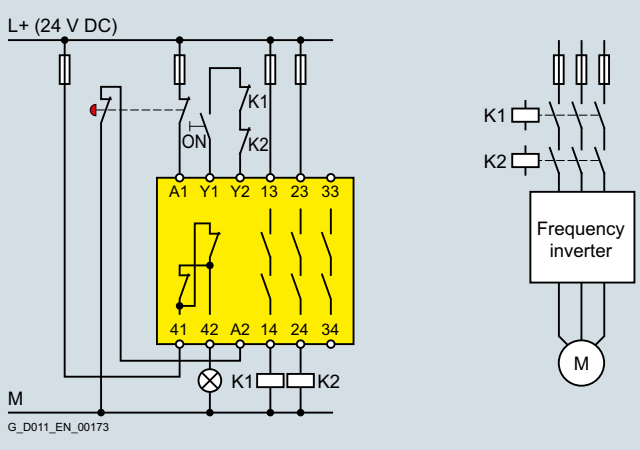
Function

Comparison between conventional and integrated safety systems

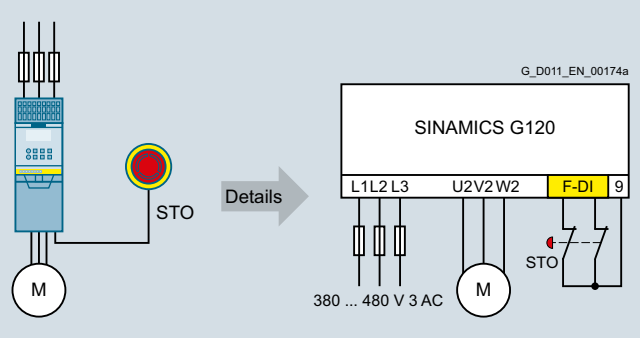
The safety functions integrated into the drive can greatly reduce the effort required to implement safety concepts.

The integrated safety functions provide support when setting up tailored safety concepts. Configurations of safety concepts are given below based on the example of the SINAMICS G120.

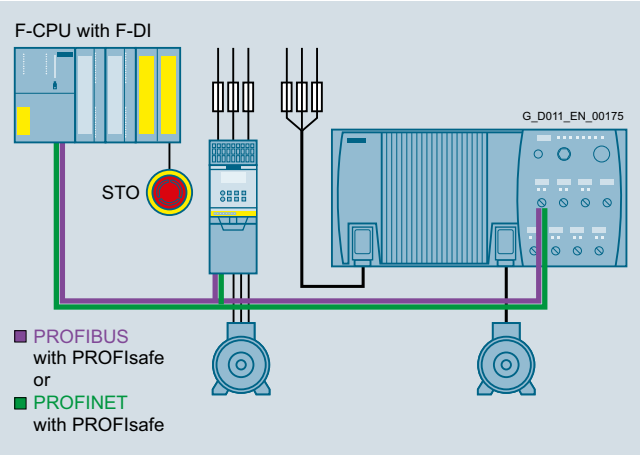
Safe Torque Off (STO)



Conventional wiring

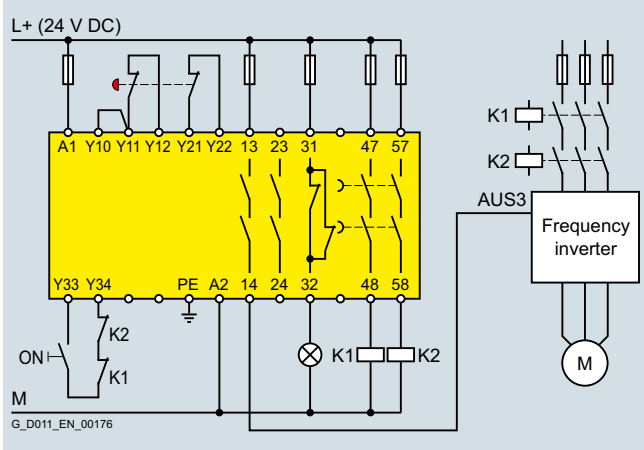


Integrated safety via fail-safe inputs

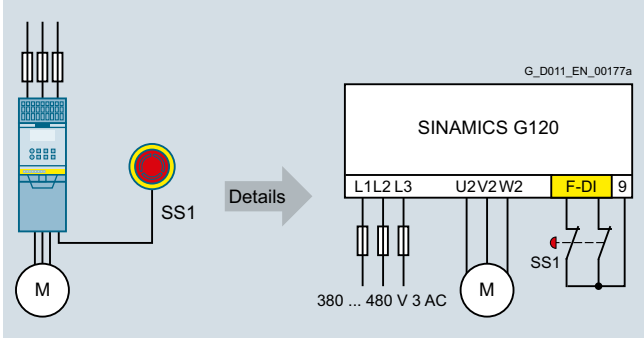


Integrated safety via PROFIsafe

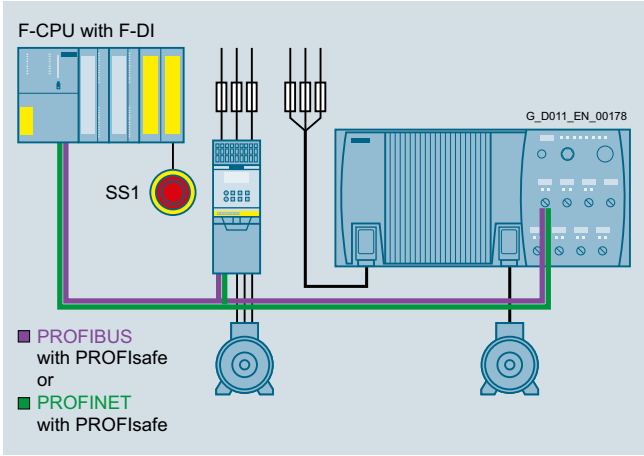
Safe Stop 1 (SS1)



Conventional wiring



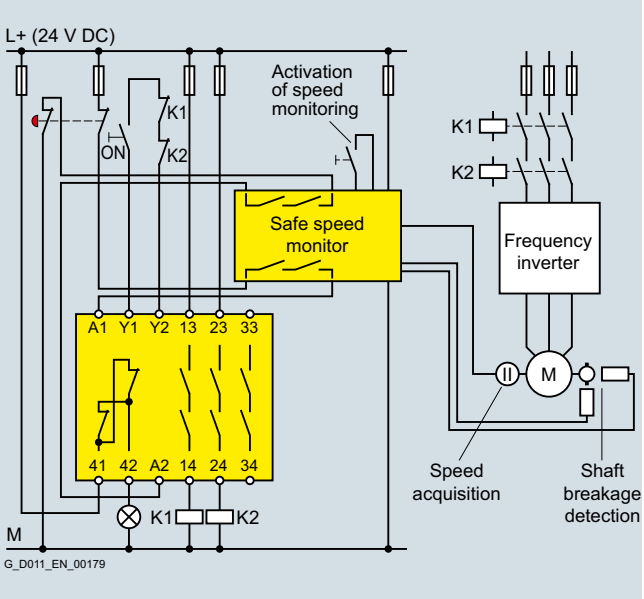
Integrated safety via fail-safe inputs



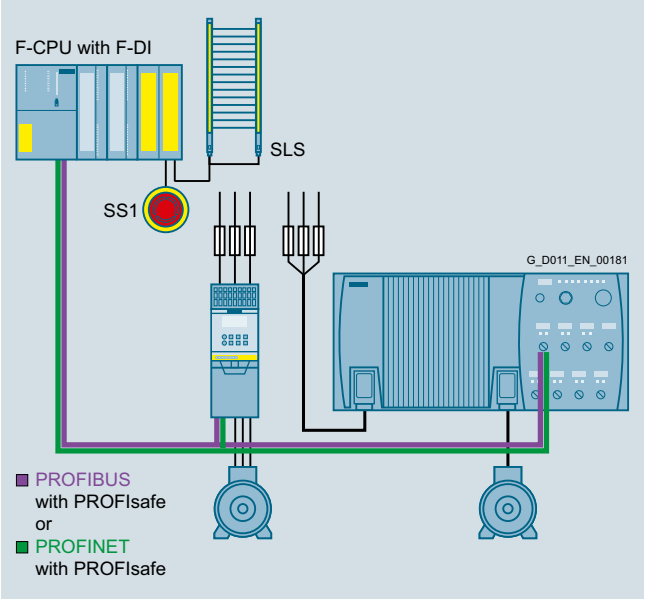
Integrated safety via PROFIsafe

Function

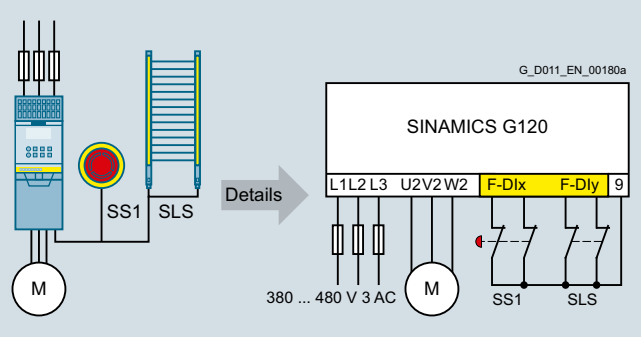
Safely Limited Speed (SLS)



Conventional wiring



Integrated safety via PROFIsafe



Integrated safety via fail-safe inputs

Function

SINAMICS G120C, SINAMICS G110M

The SINAMICS G120C and SINAMICS G110M frequency inverters offer the Safe Torque Off (STO) function as a standard feature.

The Safety Integrated function is completely integrated into the drive system. It can be activated via fail-safe digital inputs on the inverter or via PROFINET or PROFIBUS with PROFIsafe.

The Safety Integrated function is implemented electronically and therefore offers short response times in comparison to solutions with externally implemented monitoring functions.

Function	Activation	Underlying function	Reaction to limit overshoot	External setpoint input effective	Encoder required	License required
STO	• F-DI • PROFIsafe	–	–	No	No	No

2

Function

SINAMICS G120

The standard SINAMICS G120 inverters are available in a number of different versions for safety-related applications. The PM240-2, PM240 [1] and PM250 Power Modules are prepared for Safety Integrated. In conjunction with a fail-safe Control Unit, the drive can be turned into a Safety Integrated Drive with comprehensive safety functions.

In conjunction with a standard Control Unit, the drive provides the safety function STO.

The Safety Integrated functions are fully integrated in the drive system. They can be activated via fail-safe digital inputs on the Control Unit or via PROFINET or PROFIBUS with PROFIsafe.

The Safety Integrated functions are implemented electronically and therefore offer short response times compared to solutions with externally implemented monitoring functions.

Safety Integrated encoderless

The safety functions do not require a motor encoder; the implementation effort is minimal. Existing plants in particular can be updated with integrated safety technology without the need to change the motor or mechanical system.

The STO function can be used without restriction for all applications.

The SS1, SLS, SSM and SDI functions are permissible for applications in conjunction with asynchronous and SIEMOSYN motors where the load can never cause acceleration. An encoder that is used for the purposes of motor control has no significance for the safety functions here.

Safety Integrated overview

The availability of Safety Integrated functions depends on the type of Control Unit, i.e. whether it is a standard Control Unit or a fail-safe Control Unit.

The standard CU240E-2 and CU250S-2 Control Units offer STO.

The fail-safe Control Units offer Extended Functions (SLS, SDI, SSM) in addition to the Basic Functions (STO, SS1). The SBC function is currently supported by the CU250S-2.

A license is required for operation of the Extended Functions on the CU250S-2 Control Unit. It is of no consequence here which safety functions are used and how many.

The license can be ordered as an option with the memory card. Alternatively, a single-user license can also be purchased.

Safe Brake Relay

The Safe Brake Control (SBC) function requires a Safe Brake Relay. The Safe Brake Relay allows safe control of electromechanical motor brakes.

The 24 V DC solenoid of the motor brake is directly connected to the Safe Brake Relay. External surge suppressors are not required. The cable harnesses for connection to the Power Module are included in the scope of supply.

With the Safe Brake Relay function, the brake is controlled in accordance with IEC 61508 SIL 2 and EN ISO 13849-1 PL d and Category 3.

[1] PM240 Power Modules in frame size FSGX (i.e. 160 kW/250 hp and higher) are approved only for the Basic Safety functions (STO, SS1 and SBC).

Function

Overview of Safety Integrated functions

Function	Activation	Underlying function	Reaction to limit overshoot	External setpoint input effective	Encoder required	License required	Available in
Basic Functions							
STO	• F-DI • PROFIsafe	SBC (if activated)	–	No	No	No	• CU240E-2 • CU240E-2 DP • CU240E-2 PN • CU240E-2 F • CU240E-2 DP-F • CU240E-2 PN-F • CU250S-2 • CU250S-2 CAN • CU250S-2 DP • CU250S-2 PN
SS1 with SBR	• F-DI • PROFIsafe	Safe Brake Ramp (SBR) during braking. STO and SBC (if activated) following expiry of the parameterized delay time or if the speed falls below the minimum speed limit	STO	No	No	No	• CU240E-2 F • CU240E-2 DP-F • CU240E-2 PN-F • CU250S-2 • CU250S-2 CAN • CU250S-2 DP • CU250S-2 PN
SBC	• With STO (directly or following expiry of the delay time)	–	–	No	No	No	• CU250S-2 • CU250S-2 CAN • CU250S-2 DP • CU250S-2 PN
Extended Functions							
SLS	• F-DI • PROFIsafe	–	STO, SS1 (can be parameterized)	Yes	No	No	• CU240E-2 F • CU240E-2 DP-F • CU240E-2 PN-F
						Yes	• CU250S-2 • CU250S-2 CAN • CU250S-2 DP • CU250S-2 PN
SDI	• F-DI • PROFIsafe	–	STO, SS1 (can be parameterized)	Yes	No	No	• CU240E-2 F • CU240E-2 DP-F • CU240E-2 PN-F
						Yes	• CU250S-2 • CU250S-2 CAN • CU250S-2 DP • CU250S-2 PN
SSM	• Always active, if configured	–	Signals that the speed has fallen below a specified value	Yes	No	No	• CU240E-2 F • CU240E-2 DP-F • CU240E-2 PN-F
						Yes	• CU250S-2 • CU250S-2 CAN • CU250S-2 DP • CU250S-2 PN

2

Function

SINAMICS G110D and SINAMICS G120D

The SINAMICS G110D distributed frequency inverter offers the Safe Torque Off (STO) function as a standard feature. Safety functions are activated via the AS-i bus connection.

The SINAMICS G120D distributed frequency inverters include versions for safety-related applications. The PM250D Power Modules are already designed for Safety Integrated. In conjunction with a fail-safe Control Unit, the drive can be turned into a Safety Integrated Drive with comprehensive safety functions.

In conjunction with a standard Control Unit, the drive provides the safety function STO.

The Safety Integrated functions are fully integrated in the drive system. They can be activated via fail-safe digital inputs on the Control Unit or via PROFINET or PROFIBUS with PROFIsafe.

The Safety Integrated functions are implemented electronically and therefore offer short response times compared to solutions with externally implemented monitoring functions.

Safety Integrated encoderless

The safety functions do not require a motor encoder; the implementation effort is minimal. Existing systems in particular can be updated with safety technology without the need to change the motor or mechanical system.

The STO function can be used without restriction for all applications.

The SS1, SLS, SSM and SDI functions are permissible for applications in conjunction with asynchronous and SIEMOSYN motors where the load can never cause acceleration. An encoder that is used for the purposes of motor control has no significance for the safety functions here.

Control Units

The availability of Safety Integrated functions depends on the type of Control Unit, i.e. whether it is a standard Control Unit or a fail-safe Control Unit. All standard Control Units have STO.

The fail-safe Control Units offer Extended Functions (SLS, SDI, SSM) in addition to the Basic Functions (STO, SS1).

Function

Overview of Safety Integrated functions

Function	Activation	Underlying function	Reaction to limit overshoot	External setpoint input effective	Encoder required	License required	Available in
Basic Functions							
STO	• F-DI • PROFIsafe	–	–	No	No	No	• SINAMICS G110D [1] • CU240D-2 DP • CU240D-2 PN • CU240D-2 DP-F • CU240D-2 PN-F • CU250D-2 DP-F • CU250D-2 PN-F
SS1 with SBR	• F-DI • PROFIsafe	Safe Brake Ramp (SBR) during braking. STO following expiry of the parameterized delay time or if the speed falls below the minimum speed limit	STO	No	No	No	• CU240D-2 DP-F • CU240D-2 PN-F • CU250D-2 DP-F • CU250D-2 PN-F
Extended Functions							
SLS	• F-DI • PROFIsafe	–	STO, SS1 (can be parameterized)	Yes	No	No	• CU240D-2 DP-F • CU240D-2 PN-F • CU250D-2 DP-F • CU250D-2 PN-F
SDI	• F-DI • PROFIsafe	–	STO, SS1 (can be parameterized)	Yes	No	No	• CU240D-2 DP-F • CU240D-2 PN-F • CU250D-2 DP-F • CU250D-2 PN-F
SSM	• Always active	–	Signals that the speed has fallen below a specified value	Yes	No	No	• CU240D-2 DP-F • CU240D-2 PN-F • CU250D-2 DP-F • CU250D-2 PN-F

[1] Activation by safety-related shutdown of the AS-Interface cable.

Function

SINAMICS S110

The integrated safety functions of SINAMICS S110 provide highly effective application-oriented protection for personnel and machinery.

SINAMICS S110 offers Extended Functions (SS2, SOS, SLS, SDI, SSM) in addition to Basic Functions (STO, SS1, SBC).

The Safety Integrated functions are implemented electronically and therefore offer short response times compared to solutions with externally implemented monitoring functions.

The Safety Integrated functions are fully integrated in the drive system. They can be activated via fail-safe digital inputs on the CU305 Control Unit or over PROFINET or PROFIBUS with PROFIsafe.

As an alternative to controlling via terminals and/or PROFIsafe, there is also the option to parameterize several safety functions without selection. In this mode, after parameterization and a POWER ON, these functions are permanently selected.

Example:

"SLS without selection" can be used, for example, to monitor the maximum velocity to prevent the drive from exceeding a mechanical speed limit. For this purpose, using the "without selection" function, an F-DI does not have to be used; an F-CPU is also not required.

Safe speed/position sensing

Incremental encoders or absolute encoders can be used for safe sensing of the position values on a drive. Safe actual value sensing relies on redundant evaluation of the incremental tracks A/B that supply sin/cos signals of 1 V_{pp}. Only encoders of the type whose A/B track signals are created and processed using purely analog techniques can be used.

The encoder signals can be input via the Sensor Modules. As an alternative, motors with an integrated DRIVE-CLiQ interface can be used. The speed or 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 encoder must be mechanically attached in such a manner that the encoder shaft is unable to unplug or slide off. For notes on this, see IEC 61800-5-2: 2007, Table D.16.

A list of Siemens motors that fulfill the electrical and mechanical requirements is available at:

http://support.automation.siemens.com/WW/view/en/33512621

Motors with DRIVE-CLiQ interface are connected directly to the CU305 Control Unit. A SINAMICS Sensor Module is required to evaluate the encoder signals of motors without a DRIVE-CLiQ interface.

Safe actual value sensing without encoder

Some safety functions can also be operated without safety-capable encoders; implementation effort is minimal. Existing systems in particular can be updated with safety technology without the need to change the motor or mechanical system.

The STO function can be used without restriction for all applications.

The SS1, SLS, SSM and SDI functions are permissible for applications in conjunction with asynchronous and SIEMOSYN motors where the load can never cause acceleration. An encoder that is used for the purposes of motor control has no significance for the safety functions here.

Licensing

The Safety Integrated Basic Functions do not require a license.

The Safety Integrated Extended Functions do require a license. It is of no consequence here which safety functions are used and how many. The license can be ordered as an option with the memory card. Alternatively, a single-user license can also be purchased.

Safe Brake Relay

The Safe Brake Control (SBC) function requires a Safe Brake Relay. The Safe Brake Relay allows safe control of electro-mechanical motor brakes.

The 24 V DC solenoid of the motor brake is directly connected to the Safe Brake Relay. External surge suppressors are not required. The cable harnesses for connection to the Power Module are included in the scope of supply.

With the Safe Brake Relay function, the brake is controlled in accordance with IEC 61508 SIL 2 and EN ISO 13849-1 PL d and Category 3.

Function

Overview of Safety Integrated functions

Function	Activation	Underlying function	Reaction to limit overshoot	External setpoint input effective	Encoder required	License required
Basic Functions						
STO	• F-DI • PROFIsafe	SBC (if activated)	–	No	No	No
SBC	• With STO (directly or following expiry of the delay time)	–	–	–	No	No
SS1	• F-DI • PROFIsafe	STO following expiry of the parameterized delay time, followed by SBC (if activated)	STO	No	No	No
Extended Functions						
SS1 with SBR	• F-DI • PROFIsafe	Safe acceleration monitoring (Safe Brake Ramp (SBR)) during braking. STO and SBC (if activated) following expiry of the parameterized delay time or if the speed falls below the minimum speed limit	STO	No	No	Yes
SS2	• F-DI • PROFIsafe	Safe acceleration monitoring (SBR - Safe Brake Ramp) during braking. SOS following expiry of the parameterized delay time	SS1 → STO	No	Yes	Yes
SOS	• F-DI • PROFIsafe	–	SS1 → STO	Yes	Yes	Yes
SLS	• F-DI • PROFIsafe	–	STO, SS1, SS2 or SOS (can be parameterized)	Yes	Yes	Yes
SLS encoderless	• F-DI • PROFIsafe	–	STO, SS1 (can be parameterized)	Yes	No	Yes
SDI	• F-DI • PROFIsafe	–	STO, SS1, SS2 or SOS (can be parameterized)	Yes	No	Yes
SSM	• Always active, if configured	–	Signals that the speed has fallen below a specified value	Yes	No	Yes

Function

SINAMICS S120

The integrated safety functions of SINAMICS S120 provide highly effective application-oriented protection for personnel and machinery. They are suitable for machines and systems that require flexible safety functions and support the setup of tailored safety concepts.

SINAMICS S120 offers Extended Functions (SS2, SOS, SLS, SDI, SSM, SLP, SP, SBT) in addition to Basic Functions (STO, SS1, SBC).

The SP and SBT functions go beyond the functional scope according to IEC 61800-5-2.

The Safety Integrated functions are fully integrated in the drive system. They can be activated as follows:

- Via safety-related inputs on the CU310-2 Control Unit
- Via safety-related inputs on the TM54F Terminal Module
- Via PROFIBUS or PROFINET with the PROFIsafe profile

The Safety Integrated functions are implemented electronically and therefore offer short response times compared to solutions with externally implemented monitoring functions.

As an alternative to controlling via terminals and/or PROFIsafe, there is also the option to parameterize several safety functions without selection. In this mode, after parameterization and a POWER ON, these functions are permanently selected.

Example:

"SLS without selection" can be used, for example, to monitor the maximum velocity to prevent the drive from exceeding a mechanical speed limit. For this purpose, using the "without selection" function, an F-DI does not have to be used; an F-CPU is also not required.

Safe speed/position sensing

Incremental encoders or absolute encoders can be used for safe sensing of the position values on a drive. Safe actual value sensing relies on redundant evaluation of the incremental tracks A/B that supply sin/cos signals of 1 V_{pp}. Only encoders of the type whose A/B track signals are created and processed using purely analog techniques can be used. The encoder signals can be input via the Sensor Modules SMC20, SME20/25 or SME120/125.

HTL/TTL encoders can be used in a 2-encoder system to achieve safe actual value sensing. The minimum possible speed resolution must also be taken into account. The encoder signals are input via the SMC30 Sensor Module.

As an alternative, motors with an integrated DRIVE-CLiQ interface can be used. The speed or 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 encoder must be mechanically attached in such a manner that the encoder shaft is unable to unplug or slide off. For notes on this, see IEC 61800-5-2: 2007, Table D.16.

A list of Siemens motors that fulfill the electrical and mechanical requirements is available at:

http://support.automation.siemens.com/WW/view/en/33512621

The following can be used for safe speed/position sensing:

- Single-encoder systems or
- 2-encoder systems

Single encoder systems

In a single-encoder system, the motor encoder is used exclusively for safe actual value sensing.

2-encoder systems

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 (SMC20, SME20/25/120/125) must be provided.

Each measuring system requires a separate DRIVE-CLiQ connection.

Safe actual value sensing without encoder

The Extended Functions Safe Stop 1 (SS1) with SAM/SBR, Safely Limited Speed (SLS), Safe Speed Monitor (SSM) and Safe Direction (SDI) are also available for use without encoders (in combination with asynchronous (induction) motors and SIEMOSYN motors). An encoder that is used for the purposes of motor control has no significance for the safety function here. The encoderless safety functions can be implemented on request for chassis format units.

The Safety Integrated Function Manual contains additional information about the encoderless safety functions.
http://support.automation.siemens.com/WW/view/en/27103700/133300

The Extended Functions Safe Stop 2 (SS2), Safe Operating Stop (SOS), Safely Limited Position (SLP), Safe Position (SP) and Safe Brake Test (SBT) always require a safe encoder system.

Licensing

The Safety Integrated Basic Functions do not require a license.

The Safety Integrated Extended Functions do require a license. It is of no consequence here which safety functions are used and how many. The license can be ordered as an option with the memory card. Alternatively, a single-user license can also be purchased.

Function

Overview of Safety Integrated functions

Function	Activation	Underlying function	Reaction to limit overshoot	External setpoint input effective	Encoder required [1]	License required
Basic Functions						
STO	• F-DI on TM54F • F-DI on CU310-2 • PROFIsafe	SBC (if activated)	–	No	No [2]	No [3]
SBC	• With STO (immediately or following expiry of the delay time with SS1)	–	–	–	No	No
SS1	• PROFIsafe	STO following expiry of the parameterized delay time, SBC (if activated)	STO	Parameterizable	No	No
Extended Functions						
SS1 with SBR/SAM	• F-DI on TM54F • F-DI on CU310-2 • PROFIsafe	Safe Acceleration Monitor (SAM) or Safe Brake Ramp (SBR) during braking. STO and SBC (if activated) following expiry of the parameterized delay time or if the speed falls below the minimum speed limit	STO	Parameterizable	No	Yes
SS2	• F-DI on TM54F • F-DI on CU310-2 • PROFIsafe	Safe Acceleration Monitor (SAM) during braking. Following expiry of the parameterized delay time SOS	SS1 → STO	No	Yes	Yes
SLS encoder-less	• F-DI on TM54F • F-DI on CU310-2 • PROFIsafe • Continuously activated	–	STO, SS1 (can be parameterized)	Yes	No	Yes
SLS	• F-DI on TM54F • F-DI on CU310-2 • PROFIsafe • Continuously activated	–	STO, SS1, SS2 or SOS (can be parameterized)	Yes	Yes	Yes
SOS	• F-DI on TM54F • F-DI on CU310-2 • PROFIsafe	–	SS1 → STO	Yes	Yes	Yes
SSM	• Always active, if configured	–	Signals that the speed has fallen below a specified value	Yes	No	Yes
SDI	• F-DI on TM54F • F-DI on CU310-2 • PROFIsafe • Continuously activated	–	STO, SS1, SS2 or SOS (can be parameterized)	Yes	No	Yes
SLP	• F-DI on TM54F • F-DI on CU310-2 • PROFIsafe	–	STO, SS1, SS2 or SOS (can be parameterized)	Yes	Yes	Yes
SP	• Always active, if configured	–	–	Yes	Yes	Yes
SBT	• F-DI on TM54F • F-DI on CU310-2 • PROFIsafe	–	Signals test result. Warning if test fails	Yes	Yes	Yes

[1] The encoderless Safety Extended Functions can be implemented only on request for SINAMICS S120 chassis format units and cabinet units.

[2] Activation using terminals on the TM54F currently requires an encoder.

[3] Activation using terminals on the TM54F currently requires a license.

2

Function

Safe Brake Relay, Safe Brake Adapter

The following is required for Safe Brake Control (SBC):

- A Safe Brake Relay for power units in blocksize format
- A Safe Brake Adapter for power units in chassis format

The Safe Brake Control is integrated in power units in booksize format.

The Safe Brake Relay/Safe Brake Adapter and the brake control that is integrated in the booksize format allows safe control of electro-mechanical motor brakes.

The Safe Brake Relay controls a 24 V DC brake; the Safe Brake Adapter controls 230 V AC brakes. When the STO function is active, the Safe Brake Relay safely closes the connected brake. The SBC function monitors the control of the brake, however, not its mechanical functioning.

The inverter controls the connected brake using the motor holding brake function.

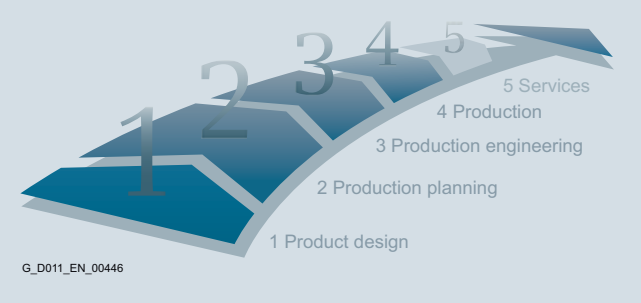
External surge suppressors are not required. The cable harnesses for connection to the Power Module are included in the scope of supply.

With the Safe Brake Relay/Safe Brake Adapter functions, the brake is controlled in accordance with IEC 61508 SIL 2 and EN ISO 13849-1 PL d and Category 3.

Safe Brake Relay

Safe Brake Adapter

Overview



Success factor: energy efficiency

Siemens helps you to optimize your energy demand, reduce your energy costs and increase your competitive advantage

Industry is facing enormous challenges:
Production processes need to be energy and resource efficient, but also highly productive. Siemens is offering an energy efficiency concept that continually and systematically reduces the power consumption of machines and equipment and thereby boosts the competitive advantage of industrial producers. When implementing energy-efficient solutions, Siemens not only assesses the production process as a whole, but also evaluates each individual production step. When you choose Siemens, you can rely on a partner with a range of products that will reduce your energy costs and make you more competitive – thanks to a comprehensive, standardized portfolio of energy-efficient drives, automation systems and services plus many years of expertise in the implementation of these solutions.

1 Product design

Improve your confidence in planning outcomes! It is important to know the costs associated with the operation of a production machine so that these can be taken into account in the machine design. For example, the SinaSave software application can help you to calculate how soon you will recoup your investment if you purchase an energy-efficient drive. The Mechatronic Support simulation package will also provide you with the means to test and optimize your machine concept, helping you to save time, energy and operating expenses. See also the SIZER for Siemens Drives engineering tool.
SinaSave: www.siemens.com/sinasave
SIZER for Siemens Drives: www.siemens.com/sizer

2 Production planning

Make your plant more profitable! It is possible to carry out an on-screen simulation of individual machines or the entire production process. By doing this, you can optimize the efficiency and productivity of production processes. For example, you can use the digital models and analysis functions provided by the Plant Simulation tool in order to optimize the motion sequences of your machines, prevent load peak overlaps, recover energy and optimize speeds.
Plant Simulation: www.siemens.com/tecnomatix

3 Production engineering

Optimize the workflow! The SIMATIC B.Data management tool helps you to achieve efficient control of energy and costs. But this requires perfectly coordinated communication and operation between hardware and software. Using the TIA Portal engineering framework, for example, it is easy to set up and optimize every single engineering process. You can then see at a glance the areas in your plant that can be made more productive and environmentally friendly. See also the STARTER commissioning tool and the SINAMICS Startdrive commissioning tool.
SIMATIC B.Data: www.siemens.com/bdata
TIA Portal: www.siemens.com/tia-portal
STARTER: www.siemens.com/starter
SINAMICS Startdrive: www.siemens.com/startdrive

4 Production

Use innovative drive technology to reduce your energy consumption! The energy-efficient components and systems developed by Siemens can cut the energy consumption of a plant. Important components in an energy-efficient plant are, for example, frequency inverters with regenerative feedback functions for applications with variable speeds or soft starters for fixed-speed drives. With its PROFIenergy system, Siemens is also offering solutions that permit centralized shutdown of loads or entire production units during production breaks – a vendor- and device-neutral interface for flexible use over short or long production breaks.

5 Services

Improve your productivity and efficiency while reducing total costs! With its Energy & Environmental Services, Siemens is offering a tailored consultancy that will provide you with the necessary support in designing and implementing systematic energy and environmental management solutions. It will give you the satisfaction of achieving maximum energy efficiency throughout your company.

Energy-efficient drives

Energy-efficient SINAMICS drives save energy in an intelligent way

Exploit energy-saving potential and optimize energy consumption: You can - with intelligent SINAMICS drives. Depending on the application in question, energy consumption can be controlled by motor speed adjustment to suit the individual process and achieve the greatest possible energy savings. The energy consumption of drives for turbomachines can be cut by as much as 70 %. Regenerative feedback is also an option for many applications. Our portfolio of frequency inverters is the most comprehensive on the market and the first choice for anyone seeking an energy-efficient drive – at low-voltage or medium-voltage level.

Energy-efficient drives with intelligent functions

Depending on the application and load profile, the intelligent energy-saving functions of SINAMICS drives can cut energy consumption.

ECO mode

In ECO mode, the operating point of the motor in the partial-load range is automatically adjusted and optimized. This reduces motor losses, for example, in machines that do not need a high torque over the entire operating range.

Hibernation mode

Variable-speed drives that are not required to operate continuously are switched to standby or "Hibernation mode". The drive is restarted again as soon as it is needed.

Bypass mode

In bypass mode it is possible to "bypass" the inverter electrically as soon as the motor is frequently operating close to its rated speed. This solution helps to reduce inverter losses and so increase overall efficiency.

Cascading

In pump, fan and compressor applications involving high outputs, the entire power demand is distributed among several motors. Phased connection and disconnection by means of partially or fully controlled cascades in combination with inverters make a drive system more energy-efficient.

Energy balancing

Through the use of inverters with coupled drives, energy is exchanged through the common DC link. Through the direct energy exchange from one inverter to the next, it is possible to minimize power losses in the system.

Energy efficiency

Overview

Reactive power compensation

The use of SINAMICS inverters with Active Line Modules reduces the capacitive and/or inductive reactive power in the machine. It is then possible to dispense with costly reactive power compensation systems.

Energy buffering

With dynamic reversing operations in single-axis and multi-axis systems, the kinetic energy available in the system is reused. Use of SINAMICS inverters results in energy equalization across the common DC link.

Energy usage counter/Energy saving counter

Actual energy usage can be displayed during operation. Furthermore, an energy saving counter can be installed to indicate the cumulative energy savings during machine operation as compared to a fixed-speed application.

Regenerative feedback

In conventional drive systems, the energy produced during braking is converted to heat using braking resistors. SINAMICS G and SINAMICS S inverters with regenerative feedback capability need no braking resistor, and supply the resulting braking energy back into the line.

DC link coupling with SINAMICS V20

Applications with two SINAMICS V20 inverters with the same power rating can share a common DC link in order to reuse regenerated energy.

Overview of energy-saving functions for SINAMICS drives

Energy-saving function	SINAMICS V	SINAMICS G							SINAMICS S	
	V20	G110	G110D	G120C	G120P	G120	G110M	G120D	S110	S120
ECO mode	✓	–	–	✓	✓	✓	✓	✓	✓	✓
Hibernation mode	✓	–	–	–	✓	✓ with CU230P-2 Control Unit	–	–	–	–
Bypass mode	–	–	–	–	✓	✓ with CU230P-2 Control Unit	–	–	–	✓
Cascading	✓	–	–	–	✓	✓ with CU230P-2 Control Unit	–	–	–	–
Energy balancing	✓	–	–	–	–	–	–	–	–	✓ for multi-axis drives only
Reactive power compensation	–	–	–	–	–	–	–	–	–	✓ with Active Line Module
Energy buffering	–	–	–	–	–	–	–	–	–	✓ for multi-axis drives only
Energy usage counter/Energy saving counter	✓	–	✓	✓	✓	✓	✓	✓	–	✓
Regenerative feedback	–	–	–	–	–	✓ with PM250 Power Module	–	✓	–	✓ with Smart Line Module or Active Line Module
Communication protocol and profile										
PROFINET	–	–	–	✓	✓	✓ not for CU240B-2 Control Unit	✓	✓	✓	✓
• PROFIenergy	–	–	–	✓	✓	✓ not for CU240B-2 Control Unit	✓	✓	–	✓

More information

Further information about energy efficiency including references from industrial product can be found at www.siemens.com/energy-efficiency

Further information about SINAMICS V20 can be found at www.siemens.com/sinamics-v20

Overview

Regenerative feedback with SINAMICS G120 and SINAMICS G120D

With its Efficient Infeed Technology, Siemens AG is setting a global standard for drives of compact design. The technology applied is a world first and provides regenerative feedback capability in smaller, lighter and much lower-cost inverter units.

Available drives with Efficient Infeed Technology

The following drives are equipped with Efficient Infeed Technology:

- SINAMICS G120 (integrated in PM250 Power Modules)
- SINAMICS G120D
- SIMATIC ET200pro FC-2 (available soon)

Potential savings thanks to Efficient Infeed Technology

The table below shows the advantages of the technology as compared to conventional 2-quadrant inverters.

	Standard Technology	Efficient Infeed Technology
Line reactor	Required	Not required
Braking resistor	Required	Not required
Configuration overhead	Standard	Low
Generated harmonics	Standard	Minimal
Heat generated when braking	Yes	No
Power infeed	Standard	Reduced
Power consumption	Standard	Lower
Energy efficiency	Standard	Good
Installation outlay	Standard	Low

G_D011_EN_00182a

Three technical criteria are of particular significance:

- Regenerative feedback
  - 100 % braking power is fed back, allowing continuous braking. This is possible using braking resistors which take up a lot of space and are expensive.
  - A braking resistor does not need to be configured.
  - No need for installation, thermal monitoring, etc. of external components.
- Minimal reactive power distortion
  - Low reactive power distortion thanks to current consumption that is almost block-shaped, the power factor λ is virtually 0.9. The transformer throughput rating is therefore lower than that required for inverters with a standard DC link.
  - In order to achieve such a low harmonic content (line harmonics) for an inverter with a conventional DC link, a line reactor with a u_K = 6 % is required.
  - This results in approx. 22 % lower current consumption which corresponds to approximately 40 % lower losses in the supply system.
  - The load on the power supply system is therefore reduced.
- Improved offset factor cos φ
  - Slightly capacitive at input ≅ 0.95 capacitive.
  - Compensates the reactive power of motors and other inductive loads on the same supply.
  - The power draw of the entire system is reduced. In a system comprising one inverter with motor and another motor on the same supply, the total power draw is reduced by up to 12 %.

Line supply conditions

Inverters with Efficient Infeed Technology have a much lower harmonic content (and therefore lower reactive current component) than a standard inverter. The harmonics up to and including the 11th are significantly lower than specified in the relevant standard. These relevant harmonics are less than half the magnitude stipulated by the relevant standard (EN 61000-3-12).

Permissible ratio between network short-circuit power S_{K_line} and inverter apparent power $S_{inverter}$:

$S_{K\_line} \geq 100 \times S_{inverter}$ according to $u_K \leq 1$ %

Benefits

- Continuous braking with 100 % braking power
- Energy savings through regenerative feedback with motor operating in generator mode
- Omission of braking resistor, line reactor and brake chopper
- No costly configuration of the braking resistors and no time-consuming cabling
- Requires considerably less space than a conventional compact inverter
- Up to 22 % less power infeed
- No additional heat generated during braking
- Cost savings
- Space savings

Efficient Infeed Technology

Application

Whenever an application involves movements with frequent changes in speed or rotational direction or requires masses to be electrically braked, inverters with regenerative feedback capability are an attractive drive solution for both operating companies and machine manufacturers.

This is also true for applications with vertical motion generally, or for driven loads with a high moment of inertia:

- Drives for conveyor vehicles
- Stage machinery in theaters
- Cranes
- Heavy load transport systems/conveyors
- Storage and retrieval machines
- Centrifuges
- Brake testing systems
- Drum-type crushers/revolving screens
- Vertical load hoists
- Industrial washing machines
- Shuttles/elevator systems/endless bucket belts
- Rolling mills/conveyor belts
- Winding machines

Generally, for applications with a high braking power over long periods of time, in many cases it makes sense to use Efficient Infeed Technology - this reduces the costs and the amount of space required.

Integration

SINAMICS infeed concepts

SINAMICS offers four design concepts for the inverter infeed circuit.

Concept	Characteristic features
Basic Infeed (only for multi-axis drives)	• Automatic energy exchange via the common DC link during infeed with Basic Line Module infeed unit • No regenerative feedback capability • Braking resistor required for braking operation • High harmonic content (reactor available as option) • Efficiency approx. 99 %
Smart Infeed (only for multi-axis drives)	• **Automatic energy exchange via the common DC link** • **Regenerative feedback capability** • **Line reactor is required** • **Efficiency approx. 98 % to 99 %**
Efficient Infeed	• **Regenerative feedback capability** • **Line reactor not required/not permitted** • **Low harmonic component** • **Efficiency approx. 98 %** • **High energy efficiency and high active current component**
Active Infeed (only for multi-axis drives)	• **Automatic energy exchange via the common DC link** • **Regenerative feedback capability** • **Low harmonics in motor and generator operation** • **Efficiency approx. 97 % to 98 %** • **Operation on island networks possible** • **Operation on weak networks possible ($u_K \leq 5$ %)** • **Boosting DC link voltage permits smaller power units** • **Decoupling from line voltage fluctuations due to constantly controlled DC link voltage**

Overview

Digital bus systems are commonly used in industrial automation today. These handle communication between the control level, the machine control, the sensors and actuators. The SINAMICS product family offers integrated communication interfaces in all product groups – which can be used to connect the most important fieldbus systems in the simplest possible way.

The properties and special application areas of the different bus systems are described briefly below.

Protocol	SINAMICS V	SINAMICS G										SINAMICS S		
	V20	G110	G110D	G120C	G120P/ G120	G120				G110M	G120D	S110	S120	
					CU230P-2	CU240B-2	CU240E-2	CU250S-2		CU240M	CU240D-2	CU250D-2	CU305	CU310-2	CU320-2
PROFINET	–	–	–	✓	✓	–	✓	✓		✓	✓	✓	✓	✓	✓
- PROFINET RT	–	–	–	✓	✓	–	✓	✓		✓	✓	✓	✓	✓	✓
- PROFINET IRT isochronous	–	–	–	–	–	–	–	–		–	–	–	✓	✓	✓
- PROFINET IRT (not isochronous)	–	–	–	✓	✓	–	✓	✓		✓	✓	✓	✓	✓	✓
- PROFINET Shared Device	–	–	–	✓	✓	–	✓	✓		✓	✓	✓	✓	✓	✓
- PROFINET media redundancy MRP (surge prone)	–	–	–	✓	✓	–	✓	✓		✓	✓	✓	✓	✓	✓
- PROFINET media redundancy MRPD (surge free)	–	–	–	✓	✓	–	✓	✓		✓	✓	✓	✓	✓	✓
- PROFIsafe	–	–	–	✓	–	–	✓	✓		✓	✓	✓	✓	✓	✓
- PROFIenergy	–	–	–	✓	✓	–	✓	✓		✓	✓	✓	–	✓	✓
- PROFIdrive application class 1	–	–	–	✓	✓	✓	✓	✓		✓	✓	–	✓	✓	✓
- PROFIdrive application class 3	–	–	–	–	–	–	–	✓		–	–	✓	✓	✓	✓
- PROFIdrive application class 4	–	–	–	–	–	–	–	–		–	–	–	✓	✓	✓
PROFIBUS DP	–	–	–	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓
- PROFIBUS DP equidistance and isochronous mode	–	–	–	–	–	–	–	–		–	–	–	✓	✓	✓
- PROFIBUS DP peer-to-peer communication	–	–	–	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓
AS-Interface	–	–	✓	–	–	–	–	–		–	–	–	–	–	–
USS	✓	✓	✓	✓	✓	✓	✓	✓		✓	–	–	✓	✓	✓
EtherNet/IP	–	–	–	✓	✓	–	✓	✓		✓	✓	✓	–	–	✓
CANopen	–	–	–	✓	✓	–	–	✓		–	–	–	✓	–	✓
BACnet MS/TP	–	–	–	–	✓	–	–	–		–	–	–	–	–	–
Modbus RTU	✓	–	–	✓	✓	✓	✓	✓		✓	–	–	–	–	–
P1 protocol	–	–	–	–	✓	–	–	–		–	–	–	–	–	–
Web server	–	–	–	–	–	–	–	–		–	–	–	–	✓	✓

More information

Further information about SINAMICS V20 can be found at www.siemens.com/sinamics-v20

2

Overview

PROFIBUS – the most successful open fieldbus in the automation environment

The requirements of users for an open, non-proprietary communication system have resulted in the specification and standardization of the PROFIBUS protocol.

PROFIBUS defines the technical and functional features of a serial fieldbus system, with which the distributed field automation devices in the lower area (sensor/actuator level) can be networked up to the mid performance range (cell level).

Standardization according to IEC 61158/EN 50170 secures your investments for the future.

Using the conformity and interoperability test performed by the test laboratories authorized by PROFIBUS & PROFINET International (PI) and the certification of the devices by PI, users have the security of knowing that the quality and functionality is guaranteed, even in multi-vendor installations.

PROFIBUS versions

Three different PROFIBUS versions have been defined in order to comply with the widely differing requirements at the field level:

PROFIBUS FMS (Fieldbus Message Specification) – the universal solution for communication tasks at the field and cell levels in the industrial communication hierarchy.

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

PROFIBUS DP (Distributed Periphery) – this version, which is optimized for speed, is specifically tailored to the communication of automation systems with distributed I/O stations and drives. PROFIBUS DP sets itself apart as a result of very short response times and high noise immunity, and replaces cost-intensive, parallel signal transfer with 24 V and measured value transfer utilizing 0/4 … 20 mA technology.

Design

Bus participants on PROFIBUS DP

PROFIBUS DP makes a distinction between two different master classes and one slave class:

DP master class 1

For PROFIBUS DP, DP master class 1 is the central component. In a defined and continually repeating message cycle the central master station exchanges information with distributed stations (DP slaves).

DP master class 2

Devices of this type (programming, configuring or operator control devices) are used during commissioning, for configuring the DP system, for diagnostics or for operating the active plant or system. A DP master class 2 can, for example, read input, output, diagnostic and configuration data of the slaves.

DP slave

A DP slave is an I/O device which receives output information or setpoints from the DP master, and as response, returns input information, measured values and actual values to the DP master. A DP slave never sends data automatically, but only when requested by the DP master.

The quantity of input and output information depends on the device, and for each DP slave in each send direction can be a maximum of 244 bytes.

Function

Functional scope in DP masters and DP slaves

The functional scope can differ between DP masters and DP slaves. The different functional scopes are classified as DP-V0, DP-V1 and DP-V2.

DP-V0 communication functions

The DP-V0 master functions consist of "Configuration", "Parameter Assignment" and "Reading 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 clock signal is sent by the DP master to all bus nodes in the form of a global control frame. Master and slaves can then synchronize their applications with this signal. The signal jitter between cycles is less than 1 µs.
- Slave-to-slave:
  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 done by sending the response frame to the master as a broadcast. Slave-to-slave communication is therefore a cyclic process.

PROFIBUS with SINAMICS

SINAMICS uses the PROFIBUS DP protocol.

The SINAMICS drives can only be used as DP slaves.

Overview

Ethernet is the basic Internet technology for worldwide networking. The wide variety of options of Intranet and Internet, that have long been available in the office environment, are now being made available to factory automation with Industrial Ethernet.

Apart from the use of information technology, the deployment of distributed automation systems is also on the increase. This means the breakdown of complex control tasks into smaller, manageable and drive-based control systems. This in turn is boosting the demand for communication which necessitates an extensive and powerful communication system.

Industrial Ethernet provides a powerful area and cell network for the industrial field, compliant with the IEEE 802.3 (ETHERNET) standard.

Benefits

Ethernet enables a very fast data transfer (10/100 Mbit/s, 1/10 Gbit/s) and at the same time has full-duplex capability. It therefore provides an ideal basis for communication tasks in the industrial field. With a share of over 90%, Ethernet is the number one network worldwide and offers important features which have essential advantages:

- Fast commissioning thanks to extremely simple 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 wide area network (WAN) technology or the Internet
- Protection of investment due to continuous and compatible development
- Wireless communication using industrial wireless LAN

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
- Fail-safety 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 with SINAMICS S

SINAMICS S provides Control Units and Communication Boards with PROFINET interface based on 100 Mbit/s Ethernet. This means that process communication in real-time, as well as engineering and HMI via standard TCP/IP are simultaneously possible.

The CU310-2 und CU320-2 Control Units have an additional Ethernet interface at the front so that service and engineering tasks can be performed very easily.

Communication with SINAMICS S over Industrial Ethernet

PG/OP/PC communication

PG/OP/PC communication is performed using protocols which are based on the basic TCP/IP protocol.

- Engineering and diagnostics with STARTER

IT communication

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

- HTTP/HTTPS: Hypertext Transfer Protocol
  Using a standard Internet browser, it is possible to retrieve predefined Web pages containing diagnostic information from the device. Furthermore, user-defined web pages containing information defined by the user can be stored in the device.
- SNMP: Simple Network Management Protocol

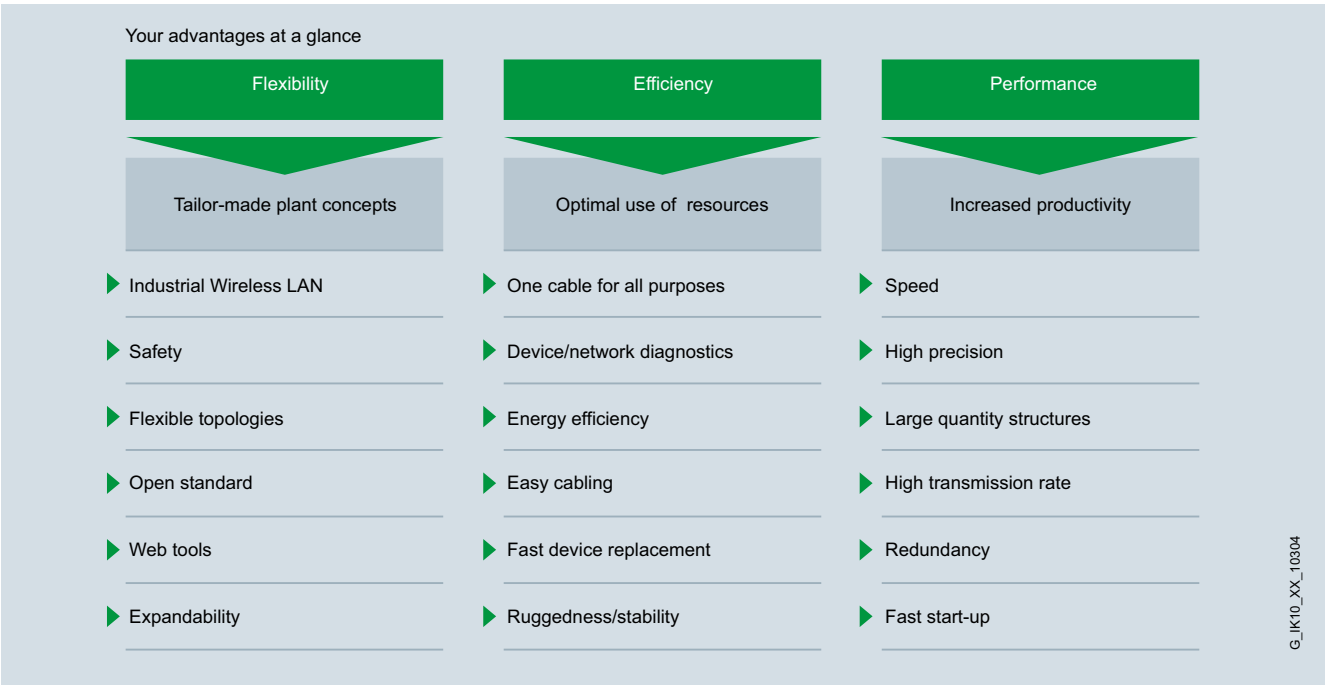
2

Overview

PROFINET – the Ethernet standard for automation

PROFINET is the world's leading Industrial Ethernet standard for automation with more than three million nodes installed worldwide.

PROFINET makes companies more successful, because it speeds up processes and raises both productivity and plant availability.



Flexibility

Short response times and optimized processes are the basic requirements for competitiveness in global markets because the product lifecycles are increasingly becoming shorter.

PROFINET ensures maximum flexibility in plant structures and production processes and enables innovative machine and plant concepts to be implemented. For example, mobile devices can also be integrated at locations that are difficult to access.

Flexible topologies

In addition to the linear structure characterized by the established fieldbuses, PROFINET also enables the use of star, tree and ring structures. This is made possible by the switching technology via active network components, such as Industrial Ethernet switches and media converters, or by integrating switch functionality into the field devices. This creates greater flexibility for the planning of machines and plants, as well as reducing the cabling requirements.

The PROFINET network can be installed without any specialist knowledge at all and meets all requirements that are relevant in the industrial environment. The PROFINET Guideline "Cabling and Interconnection Technology" supports manufacturers and users during network installation. Symmetrical copper cables or RFI-resistant fiber-optic cables are used, depending on the application. Devices from different manufacturers are easily connected via standardized and rugged plug connectors (up to IP65/IP67 degree of protection).

By integrating switch functionality into the devices, linear structures can be created that are directly oriented toward an existing machine or plant structure. This reduces cabling overhead and cuts down on components such as external switches.

IWLAN

PROFINET also supports wireless communication with Industrial Wireless LAN, opening up new fields of application. For example, technologies subject to wear, such as trailing cables, can be replaced and the use of automated guided vehicle systems and mobile operator terminals becomes possible.

Safety

The PROFIsafe safety profile, which has been tried and tested with PROFIBUS and which permits the transmission of standard and safety-related data on a single bus cable, can also be used with PROFINET. No special network components are necessary for fail-safe communication, which means that standard switches and standard network transitions can continue to be used without any restrictions. In addition, fail-safe communication is equally possible via Industrial Wireless LAN (IWLAN).

Open standard

PROFINET, the open multi-vendor standard (IEC 61158/IEC 61784), is supported by PROFIBUS and PROFINET International (PI). It stands for maximum transparency, open IT communication, network security and simultaneous real-time communication.

Overview

Thanks to its openness, PROFINET provides the basis for a standardized automation network in the plant, to which all other machines and devices can be connected. Even the integration of existing plant components, for example with PROFIBUS, presents no problems due to the use of network transitions.

Use of Web tools

Thanks to the unrestricted support of TCP/IP, PROFINET permits the use of standard Web services in the device, such as Web servers. Irrespective of the tool used, information from the automation level can be accessed from virtually any location using a commercially available Internet browser. This considerably simplifies commissioning and diagnostics. Users can then decide for themselves how much openness to the IT world they want to allow for their machine or plant. This means that PROFINET can be used simply as an isolated plant network or connected via appropriate security modules, such as the SCALANCE S modules, to the office network or the Internet. In this way, new remote maintenance concepts or the high-speed exchange of production data become possible.

Expandability

On the one hand, PROFINET facilitates the integration of existing systems and networks without any great effort or expense. In this way, PROFINET safeguards investments in existing plant components that communicate via PROFIBUS and other fieldbuses such as AS-Interface. On the other hand, additional PROFINET nodes can be added at any time. By using additional network components, network infrastructures can be expanded using cabling or wireless methods – even while the plant is operating.

Efficiency

Greater global competition means that companies must use their resources economically and efficiently. This applies in particular to production. This is where PROFINET ensures greater efficiency. Simple engineering guarantees fast commissioning, while reliable devices ensure a high level of plant availability. Comprehensive diagnostic and maintenance concepts help to reduce plant downtimes and keep maintenance costs to a minimum.

One cable for everything

PROFINET permits simultaneous fieldbus communication with isochronous mode and standard IT communication (TCP/IP) on one cable. This real-time communication for the transmission of the user/process data and diagnostic data takes place on a single cable. Specific profile communication (PROFIsafe, PROFIdrive and PROFIenergy) can be integrated without any additional cabling. This solution offers a wide scope of functions at a low level of complexity.

Device and network diagnostics

By retaining the tried and tested PROFIBUS device model, the same diagnostics information is available with PROFINET. In addition, module- and channel-specific data can also be read out from the devices during device diagnosis, enabling faults to be located quickly and easily. Apart from the availability of device information, the reliability of the network operation has top priority in the network management.

In existing networks the Simple Network Management Protocol (SNMP) has established itself as the de facto standard for the maintenance and monitoring of the network components and their functions. PROFINET uses this standard and gives users the opportunity to maintain their networks with tools that are familiar to them, such as the SINEMA Server network management software.

For easier maintenance of PROFINET devices, both on-site and remotely via a secure VPN connection, application-specific websites can be set up on the integrated Web server of the field devices using the familiar HTML standard.

Energy efficiency

En route to the green factory: PROFIenergy is a profile that provides functions and mechanisms for PROFINET field devices that support energy-efficient production.

The profile, which is defined by the PNO and is independent of any manufacturers or devices, enables the energy demand and costs to be significantly reduced: Using PROFIenergy, any specific loads that are not currently being used can be switched off. This achieves a noticeable reduction in energy costs during breaks in production. PROFIenergy permits the simple, automated activation and deactivation of technologically related plant components. It is coordinated centrally by means of a higher-level controller and is networked via PROFINET. This ensures that as much energy as possible is saved during longer breaks. Temporarily switching off plant components contributes to the even distribution and most efficient use of energy.

The use of PROFIenergy is made easy for the machine builder by its integration into familiar series of products. In addition, PROFIenergy is defined in such a way that the necessary function blocks can easily be integrated into existing automation systems at a later stage.

Simple wiring

Particularly stringent demands are made on the installation of cabling in the industrial environment. In addition, there is a requirement to set up industry-standard networks in the shortest possible time without any special knowledge.

With FastConnect, Siemens is offering a high-speed installation system that meets all of these requirements. FastConnect is the standard-compliant, industrial cabling system consisting of cables, connectors and assembly tools for PROFINET networks. The time required for connecting terminals is minimized by the simple installation method using just a single tool, while installation errors are prevented by the practical color-coding. Both copper cables and glass fiber optic cables can be easily assembled on site.

Fast device replacement

PROFINET devices are identified by means of a name assigned during configuration. On replacing a defective device, a new device can be recognized from its topology information by the IO controller and a new name can be assigned to it automatically. This means that no engineering tool is necessary for the replacement of equipment.

This mechanism can even be used for the initial commissioning of a complete system. This speeds up commissioning, particularly in the case of series machines.

Ruggedness

An automation network must be robustly protected against external sources of interference. The use of Switched Ethernet prevents faults in one part of the network from affecting the entire plant network. For areas that are particularly prone to radio frequency interference (RFI), PROFINET allows the use of fiber optic cables.

Overview

Performance

Productivity and product quality determine the level of success in the market. Precise motion control, dynamic drives, high-speed controllers and the deterministic synchronization of devices are therefore key factors in achieving superior production. They facilitate high production rates and optimum product quality at the same time.

Speed and precision

Fast motion control applications demand precise and deterministic exchange of data. This is implemented by means of drive controllers using isochronous real time (IRT).

With IRT and isochronous mode, PROFINET permits fast and deterministic communication. This synchronizes the various cycles of a system (input, network, CPU processing and output), even in the case of parallel TCP/IP traffic. The short cycle times of PROFINET make it possible to raise the productivity of machines and plants and to guarantee the product quality and high level of precision.

The standardized PROFIdrive profile permits vendor-independent communication between CPUs and drives.

Large quantity structures

The use of PROFINET makes it possible to overcome the existing restrictions regarding the scope of machines and systems that can be implemented. In one network, several different controllers can interact with their assigned field devices. The number of field devices per PROFINET network is virtually unlimited – the entire range of IP addresses is available.

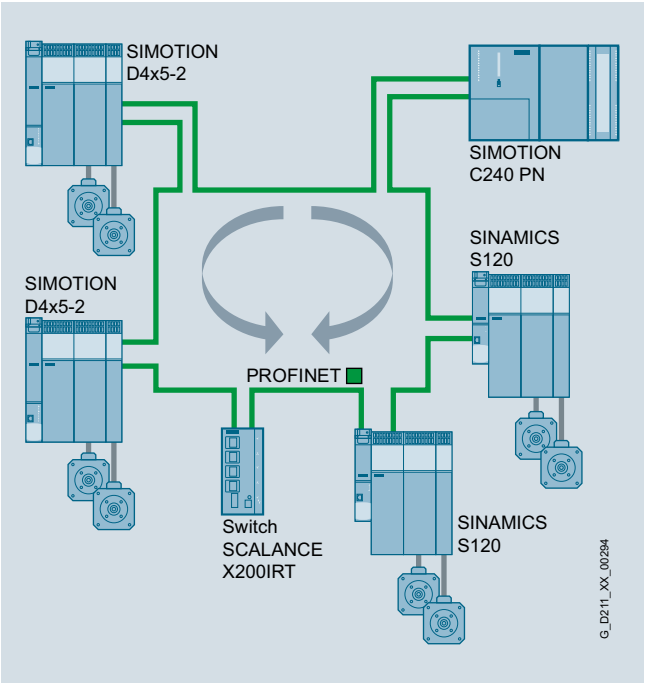
High data rate

By using 100 Mbit/s in full duplex mode, PROFINET achieves a significantly higher data rate than previous fieldbuses. This means that other plant data can be transmitted over TCP/IP without any problems, in addition to the process data. PROFINET therefore meets the combined industrial demands for simultaneously transmitting high-speed IO data and large volumes of data for additional sections of the application. Even the transmission of large volumes of data, such as that from cameras, has no adverse effect on the speed and precision of the IO data transmission, thanks to PROFINET mechanisms.

Media redundancy

A higher plant availability can be achieved with a redundant installation (ring topology). The media redundancy can be implemented not only with the aid of external switches, but also by means of integrated PROFINET interfaces. Using the media redundancy protocol (MRP), reconfiguration times of 200 ms can be achieved. If the communication is interrupted in just one part of the ring installation this means that a plant standstill is prevented and any necessary maintenance or repair work can be performed without any time pressure.

For motion control applications, PROFINET IRT in ring topologies offers the extended media redundancy for planned duplication (MRPD) which operates in a bumpless mode without any reconfiguration time. If communication is interrupted (e.g. a cable break) the process can continue operating without interruption. Until now, the functionality has only been supported by SIMOTION, SINAMICS and SCALANCE X200IRT.



Bumpless media redundancy with SIMOTION, SINAMICS S120 and SCALANCE X200IRT

Benefits

- PROFINET is the open Industrial Ethernet standard for automation
- PROFINET is based on Industrial Ethernet
- PROFINET uses TCP/IP and IT standards
- PROFINET is real-time Ethernet
- PROFINET enables seamless integration of fieldbus systems
- PROFINET supports fail-safe communication via PROFIsafe and also via IWLAN

More information

Further information is available at
www.siemens.com/profinet

Overview

PROFIdrive – the standardized drive interface for PROFINET and PROFIBUS

PROFIdrive defines the device behavior and technique to access internal device data for electric drives connected to PROFINET and PROFIBUS – from basic frequency inverters up to high-performance servo controllers.

It describes in detail the practical use of communication functions – slave-to-slave data transfer, equidistance and clock cycle synchronization (isochronous mode) in drive applications. In addition, it specifies all device characteristics which influence interfaces connected to a controller over PROFINET or PROFIBUS. This also includes the state machine (sequence control), the encoder interface, scaling of values, definition of standard telegrams, access to drive parameters etc.

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

What are profiles?

For devices and systems used in automation technology, profiles define properties and modes of behavior. This allows manufacturers and users to define common standards. Devices and systems that comply with such a cross-manufacturer profile, are interoperable on a fieldbus and, to a certain degree, can be interchanged.

Are there different types of profiles?

A distinction is made between what are known as application profiles (general or specific) and system profiles:

- Application profiles (also device profiles) predominantly refer to devices (e.g. drives) and include and agreed selection regarding bus communication as well as also specific device applications.
- System profiles describe classes of systems, including master functionality, program interfaces and integration resources.

Is PROFIdrive fit for the future?

PROFIdrive has been specified by the PROFIBUS and PROFINET International (PI) user organization, and is specified as a standard that is fit for the future through standard IEC 61800-7.

The basic philosophy: Keep it simple

The PROFIdrive profile tries to keep the drive interface as simple as possible and free from technology functions. As a result of this philosophy, referencing models as well as the functionality and performance of the PROFINET/PROFIBUS master have either no influence or only a low influence on the drive interface.

One drive profile – different application classes

The integration of drives into automation solutions depends very strongly on the particular drive application. In order to be able to address the complete, huge bandwidth of drive applications – from basic frequency inverters up to synchronized multi-axis systems with a high dynamic performance – using just one profile, PROFIdrive defines six application classes, to which most drive applications can be assigned:

- Class 1 – standard drives (for example pumps, fans, agitators etc..)
- Class 2 – standard drives with technological functions
- Class 3 – positioning drives
- Class 4 – motion control drives with central, higher-level motion control intelligence and patented position control concept "dynamic servo control"
- Class 5 – motion control drives with central, higher-level motion control intelligence and position setpoint interface
- Class 6 – motion control drives with distributed motion control intelligence integrated in the drives themselves

Design

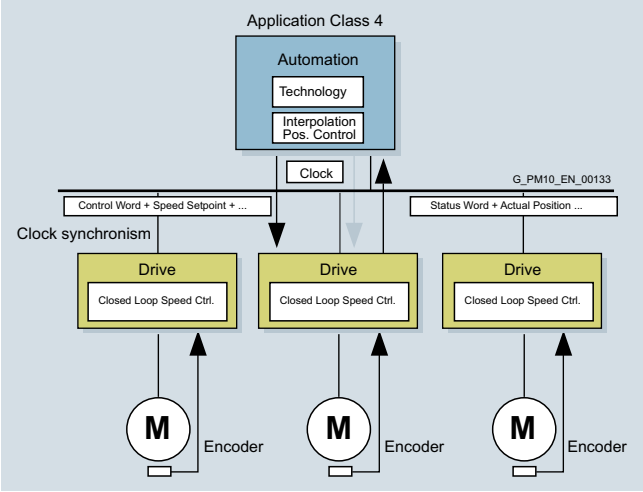
The device model of PROFIdrive

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 subset of profile parameters (approx. 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 function modules. The elements of a parameter are accessed acyclically via 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 Operation", or PROFINET IO with real-time classes RT and IRT.



More information

Further information on PROFINET and PROFIBUS is available at www.profibus.com

See under Downloads / System Descriptions / System Description PROFIdrive – Technology and Application.

Communication > AS-Interface

Overview

AS-Interface serves as a cost-effective system for the lower field level of automation. AS-Interface was specially developed to meet the demands of connecting binary sensors and actuators as well as interfacing to the higher control level. A straightforward, cost-effective installation with minimal connection costs was of paramount importance to the developers. The AS-Interface is often used in systems where numerous actuators and sensors, installed across a wide area, need to be networked cost effectively. Examples include conveyor and handling systems in airports, automated postal sorting, and the food and beverage industry.

Communication > USS and Modbus RTU

Overview

As simple fieldbus protocols, USS (**U**niversal **S**erial **I**nterface protocol of Siemens AG, 1992) and Modbus RTU can be used both cyclically and acyclically. Based on RS485 physical bus characteristics, up to 32 nodes can be networked to one bus segment and connected to a higher-level controller. These protocols are used when there are limited demands on data throughput.

Communication > BacNet MS/TP

Overview

BACnet MS/TP (**B**uilding **A**utomation and **C**ontrol **Net**works **M**aster-**S**lave/**T**oken **P**assing) is another fieldbus system based on RS485 physical characteristics, which is mainly used in the field of building automation. BACnet MS/TP defines a variety of services including data utilization, alarm processing, event handling, processing of value changes, device and network management as well as various types of objects. Interoperability is ensured by means of a uniform approach to services and procedures, which is laid down in "application profiles". These profiles are available for a wide range of applications. The SINAMICS G120P inverters, especially developed for fluid flow machines (such as pumps, fans and compressor drives), use the application profile "BACnet application-specific controller" in building automation.

Communication > CANopen

Overview

CANopen is a communication protocol based on CAN physical characteristics, which is predominantly used in the automation industry and for networking within complex devices. Originally conceived as a fieldbus for networking devices in motion control applications such as handling systems, CANopen has since established itself in the field of medical engineering, vehicle automation, rail and ship networking as well as building automation. Interoperability of CANopen is ensured through the use of application and device profiles, whereby the wide range of options offered by the bus specification enables an appropriate, precise selection to be made for the application or device in question. Furthermore, inverters with CANopen support the "CiA 402 Electrical Drives" device profile.

Communication > EtherNet/IP

Overview

Ethernet Industrial Protocol (EtherNet/IP) is an open standard for industrial networks. EtherNet/IP is used to transmit cyclic I/O data and acyclic parameter data. EtherNet/IP was developed by Rockwell Automation and the ODVA (Open DeviceNet Vendor Association), and belongs to the standardized international standard series IEC 61158. EtherNet/IP is a popular communication standard, particularly in the American market and in the Rockwell controllers environment.

Overview

The major part of the functionality of SINAMICS drives is implemented in software. This "embedded" **software** delivers the function of the product and is therefore a significant component of the overall product. The embedded software is also known as **firmware**, because it is firmly connected to specific hardware.

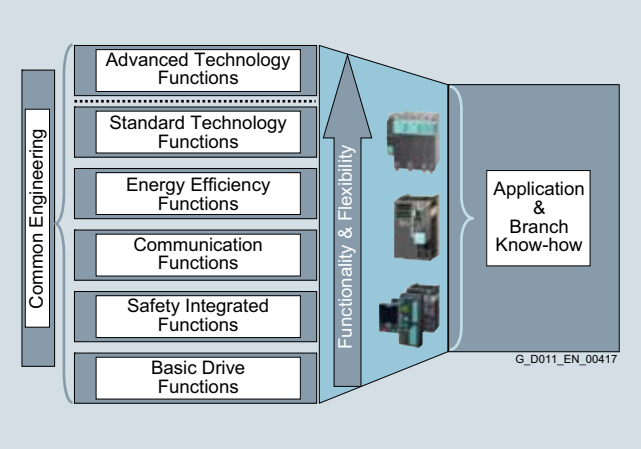
In the case of SINAMICS drives, the firmware is subdivided into the **operating system (OS)** with drivers for the hardware and the inverter functions, which are also referred to as the **runtime (RT) functions**.

Introduction

The available firmware functions are so extensive that the overall functional scope has been structured into function groups corresponding to their main applications.

The 8 main groups are:

- Advanced Technology Functions
- Standard Technology Functions
- Energy Efficiency Functions
- Communication Functions
- Safety Integrated Functions
- Basic Drive Functions
- Engineering Functions
- Special Application & Branch Functions



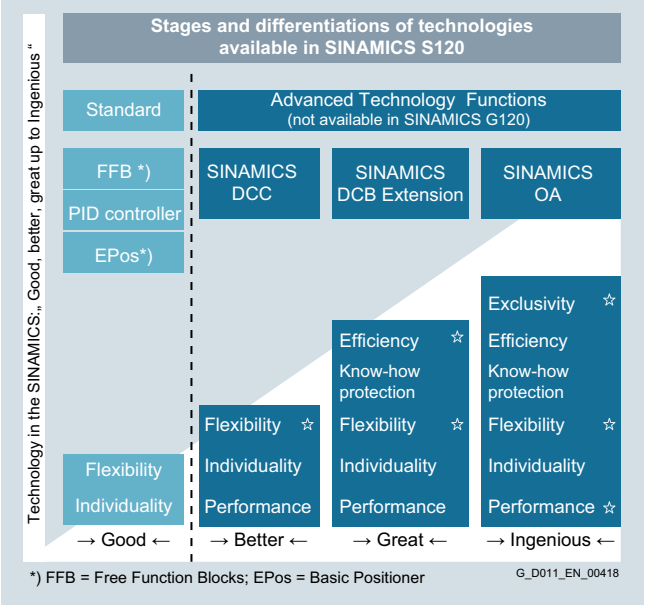
Functionality, including technology and configuration

Advanced Technology Functions

The Advanced Technology Functions are the clearly differentiating feature between the SINAMICS product families of SINAMICS G120 with the CU2xx-2 Control Units and SINAMICS S120 with the CU3x0-2 Control Units.

- SINAMICS DCC (Drive Control Chart)
  SINAMICS DCC comprises the block library DCB Standard and the DCC editor for graphical interconnection of blocks. It is primarily employed to solve arithmetic and control-related tasks or logic functions associated with complex applications.
- SINAMICS DCB Extension
  (Drive Control Block Extension) NEW
  SINAMICS DCB Extension is an extended library containing freely programmable blocks which supplement those contained in the standard library. DCB extended blocks are created for specific applications using the DCB Studio environment and are then interconnected graphically with the DCC editor in a similar fashion to standard blocks.
- SINAMICS OA (Open Application)
  SINAMICS OA are firmware expansions that are specifically created for use in a customized application with special requirements.

The Advanced Technology Functions are characterized by maximum flexibility and performance whereby extremely individual and, at the same time, efficient solutions can be achieved.



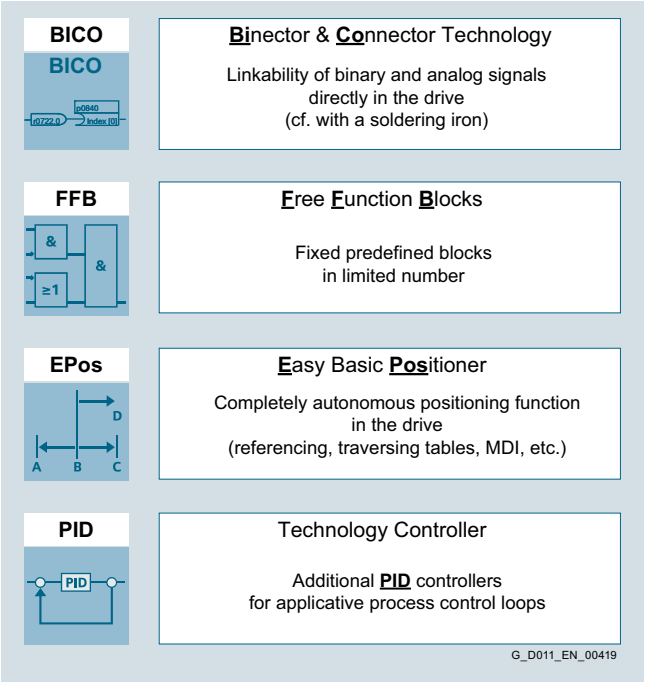
The levels and limits of the available technologies in the drive

Standard Technology Functions

The Standard Technology Functions are not restricted to a specific SINAMICS product family, but they are available in full or at least partially in SINAMICS S120 as well as in SINAMICS G120.

- BICO technology
- Free function blocks (FFB)
- Basic positioner (EPos)
- Technology controller (PID)

Overview



Standard Technology Functions

The Standard Technology Functions significantly expand the application spectrum of the SINAMICS drives because the functions are not permanently and unalterably interconnected; rather, they are interrupted at defined access points and can be connected or wired differently. The BICO technology makes it possible.

The FFBs enable additional, freely interpretable adaptation of the binary and analog signal flow to the machine application. However, the FFBs are limited in terms of the absolute quantity and the computing intervals (sampling times) that can be selected. These blocks are NOT multi-instance capable.

With EPos, comprehensive positioning tasks are autonomous in SINAMICS (i.e. their solution does not need a higher-level control). And moreover, this functionality is also extremely flexible: It can be used for highly dynamic servo control as well as for simple applications with vector-controlled asynchronous motors. Up to 64 target positions, as well as the respective traversing speeds can be permanently stored in the drive during commissioning. Positioning can be either absolute or relative.
It is, however, also possible to transfer these parameters as required from a higher-level controller. This means that target position and velocities can even be changed on-the-fly during a positioning run.

The technology controller (PID controller) enables simple process controls of all kinds. It can be used to control the line pressure, fill level, temperature, flow or also tension control or load balancing.

Energy Efficiency Functions

(see Energy efficiency Highlights)

Communication Functions

(see Communication Highlights)

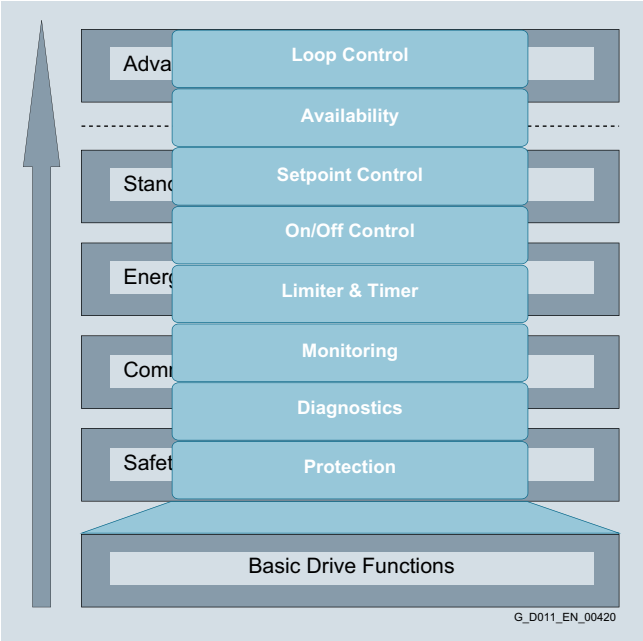
Safety Integrated Functions

(see Safety Integrated Highlights)

Basic Drive Functions

The main groups, especially the "Basic Drive Functions", are divided up into further subgroups.

- Control
- Availability
- Setpoints and commands
- Limiters, timers and monitoring functions
- Diagnosis
- Protection



Basic Drive Functions - Control Function

Control

The control methods are the core of the entire inverter firmware. They are responsible for optimum movement of the connected motor and the attached machines. The better the control functions, the faster, better and more smoothly the machine operates, thereby significantly enhancing the quality of the production output.

A distinction is made between the following methods:

- V/f control (open-loop control)
- Vector control (closed-loop control)
- Servo control (closed-loop control)

Overview

Further classification refers to the control variables:

- Current control
- Speed control
- Torque control
- Position control
- Technological process control (pressure, flow rate, temperature, fill level, etc.)

Availability

Availability refers to the frequency ratio, namely how often or seldom a single device restricts the entire production process due to a problem. That is why it is important in terms of availability that a drive enters the faulty state only when it is essential for self-protection. Moreover, it is important that the cause of the pending problem is identified and eliminated as quickly as possible.

Features and measures to increase availability:

- Parallel connections, for example, to maintain emergency operation (possibly also at a lower rating), if a power unit fails
- Automatic restart
- Flying restart
- V_{dc} control with kinetic buffering
- Redundancy (hardware, communication, etc.)

Setpoints and commands

The setpoint channel is the link between the setpoint source and the motor control. The inverter has a special feature that supports simultaneous input of two setpoints. Generation and subsequent modification of the total setpoint (influencing the direction, skip frequency, up/down ramp) take place in the setpoint channel.

Different sources of command usually result from the requirements to operate a drive from different places (on-site/remote), in different situations (standard/emergency mode) and/or different operating. The BICO technology allows SINAMICS to configure and combine the sources of command and setpoint sources entirely individually.

The following can be used for switching:

- Dataset switchover
- Switching elements among the Free Function Blocks (FFB)
- Fixed values

Limiters and monitoring functions

Limiters or limits are used to constrain input and/or output variables as appropriate to the connected machine; this means that not all positioning variables are used over their full range but are limited judiciously to enhance the safety and quality of the production process.

Timers/runtime counters are used to obtain information or make statements about the temporal course of a process.

- Recording application information for manufacturers
- Recording operating times for users
- Configurable timer for monitoring intervals
- Configurable timers for triggering activities at certain intervals (e.g. maintenance work)

Monitoring is used for early detection of conditions that may be detrimental or even dangerous to the connected machine, so that they can be counteracted expediently. If an appropriate countermeasure is not initiated, a protective response of the inverter with probable fault shutdown will ultimately result.

Diagnosis

The "Diagnosis" subgroup comprises all those functions that provide assistance with determining the possible causes of a problem.
If problems occur in a process, or in the driven machine, further interpretation of the measured variables in the inverter is required. To this end, different signals should be correlated with respect to time and then observed.

This includes:

- Error and alarm buffer
- Diagnostic buffer
- List of missing signals that interrupt operation
- Tracing for temporal assignment of signal profiles
- I/O simulation
- Telegram content diagnoses
- Terminal status

Protection

All protection functions counteract any possible damage to the inverter and/or motor. This is why the shutdown thresholds cannot be parameterized but are factory-tuned and permanently set to match the built-in components. Alarm thresholds may be parameterized as a relative variable for shutdown threshold of some monitoring processes. Thus, a countermeasure that is sensitive to the process may still be initiated upon occurrence of the alarm.

Apart from protection of the hardware, protection of the parameterization and therefore protection of the intellectual expertise of the customer from unauthorized access and copying is also an important part of the protection functions.

- Write protection NEW
- Know-how protection NEW
- Copy protection NEW

Common Engineering Functions

All functions of the inverters are implemented to enable a common engineering approach to their handling no matter which type of drive is selected; i.e. if a function is used in drive x, it can be configured intuitively and commissioned in the same way in drive y. Knowledge gained can therefore be reused easily and efficiently. The configuration and commissioning tools in particular (such as SIZER for Siemens Drives, STARTER and SINAMICS Startdrive) reflect this approach.

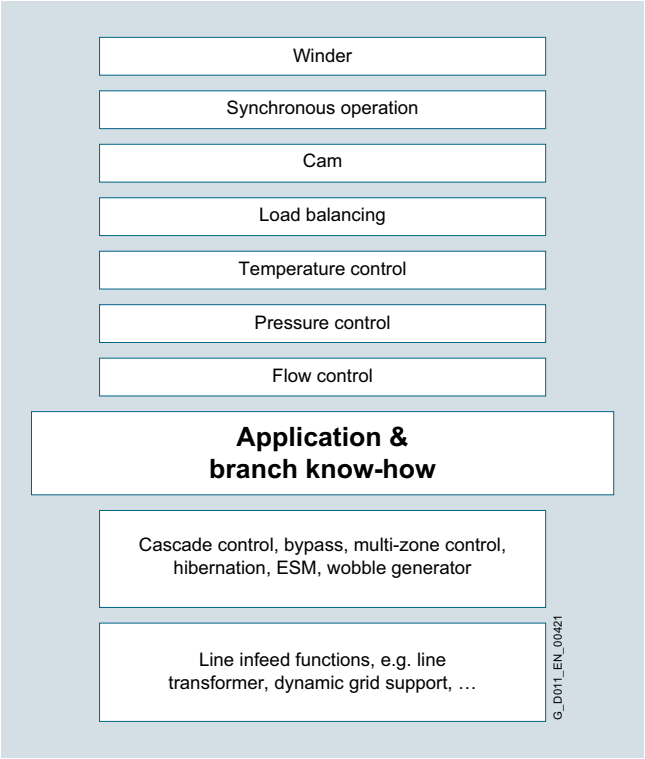
For further details, see the Section "Engineering tools".

Special Application & Branch Functions

Siemens has applied these technology functions (standard and/or advanced) to generate numerous application solutions. These applications can be downloaded from the Siemens Application Support website at
www.siemens.com/sinamics-applications
The STARTER commissioning tool can then be used to activate and configure the applications and download them to the Control Units.

Firmware functionality

Overview



Applications and sector know-how

Depending on the technology function, a license may be required for the application (see Section "SINAMICS S120").

In some sector-specific Control Units (e.g. CU230P-2) sector-specific functions are also an integral part of the firmware.

More information

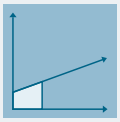
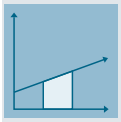
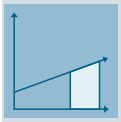
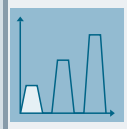
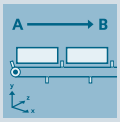
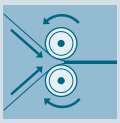
Further information about firmware functionality can be found on the Internet at
www.siemens.com/sinamics-firmware

SINAMICS G110 standard inverters
0.12 kW to 3 kW (0.16 hp to 4 hp)

SINAMICS G110 standard inverters
0.12 kW to 3 kW (0.16 hp to 4 hp)

Introduction

Application

Use	Requirements for torque accuracy / speed accuracy / position accuracy / coordination of axes / functionality					
	Continuous motion			Non-continuous motion		
	Basic	Medium	High	Basic	Medium	High
						
Pumping, ventilating, compressing	Centrifugal pumps Radial / axial fans Compressors	Centrifugal pumps Radial / axial fans Compressors	Eccentric screw pumps	Hydraulic pumps Metering pumps	Hydraulic pumps Metering pumps	Descaling pumps Hydraulic pumps
	V20 **G110** G120C G120P	G120P G130/G150 G180 [1]	S120	G120	S110	S120
Moving 	Conveyor belts Roller conveyors Chain conveyors	Conveyor belts Roller conveyors Chain conveyors Lifting/lowering devices Elevators Escalators/moving walkways Indoor cranes Marine drives Cable railways	Elevators Container cranes Mining hoists Excavators for open-cast mining Test bays	Acceleration conveyors Storage and retrieval machines	Acceleration conveyors Storage and retrieval machines Cross cutters Reel changers	Storage and retrieval machines Robotics Pick & place Rotary indexing tables Cross cutters Roll feeds Engagers/ disengagers
	V20 **G110** G110D G110M G120C	G120 G120D G130/G150 G180 [1]	S120 S150 DCM	G120 G120D	S110 DCM	S120 DCM
Processing 	Mills Mixers Kneaders Crushers Agitators Centrifuges	Mills Mixers Kneaders Crushers Agitators Centrifuges Extruders Rotary furnaces	Extruders Winders/unwinders Lead/follower drives Calenders Main press drives Printing machines	Tubular bagging machines Single-axis motion control such as • Position profile • Path profile	Tubular bagging machines Single-axis motion control such as • Position profile • Path profile	Servo presses Rolling mill drives Multi-axis motion control such as • Multi-axis positioning • Cams Interpolations
	V20 G120C	G120 G130/G150 G180 [1]	S120 S150 DCM	G120	S110	S120 DCM
Machining 	Main drives for • Turning • Milling • Drilling	Main drives for • Drilling • Sawing	Main drives for • Turning • Milling • Drilling • Gear cutting • Grinding	Axis drives for • Turning • Milling • Drilling	Axis drives for • Drilling • Sawing	Axis drives for • Turning • Milling • Drilling • Lasering • Gear cutting • Grinding • Nibbling and punching
	S110	S110 S120	S120	S110	S110 S120	S120

The SINAMICS G110 inverter is especially suited for applications with pumps and fans, as a drive in various sectors, e.g. food and beverages, textiles, packaging, as well as conveyor technology, with factory gate and garage door drives and as a universal drive for moving advertising media.

Specific application examples and descriptions can be found on the Internet at
www.siemens.com/sinamics-applications

More information

You may also be interested in these drives:

- More performance, higher functionality ⇒ SINAMICS G120, SINAMICS G120C
- Higher degree of protection ⇒ SINAMICS G110M, SINAMICS G110D, SINAMICS G120D
- Special functions for pumps, fans, and compressors ⇒ SINAMICS G120P (Catalog D 35)

[1] Industry-specific inverters.

Overview

SINAMICS G110, frame size FSA (right with flat heat sink)

SINAMICS G110, frame sizes FSB and FSC

SINAMICS G110 is an inverter with basic functions for a wide range of industrial drive applications with variable speeds.

The extremely compact SINAMICS G110 inverter operates with voltage-frequency control from 200 V to 240 V on single-phase line supply systems.

It is the ideal "price-conscious" inverter solution in the lower power range of the SINAMICS product family.

The following **line-side power components** are available for SINAMICS G110 inverters:

- EMC filters
- Line reactors
- Fuses
- Circuit breakers

The **accessories** listed below are also available:

- Operator panel
- Mounting accessories
- Commissioning tool

The latest technical documentation (catalogs, dimension drawings, certificates, manuals and operating instructions), are available on the Internet at the following address:

www.siemens.com/sinamics-g110/documentation

and offline on the DVD-ROM CA 01 in the DT Configurator. In addition, the DT Configurator can be used in the Internet without requiring any installation. The Drive Technology Configurator (DT Configurator) can be found in the Siemens Industry Mall at the following address:

www.siemens.com/dt-configurator

Benefits

- Simple installation, configuration, and commissioning
- Robust EMC design
- Extensive parameter range enables configurations for a wide range of applications
- Simple cable connection
- Scalable functionality with analog and USS versions
- Quiet motor operation as a result of the high pulse frequency
- Status information and alarms via the optional BOP (Basic Operator Panel)
- Rapid copying of parameters via the optional BOP
- External options for PC communication and BOP
- Fast response time of the digital inputs with a high degree of reproducibility for applications demanding fast responses
- Precise setpoint input using a high-resolution 10-bit analog input (analog versions only)
- LED for status information
- Variants with integrated EMC filter class A or B
- DIP switches for easy adaptation to 50 Hz or 60 Hz applications
- DIP switches for simple bus termination for the USS version (RS485)
- Bus-capable serial RS485 interface (USS versions only) enables integration into a networked drive system
- 2/3-wire method (pulsed/maintained signals) for universal control via digital inputs
- Adjustable lower voltage limit for the DC link to ensure controlled motor braking if the power fails

Accessories (overview)

- BOP operator panel
- Adapter for mounting on DIN rails (frame sizes FSA and FSB)
- PC inverter connection kit
- STARTER commissioning tool

Line-side power components (overview)

- EMC filter, class B with low leakage currents (additionally available for inverters with integrated filter)
- EMC filter, class B (additionally available for inverters with integrated filter)
- Line reactors

International standards

- Fulfills the requirements of the EU low-voltage guideline
- CE marking
- Certified to UL and cUL
- C-Tick

3

Design

The SINAMICS G110 standard inverters are equipped with a control module and a power module, providing the inverter in the CPM 110 version (Controlled Power Module) with a compact and efficient design. They operate with the latest IGBT technology and digital microprocessor control.

The SINAMICS G110 inverter product range consists of the following variants and versions:

- The **analog variant** is available in the following versions:
  - Without EMC filter, with heat sink
  - With integrated EMC filter, class A/B, with heat sink
  - Without EMC filter, with flat heat sink (FSA frame size only)
  - With integrated EMC filter, class B, with flat heat sink (FSA frame size only)
- The **USS variant** (RS485) is available in the following versions:
  - Without EMC filter, with heat sink
  - With integrated EMC filter, class A/B, with heat sink
  - Without EMC filter, with flat heat sink (FSA frame size only)
  - With integrated EMC filter, class B, with flat heat sink (FSA frame size only)

For frame size FSA, cooling is achieved through a heat sink and natural convection. Frame size FSA with flat heat sink offers space-saving and favorable heat dissipation since an additional heat sink can be installed outside the control cabinet. For frame sizes FSB and FSC, an integrated fan is used to cool the heat sink, making the compact design possible.

The connections for all inverter variants are easily accessible and in the same location. To ensure optimum electromagnetic compatibility and easy connection, the line and motor connections are located on opposite sides (as with contactors). The control terminal block does not require screws to install it.

The optional BOP (Basic Operator Panel) can be installed without the use of tools.

Function

- The stress on the machine mechanical system is reduced by using a skippable frequency range to avoid resonance effects, selecting ramp-up/ramp-down times up to 650 s, using ramp smoothing as well as being able to switch the inverter to a spinning motor (flying restart circuit)
- Increased plant availability as a result of automatic restarting following a power failure or stoppage
- Fast current limiting (FCL) for fault-free operation in the event of sudden load surges
- Parameterizable V/f characteristic (e.g. for synchronous motors)
- DC braking as well as compound braking for fast braking without an external braking resistor
- DC link voltage limiting using V_{DCmax} controller
- Slip compensation, electronic motorized potentiometer function and three fixed speed setpoints
- Parameterizable voltage boost for a higher dynamic performance when starting and accelerating
- Motor holding brake function to control an external mechanical brake

Selection and ordering data

Referring to the rated output current, most 2-pole to 6-pole low-voltage motors are being supported, e.g. the motor series 1LE1. The rated power represents a benchmark only. For a description of the overload performance, please refer to the general technical specifications of the Controlled Power Modules.

Power		Rated input current (at 230 V)	Rated output current	Frame size	Version	**SINAMICS G110 without filter**	**SINAMICS G110 with integrated filter**			
								Filter class [1] With use of shielded cables with a max. cable length of		
kW	hp	A	A			Article No.	Article No.	5 m (16 ft)	10 m (33 ft)	25 m (82 ft)
0.12	0.16	2.3	0.9	FSA	Analog	**6SL3211-0AB11-2UA1**	**6SL3211-0AB11-2BA1**	**B**	A [2]	[2]
					USS	**6SL3211-0AB11-2UB1**	**6SL3211-0AB11-2BB1**	**B**	A [2]	[2]
					Analog (with flat heat sink)	**6SL3211-0KB11-2UA1**	**6SL3211-0KB11-2BA1**	**B**	A [2]	[2]
					USS (with flat heat sink)	**6SL3211-0KB11-2UB1**	**6SL3211-0KB11-2BB1**	**B**	A [2]	[2]
0.25	0.33	4.5	1.7	FSA	Analog	**6SL3211-0AB12-5UA1**	**6SL3211-0AB12-5BA1**	**B**	A [2]	[2]
					USS	**6SL3211-0AB12-5UB1**	**6SL3211-0AB12-5BB1**	**B**	A [2]	[2]
					Analog (with flat heat sink)	**6SL3211-0KB12-5UA1**	**6SL3211-0KB12-5BA1**	**B**	A [2]	[2]
					USS (with flat heat sink)	**6SL3211-0KB12-5UB1**	**6SL3211-0KB12-5BB1**	**B**	A [2]	[2]
0.37	0.5	6.2	2.3	FSA	Analog	**6SL3211-0AB13-7UA1**	**6SL3211-0AB13-7BA1**	**B**	A [2]	[2]
					USS	**6SL3211-0AB13-7UB1**	**6SL3211-0AB13-7BB1**	**B**	A [2]	[2]
					Analog (with flat heat sink)	**6SL3211-0KB13-7UA1**	**6SL3211-0KB13-7BA1**	**B**	A [2]	[2]
					USS (with flat heat sink)	**6SL3211-0KB13-7UB1**	**6SL3211-0KB13-7BB1**	**B**	A [2]	[2]
0.55	0.75	7.7	3.2	FSA	Analog	**6SL3211-0AB15-5UA1**	**6SL3211-0AB15-5BA1**	**B**	A [2]	[2]
					USS	**6SL3211-0AB15-5UB1**	**6SL3211-0AB15-5BB1**	**B**	A [2]	[2]
					Analog (with flat heat sink)	**6SL3211-0KB15-5UA1**	**6SL3211-0KB15-5BA1**	**B**	A [2]	[2]
					USS (with flat heat sink)	**6SL3211-0KB15-5UB1**	**6SL3211-0KB15-5BB1**	**B**	A [2]	[2]
0.75	1	10	3.9 (at 40 °C (104 °F))	FSA	Analog	**6SL3211-0AB17-5UA1**	**6SL3211-0AB17-5BA1**	**B**	A [2]	[2]
					USS	**6SL3211-0AB17-5UB1**	**6SL3211-0AB17-5BB1**	**B**	A [2]	[2]
					Analog (with flat heat sink)	**6SL3211-0KB17-5UA1**	**6SL3211-0KB17-5BA1**	**B**	A [2]	[2]
					USS (with flat heat sink)	**6SL3211-0KB17-5UB1**	**6SL3211-0KB17-5BB1**	**B**	A [2]	[2]
1.1	1.5	14.7	6	FSB	Analog	**6SL3211-0AB21-1UA1**	**6SL3211-0AB21-1AA1**	B	**A** [2]	**A** [2]
					USS	**6SL3211-0AB21-1UB1**	**6SL3211-0AB21-1AB1**	B	**A** [2]	**A** [2]
1.5	2	19.7	7.8 (at 40 °C (104 °F))	FSB	Analog	**6SL3211-0AB21-5UA1**	**6SL3211-0AB21-5AA1**	B	**A** [2]	**A** [2]
					USS	**6SL3211-0AB21-5UB1**	**6SL3211-0AB21-5AB1**	B	**A** [2]	**A** [2]
2.2	3	27.2	11	FSC	Analog	**6SL3211-0AB22-2UA1**	**6SL3211-0AB22-2AA1**	B	**A** [2]	**A** [2]
					USS	**6SL3211-0AB22-2UB1**	**6SL3211-0AB22-2AB1**	B	**A** [2]	**A** [2]
3	4	35.6	13.6 (at 40 °C (104 °F))	FSC	Analog	**6SL3211-0AB23-0UA1**	**6SL3211-0AB23-0AA1**	B	**A** [2]	**A** [2]
					USS	**6SL3211-0AB23-0UB1**	**6SL3211-0AB23-0AB1**	B	**A** [2]	**A** [2]

The current data apply to an ambient temperature of 50 °C (122 °F) unless specified otherwise.

The last digit of the complete article number for the SINAMICS G110 inverters represents the release version. When ordering, a different digit from the one specified may be provided due to technical updates.

All SINAMICS G110 inverters are supplied without an operator panel (BOP). A BOP or other accessories must be ordered separately.

[1] The filter class **in bold** is stamped on the inverter rating plate.

[2] With additional filter (also class B).

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Technical specifications

	Controlled Power Modules
Power range	0.12 ... 3 kW (0.16 ... 4 hp)
Line voltage	200 ... 240 V ±10 % 1 AC
Line frequency	47 ... 63 Hz
Output frequency	0 ... 650 Hz (a 550 Hz limit is in preparation in order to satisfy legal requirements)
Output voltage	200 ... 240 V 3 AC
Offset factor cos φ	≥ 0.95
Inverter efficiency	
• For devices < 0.75 kW	90 ... 94 %
• For devices ≥ 0.75 kW	≥ 95 %
Overload capability	Overload current 1.5 × rated output current (i.e. 150 % overload) for 60 s, then 0.85 × rated output current for 240 s, cycle time 300 s
Inrush current	Not higher than the rated input current
Control methods	Linear V/f characteristic (with parameterizable voltage boost); square V/f characteristic; multipoint characteristic (parameterizable V/f characteristic)
Pulse frequency	8 kHz (standard) 2 ... 16 kHz (in 2 kHz increments)
Fixed frequencies	3, programmable
Skippable frequency range	1, programmable
Setpoint resolution	0.01 Hz digital 0.01 Hz serial 10 bit analog (motorized potentiometer 0.1 Hz)
Digital inputs	3 programmable digital inputs, non-floating; PNP type, SIMATIC-compatible
Analog input (analog variant)	1, for setpoint (0 ... 10 V, scaleable or for use as 4th digital input)
Digital output	1 isolated optocoupler output (24 V DC, 50 mA, ohmic, NPN type)
Universal serial interface (USS variant)	RS485, for operation with USS protocol
Motor cable length, max.	
• Shielded	25 m (82 ft)
• Unshielded	50 m (164 ft)
Electromagnetic compatibility	All devices with integrated EMC filter for drive systems in category C2 installations (limit value in accordance with EN 55011, class A, group 1) and category C3 installations (limit value in accordance with EN 55011, class A, group 2). All devices with an integrated EMC filter and shielded cables with a maximum length of 5 m (16 ft) also fulfill the limit values of EN 55011, class B for conducted interference.
Braking	DC injection braking, compound braking
Degree of protection	IP20
Operating temperature	-10 … +40 °C (14 °F ... 104 °F) up to +50°C (122 °F) with derating
Storage temperature	-40 ... +70 °C (-40 °F ... +158 °F)
Relative humidity	95 % (non-condensing)
Installation altitude	Up to 1000 m (3281 ft) above sea level without derating • Rated output current at 4000 m (13124 ft) above sea level: 90 % • Line voltage up to 2000 m (6562 ft) above sea level: 100 % at 4000 m (13124 ft) above sea level: 75 %
SCCR (Short Circuit Current Rating) according to UL [1]	10 kA (up to maximum 100 kA)
Protection features for	• Undervoltage • Overvoltage • Ground fault • Short-circuit • Stall protection • Thermal motor protection I^2t • Inverter overtemperature • Motor overtemperature
Compliance with standards	UL, cUL, CE, C-Tick
CE marking, according to	Low-Voltage Directive 2006/95/EC

[1] Applies to industrial control panel installations to NEC article 409 or UL 508A.

Technical specifications

		Controlled Power Modules						
		FSA ≤ 0.37 kW (0.5 hp)	**FSA** 0.55 kW (0.75 hp) and 0.75 kW (1 hp)	**FSA** ≤ 0.37 kW (0.5 hp) with flat heat sink	**FSA** 0.55 kW (0.75 hp) and 0.75 kW (1 hp) with flat heat sink	**FSB** 1.1 kW (1.5 hp) and 1.5 kW (2 hp)	**FSC** 2.2 kW (3 hp)	**FSC** 3 kW (4 hp)
Dimensions (without accessories)								
• Width	mm (in)	90 (3.54)	90 (3.54)	90 (3.54)	90 (3.54)	140 (5.51)	184 (7.24)	184 (7.24)
• Height	mm (in)	150 (5.91)	150 (5.91)	150 (5.91)	150 (5.91)	160 (6.30)	181 (7.13)	181 (7.13)
• Depth	mm (in)	116 (4.57)	131 (5.16)	101 (3.98)	101 (3.98)	142 (5.59)	152 (5.98)	152 (5.98)
Weight, approx.								
• Without filter	kg (lb)	0.7 (1.54)	0.8 (1.76)	0.6 (1.32)	0.7 (1.54)	1.4 (3.09)	1.9 (4.19)	2 (4.41)
• With filter	kg (lb)	0.8 (1.76)	0.9 (1.98)	0.7 (1.54)	0.8 (1.76)	1.5 (3.31)	2.1 (4.63)	2.2 (4.85)

Technical specifications for variant with flat heat sink

The design with flat heat sink offers space-saving and improved heat dissipation using an external heat sink.

		Controlled Power Modules frame size FSA with flat heat sink				
		0.12 kW (0.16 hp)	**0.25 kW (0.33 hp)**	**0.37 kW (0.5 hp)**	**0.55 kW (0.75 hp)**	**0.75 kW (1 hp)**
Operating temperature	°C (°F)	-10 … +50 (+14 … +122)	-10 … +50 (+14 … +122)	-10 … +50 (+14 … +122)	-10 … +50 (+14 … +122)	-10 … +40 (+14 … +104)
Total power losses at full load and maximum operating temperature as specified	W	22	28	36	43	54
Line-side and control electronics losses	W	9	10	12	13	15
Recommended thermal resistance of heat sink	K/W	3	2.2	1.6	1.2	1.2
Recommended output current	A	0.9	1.7	2.3	3.2	3.9

Derating data and power loss

Pulse frequency

Power		Power loss	**Rated output current in A** for a pulse frequency of							
kW	hp	W	2 kHz	4 kHz	6 kHz	8 kHz	10 kHz	12 kHz	14 kHz	16 kHz
0.12	0.16	22	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9
0.25	0.33	28	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7
0.37	0.5	36	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3
0.55	0.75	43	3.2	3.2	3.2	3.2	3	2.7	2.5	2.2
0.75 (at 40 °C)	1 (at 104 °F)	54	3.9	3.9	3.9	3.9	3.6	3.3	3	2.7
0.75	1	54	3.2	3.2	3.2	3.2	3	2.7	2.5	2.2
1.1	1.5	86	6	6	6	6	5.9	5.7	5.6	5.4
1.5 (at 40 °C)	2 (at 104 °F)	118	7.8	7.8	7.8	7.8	7.6	7.4	7.2	7
1.5	2	118	6	6	6	6	5.9	5.7	5.6	5.4
2.2	3	174	11	11	11	11	10.8	10.5	10.2	9.9
3 (at 40 °C)	4 (at 104 °C)	210	13.6	13.6	13.6	13.6	13.3	12.9	12.6	12.3
3	4	210	11	11	11	11	10.8	10.5	10.2	9.9

The current data apply to an ambient temperature of 50 °C (122 °F) unless specified otherwise.

3

Technical specifications

Compliance with standards

CE marking

The SINAMICS G110 inverters meet the requirements of the Low-Voltage Directive 2006/95/EC.

Low-Voltage Directive

The inverters comply with the following standards listed in the official journal of the EU:

- EN 60204
  Safety of machinery, electrical equipment of machines
- EN 61800-5-1
  Electrical power drive systems with variable speed – Part 5-1: Requirements regarding safety – electrical, thermal, and energy requirements

UL listing

Inverter devices in UL category NMMS certified to UL and cUL, in compliance with UL 508C. UL list number E121068.

For use in environments with pollution degree 2.

See also www.ul.com

Machinery Directive

The inverters are suitable for installation in machines. Compliance with the Machinery Directive 2006/42/EC requires a separate certificate of conformity. This must be provided by the plant construction company or the organization marketing the machine.

EMC Directive

- EN 61800-3
  Variable-speed electric drives
  Part 3: EMC product standard including specific test methods

The EMC product standard EN 61800-3 for electric drive systems has been valid since July 1, 2005. The transition period for the predecessor standard EN 61800-3/A11 dated February 2001 ended on October 1, 2007. The following information applies to Siemens SINAMICS G110 inverters:

- The EMC product standard EN 61800-3 does not apply directly to a frequency inverter but to a PDS (Power Drive System), which comprises the complete circuitry, motor and cables in addition to the inverter.
- Frequency inverters are normally only supplied to experts for installation in machines or systems. A frequency inverter must, therefore, only be considered as a component which, on its own, is not subject to the EMC product standard EN 61800-3. The inverter's operating instructions, however, specifies the conditions regarding compliance with the product standard if the frequency inverter is expanded to a PDS. For a PDS, the EMC Directive in the EU is complied with by observing the product standard EN 61800-3 for variable-speed electric drive systems. The frequency inverters on their own do not generally require identification according to the EMC Directive.
- In the Standard EN 61800-3 of July 2005, a distinction is no longer made between "general availability" and "restricted availability". Instead, different categories C1 to C4 have been defined in accordance with the environment of the PDS at the operating location:
  - **Category C1:** Drive systems for rated voltages < 1000 V for use in the first environment
  - **Category C2:** Stationary drive systems not connected by means of a plug connector for rated voltages < 1000 V. When used in the first environment, the system must be installed and commissioned by personnel familiar with EMC requirements. A warning note is required.
  - **Category C3:** Drive systems for rated voltages < 1000 V for exclusive use in the second environment. A warning note is required.
  - **Category C4:** Drive systems for rated voltages ≥ 1000 V or for rated currents ≥ 400 A or for use in complex systems in the second environment. An EMC plan must be created.
- The EMC product standard EN 61800-3 also defines limit values for conducted interference and radiated interference for the "second environment" (= industrial power supply systems that do not supply households). These limit values are below the limit values of filter class A to EN 55011. Unfiltered inverters can be used in industrial environments as long as they are part of a system that contains line filters on the higher-level infeed side.
- With SINAMICS G110, Power Drive Systems (PDS) that fulfill the EMC product standard EN 61800-3 can be configured when observing the installation instructions in the product documentation. The table "Overview of SINAMICS G110 components and PDS categories" and the SINAMICS G110 ordering documentation show which of the components can be installed directly in a PDS.
- A differentiation must be made between the product standards for electrical drive systems (PDS) of the range of standards EN 61800 (of which Part 3 covers EMC topics) and the product standards for the devices/systems/machines, etc. This will probably not result in any changes in the practical use of frequency inverters. Since frequency inverters are always part of a PDS and these are part of a machine, the machine manufacturer must observe various standards depending on their type and environment (e.g. EN 61000-3-2 for line harmonics and EN 55011 for radio interference). The product standard for PDS on its own is, therefore, either insufficient or irrelevant.
- With respect to the compliance with limits for line supply harmonics, the EMC product standard EN 61800-3 for PDS refers to compliance with the EN 61000-3-2 and EN 61000-3-12 standards.
- Regardless of the configuration with SINAMICS G110 and its components, the machine construction company (OEM) can also apply other measures to ensure that the machine complies with the EU EMC Directive. The EU EMC Directive is generally fulfilled when the relevant EMC product standards are observed. If they are not available, the generic standards (e.g. DIN EN 61000-x-x) can be used instead. It is important that the conducted and emitted interference at the line connection point and outside the machine remain below the relevant limit values. Any suitable measures can be applied to ensure this.

Technical specifications

Overview of SINAMICS G110 components and PDS categories

<table>
<tr><td rowspan="4">Environment 1
(Residential, commercial)</td><td colspan="2">Category C1
Unfiltered devices and external filter class B with low leakage currents (shielded motor cable up to 5 m (16.41 ft))</td><td rowspan="4">Environment 2
(Industry)</td></tr>
<tr><td>Category C2
All devices with integrated filter
(shielded motor cable up to 5 m (16.41 ft))
or
All devices with integrated filter
(frame size FSA: up to 10 m (32.81 ft);
Frame sizes FSB and FSC: shielded motor cable up to 25 m (82.03 ft)) + warning
or
All devices with integrated filter plus external filter, class B (shielded motor cable up to 25 m (82.03 ft))</td><td>Category C2
All devices with integrated filter
(shielded motor cable up to 5 m (16.41 ft))
or
All devices with integrated filter
(frame size FSA: up to 10 m (32.81 ft);
Frame sizes FSB and FSC: shielded motor cable up to 25 m (82.03 ft))
or
All devices with integrated filter plus external filter, class B (shielded motor cable up to 25 m (82.03 ft))
Note: When devices with an integrated filter and a max. motor cable length of 5 m (16.41 ft) or external class B filters are used, this exceeds the requirements of EN 61800-3 by a considerable margin!</td></tr>
<tr><td colspan="2">Category C3
All devices with integrated filter (frame size FSA: up to 10 m (32.81 ft); frame sizes FSB and FSC: shielded motor cable up to 25 m (82.03 ft))
or
All devices with integrated filter plus external filter, class B (shielded motor cable up to 25 m (82.03 ft))
A warning note is required.
Note: When devices with an integrated filter and external class B filters are used, this exceeds the requirements of EN 61800-3 by a considerable margin!</td></tr>
<tr><td colspan="2">Category C4
Does not apply to SINAMICS G110</td></tr>
</table>

Electromagnetic compatibility

Observing the installation guidelines specific to the product will ensure electromagnetic compliance.

The table below lists the measured results for emissions of and immunity to interference for the SINAMICS G110 inverters.

The inverters were installed according to the guidelines with shielded motor cables and shielded control cables.

EMC phenomenon Standard/test		Relevant criteria	Limit value
Noise emissions EN 61800-3 (environment 1)	Conducted via mains cable	150 kHz ... 30 MHz	Unfiltered devices: not tested All devices with integrated/external filter: Depending on the filter type and intended PDS installation: Category C1: The limit value corresponds to EN 55011, class B. Category C2: The limit value corresponds to EN 55011, class A, group 1 Further, all drive units with an integrated/external filter fulfill the limit value for category C3 installations. The limit value corresponds to EN 55011, class A, group 2.
	Emitted by the drive	30 MHz ... 1 GHz	All devices The limit value corresponds to EN 55011, class A, group 1
ESD immunity EN 61000-4-2	ESD by air discharge	Test level 3	8 kV
	ESD by contact discharge	Test level 3	6 kV
Electrical fields immunity EN 61000-4-3	Electrical field applied to unit	Test level 3 80 MHz ... 1 GHz	10 V/m
Burst interference immunity EN 61000-4-4	Applied to all cable terminations	Test level 4	4 kV
Surge immunity EN 61000-4-5	Applied to mains cables	Test level 3	2 kV
Immunity to RFI emissions, conducted EN 61000-4-6	Applied to mains, motor and control cables	Test level 3 0.15 MHz ... 80 MHz 80 % AM (1 kHz)	10 V

3

Accessories

Basic Operator Panel (BOP)

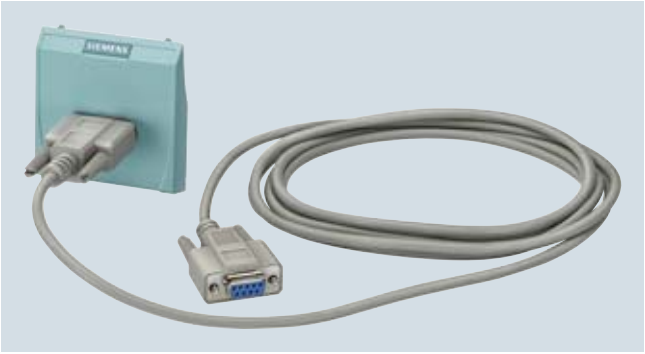
The BOP can be used to make individual parameter settings.

Values and units are displayed via a 5-digit display.

One BOP can be used for several inverters. It is plugged directly into the inverter.

The BOP provides a function for time-saving copying of parameters. A parameter set of one inverter can be saved and then loaded to another inverter.

PC inverter connection kit



For controlling and commissioning an inverter directly from a PC if the appropriate software (STARTER commissioning tool [1]) has been installed.

Isolated RS232 adapter module for a reliable point-to-point connection to a PC.

The scope of supply includes a 9-pin Sub-D connector and an RS232 standard cable (3 m (9.84 ft)).

STARTER commissioning tool

STARTER is a commissioning tool with a graphical interface for commissioning SINAMICS G110 frequency inverters. The software runs under Windows NT/2000/XP Professional and Windows 7. Parameter lists can be read out, changed, stored, read in and printed out.

Selection and ordering data

Accessories

The options listed here are suitable for all SINAMICS G110 inverters.

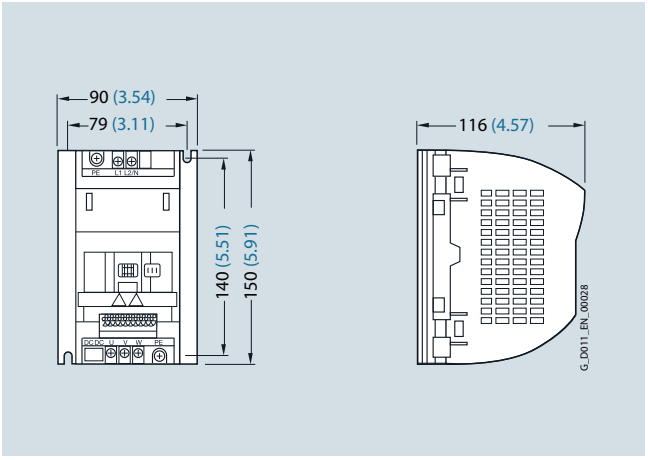
Description	Article No.
BOP operator panel (Basic Operator Panel)	**6SL3255-0AA00-4BA1**
PC inverter connection kit including 9-pin SUB-D connector and RS232 standard cable (3 m (9.84 ft))	**6SL3255-0AA00-2AA1**
Adapter for mounting on DIN rails	
• Size 1 (frame size FSA)	**6SL3261-1BA00-0AA0**
• Size 2 (frame size FSB)	**6SL3261-1BB00-0AA0**
SINAMICS Manual Collection on DVD-ROM, multilingual All manuals for low-voltage motors, geared motors and low-voltage inverters	**6SL3097-4CA00-0YG2**
STARTER commissioning tool [1] on DVD-ROM	**6SL3072-0AA00-0AG0**

Documentation

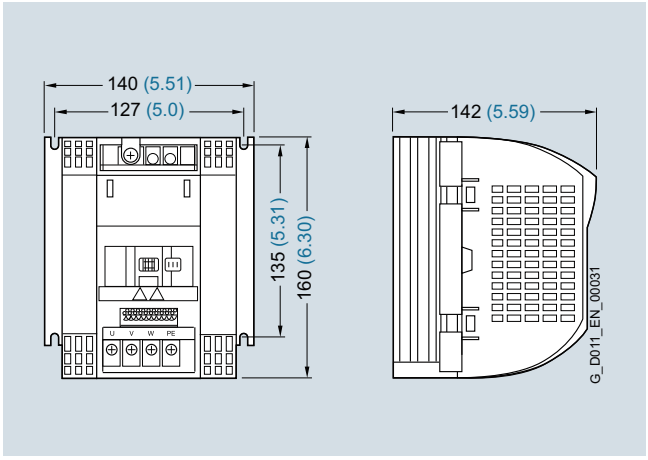
A Getting Started Guide is supplied in hard copy for the Controlled Power Modules. The operating instructions and parameter list can be downloaded free of charge from the Internet at:
http://support.automation.siemens.com/WW/view/en/13740464/133300

[1] STARTER commissioning tool is also available on the Internet at
http://support.automation.siemens.com/WW/view/en/10804985/133100

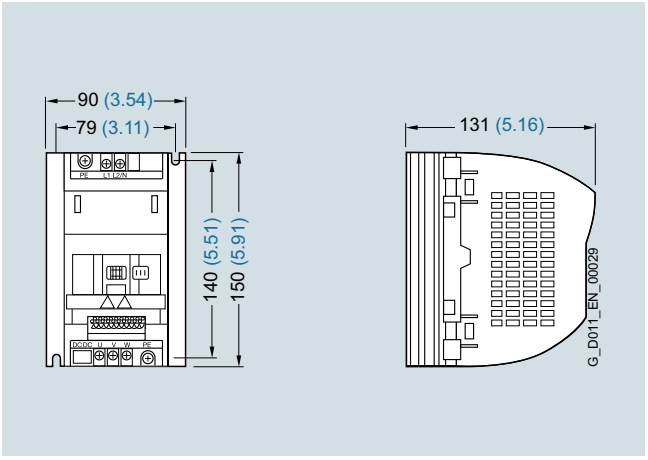
Dimensional drawings



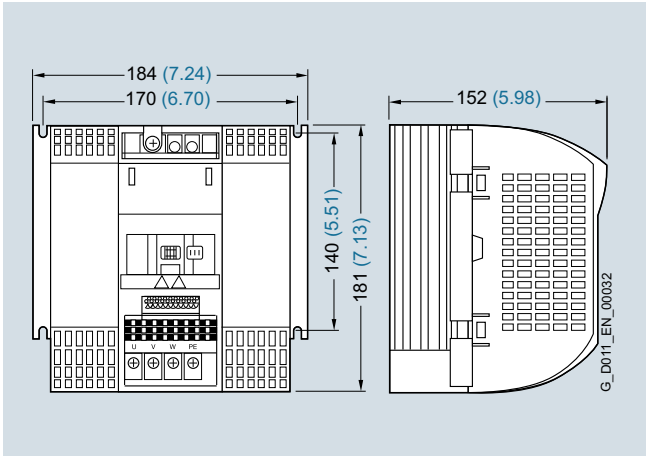
Inverter frame size FSA; 0.12 kW to 0.37 kW (0.16 hp to 0.5 hp)



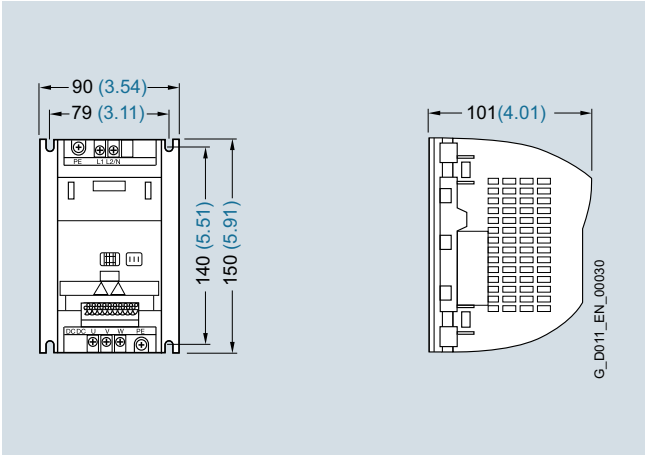
Inverter frame size FSB; 1.1 kW to 1.5 kW (1.5 hp to 2 hp)



Inverter frame size FSA; 0.55 kW to 0.75 kW (0.75 hp to 1 hp)



Inverter frame size FSC; 2.2 kW to 3 kW (3 hp to 4 hp)



Inverter frame size FSA with flat heat sink; 0.12 kW to 0.75 kW (0.16 hp to 1 hp)

Mounted using screws and washers
(not included in the scope of supply)

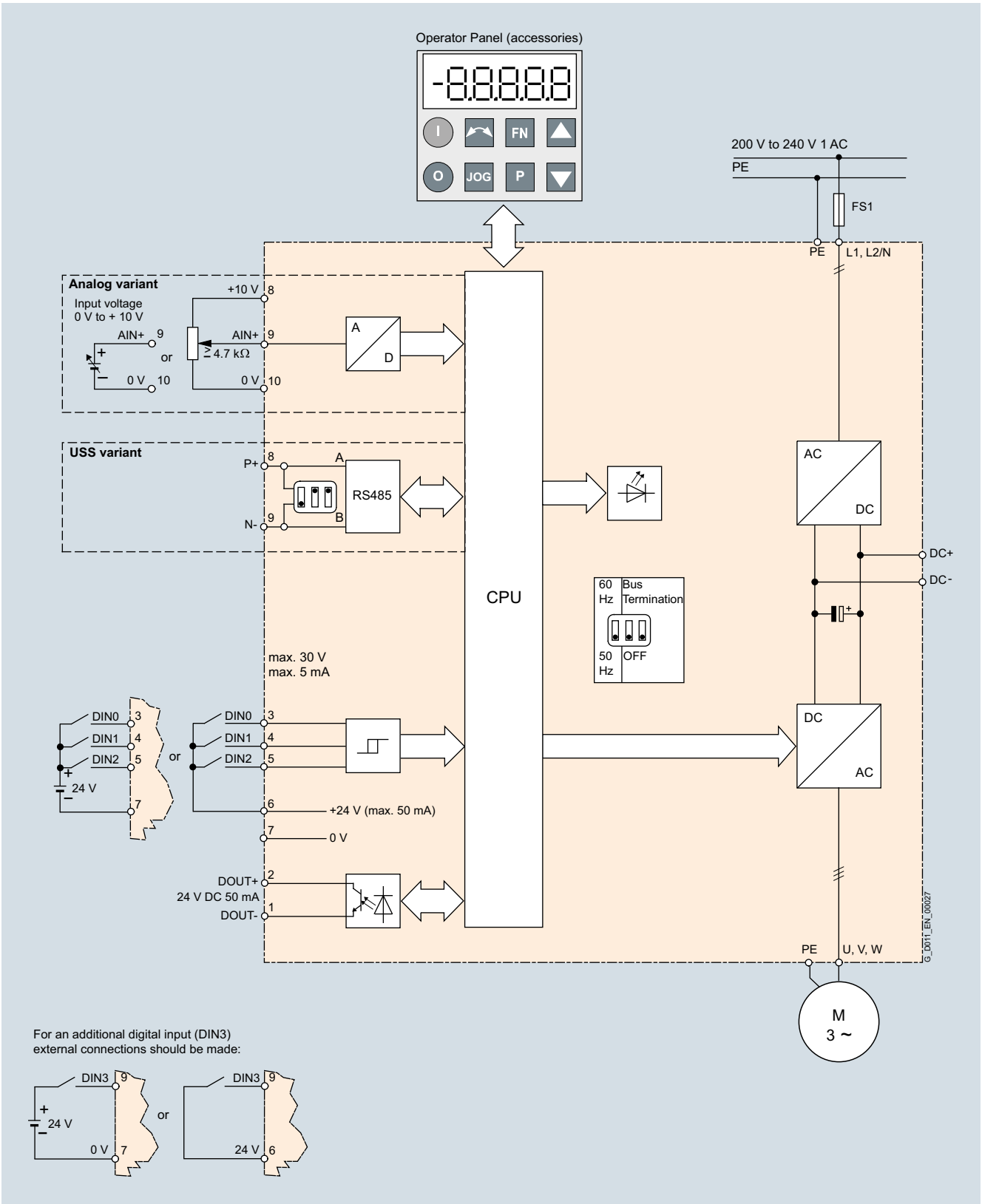
- Frame size FSA: 2 × M4
- Frame size FSB: 4 × M4
- Frame size FSC: 4 × M5

With attached operator panel (BOP), the mounting depth is increased by 8 mm (0.31 inches).

All dimensions in mm (values in brackets are in inches).

Schematics

Block diagram



Overview

Integrated EMC filter

Versions with integrated EMC filters class A and class B are available for the corresponding environments.

- **Class A**
  The requirements are fulfilled when shielded cables with a max. length of 10 m (32.8 ft) (for frame size FSA) or 25 m (82 ft) (for frame sizes FSB and FSC) are used. The limits comply with EN 55011 class A for conducted interference.
- **Class B**
  The requirements are fulfilled when shielded cables with a max. length of 5 m (16.4 ft) are used. The limits comply with EN 55011 class B for conducted interference.

An inverter with an integrated EMC filter can be used with a 30 mA residual-current circuit breaker and is only suitable for installations with fixed wiring.

Inverters without filters, which are used with "EMC filter class B with low leakage currents", have a leakage current <3.5 mA (up to 5 m (16.4 ft) shielded motor cable).

Additional EMC filter class B

Available for inverters with an integrated EMC filter.

With this filter, the inverter complies with the emission standard EN 55011, class B for conducted interference.

The requirements are fulfilled using shielded cables with a max. length of 25 m (82 ft).

EMC filter, class B with low leakage currents

With this filter, the unfiltered inverter complies with the emission standard EN 55011, class B for conducted interference. The leakage currents are reduced to <3.5 mA.

Unfiltered inverters can, therefore, be used for drive systems in Category C1 installations.

The requirements are fulfilled with

- Shielded cables with a max. length of 5 m (16.4 ft)
- Installation of the inverter in a metal housing (e.g. control cabinet)
- Pulse frequency of 16 kHz (only for frame sizes FSB and FSC)

With Category C1 installations, generally a pulse frequency of 16 kHz is recommended for inverter operation in the inaudible spectrum and for quiet motor operation.

Line reactor

Line reactors are used to smooth voltage peaks or to bridge commutating dips.

Line reactors also reduce the effects of harmonics on the inverter and the power supply.

If the ratio of the rated inverter power to supply short-circuit power is less than 1 %, a line reactor must be used in order to reduce the current peaks.

In accordance with the specifications of EN 61000-3-12 "Limits for harmonic currents with device input current ≤ 16 A per phase", there are special aspects for drives with 120 W to 550 W and 230 V single-phase supplies which can be used in non-industrial applications (environment 1).

For devices with 120 W to 370 W, either the recommended line reactors must be installed or permission obtained from the power utility company for the connection to the public supply system.

In accordance with the specifications of EN 61000-3-12 "Limits for harmonic currents >16 A and ≤75 A per phase", permission must be obtained from the power utility company to operate drives connected to the public low-voltage line supply. For the harmonic currents, see the Operating Instructions.

3

Selection and ordering data

The line-side power components listed here must be selected in accordance with the inverter. EMC filters and line reactors cannot be installed as base components.

The inverter and associated line-side power components have the same rated voltage.

All line-side power components are certified to UL (with the exception of fuses). 3NA3 fuses and 3RV circuit breakers are recommended for European countries.

Fuses for use in North America must be UL-certified Class H, J or K fuses with a rated voltage of 250 V AC.

Short Circuit Current Rating (SCCR)
according to UL

Applies to industrial control panel installations to NEC Article 409 or UL 508A.

- SINAMICS G110: 10 kA (up to maximum 100 kA)

Additional information about the listed fuses and circuit breakers can be found in Catalogs LV 10, IC 10 and IC 10 AO.

Power		EMC filter class B with low leakage currents	Line reactor	Additional EMC filter class B	IEC-compliant		UL/cUL-compliant	
					Fuse	Circuit breaker	Fuse type Rated voltage 250 V AC	
								Current
kW	hp	Article No.	Article No.	Article No.	Article No.	Article No.	Class	A
Line-side power components for inverters without EMC filter								
0.12	0.16	**6SE6400-2FL01-0AB0**	**6SE6400-3CC00-4AB3**	–	**3NA3803**	**3RV2011-1DA10**	J	7
0.25	0.33	**6SE6400-2FL01-0AB0**	**6SE6400-3CC00-4AB3**	–	**3NA3803**	**3RV2011-1FA10**	J	10
0.37	0.5	**6SE6400-2FL01-0AB0**	**6SE6400-3CC01-0AB3**	–	**3NA3803**	**3RV2011-1HA10**	J	10
0.55	0.75	**6SE6400-2FL01-0AB0**	**6SE6400-3CC01-0AB3**	–	**3NA3803**	**3RV2011-1JA10**	J	10
0.75	1	**6SE6400-2FL01-0AB0**	**6SE6400-3CC01-0AB3**	–	**3NA3805**	**3RV2011-1KA10**	J	15
1.1	1.5	**6SE6400-2FL02-6BB0**	**6SE6400-3CC02-6BB3**	–	**3NA3807**	**3RV2021-4BA10**	J	20
1.5	2	**6SE6400-2FL02-6BB0**	**6SE6400-3CC02-6BB3**	–	**3NA3810**	**3RV2021-4CA10**	J	25
2.2	3	**6SE6400-2FL02-6BB0**	**6SE6400-3CC02-6BB3**	–	**3NA3814**	**3RV1031-4EA10**	J	35
3	4	–	**6SE6400-3CC03-5CB3**	–	**3NA3820**	**3RV1031-4FA10**	J	40
Line-side power components for inverters with integrated EMC filter class A/B								
0.12	0.16	–	**6SE6400-3CC00-4AB3**	**6SE6400-2FS01-0AB0**	**3NA3803**	**3RV2011-1DA10**	J	7
0.25	0.33	–	**6SE6400-3CC00-4AB3**	**6SE6400-2FS01-0AB0**	**3NA3803**	**3RV2011-1FA10**	J	10
0.37	0.5	–	**6SE6400-3CC01-0AB3**	**6SE6400-2FS01-0AB0**	**3NA3803**	**3RV2011-1HA10**	J	10
0.55	0.75	–	**6SE6400-3CC01-0AB3**	**6SE6400-2FS01-0AB0**	**3NA3803**	**3RV2011-1JA10**	J	10
0.75	1	–	**6SE6400-3CC01-0AB3**	**6SE6400-2FS01-0AB0**	**3NA3805**	**3RV2011-1KA10**	J	15
1.1	1.5	–	**6SE6400-3CC02-6BB3**	**6SE6400-2FS02-6BB0**	**3NA3807**	**3RV2021-4BA10**	J	20
1.5	2	–	**6SE6400-3CC02-6BB3**	**6SE6400-2FS02-6BB0**	**3NA3810**	**3RV2021-4CA10**	J	25
2.2	3	–	**6SE6400-3CC02-6BB3**	**6SE6400-2FS02-6BB0**	**3NA3814**	**3RV1031-4EA10**	J	35
3	4	–	**6SE6400-3CC03-5CB3**	**6SE6400-2FS03-5CB0**	**3NA3820**	**3RV1031-4FA10**	J	40

Technical specifications

EMC filters and line reactors cannot be installed as base components.

		EMC filter class B with low leakage currents		Additional EMC filter class B		
		6SE6400-2FL01-0AB0	6SE6400-2FL02-6BB0	6SE6400-2FS01-0AB0	6SE6400-2FS02-6BB0	6SE6400-2FL03-5CB0
Dimensions						
• Width	mm (in)	73 (2.87)	149 (5.87)	73 (2.87)	149 (5.87)	185 (7.28)
• Height	mm (in)	200 (7.87)	213 (8.39)	200 (7.87)	213 (8.39)	245 (9.65)
• Depth	mm (in)	43.5 (1.71)	50.5 (1.99)	43.5 (1.71)	50.5 (1.99)	55 (2.17)
Weight, approx.	kg (lb)	0.5 (1.10)	1 (2.21)	0.5 (1.10)	1 (2.21)	1.5 (3.31)

		Line reactor			
		6SE6400-3CC00-4AB3	6SE6400-3CC01-0AB3	6SE6400-3CC02-6BB3	6SE6400-3CC03-5CB3
Dimensions					
• Width	mm (in)	75.5 (2.97)	75.5 (2.97)	150 (5.91)	185 (7.28)
• Height	mm (in)	200 (7.87)	200 (7.87)	213/233 (8.39/9.17) [1]	245/280 (9.65/11.02) [1]
• Depth	mm (in)	50 (1.97)	50 (1.97)	50 (1.97)	50 (1.97)
Weight, approx.	kg (lb)	1.31 (2.89)	1.32 (2.91)	2.2 (4.85)	3.05 (6.73)

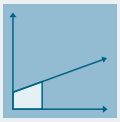
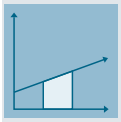
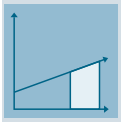
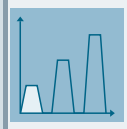
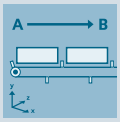
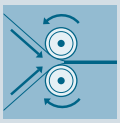
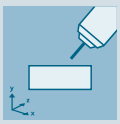
[1] The 233 mm (9.17 in) or 280 mm (11.02 in) dimensions are valid for lateral mounting using a mounting bracket.

SINAMICS G120C compact inverters
0.55 kW to 18.5 kW (0.75 hp to 25 hp)

4

SINAMICS G120C compact inverters
0.55 kW to 18.5 kW (0.75 hp to 25 hp)

Application

Use	Requirements for torque accuracy / speed accuracy / position accuracy / coordination of axes / functionality					
	Continuous motion			Non-continuous motion		
	Basic	Medium	High	Basic	Medium	High
						
Pumping, ventilating, compressing	Centrifugal pumps Radial / axial fans Compressors	Centrifugal pumps Radial / axial fans Compressors	Eccentric screw pumps	Hydraulic pumps Metering pumps	Hydraulic pumps Metering pumps	Descaling pumps Hydraulic pumps
	V20 G110 **G120C** G120P	G120P G130/G150 G180 [1]	S120	G120	S110	S120
Moving 	Conveyor belts Roller conveyors Chain conveyors	Conveyor belts Roller conveyors Chain conveyors Lifting/lowering devices Elevators Escalators/moving walkways Indoor cranes Marine drives Cable railways	Elevators Container cranes Mining hoists Excavators for open-cast mining Test bays	Acceleration conveyors Storage and retrieval machines	Acceleration conveyors Storage and retrieval machines Cross cutters Reel changers	Storage and retrieval machines Robotics Pick & place Rotary indexing tables Cross cutters Roll feeds Engagers/ disengagers
	V20 G110 G110D G110M **G120C**	G120 G120D G130/G150 G180 [1]	S120 S150 DCM	G120 G120D	S110 DCM	S120 DCM
Processing 	Mills Mixers Kneaders Crushers Agitators Centrifuges	Mills Mixers Kneaders Crushers Agitators Centrifuges Extruders Rotary furnaces	Extruders Winders/unwinders Lead/follower drives Calenders Main press drives Printing machines	Tubular bagging machines Single-axis motion control such as • Position profile • Path profile	Tubular bagging machines Single-axis motion control such as • Position profile • Path profile	Servo presses Rolling mill drives Multi-axis motion control such as • Multi-axis positioning • Cams • Interpolations
	V20 **G120C**	G120 G130/G150 G180 [1]	S120 S150 DCM	G120	S110	S120 DCM
Machining 	Main drives for • Turning • Milling • Drilling	Main drives for • Drilling • Sawing	Main drives for • Turning • Milling • Drilling • Gear cutting • Grinding	Axis drives for • Turning • Milling • Drilling	Axis drives for • Drilling • Sawing	Axis drives for • Turning • Milling • Drilling • Lasering • Gear cutting • Grinding • Nibbling and punching
	S110	S110 S120	S120	S110	S110 S120	S120

SINAMICS G120C compact inverters continuously control the speed of three-phase asynchronous (induction) motors and can be used in a wide range of industrial areas. They are generally suitable for applications involving conveyor belts, mixers, extruders, pumps, fans, compressors and basic handling machines.

Specific application examples and descriptions can be found on the Internet at
www.siemens.com/sinamics-applications

More information

You may also be interested in these drives:

- More performance in the control cabinet in IP20 degree of protection ⇒ SINAMICS G120
- Higher degree of protection for power ratings up to 7.5 kW (10 hp) ⇒ SINAMICS G110M, SINAMICS G110D, SINAMICS G120D
- With positioning function in the control cabinet in IP20 degree of protection ⇒ SINAMICS G120, SINAMICS S110
- With a positioning function for distributed drive solutions in IP65 degree of protection ⇒ SINAMICS G120D

[1] Industry-specific inverters.

Overview

SINAMICS G120C frame sizes FSA, FSB and FSC with mounted blanking cover

SINAMICS G120C compact inverters offer a well-balanced combination of features to address a wide range of applications. They are compact, rugged devices that are easy to operate and can be optionally equipped with a basic or advanced operator panel.

SINAMICS G120C inverters are especially suitable when it comes to meeting the requirements of system integrators, OEMs and distributors regarding high productivity and tailored performance.

Benefits

- Compact design
- Side-by-side design
- High power density, low envelope dimensions
- Simple installation in the tightest space
- Low space requirement
- Use in small control cabinets, close to the machine
- Optimized parameter set
- Optimized commissioning
- Getting Started document
- BOP-2 or IOP operator panels can be used
- Integrated USB connection
- Simple and fast software parameter assignment
- Simple to use during commissioning and in operation
- Minimized training costs, existing SINAMICS know-how can be used
- High degree of service friendliness, simple maintenance
- Plug-in terminals
- Cloning function using BOP-2, IOP or memory card
- Operating hours counter for "drive on" and "motor on"
- Fast mechanical installation
- Intuitive standard commissioning
- Component of Totally Integrated Automation
- Energy-efficient, sensorless vector control
- Automatic flux reduction with V/f ECO
- Integrated energy saving computer
- Safety Integrated (STO)
- Communications versions with PROFINET / EtherNet/IP, PROFIBUS DP, CANopen, USS/Modbus RTU
- Coated modules
- Operation up to an ambient temperature of 60 °C (140 °F)

Design

SINAMICS G120C is a compact inverter for control cabinet mounting in IP20 degree of protection where the Control Unit (CU) and Power Module (PM) function units are combined in one device.

The compact mechanical design and the high power density allow these devices to be installed in machine control enclosures and control cabinets for maximum space utilization. The SINAMICS G120C compact inverter can be butt-mounted directly, without derating; the PROFINET version can be butt-mounted up to 55 °C (131 °F).

SINAMICS G120C, frame size FSB, with BOP-2

SINAMICS G120C can be integrated into the widest range of applications, either using the integrated digital and analog inputs or via the integrated fieldbus interface (available in the USS, Modbus RTU, PROFIBUS, PROFINET / EtherNet/IP, CANopen versions). Especially the product versions with integrated PROFIBUS/PROFINET interface make full integration into the Siemens TIA family possible, therefore allowing the advantages of the seamless TIA product family to be fully utilized. SINAMICS G120C drives are preset in the factory so that they can be immediately connected to PROFIBUS, PROFINET or CANopen fieldbus systems and used without parameterization.

SINAMICS G120C is also equipped with the safety function STO (Safe Torque Off) as standard, which is used to safely stop drives. As a consequence, machine manufacturers can simply comply with current machinery directives with minimum associated costs.

SINAMICS G120C can control asynchronous (induction) motors in the power range from 0.37 kW up to 18.5 kW (0.5 hp up to 25 hp). Reliable and efficient motor operation is achieved by using state-of-the-art IGBT technology combined with vector control. The extensive range of functions integrated in the SINAMICS G120C also offers a high degree of protection for the inverter and motor.

Line-side components

Line reactors

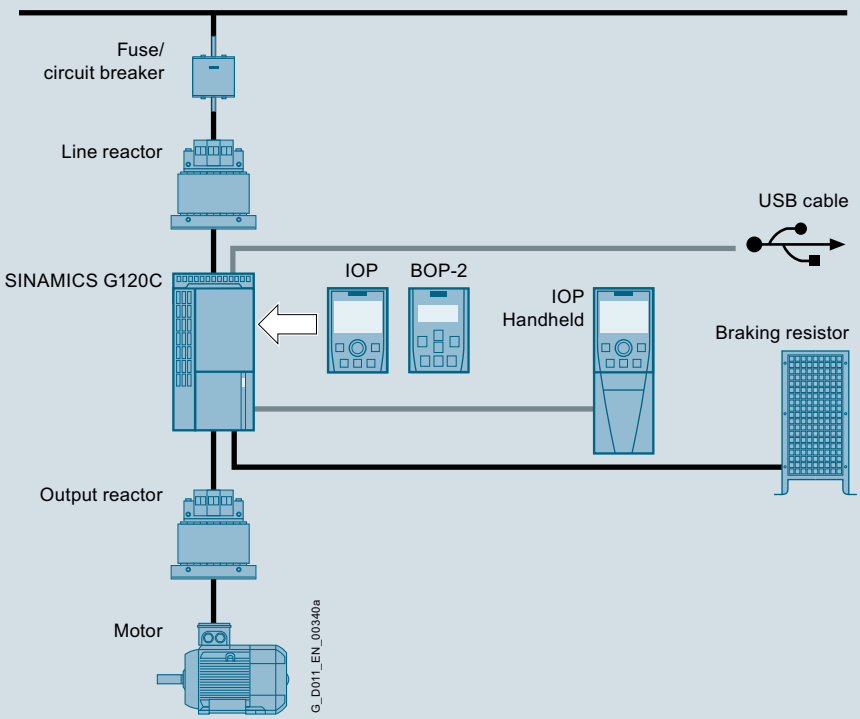
Line reactors smooth the current drawn by the inverter and thus reduce harmonic components in the line current. Through the reduction of the current harmonics, the thermal load on the power components in the rectifier and in the DC-link capacitors is reduced as well as the harmonic effects on the supply. The use of a line reactor increases the service life of the inverter.

Recommended line-side power components

Standard fuses can be used for the SINAMICS G120C. These must be dimensioned to comply with local regulations. In this chapter, you will find recommended components such as fuses and circuit breakers in compliance with IEC and UL regulations.

4

Design



DC link components

Braking resistors

The excess energy of the DC link is dissipated using the braking resistor. The braking resistors are designed for use with the SINAMICS G120C. This has an integrated brake chopper (electronic switch).

Load-side power components

Output reactors

Output reactors reduce the rate of voltage rise (dv/dt) and the height of the current peaks, and enable longer motor cables to be connected.

Supplementary system components

Intelligent Operator Panel IOP

Graphics-based, user-friendly and powerful operator panel for commissioning and diagnostics as well as local operator control and monitoring of SINAMICS G120C.

Basic Operator Panel BOP-2

A 2-line display to provide support when commissioning and troubleshooting the drive. The drive can be locally controlled.

Memory card

The parameter settings for an inverter can be stored on the SINAMICS SD memory card. When service is required, e.g. after the inverter has been replaced and the data have been downloaded from the memory card the drive system is immediately ready for use again. The associated memory card holder is integrated in the inverter.

PC inverter connection kit 2

For controlling and commissioning an inverter directly from a PC if the STARTER commissioning tool or SINAMICS Startdrive has been installed on the PC.

Spare parts

Shield plates

A set of shield plates is included in the scope of delivery for the motor and signal cables corresponding to the frame size of the SINAMICS G120C, and can also be ordered as spare parts.

Spare Parts Kit

This kit comprises 5 sets of I/O terminals, 1 RS485 terminal, 2 pairs of Control Unit doors (1 × PN and 1 × other communication versions) and 1 blanking cover.

Set of connectors

A set of connectors for the line feeder cable, braking resistor and motor cable can be ordered corresponding to the frame size of the SINAMICS G120C inverter.

Roof-mounted fan

A roof-mounted fan (at the top of the device) comprising a pre-assembled unit with holder and fan can be ordered corresponding to the frame size of the SINAMICS G120C.

Fan unit

A replacement fan (at the rear of the device; heat sink) comprising a pre-assembled unit with holder and fan can be ordered corresponding to the frame size of the SINAMICS G120C.

Configuration

The following electronic configuring guides and engineering tools are available for SINAMICS G120C compact inverters:

Drive Technology Configurator (DT Configurator) within the CA 01

The interactive catalog CA 01 – the offline Industry mall of Siemens on DVD-ROM – contains over 100,000 products with approximately 5 million possible drive system product variants. The Drive Technology Configurator (DT Configurator) has been developed to facilitate selection of the correct motor and/or inverter from the wide spectrum of drives. It is integrated as a selection tool in Catalog CA 01.

Online DT Configurator

In addition, the DT Configurator can now be used on the Internet without requiring any installation. The DT Configurator can be found in the Siemens Industry Mall at the following address:
www.siemens.com/dt-configurator

SIZER for Siemens Drives engineering tool

The SIZER for Siemens Drives engineering tool makes it easy to engineer the SINAMICS and MICROMASTER 4 drive families. It provides support when selecting the hardware and firmware components necessary to implement a drive task. SIZER for Siemens Drives covers the full range of operations required to configure a complete drive system.

You can find further information on SIZER for Siemens Drives in the section Engineering Tools.

The SIZER for Siemens Drives engineering tool is available free of charge on the internet at
www.siemens.com/sizer

STARTER commissioning tool

The STARTER commissioning tool allows menu-prompted commissioning, optimization and diagnostics. Apart from the SINAMICS drives, STARTER is also suitable for MICROMASTER 4 devices.

You can find further information on the STARTER commissioning tool in the section Engineering Tools.

Additional information on the STARTER commissioning tool is available on the internet at
www.siemens.com/starter

SINAMICS Startdrive commissioning tool

SINAMICS Startdrive is a tool for configuring, commissioning, and diagnosing the SINAMICS family of drives and is integrated into the TIA Portal. SINAMICS Startdrive can be used to implement drive tasks with the SINAMICS G120, SINAMICS G120C, SINAMICS G110M (SINAMICS Startdrive V13 and higher), SINAMICS G120D and SINAMICS G120P (SINAMICS Startdrive V13 and higher) inverter series. The commissioning tool has been optimized with regard to user friendliness and consistent use of the TIA Portal benefits of a common working environment for PLC, HMI and drives.

You can find further information on the SINAMICS Startdrive commissioning tool in the section Engineering Tools.

The SINAMICS Startdrive commissioning tool is available free of charge on the internet at
www.siemens.com/startdrive

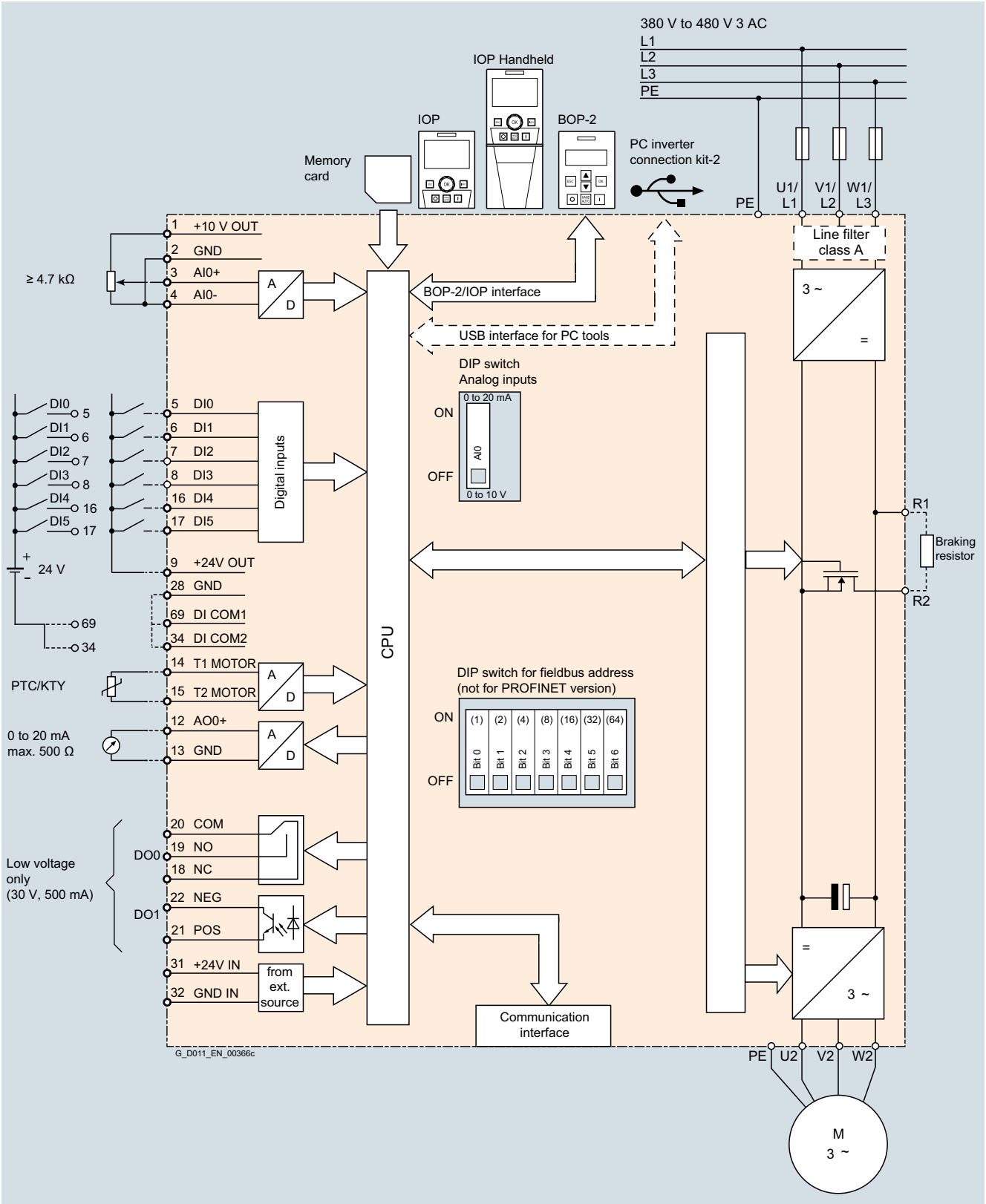
Drive ES engineering system

Drive ES is the engineering system that can be used to integrate the communication, configuration and data management functions of Siemens drive technology into the SIMATIC automation world easily, efficiently and cost-effectively. The STEP 7 Manager user interface provides the ideal basis for this. A variety of software packages are available for SINAMICS –
Drive ES Basic, Drive ES SIMATIC and Drive ES PCS.

You can find further information on the Drive ES engineering system in the section Engineering Tools.

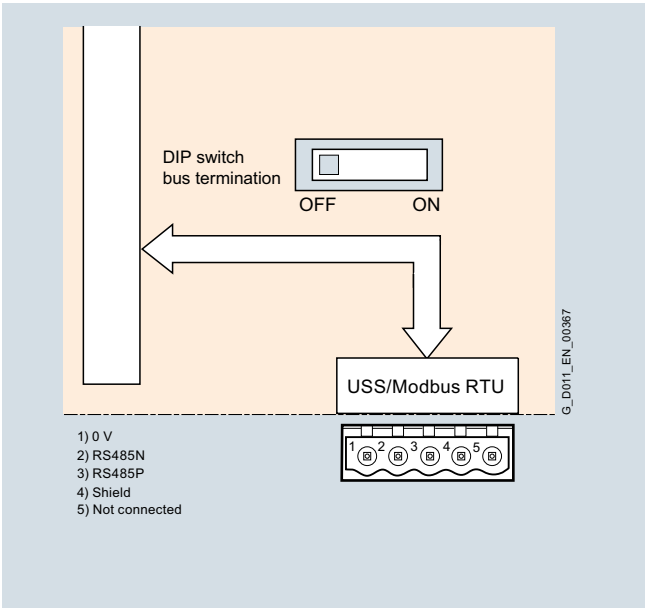
Additional information on the DRIVE ES engineering system is available on the internet at
www.siemens.com/drive-es

Integration

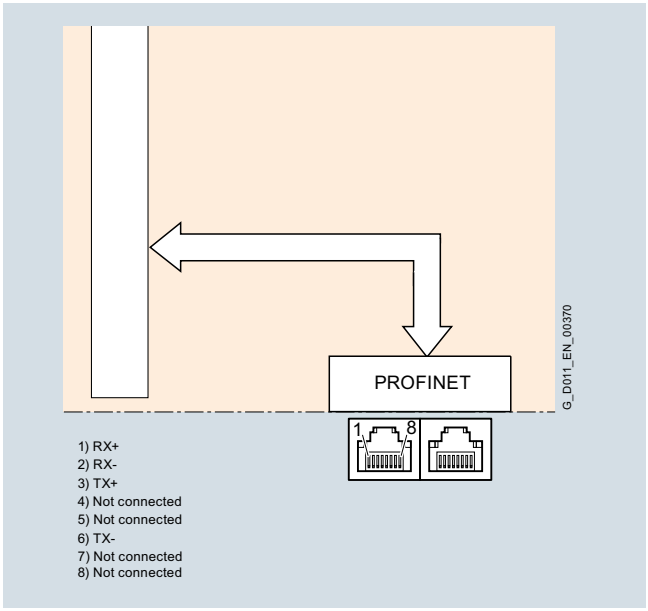


Connection example for SINAMICS G120C

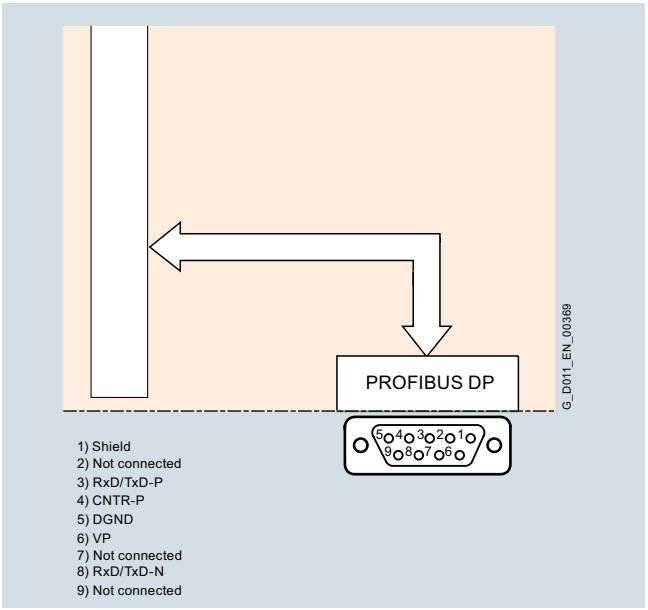
Integration



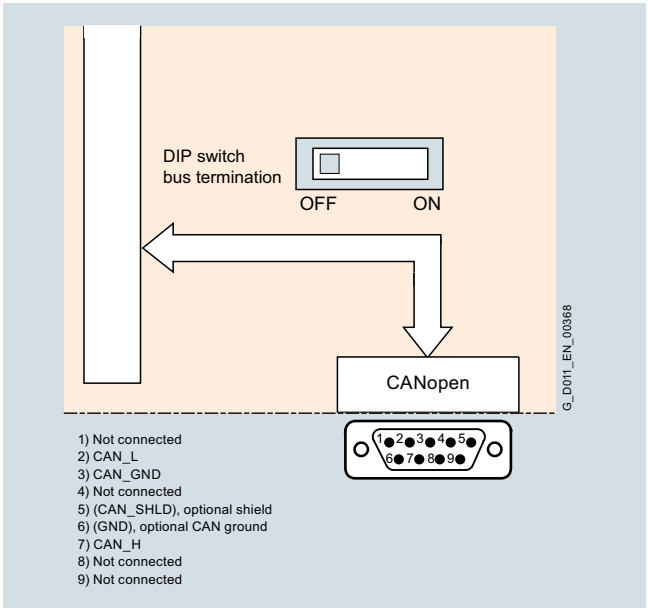
USS/Modbus RTU communication interface



Communication interface PROFINET, EtherNet/IP



PROFIBUS DP communication interface



CANopen communication interface

4

Selection and ordering data

The article number is selected corresponding to
- the required motor power or the motor current required and the overload requirements of the application,
- the necessary EMC classification and
- the required integrated fieldbus interface

Rated power [1]		Base-load current I_L [2]	Base-load current I_H [3]	Frame size	Version	SINAMICS G120C **without** line filter	SINAMICS G120C **with integrated line filter class A**
kW	hp	A	A			Article No.	Article No.
380 ... 480 V 3 AC							
0.55	0.75	1.7	1.3	FSA	USS, Modbus RTU	**6SL3210-1KE11-8UB1**	**6SL3210-1KE11-8AB1**
					PROFIBUS DP	**6SL3210-1KE11-8UP1**	**6SL3210-1KE11-8AP1**
					PROFINET, EtherNet/IP	**6SL3210-1KE11-8UF1**	**6SL3210-1KE11-8AF1**
					CANopen	**6SL3210-1KE11-8UC1**	**6SL3210-1KE11-8AC1**
0.75	1	2.2	1.7	FSA	USS, Modbus RTU	**6SL3210-1KE12-3UB1**	**6SL3210-1KE12-3AB1**
					PROFIBUS DP	**6SL3210-1KE12-3UP1**	**6SL3210-1KE12-3AP1**
					PROFINET, EtherNet/IP	**6SL3210-1KE12-3UF1**	**6SL3210-1KE12-3AF1**
					CANopen	**6SL3210-1KE12-3UC1**	**6SL3210-1KE12-3AC1**
1.1	1.5	3.1	2.2	FSA	USS, Modbus RTU	**6SL3210-1KE13-2UB1**	**6SL3210-1KE13-2AB1**
					PROFIBUS DP	**6SL3210-1KE13-2UP1**	**6SL3210-1KE13-2AP1**
					PROFINET, EtherNet/IP	**6SL3210-1KE13-2UF1**	**6SL3210-1KE13-2AF1**
					CANopen	**6SL3210-1KE13-2UC1**	**6SL3210-1KE13-2AC1**
1.5	2	4.1	3.1	FSA	USS, Modbus RTU	**6SL3210-1KE14-3UB1**	**6SL3210-1KE14-3AB1**
					PROFIBUS DP	**6SL3210-1KE14-3UP1**	**6SL3210-1KE14-3AP1**
					PROFINET, EtherNet/IP	**6SL3210-1KE14-3UF1**	**6SL3210-1KE14-3AF1**
					CANopen	**6SL3210-1KE14-3UC1**	**6SL3210-1KE14-3AC1**
2.2	3	5.6	4.1	FSA	USS, Modbus RTU	**6SL3210-1KE15-8UB1**	**6SL3210-1KE15-8AB1**
					PROFIBUS DP	**6SL3210-1KE15-8UP1**	**6SL3210-1KE15-8AP1**
					PROFINET, EtherNet/IP	**6SL3210-1KE15-8UF1**	**6SL3210-1KE15-8AF1**
					CANopen	**6SL3210-1KE15-8UC1**	**6SL3210-1KE15-8AC1**
3	4	7.3	5.6	FSA	USS, Modbus RTU	**6SL3210-1KE17-5UB1**	**6SL3210-1KE17-5AB1**
					PROFIBUS DP	**6SL3210-1KE17-5UP1**	**6SL3210-1KE17-5AP1**
					PROFINET, EtherNet/IP	**6SL3210-1KE17-5UF1**	**6SL3210-1KE17-5AF1**
					CANopen	**6SL3210-1KE17-5UC1**	**6SL3210-1KE17-5AC1**
4	5	8.8	7.3	FSA	USS, Modbus RTU	**6SL3210-1KE18-8UB1**	**6SL3210-1KE18-8AB1**
					PROFIBUS DP	**6SL3210-1KE18-8UP1**	**6SL3210-1KE18-8AP1**
					PROFINET, EtherNet/IP	**6SL3210-1KE18-8UF1**	**6SL3210-1KE18-8AF1**
					CANopen	**6SL3210-1KE18-8UC1**	**6SL3210-1KE18-8AC1**
5.5	7.5	12.5	8.8	FSB	USS, Modbus RTU	**6SL3210-1KE21-3UB1**	**6SL3210-1KE21-3AB1**
					PROFIBUS DP	**6SL3210-1KE21-3UP1**	**6SL3210-1KE21-3AP1**
					PROFINET, EtherNet/IP	**6SL3210-1KE21-3UF1**	**6SL3210-1KE21-3AF1**
					CANopen	**6SL3210-1KE21-3UC1**	**6SL3210-1KE21-3AC1**
7.5	10	16.5	12.5	FSB	USS, Modbus RTU	**6SL3210-1KE21-7UB1**	**6SL3210-1KE21-7AB1**
					PROFIBUS DP	**6SL3210-1KE21-7UP1**	**6SL3210-1KE21-7AP1**
					PROFINET, EtherNet/IP	**6SL3210-1KE21-7UF1**	**6SL3210-1KE21-7AF1**
					CANopen	**6SL3210-1KE21-7UC1**	**6SL3210-1KE21-7AC1**
11	15	25	16.5	FSC	USS, Modbus RTU	**6SL3210-1KE22-6UB1**	**6SL3210-1KE22-6AB1**
					PROFIBUS DP	**6SL3210-1KE22-6UP1**	**6SL3210-1KE22-6AP1**
					PROFINET, EtherNet/IP	**6SL3210-1KE22-6UF1**	**6SL3210-1KE22-6AF1**
					CANopen	**6SL3210-1KE22-6UC1**	**6SL3210-1KE22-6AC1**
15	20	31	25	FSC	USS, Modbus RTU	**6SL3210-1KE23-2UB1**	**6SL3210-1KE23-2AB1**
					PROFIBUS DP	**6SL3210-1KE23-2UP1**	**6SL3210-1KE23-2AP1**
					PROFINET, EtherNet/IP	**6SL3210-1KE23-2UF1**	**6SL3210-1KE23-2AF1**
					CANopen	**6SL3210-1KE23-2UC1**	**6SL3210-1KE23-2AC1**
18.5	25	37	31	FSC	USS, Modbus RTU	**6SL3210-1KE23-8UB1**	**6SL3210-1KE23-8AB1**
					PROFIBUS DP	**6SL3210-1KE23-8UP1**	**6SL3210-1KE23-8AP1**
					PROFINET, EtherNet/IP	**6SL3210-1KE23-8UF1**	**6SL3210-1KE23-8AF1**
					CANopen	**6SL3210-1KE23-8UC1**	**6SL3210-1KE23-8AC1**

[1] The rated power of the device based on the rated output current I_L and a rated input voltage of 400 V 3 AC. The rated power is specified on the device rating plate.
[2] The base-load current I_L is based on the duty cycle for low overload (LO). The current value is specified on the device rating plate.
[3] The base-load current I_H is based on the duty cycle for high overload (HO). The current value is not specified on the device rating plate.

Selection and ordering data

Optional firmware memory cards for SINAMICS G120C

Designation		Article No.
SINAMICS SD card **512 MB + firmware V4.5** (Multicard V4.5)	NEW	**6SL3054-7EF00-2BA0**
SINAMICS SD card **512 MB + firmware V4.6** (Multicard V4.6)	NEW	**6SL3054-7EG00-2BA0**
SINAMICS SD card **512 MB + firmware V4.7** (Multicard V4.7)	NEW	**6SL3054-7EH00-2BA0**

For more information on firmware V4.5:

http://support.automation.siemens.com/WW/view/en/72841234

For more information on firmware V4.6:

http://support.automation.siemens.com/WW/view/en/67385235

For more information on firmware V4.7:

http://support.automation.siemens.com/WW/view/en/92554110

4

Technical specifications

Unless explicitly specified otherwise, the following technical specifications are valid for all SINAMICS G120C compact inverters.

Mechanical specifications	
Vibratory load	
• Transport acc. to EN 60721-3-2 [1]	Class 1M2
• Operation acc. to EN 60721-3-3	Class 3M2
Shock load	
• Transport acc. to EN 60721-3-2 [1]	Class 1M2
• Operation acc. to EN 60721-3-3	Class 3M2
Degree of protection	IP20/ UL open type
Permissible mounting position	Vertical wall mounting
Ambient conditions	
Protection class according to EN 61800-5-1	Class III (PELV1)
Touch protection according to EN 61800-5-1	Class I (with protective conductor system)
Humidity, max.	95 % at 40 °C (104 °F), condensation and icing not permissible
Ambient temperature	
• Storage [1] acc. to EN 60068-2-1	-40 ... +70 °C (-40 ... +158 °F)
• Transport [1] acc. to EN 60068-2-1	-40 ... +70 °C (-40 ... +158 °F)
• Operation acc. to EN 60068-2-2	-10 ... +40 °C (14 ... 104 °F) without derating >40 ... 60 °C (104 ... 140 °F) see derating characteristics
Environmental class in operation	
• Harmful chemical substances	Class 3C2 to EN 60721-3-3
• Organic/biological pollutants	Class 3B1 to EN 60721-3-3
• Degree of pollution	2 acc. to EN 61800
Standards	
Compliance with standards	CE, cULus, C-Tick
Fail-safe certification	Function: Safe Torque Off (STO)
• According to IEC 61508	SIL 2
• According to EN ISO 13849-1	PL d and Category 3
CE marking, according to	EMC Directive 2004/108/EC Low-Voltage Directive 2006/95/EC
EMC behavior [2] According to EN 61800-3	
Interference immunity	The SINAMICS G120C compact inverters are tested with the interference immunity requirements for environments according to Category C3.
Interference emissions	
• Frame sizes FSA to FSC without integrated line filter	[3]
• Frame sizes FSA to FSC with integrated line filter class A	The inverters comply with the limits values according to Category C3. The inverters comply with the limits values for conducted interferences and field-conducted radiated interferences according to Category C2. [4] [5] Note: The EMC product standard EN 61800-3 does not apply directly to a frequency inverter but to a PDS (Power Drive System), which comprises the complete circuitry, motor and cables in addition to the inverter. The frequency inverters on their own do not generally require identification according to the EMC Directive.

1) In transport packaging.

2) For further general information, see also chapter SINAMICS G120, section Technical specifications, Compliance with standards.

3) Non-filtered devices are designed for operation on IT systems or in conjunction with an RCD. The customer must provide suitable RI suppression equipment to ensure that these devices comply with the limits defined for Category C3 or C2.

4) With shielded motor cable up to 25 m (82 ft).

5) SINAMICS G120C compact inverters frame size FSB with PROFINET interface (Article-No.: 6SL3210-1KE21-.AF1) additionally need a line reactor.

Technical specifications

SINAMICS G120C compact inverter	USS, Modbus RTU version 6SL3210-1KE..-..B1	PROFIBUS DP version 6SL3210-1KE..-..P1	PROFINET, EtherNet/IP version 6SL3210-1KE..-..F1	CANopen version 6SL3210-1KE..-..C1
Integrated bus interface				
Fieldbus protocols	• USS • Modbus RTU (switchable using a parameter)	PROFIBUS DP	• PROFINET • EtherNet/IP - ODVA AC/DC drive - SINAMICS profiles	• CANopen
Profiles	–	• PROFIdrive Profile V4.1 • PROFIsafe	• PROFIdrive Profile V4.1 • PROFIsafe • PROFIenergy	–
Hardware	Plug-in terminal, insulated, USS: max. 187.5 kbaud Modbus RTU: 19.2 kBaud, Bus terminating resistor that can be switched in	9-pin SUB-D socket, insulated, Max. 12 Mbit/s Slave address can be set using DIP switches	2 × RJ45, max. 100 Mbit/s (full duplex), device name can be stored on the device	9-pin SUB-D connector, insulated, Max. 1 Mbit/s, Bus terminating resistor that can be switched in
I/O interfaces				
Signal cable cross-section	0.15 ... 1.5 (0.01 ... 0.06 in) mm^2 (28 ... 16 AWG)			
Digital inputs – Standard	6 isolated inputs Optically isolated; Free reference potential (own potential group) NPN/PNP logic can be selected using the wiring			
• Switching level: 0 → 1	11 V			
• Switching level: 1 → 0	5 V			
• Input current, max.	15 mA			
Digital inputs, fail-safe	1 When using the standard digital inputs (DI4+DI5) Safety function: Safe Torque Off (STO)			
Digital outputs	1 relay changeover contact 30 V DC, 0.5 A (ohmic load) 1 transistor 30 V DC, 0.5 A (ohmic load)			
Analog inputs	1 analog input Differential input Switchable between voltage (-10 ... +10 V) and current (0/4 ... 20 mA) using a DIP switch 10-bit resolution Can be used as additional digital input Analog inputs are protected in a voltage range of ±30 V and have a common-mode voltage in the ±15 V range.			
• Switching threshold: 0 → 1	4 V			
• Switching threshold: 1 → 0	1.6 V			
Analog outputs	1 analog output Non-isolated output Switchable between voltage (0 ... 10 V) and current (0/4 ... 20 mA) using a parameter Voltage mode: 10 V, min. burden 10 kΩ Current mode: 20 mA, max. burden 500 Ω The analog outputs have short circuit protection			
PTC/KTY interface	1 motor temperature sensor input Connectable sensors PTC, KTY and bimetal, Accuracy ±5 °C (41 °F)			
Voltage supply for the integrated Control Unit	24 V DC via the Power Module or by connecting to an external 20.4 ... 28.8 V DC power supply Typical input current: 500 mA at 24 V DC			
Tool interfaces				
Memory card	Optional SINAMICS SD card			
Operator panels	Optional Basic Operator Panel BOP-2 or Intelligent Operator Panel IOP			
PC interface	USB			

Technical specifications

SINAMICS G120C compact inverter	USS, Modbus RTU version 6SL3210-1KE..-..B1	PROFIBUS DP version 6SL3210-1KE..-..P1	PROFINET, EtherNet/IP version 6SL3210-1KE..-..F1	CANopen version 6SL3210-1KE..-..C1
Open-loop/closed-loop control techniques				
V/f linear/quadratic/parameterizable	✓			
V/f with flux current control (FCC)	✓			
V/f ECO linear/quadratic	✓			
Vector control, sensorless	✓			
Vector control, with sensor	–			
Torque control, sensorless	–			
Torque control, with sensor	–			
Software functions				
Setpoint input	✓			
Fixed frequencies	16, parameterizable			
JOG	✓			
Digital motorized potentiometer (MOP)	✓			
Ramp smoothing	✓			
Extended ramp-function generator (with ramp smoothing Off3)	✓			
Positioning down ramp	–			
Slip compensation	✓			
Signal interconnection with BICO technology	✓			
Free function blocks (FFB) for logical and arithmetic operations	–			
Switchable drive data sets (DDS)	✓ (2)			
Switchable command data sets (CDS)	✓ (2)			
Flying restart	✓			
Automatic restart after line supply failure or operating fault (AR)	✓			
Technology controller (internal PID)	✓			
Energy consumption counter	✓			
Energy saving computer	✓			
Thermal motor protection	✓ (I^2t, sensor: PTC, KTY and bimetal)			
Thermal inverter protection	✓			
Motor identification	✓			
Motor holding brake	✓			
Auto-ramping (V_{dcmax} controller)	✓			
Kinetic buffering (V_{dcmin} controller)	✓			
Braking functions				
• DC braking	✓			
• Compound braking	✓			
• Dynamic braking with integrated brake chopper	✓			

Technical specifications

General technical specifications of the power electronics	
System operating voltage	380 ... 480 V 3 AC +10 % -20 %
Grid requirement **Short-circuit power R_{SC}**	No restriction
Input frequency	47 ... 63 Hz
Output frequency	
• Control mode V/f	0 ... 650 Hz (due to legal requirements, the maximum output frequency is restricted to 550 Hz with firmware V4.7 and higher)
• Control type Vector	0 ... 240 Hz
Pulse frequency	4 kHz for higher pulse frequencies up to 16 kHz, see derating data
Power factor λ	0.7 ... 0.85
Offset factor cos φ	≥ 0.95
Output voltage, max. as % of input voltage	95 %
Overload capability	
• Low overload LO Note: No reduction in base-load current I_L for use of overload.	1.5 × base-load current I_L (i. e. 150 % overload) for 3 s **plus** 1.1 × base-load current I_L (i. e. 110 % overload) for 57 s within a cycle time of 300 s
• High overload HO Note: No reduction in base-load current I_H for use of overload.	2 × base-load current I_H (i. e. 200 % overload) for 3 s **plus** 1.5 × base-load current I_H (i. e. 150 % overload) for 57 s within a cycle time of 300 s
Electromagnetic compatibility	• Devices without line filter [1] • Devices with integrated line filter class A according to EN 55011
Cooling	Air cooling using an integrated fan
Installation altitude	Up to 1000 m (3281 ft) above sea level without derating, 1000 m (3281 ft) see derating characteristics
Short Circuit Current Rating (SCCR), max. according to UL [2]	40 kA
Protection functions	• Undervoltage • Overvoltage • Overload • Ground fault • Short-circuit • Stall protection • Motor blocking protection • Motor overtemperature • Inverter overtemperature

[1] Non-filtered devices are designed for operation on IT systems or in conjunction with an RCD. The customer must provide suitable RI suppression equipment to ensure that these devices comply with the limits defined for Category C3 or C2.

[2] Applies to industrial control panel installations to NEC article 409 or UL 508A.

Technical specifications

Line voltage 380 ... 480 V 3 AC		SINAMICS G120C power electronics			
		6SL3210-1KE11-8..1	6SL3210-1KE12-3..1	6SL3210-1KE13-2..1	6SL3210-1KE14-3..1
Output current at 400 V 3 AC					
• Rated current I_{rated} [1]	A	1.8	2.3	3.2	4.3
• Base-load current I_L [2]	A	1.7	2.2	3.1	4.1
• Base-load current I_H [3]	A	1.3	1.7	2.2	3.1
• Maximum current I_{max}	A	2.6	3.4	4.4	6.2
Rated power					
• Based on I_L	kW (hp)	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 (0.75)	0.75 (1)	1.1 (1.5)
Rated pulse frequency	kHz	4	4	4	4
Efficiency η		0.97	0.97	0.97	0.97
Power loss [4]					
• At rated current	kW	0.033	0.038	0.048	0.058
Cooling air requirement	m^3/s (ft^3/s)	0.005 (0.18)	0.005 (0.18)	0.005 (0.18)	0.005 (0.18)
Sound pressure level L_{pA} (1 m)	dB	<52	<52	<52	<52
Rated input current [5]					
• Based on I_L	A	2.3	2.9	4.1	5.5
• Based on I_H	A	1.9	2.5	3.2	4.5
Length of cable to braking resistor, max.	m (ft)	15 (49)	15 (49)	15 (49)	15 (49)
Line supply connection U1/L1, V1/L2, W1/L3		Plug-in screw terminals	Plug-in screw terminals	Plug-in screw terminals	Plug-in screw terminals
• Conductor cross-section	mm^2	1 ... 2.5 (16 ... 14 AWG)	1 ... 2.5 (16 ... 14 AWG)	1 ... 2.5 (16 ... 14 AWG)	1 ... 2.5 (16 ... 14 AWG)
Motor connection U2, V2, W2		Plug-in screw terminals	Plug-in screw terminals	Plug-in screw terminals	Plug-in screw terminals
• Conductor cross-section	mm^2	1 ... 2.5 (16 ... 14 AWG)	1 ... 2.5 (16 ... 14 AWG)	1 ... 2.5 (16 ... 14 AWG)	1 ... 2.5 (16 ... 14 AWG)
Connection for braking resistor R1, R2		Plug-in screw terminals	Plug-in screw terminals	Plug-in screw terminals	Plug-in screw terminals
• Conductor cross-section	mm^2	1 ... 2.5 (16 ... 14 AWG)	1 ... 2.5 (16 ... 14 AWG)	1 ... 2.5 (16 ... 14 AWG)	1 ... 2.5 (16 ... 14 AWG)
PE connection		On housing with M4 screw	On housing with M4 screw	On housing with M4 screw	On housing with M4 screw
Motor cable length, max. [6]					
• Shielded	m (ft)	50 (164)	50 (164)	50 (164)	50 (164)
• Unshielded	m (ft)	100 (328)	100 (328)	100 (328)	100 (328)
Dimensions					
• Width	mm (in)	73 (2.87)	73 (2.87)	73 (2.87)	73 (2.87)
• Height	mm (in)	196 (7.72)	196 (7.72)	196 (7.72)	196 (7.72)
• Depth					
- Without operator panel	mm (in)	203 (7.99) (PN version: 225.4 (8.87))	203 (7.99) (PN version: 225.4 (8.87))	203 (7.99) (PN version: 225.4 (8.87))	203 (7.99) (PN version: 225.4 (8.87))
- With operator panel	mm (in)	224 (8.82) (PN version: 246.4 (9.70))	224 (8.82) (PN version: 246.4 (9.70))	224 (8.82) (PN version: 246.4 (9.70))	224 (8.82) (PN version: 246.4 (9.70))
Frame size		FSA	FSA	FSA	FSA
Weight, approx.					
• Without filter	kg (lb)	1.7 (3.75)	1.7 (3.75)	1.7 (3.75)	1.7 (3.75)
• With integrated filter class A	kg (lb)	1.9 (4.19)	1.9 (4.19)	1.9 (4.19)	1.9 (4.19)

[1] The rated output current I_{rated} can be used up to 100 %; however, without overload.

[2] The base-load current I_L is based on the duty cycle for low overload (LO).

[3] The base-load current I_H is based on the duty cycle for high overload (HO).

[4] Typical values. You can find more information on the Internet at http://support.automation.siemens.com/WW/view/en/94059311

[5] The rated input currents are valid for an input voltage of 400 V 3 AC and a line impedance corresponding to u_K = 1 % (without line reactor). The rated input current based on I_L is stamped on the inverter rating plate. In the particular application, the input current depends on the motor load and line impedance. The input current is reduced when using a line reactor.

[6] The maximum motor cable lengths are valid for an input voltage of 400 V 3 AC and operation with a 4 kHz pulse frequency. When an inverter with an integrated line filter class A is used to comply with the limits of EN 61800-3 Category C2 for line conducted interference emission, the maximum permissible motor cable length is 25 m (82 ft) (shielded).

Technical specifications

Line voltage 380 ... 480 V 3 AC		SINAMICS G120C power electronics			
		6SL3210-1KE15-8..1	6SL3210-1KE17-5..1	6SL3210-1KE18-8..1	6SL3210-1KE21-3..1
Output current at 400 V 3 AC					
• Rated current I_{rated} [1]	A	5.8	7.5	9	13
• Base-load current I_L [2]	A	5.6	7.3	8.8	12.5
• Base-load current I_H [3]	A	4.1	5.6	7.3	8.8
• Maximum current I_{max}	A	8.2	11.2	14.6	17.6
Rated power					
• Based on I_L	kW (hp)	2.2 (3)	3 (4)	4 (5)	5.5 (7.5)
• Based on I_H	kW (hp)	1.5 (2)	2.2 (3)	3 (4)	4 (5)
Rated pulse frequency	kHz	4	4	4	4
Efficiency η		0.97	0.97	0.97	0.97
Power loss [4]					
• At rated current	kW	0.079	0.105	0.13	0.177
Cooling air requirement	m^3/s (ft^3/s)	0.005 (0.18)	0.005 (0.18)	0.005 (0.18)	0.009 (0.32)
Sound pressure level L_{pA} (1 m)	dB	<52	<52	<52	<63
Rated input current [5]					
• Based on I_L	A	7.4	9.5	11.4	16.5
• Based on I_H	A	6	8.2	10.6	12.8
Length of cable to braking resistor, max.	m (ft)	15 (49)	15 (49)	15 (49)	15 (49)
Line supply connection U1/L1, V1/L2, W1/L3		Plug-in screw terminals	Plug-in screw terminals	Plug-in screw terminals	Plug-in screw terminals
• Conductor cross-section	mm^2	1 ... 2.5 (16 ... 14 AWG)	1 ... 2.5 (16 ... 14 AWG)	1 ... 2.5 (16 ... 14 AWG)	4 .. 6 (12 ... 10 AWG)
Motor connection U2, V2, W2		Plug-in screw terminals	Plug-in screw terminals	Plug-in screw terminals	Plug-in screw terminals
• Conductor cross-section	mm^2	1 ... 2.5 (16 ... 14 AWG)	1 ... 2.5 (16 ... 14 AWG)	1 ... 2.5 (16 ... 14 AWG)	4 ... 6 (12 ... 10 AWG)
Connection for braking resistor R1, R2		Plug-in screw terminals	Plug-in screw terminals	Plug-in screw terminals	Plug-in screw terminals
• Conductor cross-section	mm^2	1 ... 2.5 (16 ... 14 AWG)	1 ... 2.5 (16 ... 14 AWG)	1 ... 2.5 (16 ... 14 AWG)	4 ... 6 (12 ... 10 AWG)
PE connection		On housing with M4 screw	On housing with M4 screw	On housing with M4 screw	On housing with M4 screw
Motor cable length, max. [6]					
• Shielded	m (ft)	50 (164)	50 (164)	50 (164)	50 (164)
• Unshielded	m (ft)	100 (328)	100 (328)	100 (328)	100 (328)
Dimensions					
• Width	mm (in)	73 (2.87)	73 (2.87)	73 (2.87)	100 (3.94)
• Height	mm (in)	196 (7.72)	196 (7.72)	196 (7.72)	196 (7.72)
• Depth					
- Without operator panel	mm (in)	203 (7.99) (PN version: 225.4 (8.87))	203 (7.99) (PN version: 225.4 (8.87))	203 (7.99) (PN version: 225.4 (8.87))	203 (7.99) (PN version: 225.4 (8.87))
- With operator panel	mm (in)	224 (8.82) (PN version: 246.4 (9.70))	224 (8.82) (PN version: 246.4 (9.70))	224 (8.82) (PN version: 246.4 (9.70))	224 (8.82) (PN version: 246.4 (9.70))
Frame size		FSA	FSA	FSA	FSB
Weight, approx.					
• Without filter	kg (lb)	1.7 (3.75)	1.7 (3.75)	1.7 (3.75)	2.3 (5)
• With integrated filter class A	kg (lb)	1.9 (4.19)	1.9 (4.19)	1.9 (4.19)	2.5 (5.51)

[1] The rated output current I_{rated} can be used up to 100 %; however, without overload.

[2] The base-load current I_L is based on the duty cycle for low overload (LO).

[3] The base-load current I_H is based on the duty cycle for high overload (HO).

[4] Typical values. You can find more information on the Internet at http://support.automation.siemens.com/WW/view/en/94059311

[5] The rated input currents are valid for an input voltage of 400 V 3 AC and a line impedance corresponding to u_K = 1 % (without line reactor). The rated input current based on I_L is stamped on the inverter rating plate. In the particular application, the input current depends on the motor load and line impedance. The input current is reduced when using a line reactor.

[6] The maximum motor cable lengths are valid for an input voltage of 400 V 3 AC and operation with a 4 kHz pulse frequency. When an inverter with an integrated line filter class A is used to comply with the limits of EN 61800-3 Category C2 for line conducted interference emission, the maximum permissible motor cable length is 25 m (82 ft) (shielded).

4

Technical specifications

Line voltage 380 ... 480 V 3 AC		SINAMICS G120C power electronics			
		6SL3210-1KE21-7..1	6SL3210-1KE22-6..1	6SL3210-1KE23-2..1	6SL3210-1KE23-8..1
Output current at 400 V 3 AC					
• Rated current I_{rated} [1]	A	17	26	32	38
• Base-load current I_L [2]	A	16.5	25	31	37
• Base-load current I_H [3]	A	12.5	16.5	25	31
• Maximum current I_{max}	A	25	33	50	62
Rated power					
• Based on I_L	kW (hp)	7.5 (10)	11 (15)	15 (20)	18.5 (25)
• Based on I_H	kW (hp)	5.5 (7.5)	7.5 (10)	11 (15)	15 (20)
Rated pulse frequency	kHz	4	4	4	4
Efficiency η		0.97	0.97	0.97	0.97
Power loss [4]					
• At rated current	kW	0.241	0.306	0.381	0.461
Cooling air requirement	m^3/s (ft^3/s)	0.009 (0.32)	0.018 (0.64)	0.018 (0.64)	0.018 (0.64)
Sound pressure level L_{pA} (1 m)	dB	<63	<66	<66	<66
Rated input current [5]					
• Based on I_L	A	21.5	33	40.6	48.2
• Based on I_H	A	18.2	24.1	36.4	45.2
Length of cable to braking resistor, max.	m (ft)	15 (49)	15 (49)	15 (49)	15 (49)
Line supply connection U1/L1, V1/L2, W1/L3		Plug-in screw terminals	Plug-in screw terminals	Plug-in screw terminals	Plug-in screw terminals
• Conductor cross-section	mm^2	4 ... 6 (12 ... 10 AWG)	6 ... 16 (10 ... 5 AWG)	6 ... 16 (10 ... 5 AWG)	6 ... 16 (10 ... 5 AWG)
Motor connection U2, V2, W2		Plug-in screw terminals	Plug-in screw terminals	Plug-in screw terminals	Plug-in screw terminals
• Conductor cross-section	mm^2	4 ... 6 (12 ... 10 AWG)	6 ... 16 (10 ... 5 AWG)	6 ... 16 (10 ... 5 AWG)	6 ... 16 (10 ... 5 AWG)
Connection for braking resistor R1, R2		Plug-in screw terminals	Plug-in screw terminals	Plug-in screw terminals	Plug-in screw terminals
• Conductor cross-section	mm^2	4 ... 6 (12 ... 10 AWG)	6 ... 16 (10 ... 5 AWG)	6 ... 16 (10 ... 5 AWG)	6 ... 16 (10 ... 5 AWG)
PE connection		On housing with M4 screw	On housing with M4 screw	On housing with M4 screw	On housing with M4 screw
Motor cable length, max. [6]					
• Shielded	m (ft)	50 (164)	50 (164)	50 (164)	50 (164)
• Unshielded	m (ft)	100 (328)	100 (328)	100 (328)	100 (328)
Dimensions					
• Width	mm (in)	100 (3.94)	140 (5.51)	140 (5.51)	140 (5.51)
• Height	mm (in)	196 (7.72)	295 (11.61)	295 (11.61)	295 (11.61)
• Depth					
- Without operator panel	mm (in)	203 (7.99) (PN version: 225.4 (8.87))	203 (7.99) (PN version: 225.4 (8.87))	203 (7.99) (PN version: 225.4 (8.87))	203 (7.99) (PN version: 225.4 (8.87))
- With operator panel	mm (in)	224 (8.82) (PN version: 246.4 (9.70))	224 (8.82) (PN version: 246.4 (9.70))	224 (8.82) (PN version: 246.4 (9.70))	224 (8.82) (PN version: 246.4 (9.70))
Frame size		FSB	FSC	FSC	FSC
Weight, approx.					
• Without filter	kg (lb)	2.3 (5)	4.4 (9.70)	4.4 (9.70)	4.4 (9.70)
• With integrated filter class A	kg (lb)	2.5 (5.51)	4.7 (10.36)	4.7 (10.36)	4.7 (10.36)

[1] The rated output current I_{rated} can be used up to 100 %; however, without overload.

[2] The base-load current I_L is based on the duty cycle for low overload (LO).

[3] The base-load current I_H is based on the duty cycle for high overload (HO).

[4] Typical values. You can find more information on the Internet at http://support.automation.siemens.com/WW/view/en/94059311

[5] The rated input currents are valid for an input voltage of 400 V 3 AC and a line impedance corresponding to u_K = 1 % (without line reactor). The rated input current based on I_L is stamped on the inverter rating plate. In the particular application, the input current depends on the motor load and line impedance. The input current is reduced when using a line reactor.

[6] The maximum motor cable lengths are valid for an input voltage of 400 V 3 AC and operation with a 4 kHz pulse frequency. When an inverter with an integrated line filter class A is used to comply with the limits of EN 61800-3 Category C2 for line conducted interference emission, the maximum permissible motor cable length is 25 m (82 ft) (shielded).

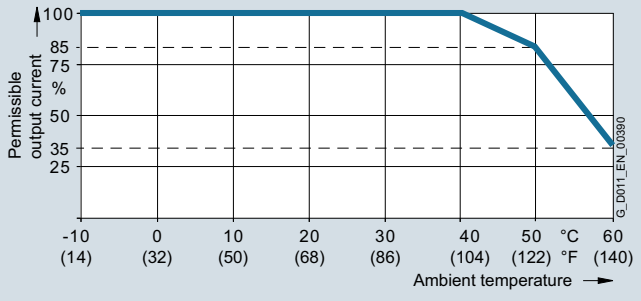
Characteristic curves

Derating data

Pulse frequency

Rated power based on low overload (LO)		**Rated output current A** for a pulse frequency of						
kW	hp	4 kHz	6 kHz	8 kHz	10 kHz	12 kHz	14 kHz	16 kHz
0.55 [1]	0.75	1.7	1.4	1.2	1	0.9	0.8	0.7
0.75 [1]	1	2.2	1.9	1.5	1.3	1.1	1	0.9
1.1 [1]	1.5	3.1	2.6	2.2	1.9	1.6	1.4	1.2
1.5 [1]	2	4.1	3.5	2.9	2.5	2.1	1.8	1.6
2.2 [1]	3	5.6	4.8	3.9	3.4	2.8	2.5	2.2
3 [1]	4	7.3	6.2	5.1	4.4	3.7	3.3	2.9
4 [1]	5	8.8	7.5	6.2	5.3	4.4	4	3.5
5.5	7.5	12.5	10.6	8.8	7.5	6.3	5.6	5
7.5	10	16.5	14	11.6	9.9	8.3	7.4	6.6
11	15	25	21.3	17.5	15	12.5	11.3	10
15	20	31	26.4	21.7	18.6	15.5	14	12.4
18.5	25	37	31.5	25.9	22.2	18.5	16.7	14.8

Ambient temperature



High overload (HO) and low overload (LO)

Note:

The PROFINET version can be butt-mounted at temperatures up to 55 °C (131 °F). At temperatures between 55 °C (131 °F) and 60 °C (140 °F), side-by-side mounting is not possible.

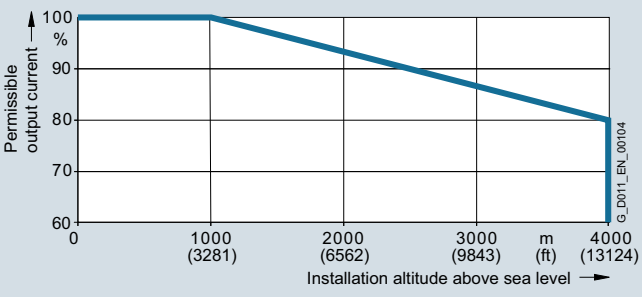
Installation altitude

Permissible line supplies depending on the installation altitude

- Installation altitude up to 2000 m (6562 ft) above sea level
  - Connection to every supply system permitted for the inverter
- Installation altitudes between 2000 m (6562 ft) and 4000 m (13124 ft) above sea level
  - Connection to a TN system with grounded neutral point
  - TN systems with grounded line conductor are not permitted
  - The TN line system with grounded neutral point can also be supplied using an isolation transformer
  - The phase-to-phase voltage does not have to be reduced

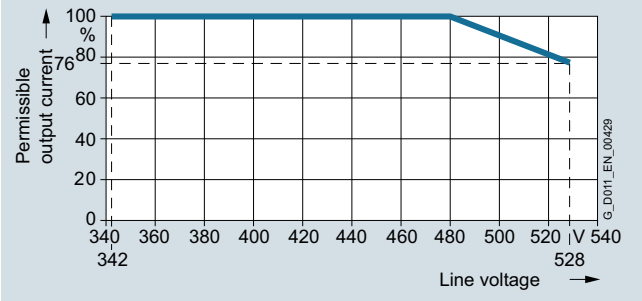
Note:

The connected motors, power elements and components must be considered separately.

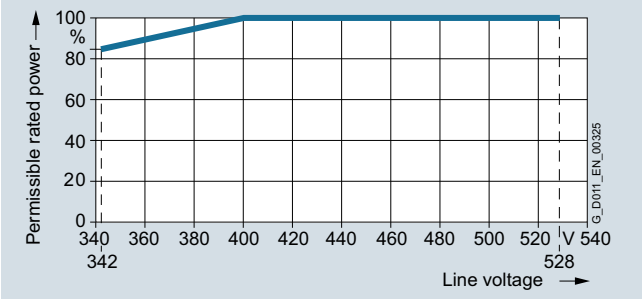


Permissible output current as a function of installation altitude

Line voltage



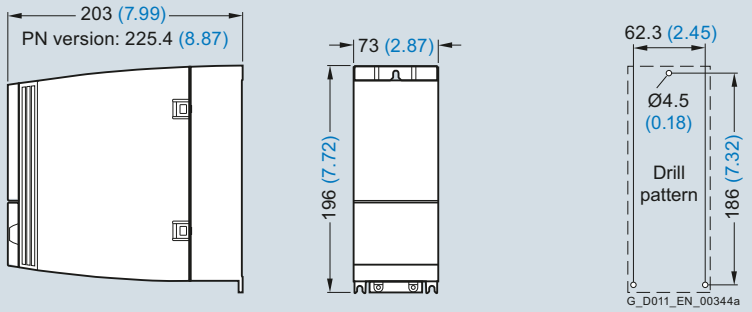
Permissible output current as a function of line voltage



Permissible rated power as a function of line voltage

[1] The permissible motor cable length depends on the cable type and the pulse frequency.

Dimensional drawings



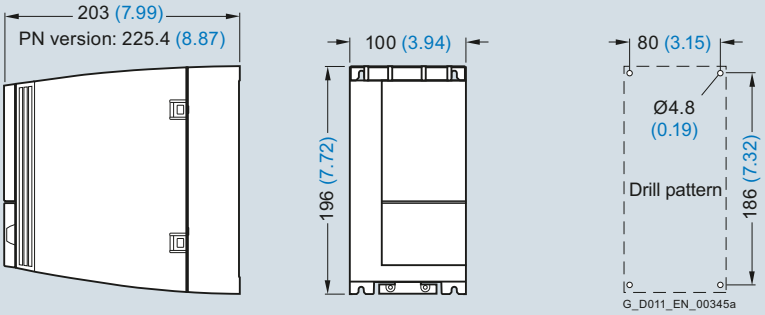
SINAMICS G120C, frame size FSA

Mounted with 3 M4 studs, 3 M4 nuts, 3 M4 washers.

Ventilation clearance required at the top: 80 mm (3.15 inches).
Ventilation clearance required at the bottom: 100 mm (3.94 inches).
Ventilation clearance required at the side: 0 mm (0 inches).

When the IOP is inserted, the mounting depth increases by 21 mm (0.83 inches).
When the BOP-2 is inserted, the mounting depth increases by 11 mm (0.43 inches).

All dimensions in mm (values in brackets are in inches).



SINAMICS G120C, frame size FSB

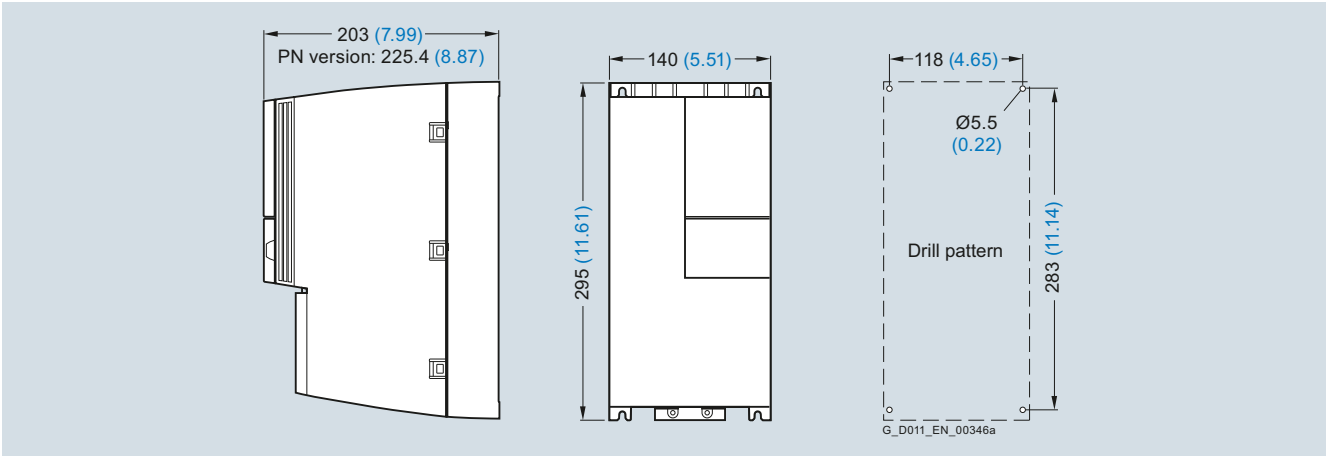
Mounted with 4 M4 studs, 4 M4 nuts, 4 M4 washers.

Ventilation clearance required at the top: 80 mm (3.15 inches).
Ventilation clearance required at the bottom: 100 mm (3.94 inches).
Ventilation clearance required at the side: 0 mm (0 inches).

When the IOP is inserted, the mounting depth increases by 21 mm (0.83 inches).
When the BOP-2 is inserted, the mounting depth increases by 11 mm (0.43 inches).

All dimensions in mm (values in brackets are in inches).

Dimensional drawings



SINAMICS G120C, frame size FSC

Mounted with 4 M5 studs, 4 M5 nuts, 4 M5 washers.

Ventilation clearance required at the top: 80 mm (3.15 inches).
Ventilation clearance required at the bottom: 100 mm (3.94 inches).
Ventilation clearance required at the side: 0 mm (0 inches).

When the IOP is inserted, the mounting depth increases by 21 mm (0.83 inches).
When the BOP-2 is inserted, the mounting depth increases by 11 mm (0.43 inches).

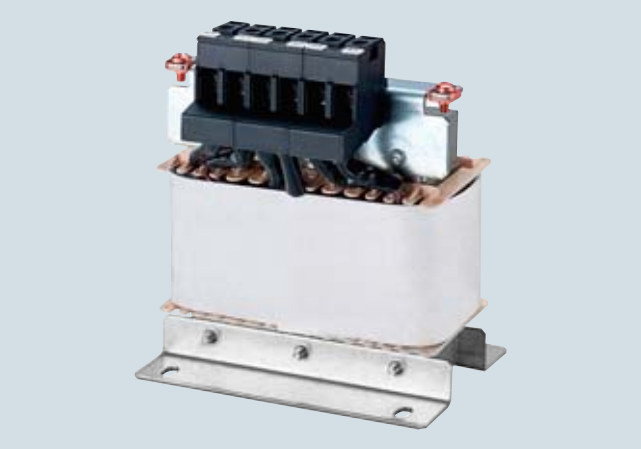
All dimensions in mm (values in brackets are in inches).

More information

Detailed information on SINAMICS G120C, the latest technical documentation (catalogs, dimensional drawings, certificates, manuals and operating instructions), are available on the Internet at:
www.siemens.com/sinamics-g120c

You can find information offline about SINAMICS G120C on the DVD-ROM CA 01 in the Drive Technology Configurator (DT Configurator).
The DT Configurator can now also be used on the Internet, i.e. it does not need to be installed on a PC. The DT Configurator can be found in the Siemens Industry Mall at the following address:
www.siemens.com/dt-configurator

Overview



Line reactor for SINAMICS G120C, frame size FSB

Line reactors smooth the current drawn by the inverter and thus reduce harmonic components in the line current. Through the reduction of the current harmonics, the thermal load on the power components in the rectifier and in the DC-link capacitors is reduced as well as the harmonic effects on the supply. The use of a line reactor increases the service life of the inverter.

If the ratio of the rated inverter power to the line supply short-circuit power is less than 1 %, then it is recommended to use a line reactor to reduce the current peaks.

Selection and ordering data

Rated power		SINAMICS G120C		Line reactor
kW	hp	Type 6SL3210-...	Frame size	Article No.
Line voltage 380 ... 480 V 3 AC				
0.55	0.75	1KE11-8..1	FSA	**6SL3203-0CE13-2AA0**
0.75	1	1KE12-3..1		
1.1	1.5	1KE13-2..1		
1.5	2	1KE14-3..1	FSA	**6SL3203-0CE21-0AA0**
2.2	3	1KE15-8..1		
3	4	1KE17-5..1		
4	5	1KE18-8..1		
5.5	7.5	1KE21-3..1	FSB	**6SL3203-0CE21-8AA0**
7.5	10	1KE21-7..1		
11	15	1KE22-6..1	FSC	**6SL3203-0CE23-8AA0**
15	20	1KE23-2..1		
18.5	25	1KE23-8..1		

Technical specifications

Line voltage 380 ... 480 V 3 AC		**Line reactor**			
		6SL3203-0CE13-2AA0	6SL3203-0CE21-0AA0	6SL3203-0CE21-8AA0	6SL3203-0CE23-8AA0
Rated current	A	4	11.3	22.3	47
Power loss at 50/60 Hz	W	23/26	36/40	53/59	88/97
Line supply/load connection 1L1, 1L2, 1L3 2L1, 2L2, 2L3		Screw-type terminals	Screw-type terminals	Screw-type terminals	Screw-type terminals
• Conductor cross-section	mm^2	4	4	10	16
PE connection		M4 × 8; U washer; spring lock washer	M4 × 8; U washer; spring lock washer	M5 × 10; U washer; spring lock washer	M5 × 10; U washer; spring lock washer
Degree of protection		Control cabinet built-in unit IP20	Control cabinet built-in unit IP20	Control cabinet built-in unit IP20	Control cabinet built-in unit IP20
Dimensions					
• Width	mm (in)	125 (4.92)	125 (4.92)	125 (4.92)	190 (7.48)
• Height	mm (in)	120 (4.72)	140 (5.51)	145 (5.71)	220 (8.66)
• Depth	mm (in)	71 (2.80)	71 (2.80)	91 (3.58)	91 (3.58)
Weight, approx.	kg (lb)	1.1 (2.4)	2.1 (4.6)	2.95 (6.5)	7.8 (17.2)
Suitable for SINAMICS G120C	Type	6SL3210-1KE11-8..1 6SL3210-1KE12-3..1 6SL3210-1KE13-2..1	6SL3210-1KE14-3..1 6SL3210-1KE15-8..1 6SL3210-1KE17-5..1 6SL3210-1KE18-8..1	6SL3210-1KE21-3..1 6SL3210-1KE21-7..1	6SL3210-1KE22-6..1 6SL3210-1KE23-2..1 6SL3210-1KE23-8..1
• Frame size		FSA	FSA	FSB	FSC

Selection and ordering data

The following table lists recommendations for additional line-side components, such as fuses and circuit breakers.

Note for use in compliance with IEC standards:

Type 3NA3 fuses and type 3RV circuit breakers are recommended for European countries. The values in the table take into account the overload capability of the inverter.

Notes for use in compliance with UL regulations:

Fuses for use in North America must be UL-certified, Class J fuses with a rated voltage of 600 V AC.

Short Circuit Current Rating (SCCR)
according to UL

Applies to industrial control panel installations to NEC Article 409 or UL 508A

- SINAMICS G120C: 40 kA

Notes regarding installations in Canada:

Overvoltage protection devices in accordance with overvoltage category III and with the following ratings must be connected on the line side of the inverter:

- Rated voltage 480 V (phase-phase) and 480 V (phase-ground)
- Voltage limit 4 kV (phase-phase) and 6 kV (phase-ground).

All overvoltage protection devices used must comply with Canadian standards for industrial installations.

Additional information about the listed fuses and circuit breakers can be found in Catalogs LV 10, IC 10 and IC 10 AO.

Rated power		SINAMICS G120C	**IEC-compliant**			**UL/cUL-compliant**	
			Fuse		**Circuit breaker**	**Fuse type** Rated voltage 600 V AC	
			Current				Current
kW	hp	Type 6SL3210-...	A	Article No.	Article No.	Class	A
Line voltage 380 ... 480 V 3 AC							
0.55	0.75	1KE11-8..1	6	**3NA3801**	**3RV2011-1DA10**	J	10
0.75	1	1KE12-3..1	6	**3NA3801**	**3RV2011-1EA10**	J	10
1.1	1.5	1KE13-2..1	6	**3NA3801**	**3RV2011-1FA10**	J	10
1.5	2	1KE14-3..1	10	**3NA3803**	**3RV2011-1HA10**	J	10
2.2	3	1KE15-8..1	10	**3NA3803**	**3RV2011-1JA10**	J	10
3	4	1KE17-5..1	16	**3NA3805**	**3RV2011-1KA10**	J	15
4	5	1KE18-8..1	16	**3NA3805**	**3RV2021-4AA10**	J	15
5.5	7.5	1KE21-3..1	20	**3NA3807**	**3RV2021-4BA10**	J	20
7.5	10	1KE21-7..1	25	**3NA3810**	**3RV2021-4DA10**	J	25
11	15	1KE22-6..1	40	**3NA3817**	**3RV1031-4FA10**	J	40
15	20	1KE23-2..1	50	**3NA3820**	**3RV1031-4GA10**	J	50
18.5	25	1KE23-8..1	63	**3NA3822**	**3RV1031-4HA10**	J	60

4

Overview

Braking resistor for SINAMICS G120C, frame size FSB

The excess energy of the DC link is dissipated using the braking resistor. The braking resistors are designed for use with the SINAMICS G120C. SINAMICS G120C has an integrated brake chopper and cannot feed back regenerative energy to the line supply. For regenerative operation, e.g. the braking of a rotating mass with high moment of inertia, a braking resistor must be connected to convert the resulting energy into heat.

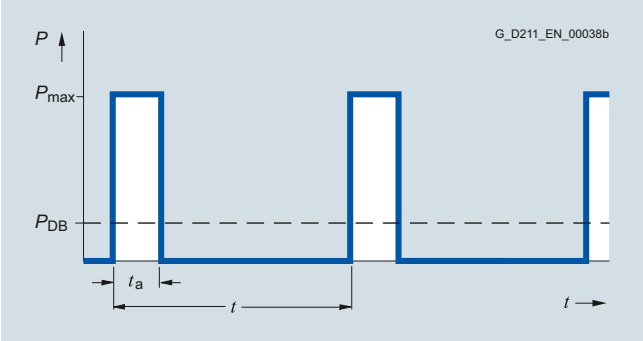
The braking resistors are designed for mounting horizontally or vertically onto a heat-resistant sheet steel panel. The resistors should be mounted such as to ensure that the air can flow in and out and heat cannot build up. The heat dissipated by the braking resistor must not diminish the inverter cooling.

Every braking resistor is equipped with a temperature switch. The temperature switch can be evaluated to prevent consequential damage if the braking resistor overheats.

Selection and ordering data

Rated power		SINAMICS G120C		Braking resistor
kW	hp	Type 6SL3210-...	Frame size	Article No.
Line voltage 380 ... 480 V 3 AC				
0.55	0.75	1KE11-8..1	FSA	**6SL3201-0BE14-3AA0**
0.75	1	1KE12-3..1		
1.1	1.5	1KE13-2..1		
1.5	2	1KE14-3..1		
2.2	3	1KE15-8..1	FSA	**6SL3201-0BE21-0AA0**
3	4	1KE17-5..1		
4	5	1KE18-8..1		
5.5	7.5	1KE21-3..1	FSB	**6SL3201-0BE21-8AA0**
7.5	10	1KE21-7..1		
11	15	1KE22-6..1	FSC	**6SL3201-0BE23-8AA0**
15	20	1KE23-2..1		
18.5	25	1KE23-8..1		

Characteristic curves



Load diagram for the braking resistors

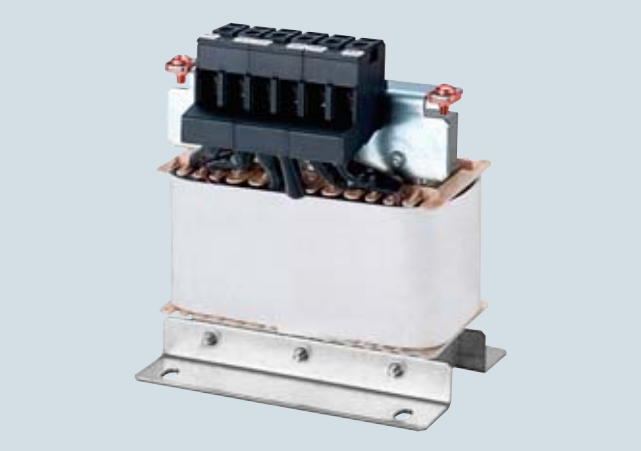
t_a = 12 s

t = 240 s

Technical specifications

Line voltage 380 ... 480 V 3 AC		**Braking resistor**			
		6SL3201-0BE14-3AA0	6SL3201-0BE21-0AA0	6SL3201-0BE21-8AA0	6SL3201-0BE23-8AA0
Resistance	Ω	370	140	75	30
Rated power P_{DB} (continuous braking power)	kW (hp)	0.075 (0.1)	0.2 (0.3)	0.375 (0.5)	0.925 (1.25)
Peak power P_{max} (load duration t_a = 12 s with period t = 240 s)	kW (hp)	1.5 (2)	4 (5)	7.5 (10)	18.5 (25)
Power connection		Terminal block	Terminal block	Terminal block	Terminal block
• Conductor cross-section	mm^2	2.5	2.5	2.5	6
Thermostatic switch		NC contact	NC contact	NC contact	NC contact
• Contact load, max.		250 V AC/2.5 A	250 V AC/2.5 A	250 V AC/2.5 A	250 V AC/2.5 A
• Conductor cross-section	mm^2	2.5	2.5	2.5	2.5
PE connection					
• Via terminal block		Yes	Yes	Yes	Yes
• PE connection on housing		M4 screw	M4 screw	M4 screw	M4 screw
Degree of protection		IP20	IP20	IP20	IP20
Dimensions					
• Width	mm (in)	105 (4.13)	105 (4.13)	175 (6.89)	250 (9.84)
• Height	mm (in)	295 (11.61)	345 (13.58)	345 (13.58)	490 (19.29)
• Depth	mm (in)	100 (3.94)	100 (3.94)	100 (3.94)	140 (5.51)
Weight, approx.	kg (lb)	1.48 (3.26)	1.8 (3.97)	2.73 (6.02)	6.2 (13.7)
Suitable for SINAMICS G120C	Type	6SL3210-1KE11-8..1 6SL3210-1KE12-3..1 6SL3210-1KE13-2..1 6SL3210-1KE14-3..1	6SL3210-1KE15-8..1 6SL3210-1KE17-5..1 6SL3210-1KE18-8..1	6SL3210-1KE21-3..1 6SL3210-1KE21-7..1	6SL3210-1KE22-6..1 6SL3210-1KE23-2..1 6SL3210-1KE23-8..1
• Frame size		FSA	FSA	FSB	FSC

Overview



Output reactor for SINAMICS G120C, frame size FSA

Output reactors reduce the rate of voltage rise (dv/dt) and the height of the current peaks, and enable longer motor cables to be connected.

Owing to the high rates of voltage rise of the fast-switching IGBTs, the capacitance of long motor cables reverses polarity very quickly with every switching operation in the inverter. As a result, the inverter is loaded with additional current peaks of substantial magnitude.

Output reactors reduce the magnitude of these additional peaks because the cable capacitance reverses polarity more slowly across the reactor inductance, thereby attenuating the amplitudes of the current peaks.

When using output reactors, the following should be observed:

- Max. permissible output frequency 200 Hz
- Max. permissible pulse frequency 4 kHz
- The output reactor must be installed as close as possible to the frequency inverter

Selection and ordering data

Rated power		SINAMICS G120C			Output reactor
kW	hp	Type 6SL3210-...	Frame size		Article No.
380 ... 480 V 3 AC					
0.55	0.75	1KE11-8..1	FSA	NEW	**6SL3202-0AE16-1CA0**
0.75	1	1KE12-3..1			
1.1	1.5	1KE13-2..1			
1.5	2	1KE14-3..1			
2.2	3	1KE15-8..1			
3	4	1KE17-5..1	FSA	NEW	**6SL3202-0AE18-8CA0**
4	5	1KE18-8..1			
5.5	7.5	1KE21-3..1	FSB	NEW	**6SL3202-0AE21-8CA0**
7.5	10	1KE21-7..1			
11	15	1KE22-6..1	FSC	NEW	**6SL3202-0AE23-8CA0**
15	20	1KE23-2..1			
18.5	25	1KE23-8..1			

Technical specifications

Line voltage 380 ... 480 V 3 AC		Output reactor			
		6SL3202-0AE16-1CA0	6SL3202-0AE18-8CA0	6SL3202-0AE21-8CA0	6SL3202-0AE23-8CA0
Rated current	A	6.1	9	18.5	39
Power loss	kW	0.09	0.08	0.08	0.11
Connection to the Power Module/ motor connection		Screw-type terminals	Screw-type terminals	Screw-type terminals	Screw-type terminals
• Conductor cross-section	mm^2	4	4	10	16
PE connection		M4 screw stud	M4 screw stud	M5 screw stud	M5 screw stud
Cable length, max. between output reactor and motor					
• 380 V -10 % ... 415 V +10 % 3 AC					
- Shielded	m (ft)	150 (492)	150 (492)	150 (492)	150 (492)
- Unshielded	m (ft)	225 (738)	225 (738)	225 (738)	225 (738)
• 440 ... 480 V 3 AC +10 %					
- Shielded	m (ft)	100 (328)	100 (328)	100 (328)	100 (328)
- Unshielded	m (ft)	150 (492)	150 (492)	150 (492)	150 (492)
Dimensions					
• Width	mm (in)	207 (8.15)	207 (8.15)	247 (9.72)	257 (10.12)
• Height	mm (in)	175 (6.89)	180 (7.08)	215 (8.46)	235 (9.25)
• Depth	mm (in)	72.5 (2.85)	72.5 (2.85)	100 (3.94)	114.7 (4.51)
Possible as base component		No	No	No	No
Degree of protection		Control cabinet built-in unit IP20	Control cabinet built-in unit IP20	Control cabinet built-in unit IP20	Control cabinet built-in unit IP20
Weight, approx.	kg (lb)	3.4 (7.49)	3.9 (8.60)	10.1 (22.26)	11.2 (24.70)
Suitable for SINAMICS G120C	Type	6SL3210-1KE11-8..1 6SL3210-1KE12-3..1 6SL3210-1KE13-2..1 6SL3210-1KE14-3..1 6SL3210-1KE15-8..1	6SL3210-1KE17-5..1 6SL3210-1KE18-8..1	6SL3210-1KE21-3..1 6SL3210-1KE21-7..1	6SL3210-1KE22-6..1 6SL3210-1KE23-2..1 6SL3210-1KE23-8..1
• Frame size		FSA	FSA	FSB	FSC

4

Overview

Operator panel	Intelligent Operator Panel IOP and IOP Handheld	Basic Operator Panel BOP-2
Description	  Thanks to the large plain text display, menu-based operation and the application wizards, commissioning of the standard drives is easy. Integrated application wizards guide the user interactively through the commissioning process for important applications such as pumps, fans, compressors and conveyor systems.	 Commissioning of standard drives is easy with the menu-prompted dialog on a 2-line display. Simultaneous display of the parameter and parameter value, as well as parameter filtering, means that basic commissioning of a drive can be performed easily and, in most cases, without a printed parameter list.
Possible applications	• Can be directly mounted on SINAMICS G120C • Can be mounted in the control cabinet door using a door mounting kit (achievable degree of protection is IP54/ UL Type 12) • Available as handheld version • The IOP supports the following languages [1]: German, English, French, Italian, Spanish, Portuguese, Dutch, Swedish, Russian, Czech, Polish, Turkish, Finnish.	• Can be directly mounted on SINAMICS G120C • Can be mounted in the control cabinet door using a door mounting kit (achievable degree of protection is IP55/UL Type 12)
Quick commissioning without expert knowledge	• Standard commissioning using the clone function • User-defined parameter list with a reduced number of self-selected parameters • Simple commissioning of standard applications using application-specific wizards; it is not necessary to know the parameter structure • Simple local commissioning using the handheld version • Commissioning largely without documentation	• Standard commissioning using the clone function
High degree of operator friendliness and intuitive operation	• Direct manual operation of the drive – you can simply toggle between the automatic and manual modes	• Direct manual operation of the drive – you can simply toggle between the automatic and manual modes
	• Intuitive navigation using a rotary knob – just like in everyday applications	–
	• Graphic display to show status values such as pressure or flow in bar-type diagrams	• 2-line display for showing up to 2 process values with text
	• Status display with freely selectable units to specify physical values	• Status display of predefined units
Minimization of maintenance times	• Diagnostics using plain text display, can be used locally on-site without documentation • Simple update of languages, wizards and firmware updates via USB	• Diagnostics with menu prompting with 7-segment display

[1] You can find more information at
http://support.automation.siemens.com/WW/view/en/67273266

Overview

Intelligent Operator Panel IOP

Intelligent Operator Panel IOP

The Intelligent Operator Panel IOP is a very user-friendly and powerful operator panel for the SINAMICS G120, SINAMICS G120C, SINAMICS G120P, SINAMICS G110D, SINAMICS G120D, SINAMICS G110M and SINAMICS S110 standard drives.

The IOP supports both entry-level personnel and drive experts. Thanks to the large plain text display, the menu-based operation and the application wizards, it is easy to commission standard drives. A drive can be essentially commissioned without having to use a printed parameter list – as the parameters are displayed in plain text, and explanatory help texts and the parameter filtering function are provided.

Application wizards interactively guide you when commissioning important applications such as conveyor technology, pumps, fans and compressors. There is a basic commissioning wizard for general commissioning.

Up to 2 process values can be displayed graphically or numerically on the status screen/status display. Process values can also be displayed in technological units.

The IOP supports standard commissioning of identical drives. For this purpose, a parameter list can be copied from an inverter into the IOP and downloaded into other drive units of the same type as required.

The IOP supports the following languages [1]: German, English, French, Italian, Spanish, Portuguese, Dutch, Swedish, Russian, Czech, Polish, Turkish, Finnish.

The IOP can be installed in control cabinet doors using the optionally available door mounting kit.

The operating temperature of the IOP is 0 to 50 °C (32 to 122 °F).

IOP Handheld

IOP Handheld

A handheld version of the IOP can be ordered for mobile use. In addition to the IOP, this includes a housing with rechargeable batteries, charging unit and RS232 connecting cable. The charging unit is supplied with connector adapters for Europe, the US and UK. When the batteries are fully charged, the operating time is up to 8 hours.

To connect the IOP handheld to SINAMICS G110D, SINAMICS G120D or SINAMICS G110M, the RS232 connecting cable with optical interface is required in addition.

Updating the IOP

The IOP can be updated and expanded using the integrated USB interface.

Data to support future drive systems can be transferred from the PC to the IOP. Further, the USB interface allows user languages and wizards that will become available in the future to be subsequently downloaded and the firmware to be updated for the IOP [1].

The IOP is supplied with power via the USB interface during an update.

[1] You can find more information at
http://support.automation.siemens.com/WW/view/en/67273266

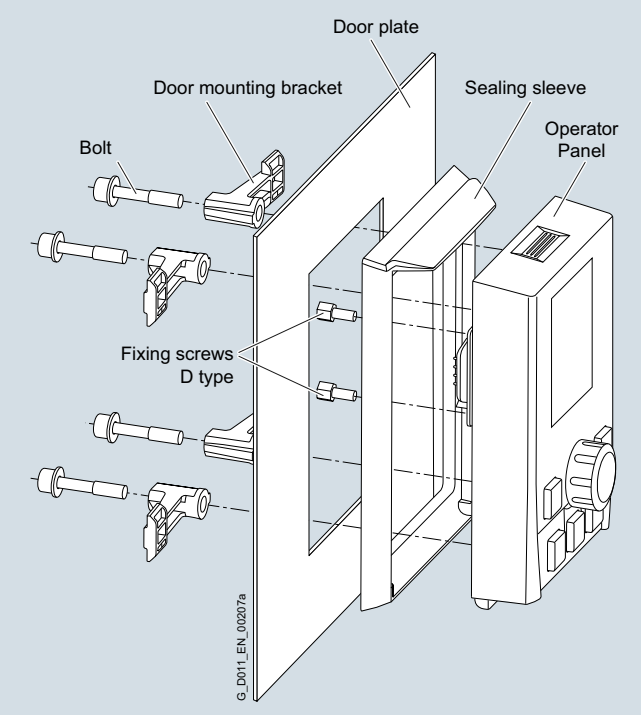
4

Benefits

- Simple commissioning of standard applications using wizards, it is not necessary to know the parameter structure
- Diagnostics using plain text display; can be used locally on-site without documentation
- Direct manual operation of the drive; you can toggle between the automatic and manual modes
- Status display with freely selectable units; display of real physical values
- Intuitive, navigation using a wheel – just like in everyday applications
- Graphic display e.g. for status values such as pressure or flowrate in bar charts
- Quickly and simply mounted in the door – mechanically and electrically
- Simple local commissioning on-site using the handheld version
- Commissioning without documentation using the integrated help function
- Standard commissioning using the clone function (parameter set data is saved for fast replacement)
- User-defined parameter list with a reduced number of self-selected parameters (to generate your own commissioning screens)
- The IOP supports the following languages [1]: German, English, French, Italian, Spanish, Portuguese, Dutch, Swedish, Russian, Czech, Polish, Turkish, Finnish
- Simple update of languages, wizards and firmware updates via USB [1]

Integration

Using the optionally available door mounting kit, an operator panel can be simply mounted in a control cabinet door with just a few manual operations. For door mounting with an IOP, degree of protection IP54/UL Type 12 is achieved, and with BOP-2, degree of protection IP55.



Door mounting kit with plugged-on IOP

Selection and ordering data

Description	Article No.
Intelligent Operator Panel IOP	**6SL3255-0AA00-4JA1**
IOP Handheld For use with SINAMICS G120, SINAMICS G120C, SINAMICS G120P, SINAMICS G110D, SINAMICS G120D, SINAMICS G110M and SINAMICS S110 Included in the scope of delivery: • IOP • Handheld housing • Rechargeable batteries (4 × AA) • Charging unit (international) • RS232 connecting cable (3 m/9.84 ft long, used in combination with SINAMICS G120, SINAMICS G120C, SINAMICS G120P and SINAMICS S110 [2]) • USB cable (1 m/3.28 ft long)	**6SL3255-0AA00-4HA0**
Accessories	
Door mounting kit For mounting an operator panel in control cabinet doors with sheet steel thicknesses of 1 ... 3 mm (0.04 ... 0.12 in) IP54 degree of protection for IOP IP55 degree of protection for BOP-2 Included in the scope of delivery: • Seal • Mounting material • Connecting cable (5 m/16.4 ft long, also supplies voltage to the IOP directly via the SINAMICS G120C compact inverter)	**6SL3256-0AP00-0JA0**

[1] You can find more information at http://support.automation.siemens.com/WW/view/en/67273266

[2] For use in combination with SINAMICS G110D, SINAMICS G120D and SINAMICS G110M, the RS232 connecting cable with optical interface is required (Article No.: 3RK1922-2BP00). The cable must be ordered separately.

Overview

Basic Operator Panel BOP-2

The Basic Operator Panel BOP-2 can be used to commission drives, monitor drives in operation and input individual parameter settings.

Commissioning of standard drives is easy with the menu-prompted dialog on a 2-line display. Simultaneous display of the parameter and parameter value, as well as parameter filtering, means that basic commissioning of a drive can be performed easily and, in most cases, without a printed parameter list.

The drives are easily controlled manually using directly assigned navigation buttons. The BOP-2 has a dedicated switchover button to switch from automatic to manual mode.

Diagnostics can easily be performed on the connected inverter by following the menus.

Up to two process values can be numerically visualized simultaneously.

BOP-2 supports standard commissioning of identical drives. For this purpose, a parameter list can be copied from an inverter into the BOP-2 and when required, downloaded into other drive units of the same type.

The operating temperature of the BOP-2 is 0 to 50 °C (32 to 122 °F).

Benefits

- Shorten commissioning times – Easy commissioning of standard drives using basic commissioning wizards (setup)
- Minimize standstill times – Fast detection and rectification of errors (Diagnostics)
- Greater transparency in the process – The status display of the BOP-2 makes process variable monitoring easy (Monitoring)
- Direct mounting on the inverter (also see IOP)
- User-friendly user interface:
  - Easy navigation using clear menu structure and clearly assigned control keys
  - Two-line display

Selection and ordering data

Description	Article No.
Basic Operator Panel BOP-2	**6SL3255-0AA00-4CA1**
Accessories	
Door mounting kit For mounting an operator panel in control cabinet doors with sheet steel thicknesses of 1 ... 3 mm (0.04 ... 0.12 in) IP54 degree of protection for IOP IP55 degree of protection for BOP-2 Included in the scope of delivery: • Seal • Mounting material • Connecting cable (5 m/16.4 ft long, also supplies voltage to the BOP-2 directly via the SINAMICS G120C compact inverter)	**6SL3256-0AP00-0JA0**

4

Overview

SINAMICS memory card (SD card)

The parameter settings for an inverter can be stored on the SINAMICS SD memory card. When service is required, e.g. after the inverter has been replaced and the data have been downloaded from the memory card the drive system is immediately ready for use again.

- Parameter settings can be written from the memory card to the inverter or saved from the inverter to the memory card.
- Up to 100 parameter sets can be stored.
- The memory card supports standard commissioning without the use of an operator panel such as the IOP, BOP-2 or the STARTER and SINAMICS Startdrive commissioning tools.
- If firmware is stored on the memory card and a frequency inverter is installed, the firmware can be upgraded/downgraded during inverter startup [1].

Note:

The memory card is not required for operation and does not have to remain inserted.

Selection and ordering data

Designation		Article No.
SINAMICS SD card 512 MB		**6SL3054-4AG00-2AA0**
Optional firmware memory cards		
SINAMICS SD card 512 MB + firmware V4.5 (Multicard V4.5)	NEW	**6SL3054-7EF00-2BA0**
SINAMICS SD card 512 MB + firmware V4.6 (Multicard V4.6)	NEW	**6SL3054-7EG00-2BA0**
SINAMICS SD card 512 MB + firmware V4.7 (Multicard V4.7)	NEW	**6SL3054-7EH00-2BA0**

For more information on firmware V4.5:

http://support.automation.siemens.com/WW/view/en/72841234

For more information on firmware V4.6:

http://support.automation.siemens.com/WW/view/en/67385235

For more information on firmware V4.7:

http://support.automation.siemens.com/WW/view/en/92554110

[1] You can find more information about firmware upgrades/downgrades on the Internet at
http://support.automation.siemens.com/WW/view/en/67364620

Overview

PC inverter connection kit 2

For controlling and commissioning an inverter directly from a PC if the STARTER [1] commissioning tool or SINAMICS Startdrive has been installed on the PC. With this, the inverter can be

- parameterized (commissioned, optimized),
- monitored (diagnostics)
- controlled (master control via the STARTER or SINAMICS Startdrive commissioning tool for test purposes)

A USB cable (3 m/9.84 ft) is included in the scope of delivery.

Selection and ordering data

Description	Article No.
PC inverter connection kit 2 USB cable (3 m/9.84 ft long) for • SINAMICS G120C • SINAMICS G120 Control Units - CU230P-2 - CU240B-2 - CU240E-2 - CU250S-2 • SINAMICS G110M Control Units - CU240M • SINAMICS G120D Control Units - CU240D-2 - CU250D-2	**6SL3255-0AA00-2CA0**

[1] STARTER commissioning tool is available on the Internet at http://support.automation.siemens.com/WW/view/en/10804985/133100

4

Overview

The following spare parts are available for SINAMICS G120C for service and maintenance work.

SINAMICS G120C shield plates

A set of shield plates is included in the scope of delivery for the motor and signal cables corresponding to the frame size of the SINAMICS G120C compact inverter, and can also be ordered as spare parts.

SINAMICS G120C Spare Parts Kit

This kit comprises 5 sets of I/O terminals, 1 RS485 terminal, 2 sets of Control Unit doors (1 × PN and 1 × other communication versions) and 1 blanking cover.

SINAMICS G120C connectors

A set of connectors for the line feeder cable, braking resistor and motor cable can be ordered corresponding to the frame size of the SINAMICS G120C compact inverter.

SINAMICS G120C roof-mounted fan

A roof-mounted fan (at the top of the device) comprising a pre-assembled unit with holder and fan can be ordered corresponding to the frame size of the SINAMICS G120C compact inverter.

SINAMICS G120C, frame size FSB, with integrated roof-mounted fan

SINAMICS G120C fan unit

A replacement fan (at the rear of the device; heat sink) comprising a pre-assembled unit with holder and fan can be ordered corresponding to the frame size of the SINAMICS G120C compact inverter.

SINAMICS G120C, frame size FSB, with fan unit (rear view of rotated inverter)

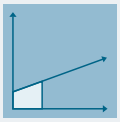
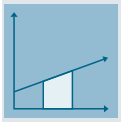
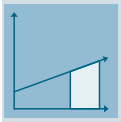
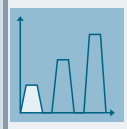
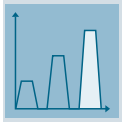
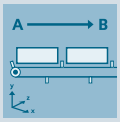
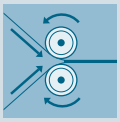
Selection and ordering data

Description	Article No.
SINAMICS G120C shield plate	
• Frame size FSA	**6SL3266-1EA00-0KA0**
• Frame size FSB	**6SL3266-1EB00-0KA0**
• Frame size FSC	**6SL3266-1EC00-0KA0**
SINAMICS G120C Spare Parts Kit	**6SL3200-0SK41-0AA0**
SINAMICS G120C connectors	
• Frame size FSA	**6SL3200-0ST05-0AA0**
• Frame size FSB	**6SL3200-0ST06-0AA0**
• Frame size FSC	**6SL3200-0ST07-0AA0**
SINAMICS G120C roof-mounted fan	
• Frame size FSA	**6SL3200-0SF40-0AA0**
• Frame size FSB	**6SL3200-0SF41-0AA0**
• Frame size FSC	**6SL3200-0SF42-0AA0**
SINAMICS G120C fan unit	
• Frame size FSA	**6SL3200-0SF12-0AA0**
• Frame size FSB	**6SL3200-0SF13-0AA0**
• Frame size FSC	**6SL3200-0SF14-0AA0**

SINAMICS G120 standard inverters
0.37 kW to 250 kW (0.5 hp to 400 hp)

5

Application

Use	Requirements for torque accuracy/speed accuracy/position accuracy/coordination of axes/functionality					
	Continuous motion			Non-continuous motion		
	Basic	Medium	High	Basic	Medium	High
						
Pumping, ventilating, compressing	Centrifugal pumps Radial / axial fans Compressors	Centrifugal pumps Radial / axial fans Compressors	Eccentric screw pumps	Hydraulic pumps Metering pumps	Hydraulic pumps Metering pumps	Descaling pumps Hydraulic pumps
	V20 G110 G120C G120P	G120P G130/G150 G180 [1]	S120	**G120**	S110	S120
Moving 	Conveyor belts Roller conveyors Chain conveyors	Conveyor belts Roller conveyors Chain conveyors Lifting/lowering devices Elevators Escalators/moving walkways Indoor cranes Marine drives Cable railways	Elevators Container cranes Mining hoists Excavators for open-cast mining Test bays	Acceleration conveyors Storage and retrieval machines	Acceleration conveyors Storage and retrieval machines Cross cutters Reel changers	Storage and retrieval machines Robotics Pick & place Rotary indexing tables Cross cutters Roll feeds Engagers/ disengagers
	V20 G110 G110D G110M G120C	**G120** G120D G130/G150 G180 [1]	S120 S150 DCM	**G120** G120D	S110 DCM	S120 DCM
Processing 	Mills Mixers Kneaders Crushers Agitators Centrifuges	Mills Mixers Kneaders Crushers Agitators Centrifuges Extruders Rotary furnaces	Extruders Winders/unwinders Lead/follower drives Calenders Main press drives Printing machines	Tubular bagging machines Single-axis motion control such as • Position profile • Path profile	Tubular bagging machines Single-axis motion control such as • Position profile • Path profile	Servo presses Rolling mill drives Multi-axis motion control such as • Multi-axis positioning • Cams • Interpolations
	V20 G120C	**G120** G130/G150 G180 [1]	S120 S150 DCM	**G120**	S110	S120 DCM
Machining 	Main drives for • Turning • Milling • Drilling	Main drives for • Drilling • Sawing	Main drives for • Turning • Milling • Drilling • Gear cutting • Grinding	Axis drives for • Turning • Milling • Drilling	Axis drives for • Drilling • Sawing	Axis drives for • Turning • Milling • Drilling • Lasering • Gear cutting • Grinding • Nibbling and punching
	S110	S110 S120	S120	S110	S110 S120	S120

The standard SINAMICS G120 inverter is especially well-suited

- as a universal drive in all industrial and commercial applications
- e.g. in the automotive, textile, printing and chemical industries
- for higher-level applications such as, for example, conveyor systems in the steel, oil, gas and offshore sectors, or in regenerative energy recovery applications.

Specific application examples and descriptions can be found on the Internet at
www.siemens.com/sinamics-applications

More information

You may also be interested in these drives:

- Higher degree of protection for power ratings up to 7.5 kW (10 hp) ⇒ SINAMICS G110M, SINAMICS G110D, SINAMICS G120D
- With a positioning function for distributed drive solutions in IP65 degree of protection ⇒ SINAMICS G120D
- With positioning function in the control cabinet in IP20 degree of protection ⇒ SINAMICS S110
- Special functions for pumps, fans, and compressors ⇒ SINAMICS G120P (Catalog D 35)

[1] Industry-specific inverters.

Overview

The SINAMICS G120 frequency inverter is designed to provide precise and cost-effective speed/torque control of three-phase motors.

With different device versions (frame sizes FSA to FSGX) in an output range of 0.37 kW to 250 kW (0.5 hp to 400 hp), it is suitable for a wide variety of drive solutions.

Example: SINAMICS G120, frame sizes FSA, FSB and FSC; each with Power Module, CU240E-2 F Control Unit and Basic Operator Panel BOP-2

Example: SINAMICS G120, frame sizes FSD, FSE and FSF; each with Power Module, CU240E-2 F Control Unit and Basic Operator Panel BOP-2

Example: SINAMICS G120, frame size FSGX; with Power Module, CU240E-2 F Control Unit and Basic Operator Panel BOP-2

Operator-friendly design

SINAMICS G120 is a modular inverter system that essentially comprises two function units:

- Control Unit (CU)
- Power Module (PM)

The Control Unit controls and monitors the Power Module and the connected motor using several different closed-loop control types that can be selected. It supports communication with a local or central controller and monitoring devices.

The Power Module supplies the motor in the power range 0.37 kW to 250 kW (0.5 hp to 400 hp). It features state-of-the-art IGBT technology with pulse-width-modulated motor voltage and selectable pulse frequency. Comprehensive protection functions provide a high degree of protection for the Power Module and the motor.

The Control Units can be combined with the following Power Modules:

Control Units	Power Modules degree of protection IP20			
	PM230 [1]	PM240-2	PM240	PM250
CU230P-2	✓	✓	✓	✓
CU240B-2	✓	✓	✓	✓
CU240E-2	✓	✓	✓	✓
CU250S-2	–	✓	✓	✓

[1] PM230 Power Modules with integrated filter class A or class B, degree of protection IP55/UL Type 12, 0.37 kW to 90 kW (0.5 to 120.6 hp) are integral components of the SINAMICS G120P for pumps, fans and compressors. The CU230P-2 is the Control Unit for SINAMICS G120P and SINAMICS G120P Cabinet for pumps, fans and compressors.
Detailed information can be found in Catalog D 35.

5

Overview

Safety Integrated

SINAMICS G120 standard inverters are available in different versions for safety-related applications. The PM240-2, PM240 and PM250 Power Modules are prepared for Safety Integrated. PM240 Power Modules in frame size FSGX (i.e. 160 kW/250 hp and higher) are approved only for the Basic Safety functions (STO, SS1 and SBC). A drive can be combined with a Control Unit with safety functions (see overview) in order to create a Safety Integrated drive. The availability of Safety Integrated functions depends on the type of Control Unit.

Control Unit	Basic Safety functions			Extended Safety functions		
	STO	SS1	SBC [1]	SLS	SDI	SSM
CU230P-2	–	–	–	–	–	–
CU240B-2	–	–	–	–	–	–
CU240E-2	✓	–	–	–	–	–
CU240E-2 F	✓	✓	–	✓	✓	✓
CU250S-2	✓	✓	✓	✓ [2]	✓ [2]	✓ [2]

Basic Safety functions (certified according to IEC 61508 SIL 2, and EN ISO 13849-1 PL d and Category 3)

- Safe Torque Off (STO)
  to protect against active movement of the drive
- Safe Stop 1 (SS1)
  for continuous monitoring of a safe braking ramp
- Safe Brake Control (SBC) is used to safely control a holding brake. When enabled, SBC is always activated at the same time as STO. The Safe Brake Relay is used for SBC

Extended Safety functions (certified according to IEC 61508 SIL 2 and EN ISO 13849-1 PL d and Category 3)

- Safely Limited Speed (SLS)
  for protection against dangerous movements on exceeding a speed limit
- Safe Direction (SDI)
  This function ensures that the drive can only rotate in the selected direction
- Safe Speed Monitoring (SSM)
  This function signals if a drive operates below a specific speed/feed velocity

Basic Safety and Extended Safety functions can be activated via PROFIsafe or by means of the safety inputs.

None of the safety functions require a motor encoder and they are thus cheaper and easier to implement. Existing systems in particular can be simply updated with safety technology without the need to change the motor or mechanical system.

The Safe Torque Off (STO) function can be used without restriction for all applications. The SS1, SLS, SSM and SDI functions are only permissible for applications where the load can never accelerate when the inverter is switched off. They are therefore not permitted for applications involving pull-through loads such as hoisting gear and unwinders.

Additional information is provided in chapter Highlights, section Safety Integrated.

Efficient Infeed Technology

The innovative Efficient Infeed Technology is employed in PM250 Power Modules. This technology allows the energy produced by motors operating in generator mode connected to standard inverters to be fed back into the supply system. For control cabinets, an additional temperature rise can be avoided and the amount of space required can be reduced due to the fact that components such as braking resistors, braking choppers and line reactors can be eliminated. Further, wiring and engineering costs are significantly reduced. At the same time, energy consumption can be reduced and ongoing operating costs noticeably reduced.

Additional information is provided in chapter Highlights, section Efficient Infeed Technology.

Innovative cooling concept and varnishing of electronic modules

The new cooling system and varnishing of the electronic modules significantly increases the service life or useful life of the device.

- Disposal of all heat losses via an external heat sink
- Consequential convection cooling of the Control Unit, electronic modules are not located in the air duct
- All cooling air from the fan is directed through the heat sink

Energy efficiency

Integrated technologies help when optimizing the energy usage of the plant or system referred to the particular application:

- Energy-efficient vector control with or without sensors
- Automatic flux reduction with V/f ECO mode
- Integrated energy saving computer

Additional information is provided in chapter Highlights, section "Energy efficiency".

[1] The SBC function can be utilized only if a Safe Brake Relay is installed.

[2] With license for Extended Safety functions.

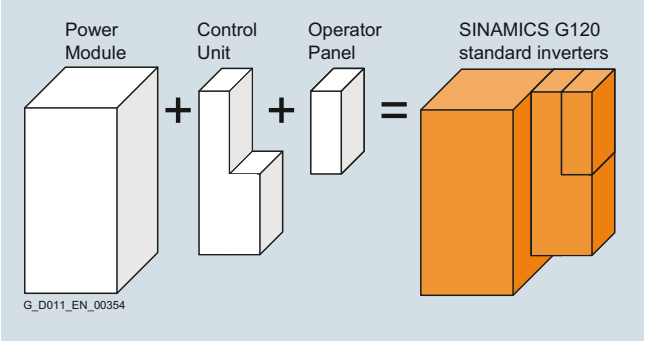
Benefits

- Modularity ensures flexibility for a drive concept that is fit for the future
  - Control Unit can be hot-swapped
  - Pluggable terminals
  - The modules can be easily replaced, which makes the system extremely service friendly
- The integrated safety functions significantly reduce the costs when integrating drives into safety-oriented machines or systems
- Communications-capable via PROFINET or PROFIBUS with PROFIdrive Profile 4.0
  - Plant-wide engineering
  - Easy to handle
- The innovative circuit design (bidirectional input rectifier with "pared-down" DC link) allows the kinetic energy of a load to be fed back into the supply system when PM250 Power Modules are used. This feedback capability provides enormous potential for savings because generated energy no longer has to be converted into heat in a braking resistor
- Integrated USB interface for simplified, local commissioning and diagnostics
- Application-specific functions for pumps, fans and compressors
  Integrated are, e.g.:
  - 4 freely-programmable PID controllers
  - Application-specific wizards
  - Pt1000/LG-Ni1000 temperature sensor interface
  - 230 V AC relay
  - 3 freely-programmable digital time switches
- New with CU250S-2 Control Units: Integrated positioning functionality (basic positioner EPos) supports process-related implementation of positioning tasks with a high dynamic response. Positioning can be implemented with an incremental and/or absolute encoder (SSI)
- New with CU250S-2 Control Units: Encoder interfaces Drive-CLiQ, HTL/TTL/SSI (SUB-D) and Resolver/HTL (terminal)
- New with CU250S-2 Control Units: Vector control with or without sensors
- Integrated control functionality by using BICO technology
- An innovative cooling concept and coated electronic modules increase robustness and service life
  - External heat sink
  - Electronic components are not located in air duct
  - Control Unit that is completely cooled by convection
  - Additional coating of the most important components
- Simple unit replacement and quick copying of parameters using an optional Operator Panel or an optional memory card
- Quiet motor operation as a result of the high pulse frequency
- Compact, space-saving design
- Software parameters for simple adaptation to 50 Hz or 60 Hz motors (IEC or NEMA motors)
- 2/3-wire control for static/pulsed signals for universal control via digital inputs
- Fast engineering and commissioning by using standard engineering tools such as SIZER for Siemens Drives, STARTER and Drive ES – STARTER is integrated into STEP 7 using Drive ES Basic, with all of the benefits of central data management and totally integrated communication
- Certified worldwide for compliance with CE, UL, cUL, C-Tick and Safety Integrated according to IEC 61508 SIL 2 and EN ISO 13849-1 PL d and Category 3

Design

Application-orientated design of SINAMICS G120

SINAMICS G120 standard inverters are modular inverters for standard drives. Selection of the SINAMICS G120 is reduced to two or three steps thanks to the modular system used.



Selecting the Control Unit

The optimum Control Unit is selected first, based on the number of I/Os and any additional functions required such as Safety Integrated or HVAC. The communication options are already integrated and do not have to be additionally ordered or plugged in. Three product series are available corresponding to the particular application.

CU230P-2 Control Units

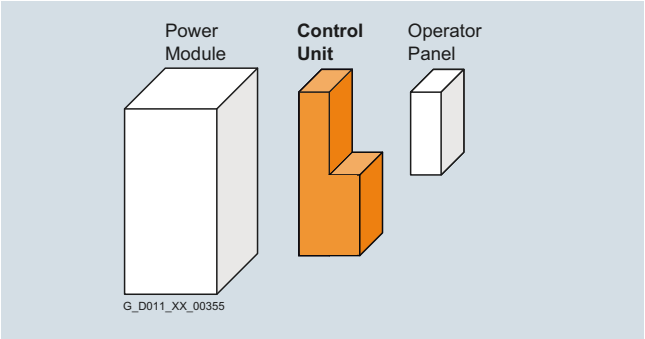
The CU230P-2 Control Units have been specifically designed for pump, fan and compressor applications.
The CU230P-2 is the Control Unit for SINAMICS G120P and SINAMICS G120P Cabinet for pumps, fans and compressors.
Detailed information can be found in Catalog D 35.

CU240B-2 and CU240E-2 Control Units

The CU240B-2 and CU240E-2 Control Units are suitable for a wide range of applications in general machine construction, such as conveyor belts, mixers and extruders.

CU250S-2 Control Units

The CU250S-2 Control Units are suitable for applications involving single drives with exacting speed control requirements such as extruders and centrifuges, and for positioning tasks such as conveyor belts, lifting/lowering devices, etc. They can also be used to implement multi-motor drives without DC coupling such as wire-drawing machines and simple material lines.



Design

Designation	Fieldbus	Profile	Inputs Outputs	Integrated safety technology	Fail-safe digital inputs digital outputs		Control Unit Article No.
CU230P-2 series – the specialist for pumps, fans, compressors, water, buildings Technology functions (selection): Free blocks (FFB), 4 × PID controller, cascade connection, hibernation mode, essential service mode, multi-zone control							
CU230P-2 HVAC	• USS • Modbus RTU • BACnet MS/TP • P1 protocol	–	6 DI 4 AI 3 DO 2 AO	–	–	NEW	**6SL3243-0BB30-1HA3**
CU230P-2 DP	• PROFIBUS DP	• PROFIdrive				NEW	**6SL3243-0BB30-1PA3**
CU230P-2 PN	• PROFINET	• PROFIdrive • PROFIenergy				NEW	**6SL3243-0BB30-1FA0**
	• EtherNet/IP - ODVA AC drive - SINAMICS profile	–					
CU230P-2 CAN	• CANopen	–				NEW	**6SL3243-0BB30-1CA3**
CU240B-2 series – for basic applications with variable-speed drives – without encoder Technology functions (selection): Free function blocks (FFB), 1 × PID controller, motor holding brake							
CU240B-2	• USS • Modbus RTU	–	4 DI 1 AI 1 DO 1 AO	–	–		**6SL3244-0BB00-1BA1**
CU240B-2 DP	• PROFIBUS DP	• PROFIdrive					**6SL3244-0BB00-1PA1**
CU240E-2 series – for standard applications in general machinery construction, such as conveyor belts, mixers and extruders – without encoder Technology functions (selection): Free function blocks (FFB), 1 × PID controller, motor holding brake							
CU240E-2	• USS • Modbus RTU	–	6 DI 2 AI 3 DO 2 AO	STO	1 F-DI (opt. for each 2 DI)		**6SL3244-0BB12-1BA1**
CU240E-2 DP	• PROFIBUS DP	• PROFIdrive • PROFIsafe					**6SL3244-0BB12-1PA1**
CU240E-2 PN	• PROFINET	• PROFIdrive • PROFIsafe • PROFIenergy					**6SL3244-0BB12-1FA0**
	• EtherNet/IP - ODVA AC drive - SINAMICS profile	–					
CU240E-2 F	• USS • Modbus RTU	–		STO, SS1, SLS, SSM, SDI	3 F-DI (opt. for each 2 DI)		**6SL3244-0BB13-1BA1**
CU240E-2 DP-F	• PROFIBUS DP	• PROFIdrive • PROFIsafe					**6SL3244-0BB13-1PA1**
CU240E-2 PN-F	• PROFINET	• PROFIdrive • PROFIsafe • PROFIenergy					**6SL3244-0BB13-1FA0**
	• EtherNet/IP - ODVA AC drive - SINAMICS profile	–					
CU250S-2 series – for complex applications such as extruders and centrifuges – with and without encoder Technology functions (selection): Free function blocks (FFB), 1 × PID controller, motor holding brake							
CU250S-2	• USS • Modbus RTU	–	11 DI 2 AI 3 DO 2 AO 4 DI/DO (DI can be used as high-speed inputs)	STO, SBC, SS1	3 F-DI (opt. for each 2 DI) 1 F-DO (opt. for each 2 DO)	NEW	**6SL3246-0BA22-1BA0**
CU250S-2 DP	• PROFIBUS DP	• PROFIdrive • PROFIsafe				NEW	**6SL3246-0BA22-1PA0**
CU250S-2 PN	• PROFINET	• PROFIdrive • PROFIsafe • PROFIenergy				NEW	**6SL3246-0BA22-1FA0**
	• EtherNet/IP - ODVA AC drive - SINAMICS profile	–					
CU250S-2 CAN	• CANopen	–				NEW	**6SL3246-0BA22-1CA0**

Design

Optional memory card with firmware V4.7 for CU230P-2, CU240B-2, CU240E-2 and CU250S-2 Control Units

Designation	Suitable for		Article No.
SINAMICS SD card 512 MB + firmware V4.7 (Multicard V4.7)	CU230P-2 CU240B-2 CU240E-2 CU250S-2	NEW	**6SL3054-7EH00-2BA0**

Optional memory cards with licenses for CU250S-2 Control Units only

Designation		SINAMICS SD card 512 MB + licenses Article No.		SINAMICS SD card 512 MB + firmware V4.7 (Multicard V4.7) + licenses Article No.		Licenses (without SD card) for upgrading license of an existing SD card Article No.
License Extended Functions Basic positioner (EPos)	NEW	**6SL3054-4AG00-2AA0-Z E01**	NEW	**6SL3054-7EH00-2BA0-Z E01**	NEW	**6SL3074-7AA04-0AA0**
License Extended Functions Safety (SLS, SSM, SDI)	NEW	**6SL3054-4AG00-2AA0-Z F01**	NEW	**6SL3054-7EH00-2BA0-Z F01**	NEW	**6SL3074-0AA10-0AA0**
Licenses Extended Functions Basic positioner (EPos) + Safety (SLS, SSM, SDI)	NEW	**6SL3054-4AG00-2AA0-Z E01+F01**	NEW	**6SL3054-7EH00-2BA0-Z E01+F01**		**–**

For more information on firmware V4.7:

http://support.automation.siemens.com/WW/view/en/92554110

Optional memory cards with firmware V4.5 or V4.6 for existing installations when service is required

Designation	Suitable for		Article No.
SINAMICS SD card 512 MB + firmware V4.5 (Multicard V4.5)	CU240B-2 CU240E-2	NEW	**6SL3054-7EF00-2BA0**
SINAMICS SD card 512 MB + firmware V4.6 (Multicard V4.6)	CU230P-2 CU240B-2 CU240E-2 CU250S-2	NEW	**6SL3054-7EG00-2BA0**

For further information about firmware V4.5 (for CU240B-2 and CU240E-2 only):

http://support.automation.siemens.com/WW/view/en/72841234

For further information about firmware V4.6:

http://support.automation.siemens.com/WW/view/en/67385235

Design

Selecting the Power Module

The optimum power unit can be quickly selected based on the required motor power, the supply voltage and the braking cycles to be expected. Power Modules in degree of protection IP20 are intended for installation in a control cabinet.

PM230 Power Modules – degree of protection IP20

PM230 Power Modules are designed for applications involving pumps, fans and compressors with a square characteristic. They do not have an integrated braking chopper (single-quadrant applications).
PM230 Power Modules with integrated filter class A or class B, degree of protection IP55/UL Type 12, 0.37 kW to 90 kW (0.5 to 120.6 hp) are integral components of the SINAMICS G120P for pumps, fans and compressors. Detailed information can be found in Catalog D 35.

PM240 and PM240-2 Power Modules – degree of protection IP20

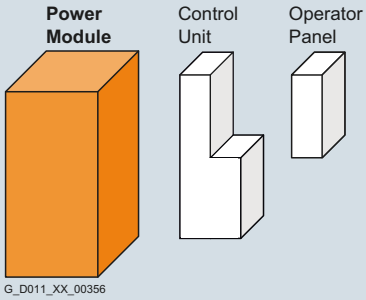
PM240 and PM240-2 Power Modules have a braking chopper (four-quadrant applications) and are suitable for a large number of applications in general machinery construction.

PM250 Power Modules – degree of protection IP20

PM250 Power Modules are suitable for the same applications as the PM240. Any braking energy is directly fed back into the line supply (four-quadrant applications – no braking resistor required).

The Power Modules can be combined with the following Control Units:

Control Units	Power Modules degree of protection IP20			
	PM230 [1]	PM240-2	PM240	PM250
CU230P-2	✓	✓	✓	✓
CU240B-2	✓	✓	✓	✓
CU240E-2	✓	✓	✓	✓
CU250S-2	–	✓	✓	✓



[1] PM230 Power Modules with integrated filter class A or class B, degree of protection IP55/UL Type 12, 0.37 kW to 90 kW (0.5 to 120.6 hp) are integral components of the SINAMICS G120P for pumps, fans and compressors. The CU230P-2 is the Control Unit for SINAMICS G120P and SINAMICS G120P Cabinet for pumps, fans and compressors.
Detailed information can be found in Catalog D 35.

Design

PM230, PM240-2 and PM240 Power Modules

Rated power [1]		Rated output current I_{rated} [2]	PM230 Power Module degree of protection IP20 [3] The following Control Units are supported: CU230P-2 ..., CU240B-2 ..., CU240E-2 ...		PM240/PM240-2 Power Modules degree of protection IP20 All CUs pluggable
kW	hp	A	Article No.		Article No.
200 ... 240 V 1 AC/3 AC					
0.55	0.75	3.2	–	NEW	6SL3210-1PB13-0■L0
0.75	1	4.2	–	NEW	6SL321■-1PB13-8■L0
1.1	1.5	6	–	NEW	6SL3210-1PB15-5■L0
1.5	2	7.4	–	NEW	6SL3210-1PB17-4■L0
2.2	3	10.4	–	NEW	6SL321■-1PB21-0■L0
3	4	13.6	–	NEW	6SL3210-1PB21-4■L0
4	5	17.5	–	NEW	6SL321■-1PB21-8■L0
200 ... 240 V 3 AC					
5.5	7.5	22	–	NEW	6SL3210-1PC22-2■L0
7.5	10	28	–	NEW	6SL3210-1PC22-8■L0
380 ... 480 V 3 AC					
0.37 [4]	0.5	1.3	NEW 6SL3210-1NE11-3■L1		– [4]
0.55	0.75	1.7	NEW 6SL3210-1NE11-7■L1	NEW	6SL3210-1PE11-8■L1
0.75	1	2.2	NEW 6SL3210-1NE12-2■L1	NEW	6SL3210-1PE12-3■L1
1.1	1.5	3.1	NEW 6SL3210-1NE13-1■L1	NEW	6SL3210-1PE13-2■L1
1.5	2	4.1	NEW 6SL3210-1NE14-1■L1	NEW	6SL3210-1PE14-3■L1
2.2	3	5.9	NEW 6SL3210-1NE15-8■L1	NEW	6SL3210-1PE16-1■L1
3	4	7.7	NEW 6SL321■-1NE17-7■L1	NEW	6SL321■-1PE18-0■L1
4	5	10.2	NEW 6SL3210-1NE21-0■L1	NEW	6SL3210-1PE21-1■L0
5.5	7.5	13.2	NEW 6SL3210-1NE21-3■L1	NEW	6SL3210-1PE21-4■L0
7.5	10	18	NEW 6SL321■-1NE21-8■L1	NEW	6SL321■-1PE21-8■L0
11	15	26	NEW 6SL3210-1NE22-6■L1	NEW	6SL3210-1PE22-7■L0
15	20	32	NEW 6SL3210-1NE23-2■L1	NEW	6SL321■-1PE23-3■L0
18.5	25	38	NEW 6SL321■-1NE23-8■L1		6SL3224-0BE31-5■A0
22	30	45	6SL3210-1NE24-5■L0		6SL3224-0BE31-8■A0
30	40	60	6SL3210-1NE26-0■L0		6SL3224-0BE32-2■A0
37	50	75	6SL3210-1NE27-5■L0		6SL3224-0BE33-0■A0
45	60	90	6SL3210-1NE28-8■L0		6SL3224-0BE33-7■A0
55	75	110	6SL3210-1NE31-1■L0		6SL3224-0BE34-5■A0
75	100	145	6SL3210-1NE31-5■L0		6SL3224-0BE35-5■A0
90	125	178	–		6SL3224-0BE37-5■A0
110	150	205	–		6SL3224-0BE38-8UA0
132	200	250	–		6SL3224-0BE41-1UA0
160	250	302	–		6SL3224-0XE41-3UA0
200	300	370	–		6SL3224-0XE41-6UA0
250	400	477	–		6SL3224-0XE42-0UA0
Heat sink variant			↑		↑
Standard			**0**		**0**
Push-through			**1**		**1**
Integrated line filter			↑		↑
Without	(for IT systems)		**U**		**U**
Class A	(for TN systems)		**A**		**A**

Data based on a duty cycle with low overload (LO).
Data based on a duty cycle with high overload (HO) see section Power Modules.

[1] Rated power based on the rated output current I_{rated}. The rated output current I_{rated} is based on a duty cycle for low overload (LO). The LO duty cycle is generally used for applications with square torque characteristic such as for pumps, fans and compressors; the HO duty cycle for constant torque characteristics, for example conveyor belts.

[2] The rated output current I_{rated} is based on a duty cycle for low overload (LO). These current values are applicable for 200 V or 400 V.

[3] PM230 Power Modules with integrated filter class A or class B, degree of protection IP55/UL Type 12, 0.37 kW to 90 kW (0.5 to 120.6 hp) are integral components of the SINAMICS G120P for pumps, fans and compressors. The CU230P-2 is the Control Unit for SINAMICS G120P and SINAMICS G120P Cabinet for pumps, fans and compressors. Detailed information can be found in Catalog D 35.

[4] The PM240-2 Power Module with Article No. 6SL3210-1PE11-8. L1 corresponds to 0.37 kW (0.5 hp) with duty cycle HO.

Design

PM250 Power Modules

Rated power [1]		Rated output current I_{rated} [2]	**PM250 Power Module degree of protection IP20 All CUs pluggable**
kW	hp	A	Article No.
380 ... 480 V 3 AC			
7.5	10	18	**6SL3225-0BE25-5AA1**
11	15	25	**6SL3225-0BE27-5AA1**
15	20	32	**6SL3225-0BE31-1AA1**
18.5	25	38	**6SL3225-0BE31-5■A0**
22	30	45	**6SL3225-0BE31-8■A0**
30	40	60	**6SL3225-0BE32-2■A0**
37	50	75	**6SL3225-0BE33-0■A0**
45	60	90	**6SL3225-0BE33-7■A0**
55	75	110	**6SL3225-0BE34-5■A0**
75	100	145	**6SL3225-0BE35-5■A0**
90	125	178	**6SL3225-0BE37-5■A0**
Integrated line filter			↑
Without (for IT systems)			**U**
Class A (for TN systems)			**A**
Class B (for TN systems)			Integrated line filter not available, as external option only

Data based on a duty cycle with low overload (LO).
Data based on a duty cycle with high overload (HO) see section Power Modules.

Selecting optional system components

Intelligent Operator Panel IOP

Graphic display with bar-type diagrams, e.g. for status values such as pressure or flowrate.

User-friendly commissioning, diagnostics and local operator control using a large plain text display, clear menu navigation and integrated application wizards.

Intelligent Operator Panel IOP Handheld

A handheld version of the IOP can be ordered for mobile use. In addition to the IOP, this includes a housing with rechargeable batteries, charging unit and RS232 connecting cable.

Basic Operator Panel BOP-2

Menu navigation and 2-line display permit fast and user-friendly commissioning of the inverter.

Simple basic commissioning by simultaneously displaying parameter and parameter value, as well as the option of filtering parameters.

Door mounting kit for IOP/BOP-2

Using the optionally available door mounting kit, the IOP/BOP-2 can be mounted in a control cabinet door with just a few manual operations (IP54/UL Type 12 degree of protection is achieved).

Push-through mounting frame for push-through variants of the PM230 and PM240-2 Power Modules

It is advisable to use an optionally available mounting frame to install the push-through unit in a control cabinet. This mounting frame includes the necessary seals and frame to ensure compliance with degree of protection IP54. If the Power Module is installed without use of the optional mounting frame, the user is responsible for ensuring that the requisite degree of protection is provided. The kit contains all the necessary nuts and seals.

Memory card

The parameter settings for an inverter can be stored on the SINAMICS SD card. When service is required, e.g. after the inverter has been replaced, the drive system is immediately ready for use again. The memory card can also be used to upgrade the firmware of the Control Unit.

Brake Relay

The Brake Relay allows the Power Module to be connected to an electromechanical motor brake, thereby allowing the motor brake to be driven directly by the Control Unit.

Safe Brake Relay

The Safe Brake Relay allows the Power Module to be safely connected to an electromechanical motor brake, allowing the brake to be directly and safely controlled from the CU250S-2 Control Unit in accordance with IEC 61508 SIL 2 and EN ISO 13849-1 PL d and Category 3.

[1] Rated power based on the rated output current Irated. The rated output current I_{rated} is based on a duty cycle for low overload (LO). The LO duty cycle is generally used for applications with square torque characteristic such as for pumps, fans and compressors; the HO duty cycle for constant torque characteristics, for example conveyor belts.

[2] The rated output current I_{rated} is based on a duty cycle for low overload (LO). These current values are applicable for 400 V.

Design

PC inverter connection kit 2

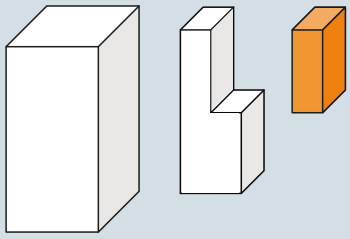
For controlling and commissioning an inverter directly from a PC if the appropriate software (STARTER commissioning tool or SINAMICS Startdrive) has been installed.

Shield connection kit for Power Modules

The shield connection kit makes it easier to connect the shields of supply and control cables, provides mechanical strain relief and thus ensures optimum EMC performance.

Shield connection kit for Control Units

The shield connection kit offers optimum shield connection and strain relief for all signal and communication cables. It includes a matching shield bonding plate and all of the necessary connecting and retaining elements for mounting.



Description		Article No.
Operator Panel IOP		**6SL3255-0AA00-4JA1**
Operator Panel IOP Handheld		**6SL3255-0AA00-4HA0**
Operator Panel BOP-2		**6SL3255-0AA00-4CA1**
Door mounting kit for IOP/BOP-2		**6SL3256-0AP00-0JA0**
Push-through mounting frame		
• For PM230 and PM240-2 Power Modules, degree of protection IP20 – push-through variants		
- Frame size FSA		**6SL3260-6AA00-0DA0**
- Frame size FSB		**6SL3260-6AB00-0DA0**
- Frame size FSC		**6SL3260-6AC00-0DA0**
Memory card		
• SINAMICS SD card [1] 512 MB		**6SL3054-4AG00-2AA0**
Brake Relay		**6SL3252-0BB00-0AA0**
Safe Brake Relay	NEW	**6SL3252-0BB01-0AA0**
PC inverter connection kit 2		**6SL3255-0AA00-2CA0**
Shield connection kits		
• For PM230 and PM240-2 Power Modules standard and push-through variants		
- Frame sizes FSA to FSC		Supplied with the Power Modules, available as a spare part
• For PM230 and PM240 Power Modules		
- Frame sizes FSD and FSE		**6SL3262-1AD00-0DA0**
- Frame size FSF		**6SL3262-1AF00-0DA0**
• For PM250 Power Modules		
- Frame size FSC		**6SL3262-1AC00-0DA0**
- Frame sizes FSD and FSE		**6SL3262-1AD00-0DA0**
- Frame size FSF		**6SL3262-1AF00-0DA0**
• For Control Units		
- For CU230P-2 HVAC/DP/CAN		**6SL3264-1EA00-0FA0**
- For CU240B-2 and CU240E-2		**6SL3264-1EA00-0HA0**
- For CU230P-2 PN, CU240E-2 PN and CU240E-2 PN-F		**6SL3264-1EA00-0HB0**
- For CU250S-2	NEW	**6SL3264-1EA00-0LA0**
STARTER commissioning tool [2] on DVD-ROM		**6SL3072-0AA00-0AG0**
SINAMICS Startdrive commissioning tool [3] on DVD-ROM		**6SL3072-4DA02-0XG0**

[1] Approved only for CU230P-2 HVAC, CU230P-2 CAN and CU230P-2 DP Control Units with firmware version V4.6 and higher.

[2] STARTER commissioning tool can be found on the Internet at http://support.automation.siemens.com/WW/view/en/10804985/133100

[3] SINAMICS Startdrive commissioning tool can be found on the Internet at http://support.automation.siemens.com/WW/view/en/68034568

Design

Line-side power components

The following line-side power components are available for SINAMICS G120 standard inverters:

Line filters

With one of the additional line filters, the Power Module reaches a higher radio interference class.

Line reactors (for PM240 and PM240-2 Power Modules only)

Line reactors smooth the current drawn by the inverter and thus reduce harmonic components in the line current. Through the reduction of the current harmonics, the thermal load on the power components in the rectifier and in the DC-link capacitors is reduced as well as the harmonic effects on the supply. The use of a line reactor increases the service life of the inverter.

Recommended line-side power components

Furthermore, this is a recommendation for additional line-side components, such as fuses and circuit breakers (line-side components must be dimensioned in accordance with IEC standards).

Additional information about the listed fuses and circuit breakers can be found in Catalogs LV 10, IC 10 and IC 10 AO.

DC link components

The following DC link components are available for the SINAMICS G120 standard inverters:

Braking resistors (for PM240 and PM240-2 Power Modules only)

Excess energy in the DC link is dissipated in the braking resistor. The braking resistors are designed for use with PM240 and PM240-2 Power Modules. They are equipped with an integrated braking chopper (electronic switch). There is an optional plug-in Braking Module for frame size FSGX.

Braking Modules (only for PM240 Power Modules, frame size FSGX)

A Braking Module and the matching external braking resistor are required to bring drives with a PM240 Power Module, frame size FSGX, to a controlled standstill in the event of a power failure (e.g. emergency retraction or EMERGENCY STOP Category 1) or to limit the DC link voltage during a short period of generator operation. The Braking Module includes the power electronics and the associated control circuit.

Load-side power components

The following load-side power components are available for the SINAMICS G120 standard inverters. This means that during operation with output reactors or sine-wave filters, longer, shielded motor cables are possible and the motor service life can be extended:

Output reactors

Output reactors reduce the rate of voltage rise (dv/dt) and the height of the current peaks, and enable longer motor cables to be connected.

Sine-wave filter

Sine-wave filters limit the rate of voltage rise (dv/dt) and the peak voltages on the motor winding. Similar to an output reactor, they enable the connection of longer motor cables.

Spare parts

Spare Parts Kit for Control Units

The Spare Parts Kit contains small parts for all variants of the following SINAMICS G120 Control Units:

- CU230P-2
- CU240B-2
- CU240E-2
- CU240E-2 F
- CU250S-2

Shield plates for PM230 and PM240-2 Power Modules

PM230 Power Modules, frame sizes FSA to FSC, in degree of protection IP20, and PM240-2 Power Modules, frame sizes FSA to FSC (for both standard and push-through variants) are supplied with a shield plate for motor and signal cables. This shield plate is also available as a spare part.

Terminal cover kit

The kit includes a replacement cover for the terminals. The kit can be ordered for PM250, PM240 and PM230 Power Modules in degree of protection IP20 (standard variants) in frame sizes FSD, FSE and FSF.

Replacement connectors for PM240-2 Power Modules

A set of connectors for the line feeder cable, braking resistor and motor cable can be ordered corresponding to the frame size of the PM240-2 Power Module.

Replacement door for PM240 Power Modules, frame size FSGX

A complete replacement door can be ordered for the PM240 Power Module, frame size FSGX.

Fan units for PM230 and PM240-2 Power Modules

The fans of PM230 and PM240-2 Power Modules are designed for extra long service life. For special requirements, replacement fans are available that can be exchanged quickly and easily.

Replacement fans for PM240 and PM250 Power Modules

The fans of PM240 and PM250 Power Modules are designed for extra long service life. Replacement fans can be ordered for special applications.

Configuration

The following electronic configuring aids and engineering tools are available for the SINAMICS G120 standard inverters:

Drive Technology Configurator (DT Configurator) within the CA 01

The interactive catalog CA 01 – the offline Industry mall of Siemens on DVD-ROM – contains over 100.000 products with approximately 5 million possible drive system product variants. The Drive Technology Configurator (DT Configurator) has been developed to facilitate selection of the correct motor and/or inverter from the wide spectrum of drives. It is integrated as a selection tool in Catalog CA 01.

Online DT Configurator

In addition, the DT Configurator can be used in the Internet without requiring any installation. The DT Configurator can be found in the Siemens Industry Mall at the following address:
www.siemens.com/dt-configurator

SIZER for Siemens Drives engineering tool

The SIZER for Siemens Drives engineering tool makes it easy to engineer the SINAMICS and MICROMASTER 4 drive families. It provides support when selecting the hardware and firmware components necessary to implement a drive task. SIZER for Siemens Drives is designed to support configuring of the entire drive system.

Additional information on the SIZER for Siemens Drives engineering tool is provided in the chapter Engineering tools.

The SIZER for Siemens Drives engineering tool is available free on the Internet at
www.siemens.com/sizer

STARTER commissioning tool

The STARTER commissioning tool allows menu-prompted commissioning, optimization and diagnostics. Apart from the SINAMICS drives, STARTER is also suitable for MICROMASTER 4 devices.

You can find further information about the STARTER commissioning tool in the chapter Engineering Tools.

Additional information about the STARTER commissioning tool is available on the Internet at
www.siemens.com/starter

SINAMICS Startdrive commissioning tool

SINAMICS Startdrive is a tool for configuring, commissioning, and diagnosing the SINAMICS family of drives and is integrated into the TIA Portal. SINAMICS Startdrive can be used to implement drive tasks with the SINAMICS G110M, SINAMICS G120, SINAMICS G120C, SINAMICS G120D and SINAMICS G120P inverter series. The commissioning tool has been optimized with regard to user friendliness and consistent use of the TIA Portal benefits of a common working environment for PLC, HMI and drives.

You can find further information on the SINAMICS Startdrive commissioning tool in the section Engineering Tools.

The SINAMICS Startdrive commissioning tool is available free on the Internet at
www.siemens.com/startdrive

Drive ES engineering system

Drive ES is the engineering system that can be used to integrate the communication, configuration and data management functions of Siemens drive technology into the SIMATIC automation world easily, efficiently and cost-effectively. The STEP 7 Manager user interface provides the ideal basis for this. A variety of software packages are available for SINAMICS – Drive ES Basic, Drive ES SIMATIC and Drive ES PCS.

You can find further information about the Drive ES engineering system in the chapter Engineering Tools.

Additional information about the Drive ES engineering system is available on the Internet at
www.siemens.com/drive-es

Technical specifications

Unless explicitly specified otherwise, the following technical specifications are valid for all the following components of the SINAMICS G120 standard inverters.

General technical specifications	
Mechanical specifications	
Vibratory load	
• Transport in accordance with EN 60721-3-2	
- Inverters and components, frame sizes FSA to FSC [1]	Class 1M2
- Inverters and components, frame sizes FSD to FSF [2]	Class 2M3
- Inverters and components, frame size FSGX [2]	Class 2M2
• Operation acc. to EN 60721-3-3	
- Inverters and components, frame sizes FSA to FSC	Class 3M1
- Inverters and components, frame sizes FSD to FSF	Class 3M1
- Inverters and components, frame size FSGX	Test Fc according to EN 60068-2-6 Deflection: 0.075 mm at 10 ... 58 Hz Acceleration: 10 m/s^2 (1 × *g*) at 58 ... 200 Hz
Shock load	
• Transport in accordance with EN 60721-3-2	
- Inverters and components, frame sizes FSA to FSC [1]	Class 1M2
- Inverters and components, frame sizes FSD to FSF [2]	Class 2M3
- Inverters and components, frame size FSGX [2]	Class 2M2
• Operation acc. to EN 60721-3-3	
- Inverters and components, frame sizes FSA to FSC	Class 3M2
- Inverters and components, frame sizes FSD to FSF	Class 3M1
- Inverters and components, frame size FSGX	Test Ea according to EN 60068-2-27 Acceleration: 98 m/s^2 (10 × *g*) at 20 ms

General technical specifications	
Ambient conditions	
Protection class acc. to EN 61800-5-1	Class I (with protective conductor system) and class III (PELV)
Touch protection acc. to EN 61800-5-1	For the intended purpose
Permissible ambient and coolant temperature (air) during operation for line-side power components and Power Modules	
• Low overload (LO)	0 ... 40 °C (32 ... 104 °F) without derating >40 ... 60 °C (>104 ... 140 °F) see derating characteristics
• High overload (HO)	0 ... 50 °C (32 ... 122 °F) without derating (for PM240 frame size FSGX: 0 ... 40 °C, 32 ... 104 °F), >50 ... 60 °C (>104 ... 140 °F) see derating characteristics
Permissible ambient and coolant temperature (air) during operation for Control Units and supplementary system components	With CU230P-2 HVAC/DP/CAN: -10 ... 60 °C (14 ... 140 °F) With CU230P-2 PN: -10 ... 55 °C (14 ... 131 °F) With CU240B-2 and CU240E-2 (without PN): -10 ... 55 °C (14 ... 131 °F) With CU240E-2 PN and CU240E-2 PN-F: -10 ... 53 °C (14 ... 127.4 °F) With CU250S-2: -10 ... 50 °C (14 ... 122 °F) With IOP/BOP: 0 ... 50 °C (32 ... 122 °F) Derating of 3 K/1000 m (3281 ft) applies to Control Units as of an installation altitude of 1000 m (3281 ft) above sea level.
Climatic ambient conditions	
• Storage [2] acc. to EN 60721-3-1	Class 1K3 Temperature -25 ... +55 °C (-13 ... +131 °F)
• Transport [2] 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 acc. to EN 60721-3-3	Class 3K3 Condensation, splashwater, and ice formation not permitted (EN 60204, Part 1)
Environmental class/harmful chemical substances	
• Storage [2] acc. to EN 60721-3-1	Class 1C2
• Transport [2] acc. to EN 60721-3-2	Class 2C2
• Operation acc. to EN 60721-3-3	Class 3C2 [3]
Organic/biological influences	
• Storage [2] acc. to EN 60721-3-1	Class 1B1
• Transport [2] acc. to EN 60721-3-2	Class 2B1
• Operation acc. to EN 60721-3-3	Class 3B1
Degree of pollution acc. to EN 61800-5-1	2

[1] In product packaging.

[2] In transport packaging.

[3] SIPLUS components for extreme requirements will be available soon. For further information, please go to www.siemens.com/siplus-drives

Technical specifications

General technical specifications	
Certification for fail-safe versions	
Applies to Control Units of the CU240E-2 and CU250S-2 Series. The values comprise the Control Unit and Power Module.	
• According to IEC 61508	SIL 2
• According to EN ISO 13849-1	PL d and Category 3
Standards	
Compliance with standards	UL [1], cUL [1], CE, C-Tick, SEMI F-47
CE marking	According to Low-Voltage Directive 2006/95/EC
EMC Directive According to EN 61800-3	
EMC Directive according to EN 61800-3	
Interference immunity	
PM230 Power Modules with degree of protection IP20 **PM240-2 Power Modules** **PM240 Power Modules** **PM250 Power Modules**	The Power Modules are tested with the interference immunity requirements for environments according to Category C3
Interference emissions	
PM230 Power Modules with degree of protection IP20	
• Frame sizes FSA to FSF without integrated line filter	[2]
• Frame sizes FSA to FSF with integrated line filter class A	Observance of the limit values according to Category C3 and C2 [3]
• Frame sizes FSA to FSF without integrated line filter with optional line filter class B	Observance of the limit values - for low-frequency harmonic effects and conducted interferences according to Category C1 - for field-conducted radiated interferences according to Category C2 [3]
PM240-2 Power Modules	
• Frame sizes FSA to FSC without integrated line filter	[2]
• Frame sizes FSA to FSC with integrated line filter class A	Observance of the limit values - according to Category C3 - for conducted interferences and field-conducted radiated interferences according to Category C2 [3]
• Frame sizes FSA to FSC without integrated line filter with optional line filter class B	Observance of the limit values - for conducted interferences according to Category C1 - for field-conducted radiated interferences according to Category C2 [3]
PM240 Power Modules	
• Frame sizes FSD to FSGX without integrated line filter	[2]
• Frame sizes FSD to FSF with integrated line filter class A	Observance of the limit values - according to Category C3 - for conducted interferences and field-conducted radiated interferences according to Category C2 [3]
• Frame sizes FSF to FSGX without integrated line filter with optional line filter class A	Observance of the limit values - according to Category C3 - for conducted interferences and field-conducted radiated interferences according to Category C2 [3]
PM250 Power Modules	
• Frame size FSC with integrated line filter class A	Observance of the limit values according to Category C3 and C2 [3]
• Frame size FSC with integrated line filter class A and optional line filter class B	Observance of the limit values - for low-frequency harmonic effects and conducted interferences according to Category C1 - for field-conducted radiated interferences according to Category C2 [3]
• Frame sizes FSD to FSF without integrated line filter	[2]
• Frame sizes FSD to FSF with integrated line filter class A	Observance of the limit values according to Category C3 and C2 [3]

Note:

The EMC product standard EN 61800-3 does not apply directly to a frequency inverter but to a PDS (Power Drive System), which comprises the complete circuitry, motor and cables in addition to the inverter. The frequency inverters on their own do not generally require identification according to the EMC Directive.

Compliance with standards

CE marking

The SINAMICS G120 inverters meet the requirements of the Low-Voltage Directive 2006/95/EC.

Low-Voltage Directive

The inverters comply with the following standards listed in the official journal of the EU:

- EN 60204
  Safety of machinery, electrical equipment of machines
- EN 61800-5-1
  Electrical power drive systems with variable speed – Part 5-1: Requirements regarding safety – electrical, thermal, and energy requirements

UL listing

Inverter devices in UL category NMMS certified to UL and cUL, in compliance with UL508C. UL list numbers E121068 and E192450. This applies to all PM230 Power Modules degree of protection IP20 (cUL only with frame sizes FSA to FSC), PM240, PM240-2 and PM250 Power Modules with integrated line filter class A.

For use in environments with pollution degree 2.

See also www.ul.com

Machinery Directive

The inverters are suitable for installation in machines. Compliance with the Machinery Directive 2006/42/EC requires a separate certificate of conformity. This must be provided by the plant construction company or the organization marketing the machine.

[1] Applies to all PM230 Power Modules degree of protection IP20 (cUL only with frame sizes FSA to FSC), PM240-2, PM240 and PM250 Power Modules with integrated line filter class A.

[2] Non-filtered devices are designed for operation on IT systems or in conjunction with an RCD. The customer must provide suitable RI suppression equipment to ensure that these devices comply with the limits defined for Category C3 or C2.

[3] With shielded motor cable up to 25 m (82 ft).

Technical specifications

Compliance with standards *(continued)*

EMC directive

- EN 61800-3
  Variable-speed electric drives
  Part 3: EMC product standard including specific test methods

The following information applies to the inverters of the Siemens SINAMICS G120 series:

- The EMC product standard EN 61800-3 does not apply directly to a frequency inverter but to a PDS (Power Drive System), which comprises the complete circuitry, motor and cables in addition to the inverter.
- Frequency inverters are normally only supplied to experts for installation in machines or systems. A frequency inverter must, therefore, only be considered as a component which, on its own, is not subject to the EMC product standard EN 61800-3. The inverter's operating instructions, however, specifies the conditions regarding compliance with the product standard if the frequency inverter is expanded to become a PDS. For a PDS, the EMC Directive in the EU is complied with by observing the product standard EN 61800-3 for variable-speed electric drive systems. The frequency inverters on their own do not generally require identification according to the EMC Directive.
- Different categories C1 to C4 have been defined in accordance with the environment of the PDS at the operating location:
  - **Category C1:** Drive systems for rated voltages < 1000 V for use in the first environment
  - **Category C2:** Stationary drive systems not connected by means of a plug connector for rated voltages < 1000 V. When used in the first environment, the system must be installed and commissioned by personnel familiar with EMC requirements. A warning note is required.
  - **Category C3:** Drive systems for rated voltages < 1000 V for exclusive use in the second environment. A warning note is required.
  - **Category C4:** Drive systems for rated voltages ≥ 1000 V or for rated currents ≥ 400 A or for use in complex systems in the second environment. An EMC plan must be created.
- The EMC product standard EN 61800-3 also defines limit values for conducted interference and radiated interference for the "second environment" (= industrial power supply systems that do not supply households). These limit values are below the limit values of filter class A to EN 55011. Unfiltered inverters can be used in industrial environments as long as they are part of a system that contains line filters on the higher-level infeed side.
- With SINAMICS G120, Power Drive Systems (PDS) that fulfill the EMC product standard EN 61800-3 can be configured when observing the installation instructions in the product documentation.
- A differentiation must be made between the product standards for electrical drive systems (PDS) of the range of standards EN 61800 (of which Part 3 covers EMC topics) and the product standards for the devices/systems/machines, etc. This will probably not result in any changes in the practical use of frequency inverters. Since frequency inverters are always part of a PDS and these are part of a machine, the machine manufacturer must observe various standards depending on their type and environment (e.g. EN 61000-3-2 for line harmonics and EN 55011 for radio interference). The product standard for PDS on its own is, therefore, either insufficient or irrelevant.
- With respect to the compliance with limits for line supply harmonics, the EMC product standard EN 61800-3 for PDS refers to compliance with the EN 61000-3-2 and EN 61000-3-12 standards.
- Regardless of the configuration with SINAMICS G120 and its components, the machine construction company (OEM) can also apply other measures to ensure that the machine complies with the EU EMC Directive. The EU EMC Directive is generally fulfilled when the relevant EMC product standards are observed. If they are not available, the generic standards (e.g. DIN EN 61000-x-x) can be used instead. It is important that the conducted and emitted interference at the line supply connection point and outside the machine remain below the relevant limit values. Any suitable technical measures can be applied to ensure this.

SEMI F47

SEMI F47 is an industry standard relating to the immunity to voltage dips. This includes the requirement that industrial equipment must be able to tolerate defined dips or drops of the line supply voltage. As a result, industrial equipment that fulfills this standard is more reliable and productive. In the SINAMICS G120 product family, the PM230, PM240, PM240-2 and PM250 Power Modules fulfill the latest SEMI F47-0706 standard. In the case of a voltage dip defined in accordance with SEMI F47-0607, these drives either continue to supply a defined output current, or automatically restart and continue to operate as expected.

Overview

CU230P-2 Control Units

CU230P-2 PN Control Unit

The Control Unit performs closed-loop control functions for the inverter.

The CU230P-2 Control Units are designed for drives with integrated technological functions for pump, fan and compressor applications.

The I/O interface, the fieldbus interfaces and the additional software functions optimally support these applications. The integration of technological functions is a significant differentiating feature to the other Control Units of the SINAMICS G120 drive family.

The CU230P-2 Control Units can be operated with the following Power Modules:

- PM230
- PM240-2
- PM240
- PM250

Note:

The CU230P-2 is the Control Unit for SINAMICS G120P and SINAMICS G120P Cabinet for pumps, fans and compressors. Please refer to Catalog D 35 for further information.

Note:

Shield plates and shield connection kits are available. These can be used in the wiring installation for the Control Units and Power Modules to ensure that it complies with EMC guidelines. For more information about shield connection kits and shield plates for Control Units and Power Modules, please refer to section "Supplementary system components".

Typical, integrated HVAC/HLK functions

- Linear and square torque characteristic for fluid flow and positive displacement machines
- ECO mode for additional energy saving in V/f control mode
- 2 analog inputs (current/voltage can be selected) to directly connect pressure/level sensors
- 2 additional analog inputs to connect Pt1000/LG-Ni1000 temperature sensors
- Direct control of valves and flaps using two 230 V AC relays
- Automatic restart
- Flying restart
- Skip frequencies
- Hibernation mode
- Load check function to monitor belts and flow
- Cascade connection
- 4 integrated PID controllers (e.g. for temperature, pressure, air quality, level)
- Multi-zone controller
- Essential service mode
- Real time clock with three time generators

IOP wizards for special applications

- Pumps: Positive displacement (constant load torque) and centrifugal pumps (square load torque) with and without PID controller
- Fans: Radial and axial fans (square load torque) with and without PID controller
- Compressors: Positive displacement (constant load torque) and fluid flow machines (square load torque) with and without PID controller

Overview

CU240B-2 and CU240E-2 Control Units

CU240B-2 DP Control Unit

CU240E-2 DP-F Control Unit

The Control Unit performs closed-loop control functions for the inverter.

The CU240B-2 and CU240E-2 Control Units are designed as standard Control Units for all of the usual applications involving V/f or vector control.

- CU240B-2 series with basic I/O quantity structure, ideal for a large number of applications
- CU240E-2 series with standard I/O quantity structure and integrated safety technology

The CU240B-2 and CU240E-2 Control Units can be combined with the following Power Modules:

- PM230 degree of protection IP20 [1)]
- PM240-2
- PM240
- PM250

Note:

Shield plates and shield connection kits are available. These can be used in the wiring installation for the Control Units and Power Modules to ensure that it complies with EMC guidelines. For more information about shield connection kits and shield plates for Control Units and Power Modules, please refer to section "Supplementary system components".

Safety Integrated functions

The safety function "Safe Torque Off" (STO) (certified according to IEC 61508 SIL 2 and EN ISO 13849-1 PL d and Category 3) is already integrated into the basic versions of the CU240E-2 series (CU240E-2, CU240E-2 DP, CU240E-2 PN).

With the fail-safe variants of the CU240E-2 series (CU240E-2 F, CU240E-2 DP-F, CU240E-2 PN-F), the fail-safe SINAMICS G120 inverter provides five safety functions which are certified according to IEC 61508 SIL 2 and EN ISO 13849-1 PL d and Category 3:

- Safe Torque Off (STO)
  to protect against active movement of the drive
- Safe Stop 1 (SS1)
  for continuous monitoring of a safe braking ramp
- Safely Limited Speed (SLS)
  for protection against dangerous movements when a speed limit is exceeded (the CU240E-2 DP-F Control Unit has up to 4 selectable SLS limit values)
- Safe Direction (SDI)
  This function ensures that the drive can only rotate in the selected direction.
- Safe speed monitoring (SSM)
  This function signals if a drive operates below a specific speed/feed velocity (only CU240E-2 DP-F with PROFIsafe).

These functions can be activated by means of PROFIsafe or via the safety inputs.

None of the safety functions require a motor encoder and they are thus much cheaper and easier to implement. Existing systems in particular can be simply updated with safety technology without the need to change the motor or mechanical system.

The Safe Torque Off (STO) function can be used without restriction for all applications. The SS1, SLS, SDI and SSM functions are only permissible for applications where the load can never accelerate when the inverter is switched off. They are therefore not permitted for applications involving pull-through loads such as hoisting gear and unwinders.

Additional information is provided in chapter Highlights, section Safety Integrated.

[1)] The CU240E-2 Control Unit can also be combined with PM230 Power Modules with degree of protection IP55. Detailed information can be found in Catalog D 35. A long-distance connector Art. No. 10055500 (ordered from and supplied by KnorrTec) is required to operate a PM230 Power Module with degree of protection IP55 in combination with a CU240E-2 Control Unit and an IOP/BOP-2.

Overview

CU250S-2 Control Units

CU250S-2 Control Unit

The Control Unit performs closed-loop control functions for the inverter.

The CU250S-2 Control Units are designed as standard Control Units for all of the usual applications involving V/f or vector control.

CU250S-2 Control Units can be used to implement all common applications involving V/f or vector control as well as applications for drives with positioning requirements. This expansion allows them to be used in lifting, swiveling, traversing or rotating applications. The positioning functionality is comparable with SINAMICS S110 servo drives.

Two points must be noted here:

- Vector control (VC) and sensorless vector control (SLVC) are possible
- Positioning possible via one encoder or in parallel using two encoders

The CU250S-2 Control Units can be combined with the following Power Modules:

- PM240-2
- PM240
- PM250

Note:

Shield plates and shield connection kits are available for use in the wiring installation of Control Units and Power Modules to ensure that it complies with EMC guidelines.

For further information about shield connection kits and shield plates for Control Units and Power Modules, please refer to section "Supplementary system components".

Safety Integrated functions

The following Safety Integrated Basic Functions (certified according to IEC 61508 SIL 2 and EN ISO 13849-1 PL d and Category 3) are integrated as standard in the CU250S-2 series:

- Safe Torque Off (STO)
  to protect against active movement of the drive
- Safe Stop 1 (SS1)
  for continuous monitoring of a safe braking ramp
- Safe Brake Control (SBC) is used to safely control a holding brake

The following Safety Integrated Extended Functions (certified according to IEC 61508 SIL 2 and EN ISO 13849-1 PL d and Category 3) are optionally available for the CU250S-2 series:

- Safely Limited Speed (SLS)
  for protection against dangerous movements on exceeding a speed limit
- Safe Direction (SDI)
  This function ensures that the drive can only rotate in the selected direction.
- Safe Speed Monitor (SSM)
  This function signals if a drive operates below a specific speed/feed velocity.

These functions can be activated by means of PROFIsafe or via the safety inputs.

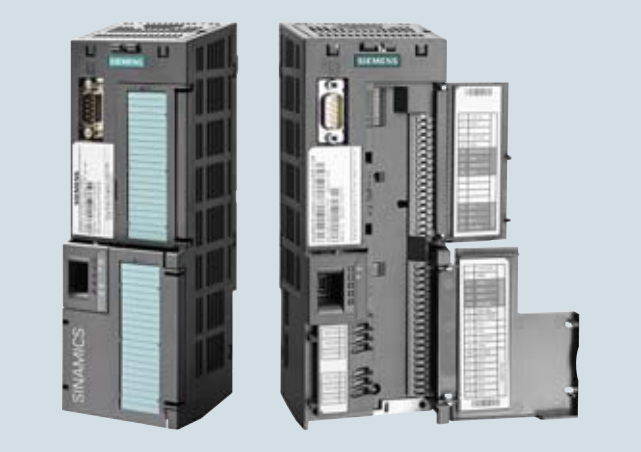
None of the safety functions require a motor encoder and they are thus much cheaper and easier to implement. Existing systems in particular can be simply updated with safety technology without the need to change the motor or mechanical system.

The Safe Torque Off (STO) function can be used without restriction for all applications. The SS1, SLS, SDI and SSM functions are only permissible for applications where the load can never accelerate when the inverter is switched off. They are therefore not permitted for applications involving pull-through loads such as hoisting gear and unwinders.

Additional information is provided in chapter Highlights, section Safety Integrated.

Design

CU230P-2 HVAC, CU230P-2 DP, CU230P-2 PN and CU230P-2 CAN Control Units



CU230P-2 Control Unit with open and closed terminal covers

Terminal No.	Signal	Features
Digital inputs (DI) – Standard		
69	DI COM	Reference potential for digital inputs
5 ... 8, 16.17	DI0 ... DI5	Freely programmable isolated, inputs in compliance with IEC 61131-2
Digital outputs (DO)		
18	DO0, NC	Relay output 1 NC contact (5 A, 30 V DC or 2 A, 250 V AC) [1]
19	DO0, NO	Relay output 1 NO contact (5 A, 30 V DC or 2 A, 250 V AC)
20	DO0, COM	Relay output 1 Common contact (5 A, 30 V DC or 2 A, 250 V AC) [1]
21	DO1, NO	Relay output 2 NO contact (0.5 A, 30 V DC)
22	DO1, COM	Relay output 2 Common contact (0.5 A, 30 V DC)
23	DO2, NC	Relay output 3 NC contact (5 A, 30 V DC or 2 A, 250 V AC) [1]
24	DO2, NO	Relay output 3 NO contact (5 A, 30 V DC or 2 A, 250 V AC)
25	DO2, COM	Relay output 3 Common contact (5 A, 30 V DC or 2 A, 250 V AC) [1]

Terminal No.	Signal	Features
Analog inputs (AI)		
3	AI0+	Differential input, switchable between current, voltage Value range: 0 ... 10 V, -10 ... +10 V, 0/2 ... 10 V, 0/4 ... 20 mA
4	AI0-	
10	AI1+	Differential input, switchable between current, voltage Value range: 0 ... 10 V, -10 ... +10 V, 0/2 ... 10 V, 0/4 ... 20 mA
11	AI1-	
50	AI2+	Non-isolated input, switchable between current and temperature sensors, type Pt1000/LG-Ni1000 Value range: 0/4 ... 20 mA, Pt1000 -50 ... +250 °C; LG-Ni1000 -50 ... +150 °C
51	GND	Reference potential of the AI2/ internal electronics ground
52	AI3+	Non-isolated input for temperature sensors, type Pt1000/LG-Ni1000 Value range: Pt1000: -50 ... +250 °C; LG-Ni1000: -50 ... +150 °C
53	GND	Reference potential of the AI3/ internal electronics ground
Analog outputs (AO)		
12	AO0+	Non-isolated output Freely programmable Value range: 0 ... 10 V; 0/4 ... 20 mA
13	GND	Reference potential of the AO0/ internal electronics ground
26	AO1+	Non-isolated output Freely programmable Value range: 0 ... 10 V; 0/4 ... 20 mA
27	GND	Reference potential of the AO1/ internal electronics ground
PTC/KTY interface		
14	T1 MOTOR	Positive input for motor temperature sensor Type: PTC, KTY, bimetal
15	T2 MOTOR	Negative input for motor temperature sensor
Power supply		
9	+24 V OUT	Power supply output 24 V DC, max. 100 mA
28	GND	Reference potential of the power supply/ internal electronics ground
1	+10 V OUT	Power supply output 10 V DC ±0.5 V, max. 10 mA
2	GND	Reference potential of the power supply/ internal electronics ground
31	+24 V IN	Power supply input 20.4 ... 28.8 V DC, max. 1500 mA
32	GND IN	Reference potential of the power supply input
35	+10 V OUT	Power supply output 10 V DC ±0.5 V, max. 10 mA
36	GND	Reference potential of the power supply/ internal electronics ground

[1] The following applies to systems complying with UL: A maximum of 3 A, 30 V DC or 2 A, 250 V AC may be connected via terminals 18 / 20 (DO0 NC) and 23 / 25 (DO2 NC).

Design

CU240B-2 and CU240B-2 DP Control Units

CU240B-2 Control Unit with open and closed terminal covers

Terminal No.	Signal	Features
Digital inputs (DI)		
5 ... 8	DI0 ... DI3	Freely programmable (isolated) 5.5 mA/24 V
69	DI COM	Reference potential for digital inputs
Digital output (DO)		
18	DO0, NC	Relay output DO0 NC contact (0.5 A, 30 V DC)
19	DO0, NO	Relay output DO0 NO contact (0.5 A, 30 V DC)
20	DO0, COM	Relay output DO0 Common contact (0.5 A, 30 V DC)

Terminal No.	Signal	Features
Analog input (AI)		
3	AI0+	Differential input, switchable between current, voltage Value range: 0 ... 10 V, -10 ... +10 V, 0/2 ... 10 V, 0/4 ... 20 mA
4	AI0-	
Analog output (AO)		
12	AO0+	Non-isolated output Freely programmable Value range: 0 ... 10 V; 0/4 ... 20 mA
13	GND	Reference potential of the AO0/ internal electronics ground
PTC/KTY interface		
14	T1 MOTOR	Positive input for motor temperature sensor Type: PTC, KTY, bimetal
15	T2 MOTOR	Negative input for motor temperature sensor
Power supply		
9	+24 V OUT	Power supply output 24 V DC, max. 100 mA
28	GND	Reference potential of the power supply/ internal electronics ground
1	+10 V OUT	Power supply output 10 V DC ±0.5 V, max. 10 mA
2	GND	Reference potential of the power supply/ internal electronics ground
31	+24 V IN	Power supply input 20.4 ... 28.8 V DC, max. 1500 mA
32	GND IN	Reference potential of the power supply input

Design

CU240E-2, CU240E-2 DP, CU240E-2 PN, CU240E-2 F, CU240E-2 DP-F and CU240E-2 PN-F Control Units

CU240E-2 Control Unit with open and closed terminal covers

Terminal No.	Signal	Features
Digital inputs (DI) – Standard		
5 ... 8, 16.17	DI0 ... DI5	Freely programmable (isolated) 5.5 mA/24 V
69	DI COM1	Reference potential for digital inputs 0, 2, 4, 6
34	DI COM2	Reference potential for digital inputs 1, 3, 5, 7
Digital inputs (DI) – Fail-safe (formed from two standard inputs using the appropriate parameter setting)		
16, 17	F-DI0	Fail-safe digital inputs, 2 channels (redundant), freely programmable (isolated) 5.5 mA/24 V
The following are only available for CU240E-2 F, CU240E-2 DP-F and CU240E-2 PN-F		
5, 6	F-DI0	Fail-safe digital inputs, 2 channels (redundant), freely programmable (isolated) 5.5 mA / 24 V
7, 8	F-DI1	Fail-safe digital inputs, 2 channels (redundant), freely programmable (isolated) 5.5 mA / 24 V
16, 17	F-DI2	Fail-safe digital inputs, 2 channels (redundant), freely programmable (isolated) 5.5 mA / 24 V
Digital outputs (DO)		
18	DO0, NC	Relay output DO0 NC contact (0.5 A, 30 V DC)
19	DO0, NO	Relay output DO0 NO contact (0.5 A, 30 V DC)
20	DO0, COM	Relay output DO0 Common contact (0.5 A, 30 V DC)
21	DO1+	Transistor output DO1 Positive (0.5 A, 30 V DC)
22	DO1-	Transistor output DO1 Negative (0.5 A, 30 V DC)
23	DO2, NC	Relay output DO2 NC contact (0.5 A, 30 V DC)
24	DO2, NO	Relay output DO2 NO contact (0.5 A, 30 V DC)
25	DO2, COM	Relay output DO2 Common contact (0.5 A, 30 V DC)

Terminal No.	Signal	Features
Analog inputs (AI)		
3	AI0+	Differential input, switchable between current, voltage Value range: 0 ... 10 V, -10 ... +10 V, 0/2 ... 10 V, 0/4 ... 20 mA
4	AI0-	
10	AI1+	Differential input, switchable between current, voltage Value range: 0 ... 10 V, -10 ... +10 V, 0/2 ... 10 V, 0/4 ... 20 mA
11	AI1-	
Analog outputs (AO)		
12	AO0+	Non-isolated output Freely programmable Value range: 0 ... 10 V; 0/4 ... 20 mA
13	GND	Reference potential of the AO0/ internal electronics ground
26	AO1+	Non-isolated output Freely programmable Value range: 0 ... 10 V; 0/4 ... 20 mA
27	GND	Reference potential of the AO1/ internal electronics ground
PTC/KTY interface		
14	T1 MOTOR	Positive input for motor temperature sensor Type: PTC, KTY, bimetal
15	T2 MOTOR	Negative input for motor temperature sensor
Power supply		
9	+24 V OUT	Power supply output 24 V DC, max. 100 mA
28	GND	Reference potential of the power supply/ internal electronics ground
1	+10 V OUT	Power supply output 10 V DC ±0.5 V, max. 10 mA
2	GND	Reference potential of the power supply/ internal electronics ground
31	+24 V IN	Power supply input 20.4 ... 28.8 V DC, max. 1500 mA
32	GND IN	Reference potential of the power supply input

Design

CU250S-2, CU250S-2 DP, CU250S-2 PN, CU250S-2 CAN Control Units

CU250S-2 Control Unit with open and closed terminal covers

Terminal No.	Signal	Features
Digital inputs (DI)		
5	DI0	Digital inputs, floating, 5.5 mA/24 V
6	DI1+	Digital inputs, floating, 5.5 mA/24 V
64	DI1-	Digital inputs, floating, 5.5 mA/24 V
7	DI2	Digital inputs, floating, 5.5 mA/24 V
8	DI3+	Digital inputs, floating, 5.5 mA/24 V
65	DI3-	Digital inputs, floating, 5.5 mA/24 V
16	DI4	Digital inputs, floating, 5.5 mA/24 V
17	DI5+	Digital inputs, floating, 5.5 mA/24 V
66	DI5-	Digital inputs, floating, 5.5 mA/24 V
67	DI6	Digital inputs, floating, 5.5 mA/24 V
69	DI COM1	Reference potential for digital inputs DI0, DI2, DI4, DI6
Digital inputs (DI)		
41 ... 44	DI16 ... DI19	Freely programmable (isolated) 5.5 mA/24 V
40	DI COM3	Reference potential for digital inputs DI16 ... DI19
Digital inputs (DI) – Fail-safe (formed from two standard inputs using the appropriate parameter setting)		
5, 6	F-DI0	Fail-safe digital inputs, 2 channels (redundant), freely programmable (isolated) 5.5 mA / 24 V
7, 8	F-DI1	Fail-safe digital inputs, 2 channels (redundant), freely programmable (isolated) 5.5 mA / 24 V
16, 17	F-DI2	Fail-safe digital inputs, 2 channels (redundant), freely programmable (isolated) 5.5 mA / 24 V
69	DI COM1	Reference potential for digital inputs F-DI0, F-DI1, F-DI2

Terminal No.	Signal	Features
Switchable digital inputs or outputs (digital inputs DI24 to DI27can also be used as a pulse input with a maximum frequency of 32 kHz)		
51	DI24/DO24	Freely programmable (non-floating), DI: 5.5 mA/24 V, DO: 100 mA/24 V
53	DI25/DO25	Freely programmable (non-floating), DI: 5.5 mA/24 V, DO: 100 mA/24 V
53	DI26/DO26	Freely programmable (non-floating), DI: 5.5 mA/24 V, DO: 100 mA/24 V
54	DI27/DO27	Freely programmable (non-floating), DI: 5.5 mA/24 V, DO: 100 mA/24 V
50	GND	Reference potential
Digital outputs (DO) – Fail-safe		
18	DO0, NC	Relay output DO0 NC contact (0.5 A, 30 V DC)
19	DO0, NO	Relay output DO0 NO contact (0.5 A, 30 V DC)
20	DO0, COM	Relay output DO0 Common contact (0.5 A, 30 V DC)
21	DO1 NO	Transistor output DO1 Positive (0.5 A, 30 V DC)
22	DO1 COM	Transistor output DO1 Negative (0.5 A, 30 V DC)
23	DO2, NC	Relay output DO2 NC contact (0.5 A, 30 V DC)
24	DO2, NO	Relay output DO2 NO contact (0.5 A, 30 V DC)
25	DO2, COM	Relay output DO2 Common contact (0.5 A, 30 V DC)
Analog inputs (AI)		
3	AI0+	Differential input, switchable between current, voltage Value range: 0 ... 10 V, -10 ... +10 V, 0/2 ... 10 V, 0/4 ... 20 mA
4	AI0-	
10	AI1+	Differential input, switchable between current, voltage Value range: 0 ... 10 V, -10 ... +10 V, 0/2 ... 10 V, 0/4 ... 20 mA
11	AI1-	
13	GND	Reference potential of AI
Analog outputs (AO)		
12	AO0+	Non-isolated output Freely programmable Value range: 0 ... 10 V; 0/4 ... 20 mA
26	AO1+	Non-isolated output Freely programmable Value range: 0 ... 10 V; 0/4 ... 20 mA
27	GND	Reference potential of AO

Design

CU250S-2, CU250S-2 DP, CU250S-2 PN, CU250S-2 CAN Control Units (continued)

Terminal No.	Signal	Features
PTC/KTY interface		
14	T1 MOTOR	Positive input for motor temperature sensor Type: PTC, KTY, bimetal
15	T2 MOTOR	Negative input for motor temperature sensor
Power supply		
9	+24 V OUT	Power supply output 24 V DC, max. 200 mA
28	GND	Reference potential of the power supply/ internal electronics ground
1	+10 V OUT	Power supply output 10 V DC ±0.5 V, max. 10 mA
2	GND	Reference potential of the power supply/ internal electronics ground
31	+24 V IN	Power supply input 20.4 ... 28.8 V DC, max. 1500 mA
32	GND IN	Reference potential of the power supply input

Terminal No.	Signal	Features
HTL encoder/resolver interface via terminal		
33	ENC+	HTL encoder power supply
79	GND	Reference potential
70	AP/S2	HTL track A+ / resolver signal A (sin+)
71	AN/S4	HTL track A- / inverted resolver signal A (sin-)
72	BP/S1	HTL track B+ / resolver signal S1
73	BN/S3	HTL track B- / inverted resolver signal B (cos-)
74	ZP	HTL zero signal+
75	ZN	HTL zero signal-
76	R1	Resolver excitation+
77	R2	Resolver excitation-
DRIVE-CLiQ		
1	Transmit data +	
2	Transmit data -	
3	Receive data +	
4	–	
5	–	
6	Receive data -	
7	–	
8	–	
A	+24 V power supply	
B	M, reference for power supply	

HTL, TTL, SSI, temperature via SUB-D interface

Terminal No.	Signal	HTL	TTL	SSI (RS422 standard)	KTY84, PTC, bimetal
1	Motor temperature sensing +	–	–	–	Temp +
2	SSI clock	–	–	Clock +	–
3	Inverse SSI clock	–	–	Clock -	–
4	5 V/24 V encoder supply	P encoder	P encoder	P encoder	–
5	5 V/24 V encoder supply	P encoder	P encoder	P encoder	–
6	Sense input, encoder supply	–	P sense	–	–
7	0 V, reference for encoder supply	M encoder	M encoder	M encoder	–
8	Motor temperature sensing -	–	–	–	Temp-
9	0 V, reference for sense input	–	M sense	–	–
10	Referencing signal	R +	R +	–	–
11	Inverted referencing signal	R -	R -	–	–
12	Inverted incremental signal B	B -	B -	–	–
13	Incremental signal B	B +	B +	–	–
14	Inverted incremental signal A / SSI data	A -	A -	Data -	–
15	Incremental signal A / SSI data	A +	A +	Data +	–

Function

Basic positioner (EPos)

Overview

- Absolute and relative positioning
- Linear and rotary axis
- Motor encoder or direct measuring system
- 4 referencing modes
- 16 traversing blocks
- Direct setpoint input (MDI)
- Jog mode
- Backlash on reversal compensation
- Following error monitoring
- Cam signals

The positioning functions are only available in the CU250S-2 Control Unit and are functionally identical to the positioning functionality of SINAMICS S110. 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. Furthermore, they are characterized by their comprehensive monitoring functions.

Many applications can be carried out without external position controllers.

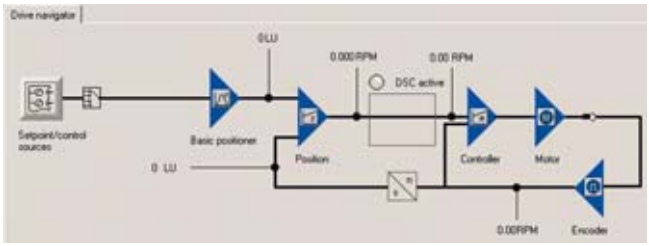
The EPos basic positioner is available as an additional function module that can be activated, and is used for the absolute/relative positioning of linear and rotary axes (modulo) with both rotary and linear motor encoders (indirect measuring system).

User-friendly configuring and commissioning including control panel (operation using PC) and diagnostics with the STARTER commissioning tool V4.3 and higher.

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 frames are available which, when selected, automatically establish the internal "connection" to the basic positioner.



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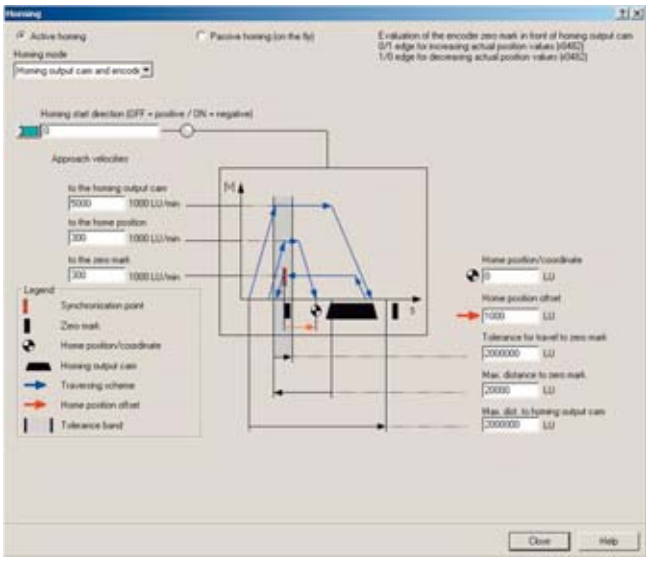
Function



Functionality of the EPos basic positioner

Lower-level closed-loop position control with the following essential components

- Actual position value processing (including the lower-level measuring input evaluation and reference mark search)
- Position controller (including limits, adaptation and precontrol calculation)
- Position control cycle 8 ms (speed control cycle 2 ms)
- Monitoring functions (standstill, positioning and dynamic following error monitoring, cam signals)

Mechanical system

- Backlash on reversal compensation

Limitations

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

Referencing or adjustment

- 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, referencing to "output cam and encoder zero mark" or only "encoder zero mark" or "external zero mark (BERO)")
- Flying referencing (seamless subordinate referencing is possible during "normal" traversing with the aid of measuring input evaluation, generally evaluation, e.g. of a proximity sensor). Subordinate function for the modes "jog", "direct setpoint input/MDI" and "traversing blocks")
- Absolute encoder alignment

Traversing blocks mode (16 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)

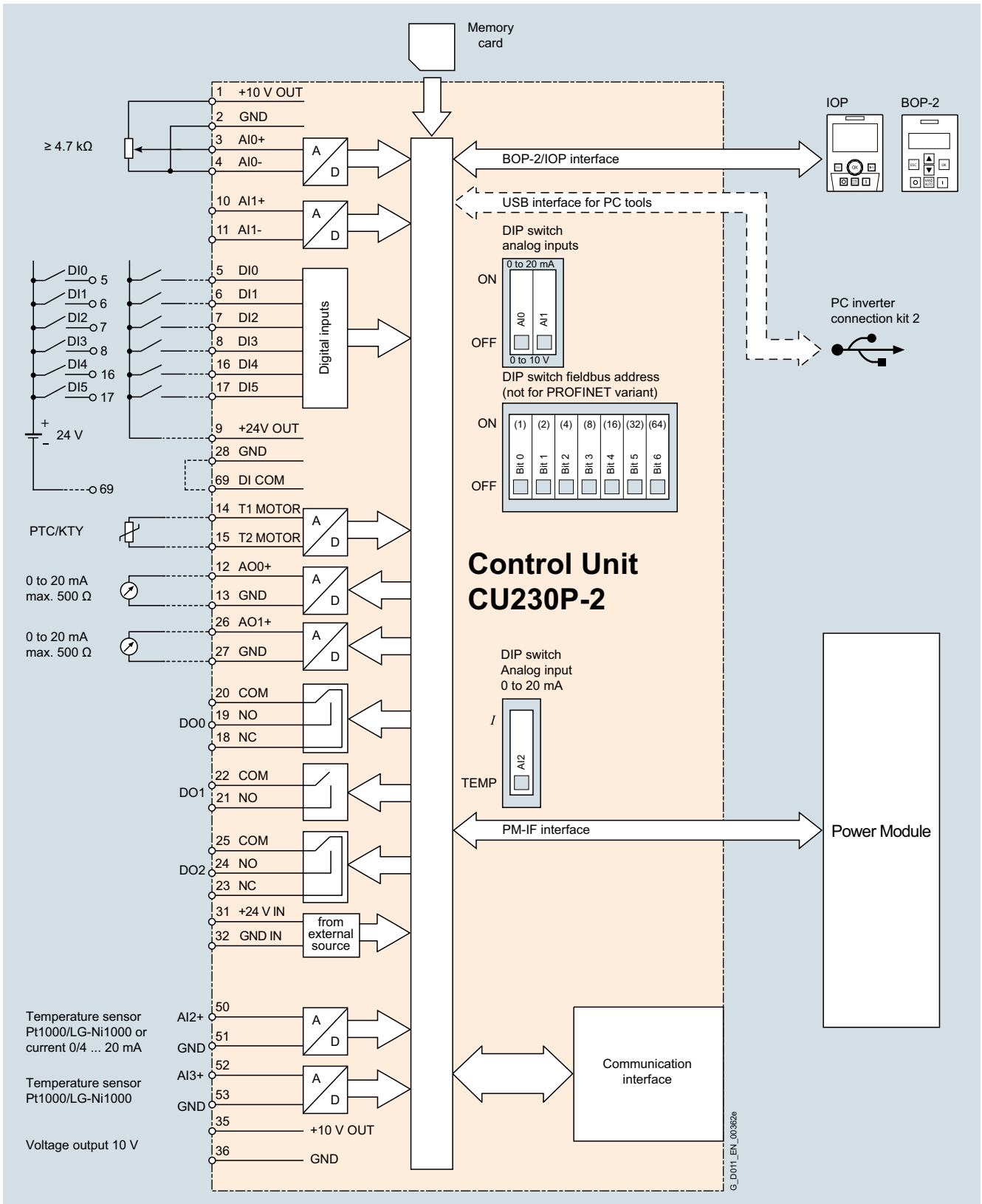
Direct setpoint input (MDI) mode

- 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 for on-the-fly changes between the setup and positioning modes.
- The direct setpoint specification operating mode (MDI) can also be used in the relative positioning or setup mode if the axis is not referenced. This means that on-the-fly synchronization and re-referencing can be carried out using "flying referencing".

Jog mode

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

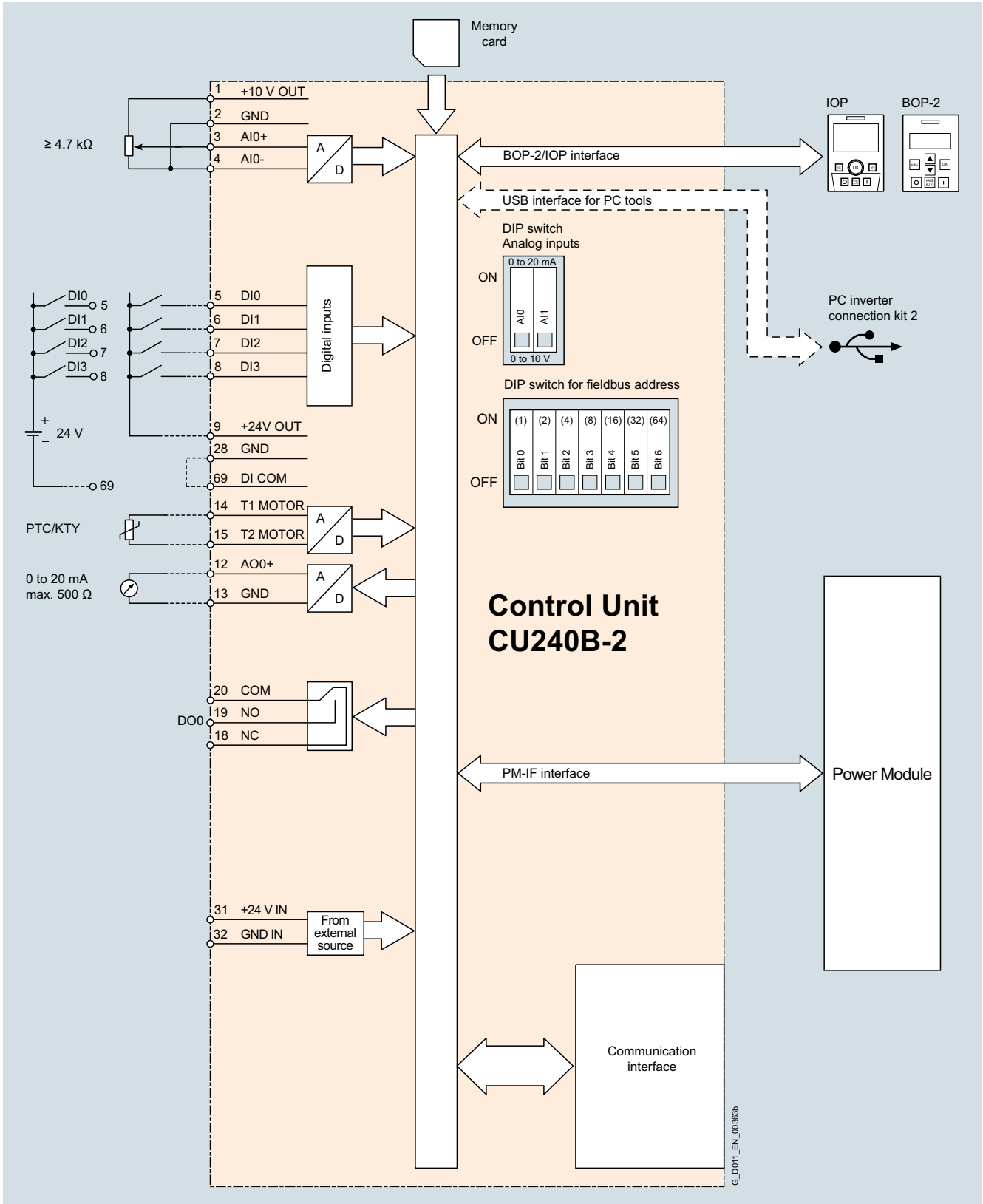
Integration



Connection diagram for the CU230P-2 Control Unit series

More information about the interfaces of the Control Unit is available on the Internet at
http://support.automation.siemens.com/WW/view/en/30563628/133300

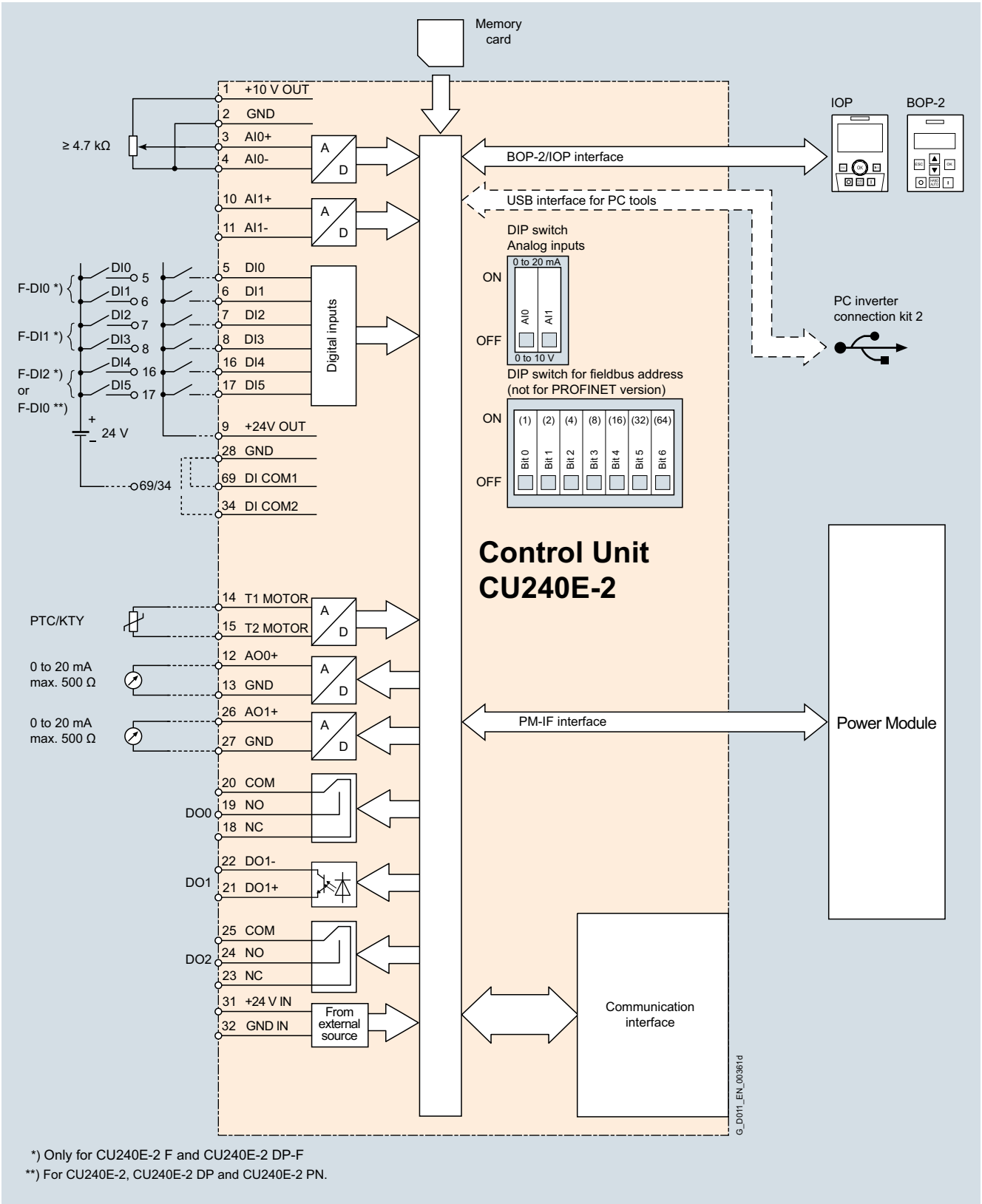
Integration



Connection diagram for the CU240B-2 Control Unit series

More information about the interfaces of the Control Unit is available on the Internet at
http://support.automation.siemens.com/WW/view/en/30563628/133300

Integration

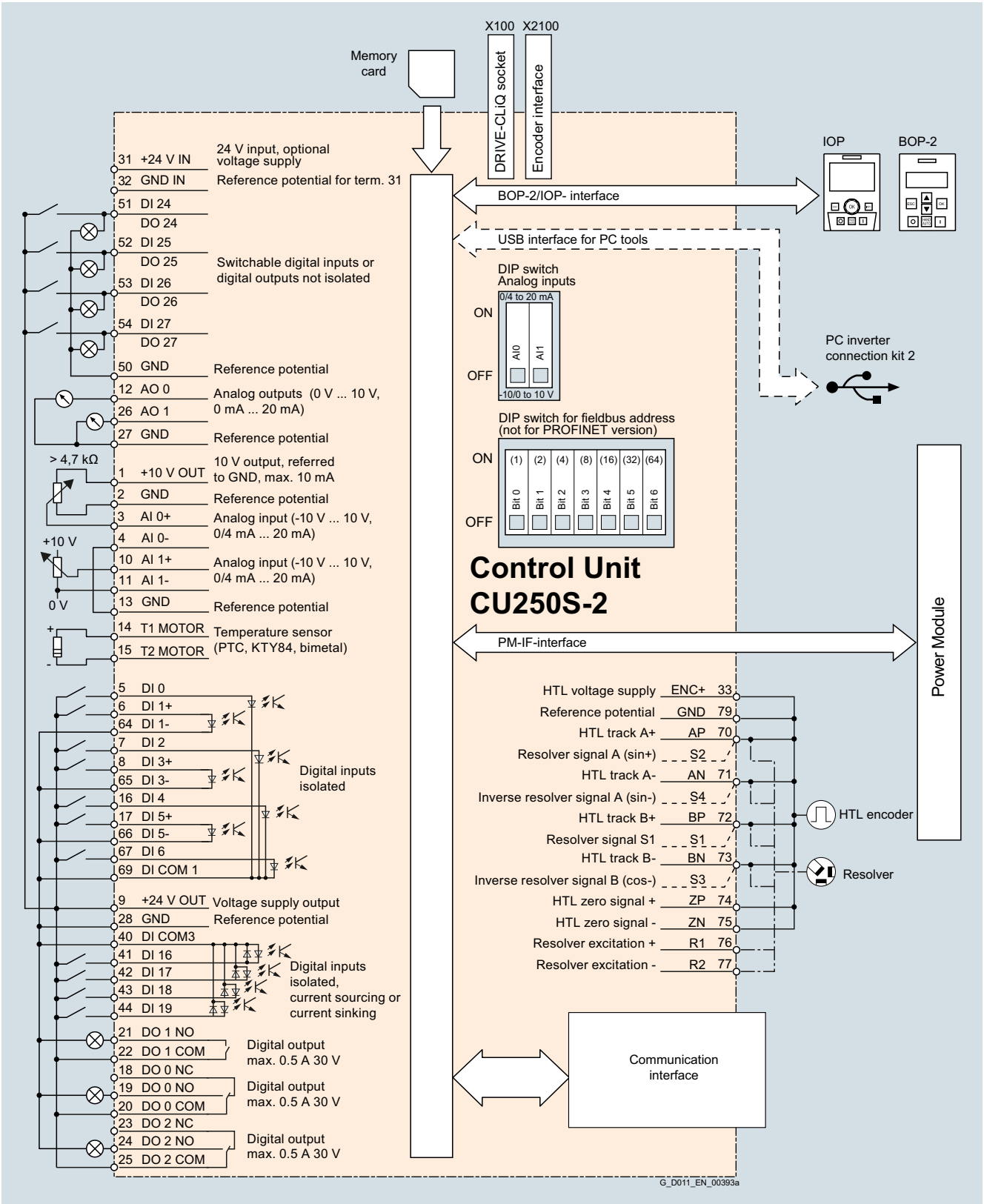


*) Only for CU240E-2 F and CU240E-2 DP-F
**) For CU240E-2, CU240E-2 DP and CU240E-2 PN.

Connection diagram for the CU240E-2 Control Unit series

More information about the interfaces of the Control Unit is available on the Internet at
http://support.automation.siemens.com/WW/view/en/30563628/133300

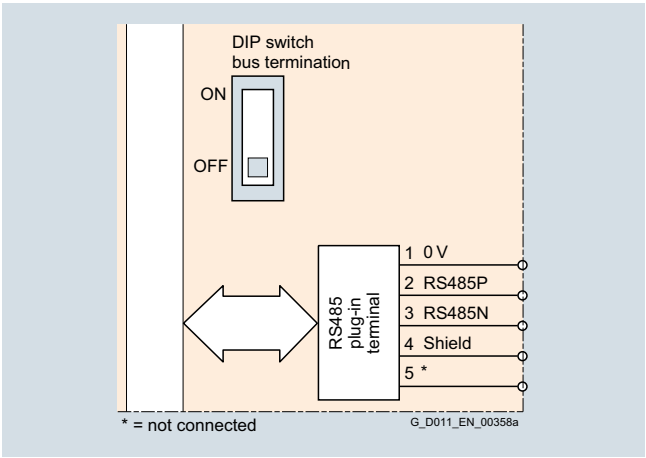
Integration



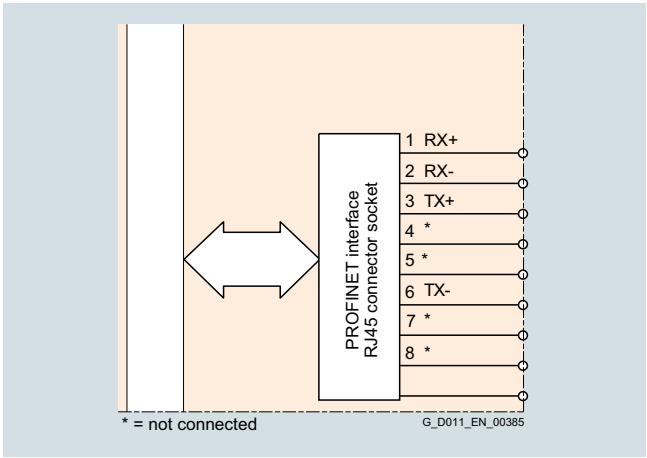
Connection diagram for the CU250S-2 Control Unit series

More information about the interfaces of the Control Unit is available on the Internet at
http://support.automation.siemens.com/WW/view/en/30563628/133300

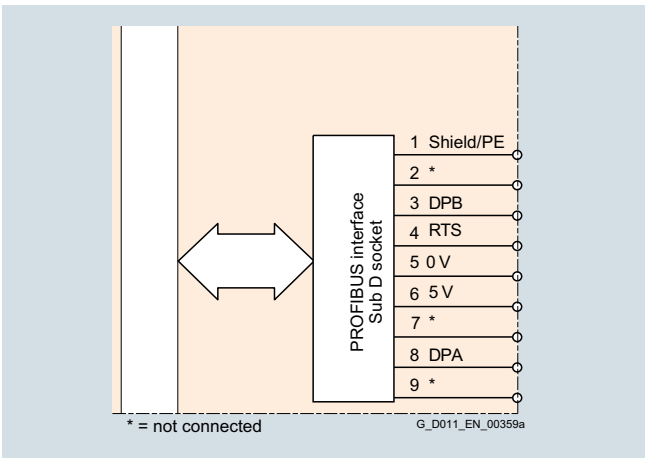
Integration



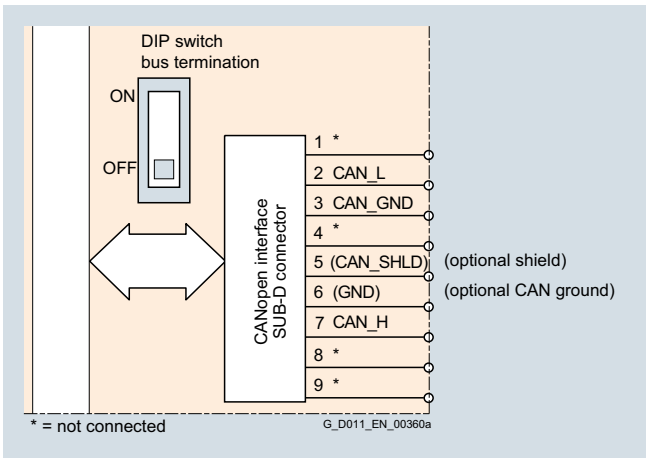
Communication interface USS, Modbus RTU, BACnet MS/TP, P1 protocol (BACnet MS/TP and P1 protocol only for CU230P-2 HVAC)



Communication interface PROFINET, EtherNet/IP



PROFIBUS DP communication interface



CANopen communication interface

Selection and ordering data

Designation	Fieldbus	Profile	Inputs Outputs	Integrated safety technology	Fail-safe digital inputs digital outputs		**Control Unit** Article No.
CU230P-2 series – the specialist for pumps, fans, compressors, water, buildings Technology functions (selection): Free blocks (FFB), 4 × PID controller, cascade connection, hibernation mode, essential service mode, multi-zone control							
CU230P-2 HVAC	• USS • Modbus RTU • BACnet MS/TP • P1 protocol	–	6 DI 4 AI 3 DO 2 AO	–	–	NEW	**6SL3243-0BB30-1HA3**
CU230P-2 DP	• PROFIBUS DP	• PROFIdrive				NEW	**6SL3243-0BB30-1PA3**
CU230P-2 PN	• PROFINET	• PROFIdrive • PROFIenergy				NEW	**6SL3243-0BB30-1FA0**
	• EtherNet/IP - ODVA AC drive - SINAMICS profile	–					
CU230P-2 CAN	• CANopen	–				NEW	**6SL3243-0BB30-1CA3**
CU240B-2 series – for basic applications with variable-speed drives – without encoder Technology functions (selection): Free function blocks (FFB), 1 × PID controller, motor holding brake							
CU240B-2	• USS • Modbus RTU	–	4 DI 1 AI 1 DO 1 AO	–	–		**6SL3244-0BB00-1BA1**
CU240B-2 DP	• PROFIBUS DP	• PROFIdrive					**6SL3244-0BB00-1PA1**
CU240E-2 series – for standard applications in general machinery construction, such as conveyor belts, mixers and extruders – without encoder Technology functions (selection): Free function blocks (FFB), 1 × PID controller, motor holding brake							
CU240E-2	• USS • Modbus RTU	–	6 DI 2 AI 3 DO 2 AO	STO	1 F-DI (opt. for each 2 DI)		**6SL3244-0BB12-1BA1**
CU240E-2 DP	• PROFIBUS DP	• PROFIdrive • PROFIsafe					**6SL3244-0BB12-1PA1**
CU240E-2 PN	• PROFINET	• PROFIdrive • PROFIsafe • PROFIenergy					**6SL3244-0BB12-1FA0**
	• EtherNet/IP - ODVA AC drive - SINAMICS profile	–					
CU240E-2 F	• USS • Modbus RTU	–		STO, SS1, SLS, SSM, SDI	3 F-DI (opt. for each 2 DI)		**6SL3244-0BB13-1BA1**
CU240E-2 DP-F	• PROFIBUS DP	• PROFIdrive • PROFIsafe					**6SL3244-0BB13-1PA1**
CU240E-2 PN-F	• PROFINET	• PROFIdrive • PROFIsafe • PROFIenergy					**6SL3244-0BB13-1FA0**
	• EtherNet/IP - ODVA AC drive - SINAMICS profile	–					
CU250S-2 series – for complex applications such as extruders and centrifuges – with and without encoder Technology functions (selection): Free function blocks (FFB), 1 × PID controller, motor holding brake							
CU250S-2	• USS • Modbus RTU	–	11 DI 2 AI 3 DO 2 AO 4 DI/DO (DI can be used as high-speed inputs)	STO, SBC, SS1	3 F-DI (opt. for each 2 DI) 1 F-DO (opt. for each 2 DO)	NEW	**6SL3246-0BA22-1BA0**
CU250S-2 DP	• PROFIBUS DP	• PROFIdrive • PROFIsafe				NEW	**6SL3246-0BA22-1PA0**
CU250S-2 PN	• PROFINET	• PROFIdrive • PROFIsafe • PROFIenergy				NEW	**6SL3246-0BA22-1FA0**
	• EtherNet/IP - ODVA AC drive - SINAMICS profile	–					
CU250S-2 CAN	• CANopen	–				NEW	**6SL3246-0BA22-1CA0**

Selection and ordering data

Optional memory card with firmware V4.7 for CU230P-2, CU240B-2, CU240E-2 and CU250S-2 Control Units

Designation	Suitable for		Article No.
SINAMICS SD card 512 MB + firmware V4.7 (Multicard V4.7)	CU230P-2 CU240B-2 CU240E-2 CU250S-2	NEW	**6SL3054-7EH00-2BA0**

Optional memory cards with licenses for CU250S-2 Control Units only

Designation		SINAMICS SD card 512 MB + licenses Article No.		SINAMICS SD card 512 MB + firmware V4.7 (Multicard V4.7) + licenses Article No.		Licenses (without SD card) for upgrading license of an existing SD card Article No.
License Extended Functions Basic positioner (EPos)	NEW	**6SL3054-4AG00-2AA0-Z E01**	NEW	**6SL3054-7EH00-2BA0-Z E01**	NEW	**6SL3074-7AA04-0AA0**
License Extended Functions Safety (SLS, SSM, SDI)	NEW	**6SL3054-4AG00-2AA0-Z F01**	NEW	**6SL3054-7EH00-2BA0-Z F01**	NEW	**6SL3074-0AA10-0AA0**
Licenses Extended Functions Basic positioner (EPos) + Safety (SLS, SSM, SDI)	NEW	**6SL3054-4AG00-2AA0-Z E01+F01**	NEW	**6SL3054-7EH00-2BA0-Z E01+F01**		**–**

For more information on firmware V4.7:

http://support.automation.siemens.com/WW/view/en/92554110

Optional memory cards with firmware V4.5 or V4.6 for existing installations when service is required

Designation	Suitable for		Article No.
SINAMICS SD card 512 MB + firmware V4.5 (Multicard V4.5)	CU240B-2 CU240E-2	NEW	**6SL3054-7EF00-2BA0**
SINAMICS SD card 512 MB + firmware V4.6 (Multicard V4.6)	CU230P-2 CU240B-2 CU240E-2 CU250S-2	NEW	**6SL3054-7EG00-2BA0**

For further information about firmware V4.5 (for CU240B-2 and CU240E-2 only):

http://support.automation.siemens.com/WW/view/en/72841234

For further information about firmware V4.6:

http://support.automation.siemens.com/WW/view/en/67385235

Technical specifications

Control Unit	CU230P-2 series 6SL3243-0BB30-1 . A3 6SL3243-0BB30-1FA0	CU240B-2 series 6SL3244-0BB00-1 . A1	CU240E-2 series 6SL3244-0BB1 . -1 . A1 6SL3244-0BB1 . -1FA0	CU250S-2 series 6SL3246-0BA22-1 . A0
Electrical specifications				
Operating voltage	24 V DC via the Power Module or by connecting to an external 20.4 ... 28.8 V DC power supply			
Current consumption, max.	0.5 A	0.5 A	0.5 A	2 A
Protective insulation	PELV according to EN 50178 Protective separation from the line supply using double/reinforced insulation			
Power loss, max.	5 W	5 W	5 W	12 W
Interfaces				
Digital inputs – Standard	6 floating inputs	4 floating inputs	6 floating inputs	11 floating inputs +4 switchable DI/DO, non-floating (DI can be used as high-speed inputs)
	Optically isolated, free reference potential (own potential group), max. input current 5.5 mA NPN/PNP logic can be selected using the wiring Switching level: 0 → 1: 11 V Switching level: 1 → 0: 5 V			
Digital inputs – Fail-safe	–	–	1 (use of 2 × DI standard) Max. 3 (use of 6 × DI standard) for CU240E-2 F, CU240E-2 PN-F and CU240E-2 DP-F	1 (use of 2 × DI standard) Max. 3 (use of 6 × DI standard)
Digital outputs	2 relay changeover contacts 250 V AC, 2 A (inductive load), 30 V DC, 5 A (ohmic load) The following applies to systems complying with UL: A maximum of 3 A, 30 V DC or 2 A, 250 V AC may be connected via terminals 18 / 20 (DO0 NC) and 23 / 25 (DO2 NC) 1 relay NO contact 30 V DC, 0.5 A (ohmic load)	1 relay changeover contact 30 V DC, 0.5 A (ohmic load)	1 transistor 30 V DC, 0.5 A (ohmic load) 2 relay changeover contacts 30 V DC, 0.5 A (ohmic load)	3 relay changeover contacts 30 V DC, 0.5 A (ohmic load)
Analog inputs – Standard	2 differential inputs	1 differential input	2 differential inputs	2 differential inputs
	Switchable using DIP switch between voltage and current: -10 ... +10 V, 0/4 ... 20 mA, 12-bit resolution (with CU250S-2: 13-bit resolution) The differential analog inputs can be configured as additional digital inputs. Switching thresholds: 0 → 1: Rated voltage 4 V 1 → 0: Rated voltage 1.6 V			
Analog inputs – switchable: Temperature sensor/current	1 non-isolated input, switchable using DIP switch between current 0/4 ... 20 mA and temperature sensor, type Pt1000/LG-Ni1000, 12-bit resolution	–	–	–
Analog inputs – temperature sensor	1 non-isolated input, temperature sensor, type Pt1000/LG-Ni1000, 12-bit resolution	–	–	–
Analog outputs	2 non-isolated outputs	1 non-isolated output	2 non-isolated outputs	2 non-isolated outputs
	Switchable between voltage and current using parameter setting: 0 ... 10 V, 0/4 ... 20 mA Voltage mode: 10 V, min. burden 10 kΩ Current mode: 20 mA, max. burden 500 Ω The analog outputs have short circuit protection			
PTC/KTY interface	1 motor temperature sensor input, sensors that can be connected PTC, KTY and bimetal, accuracy ±5 °C	1 motor temperature sensor input, sensors that can be connected PTC, KTY and bimetal, accuracy ±5 °C	1 motor temperature sensor input, sensors that can be connected PTC, KTY and bimetal, accuracy ±5 °C	2 motor temperature sensor inputs, sensors that can be connected PTC, KTY and bimetal, accuracy ±5 °C • 1 input via terminal 14/15 • 1 input via SUB-D encoder interface X2100
Removable terminal connector for I/O interface	–	✓	✓	✓

Technical specifications

Control Unit	CU230P-2 series 6SL3243-0BB30-1 . A3 6SL3243-0BB30-1FA0	CU240B-2 series 6SL3244-0BB00-1 . A1	CU240E-2 series 6SL3244-0BB1 . -1 . A1 6SL3244-0BB1 . -1FA0	CU250S-2 series 6SL3246-0BA22-1 . A0
Integrated bus interface				
USS, Modbus RTU RS485 connected at a terminal, isolated, bus terminating resistor can be switched in, slave address can be set using DIP switches USS: max. 187.5 kBaud Modbus RTU:19.2 kBaud	CU230P-2 HVAC 6SL3243-0BB30-1HA3	CU240B-2 6SL3244-0BB00-1BA1	CU240E-2 6SL3244-0BB12-1BA1 CU240E-2 F 6SL3244-0BB13-1BA1	CU250S-2 6SL3246-0BA22-1BA0
BACnet MS/TP, P1 protocol RS485 connected to a terminal, isolated, bus terminating resistor can be switched in Max. 187.5 kBaud	CU230P-2 HVAC 6SL3243-0BB30-1HA3	–	–	–
PROFIBUS DP - PROFIdrive profile 9-pin SUB-D socket, isolated, PROFIdrive profile V4.1, slave address can be set using DIP switches Max. 12 Mbit/s	CU230P-2 DP 6SL3243-0BB30-1PA3	CU240B-2 DP 6SL3244-0BB00-1PA1	CU240E-2 DP 6SL3244-0BB12-1PA1 incl. PROFIsafe CU240E-2 DP-F 6SL3244-0BB13-1PA1 incl. PROFIsafe	CU250S-2 DP 6SL3246-0BA22-1PA0 incl. PROFIsafe
PROFINET - PROFIdrive profile - PROFIenergy profile 2 × RJ45, PROFIdrive profile V4.1, device name can be stored on the device Max. 100 Mbit/s (full duplex)	CU230P-2 PN 6SL3243-0BB30-1FA0	–	CU240E-2 PN 6SL3244-0BB12-1FA0 incl. PROFIsafe CU240E-2 PN-F 6SL3244-0BB13-1FA0 incl. PROFIsafe	CU250S-2 PN 6SL3246-0BA22-1FA0 incl. PROFIsafe
EtherNet/IP - ODVA AC drive - SINAMICS profile	CU230P-2 PN 6SL3243-0BB30-1FA0	–	CU240E-2 PN 6SL3244-0BB12-1FA0 CU240E-2 PN-F 6SL3244-0BB13-1FA0	CU250S-2 PN 6SL3246-0BA22-1FA0
CANopen 9-pin SUB-D connector, isolated, slave address can be set using DIP switches, bus terminating resistor can be switched in Max. 1 Mbit/s	CU230P-2 CAN 6SL3243-0BB30-1CA3	–	–	CU250S-2 CAN 6SL3246-0BA22-1CA0
Tool interfaces				
Memory card	SINAMICS SD card			
Operator panels	• IOP supported connection options between Control Unit and IOP: Can be directly plugged on, door mounting or handheld • BOP-2 Supported connection options between Control Unit and BOP-2: can be directly plugged on or door-mounted			
PC interface	USB (connection via PC inverter connection kit 2)			
Open-loop/closed-loop control techniques				
V/f linear/square/parameterizable	✓			
V/f with flux current control (FCC)	✓			
V/f ECO; linear/square-law	✓			
Vector control, sensorless	✓			
Vector control, with sensor	–	–	–	✓
Torque control, sensorless	✓			
Torque control, with sensor	–	–	–	✓
Software functions				
Application macro	✓			
Setpoint input, can be parameterized	✓			
Fixed frequencies	16, parameterizable			
JOG	✓			
Digital motorized potentiometer (MOP)	✓			
Ramp smoothing	✓			
Extended ramp-function generator (with ramp smoothing OFF3)	✓			
Slip compensation	✓			

Technical specifications

Control Unit	CU230P-2 series 6SL3243-0BB30-1 . A3 6SL3243-0BB30-1FA0	CU240B-2 series 6SL3244-0BB00-1 . A1	CU240E-2 series 6SL3244-0BB1 . -1 . A1 6SL3244-0BB1 . -1FA0	CU250S-2 series 6SL3246-0BA22-1 . A0
Software functions (continued)				
Signal interconnection with BICO technology	✓			
Trace	✓			
Energy saving display	✓			
Switchable drive data sets (DDS)	✓ (4)			
Switchable command data sets (CDS)	✓ (4)			
Free function blocks (FFB) for logical and arithmetic operations	✓			
Technology controller (internal PID)	✓			
3 additional, free PID controllers	✓	–	–	–
2-zone controller	✓	–	–	–
Flying restart	✓			
Automatic restart after line supply failure or operating fault (AR)	✓			
Hibernation mode with internal/ external PID controller	✓	–	–	–
Belt monitoring with and without sensor (load torque monitoring)	✓	–	–	✓
Dry-running/overload protection monitoring (load torque monitoring)	✓	–	–	–
Thermal motor protection	✓ (I^2t, sensor: PTC/KTY/bimetal)			
Thermal inverter protection	✓			
Motor identification	✓			
Motor holding brake	–	✓	✓	✓
Auto-ramping (V_{dcmax} controller)	✓			
Kinetic buffering (V_{dcmin} controller)	✓			
Braking functions for PM230				
• DC braking	✓	✓	✓	–
• Compound braking	–			
• Dynamic braking	–			
Braking functions for PM240/ PM240-2				
• DC braking	✓			
• Compound braking	✓			
• Dynamic braking with integrated braking chopper and external braking resistor	✓			
Braking functions for PM250 Regenerative feedback	✓			
Mechanical specifications and ambient conditions				
Degree of protection	IP20			
Signal cable cross-section				
• Min.	0.15 mm^2 (AWG28)	0.2 mm^2 (AWG24)	0.2 mm^2 (AWG24)	0.2 mm^2 (AWG24)
• Max.	1.5 mm^2 (AWG16)	1.5 mm^2 (AWG16)	1.5 mm^2 (AWG16)	1.5 mm^2 (AWG16)
Operating temperature Derating of 3 K/1000 m (3281 ft) applies to Control Units as of an installation altitude of 1000 m (3281 ft) above sea level.	-10 ... 60 °C (14 ... 140 °F) For CU230P-2 PN: -10 ... 55 °C (14 ... 131 °F) With IOP/BOP-2: 0 ... 50 °C (32 ... 122 °F)	-10 ... 55 °C (14 ... 131 °F) With IOP/BOP-2: 0 ... 50 °C (32 ... 122 °F)	-10 ... 55 °C (14 ... 131 °F) For CU240E-2 PN and CU240E-2 PN-F: -10 ... 53 °C (14 ... 127.4 °F) With IOP/BOP-2: 0 ... 50 °C (32 ... 122 °F)	-10 ... 50 °C (14 ... 122 °F) With IOP/BOP-2: 0 ... 50 °C (32 ... 122 °F)
Storage temperature	-40 ... +70 °C (-40 ... +158 °F)			
Relative humidity	< 95 % RH, condensation not permissible			
Dimensions				
• Width	73 mm	73 mm	73 mm	73 mm
• Height	199 mm	199 mm	199 mm	199 mm
• Depth	65.5 mm	46 mm	46 mm	67 mm
Weight, approx.	0.61 kg	0.49 kg	0.49 kg	0.67 kg

Overview

PM230 Power Modules – 0.37 kW to 90 kW (0.5 to 125 hp), IP20 degree of protection

PM230 Power Modules, degree of protection IP20, standard variant, frame sizes FSA to FSF (with Control Unit and Operator Panel)

PM230 Power Modules, degree of protection IP20, push-through variant, frame sizes FSA to FSC (with Control Unit and operator panel)

PM230 Power Modules are designed for applications involving pumps, fans and compressors with a square characteristic. They do not have an integrated braking chopper (single-quadrant applications).

The PM230 Power Module only generates low line harmonics and apparent power losses. In addition to the energy-related advantages, environmental stressing is also reduced.

- Line harmonics are reduced significantly.
  - The limit values of EN 61000-3-2, EN 61000-3-4 and IEC 61000-3-12 are maintained for $R_{SCE} > 250$. R_{SCE} is the short-circuit power. $S_{k\_line}/S_{inverter}$ according to EN 61000-3-2, EN 61000-3-12 and EN 61000-3-4 and for three-phase devices is identical to RSC according to IEC 60146-1-1.
  - Additional components such as line reactors are not required and it is not permissible to use them. As a consequence, low envelope dimensions are obtained for space-saving designs.
- The active power component is very high, i.e. the devices consume less current from the supply for the same drive power. As a consequence, smaller supply cables can be used.

Frame sizes FSA to FSF of the PM230 Power Module in degree of protection IP20 standard variant are available with integrated line filter class A for installations according to Category C2 or without an integrated line filter.

Frame sizes FSA to FSC of the PM230 Power Module in degree of protection IP20 push-through variant are available with integrated line filter class A for installations according to Category C2 or without an integrated line filter.

In order to maintain EMC categories C2 (line filter A) or C1 table 14 (line filter B, conducted), the permissible shielded cable lengths between the inverter and motor are limited to max. 25 m (82 ft).

The permissible cable lengths between inverter and motor are limited. Longer cables can be used if output reactors are connected for PM230 (see section "Load-side power components").

The line system configurations that are supported are symmetrical systems with grounded neutral point.

The PM230 Power Modules don't support Control Units with Safety Integrated. External switchgears can implement safety functions.

PM230 Power Modules with integrated filter class A or class B, degree of protection IP55/UL Type 12, 0.37 kW to 90 kW (0.5 to 125 hp) are integral components
of the SINAMICS G120P for pumps, fans and compressors.
Detailed information can be found in Catalog D 35.

Note:

Shield plates and shield connection kits are available. These can be used in the wiring installation for the Control Units and Power Modules to ensure that it complies with EMC guidelines.
For further information, see Shield connection kits and Shield plates for Control Units and Power Modules in section Supplementary system components.

Overview

PM240-2 Power Modules – 0.55 kW to 15 kW (0.75 hp to 20 hp), degree of protection IP20

PM240-2 Power Modules, degree of protection IP20, standard variant, frame sizes FSA to FSC

PM240-2 Power Modules, degree of protection IP20, push-through variant, frame sizes FSA to FSC (with Control Unit and Operator Panel)

The new PM240-2 Power Modules are based on a new hardware platform. This permits an increase in power density as well as the application of innovative cooling concepts (push-through technology) with especially high requirements in terms of control cabinet cooling.

Furthermore, the PM240-2 Power Module is also suitable for use in safety-oriented applications. In conjunction with a fail-safe Control Unit, the drive can be transformed into a Safety Integrated Drive (see section "Control Units").

The PM240-2 Power Modules frame sizes FSA to FSC are available both with and without an integrated line filter class A of compact design for 200 V and 400 V line voltages.

The PM240-2 Power Modules with integrated line filter class A are suitable for connection to TN supply systems. Power Modules without integrated line filter can be connected to grounded TN/TT systems and non-grounded IT systems.

The permissible cable lengths between inverter and motor are limited. Longer cables can be used if output reactors are connected (see section "Load-side power components").

Push-through variant

The push-through variant allows the cooling fins of the Power Module to be pushed through the rear panel of the control cabinet. Push-through variants should be used in applications in which the amount of waste heat generated inside the control cabinet itself must be minimized.

Shield plates and shield connection kits are available. These can be used in the wiring installation for the Control Units and Power Modules to ensure that it complies with EMC guidelines. For further information, see Shield connection kits and shield plates for Control Units and Power Modules in section Supplementary system components.

Overview

PM240 Power Modules – 18.5 kW to 250 kW (25 hp to 400 hp), IP20 degree of protection

PM240 Power Modules, frame sizes FSD to FSF

PM240 Power Modules, frame size FSGX

PM240 Power Modules have a braking chopper (four-quadrant applications) and are suitable for a large number of applications in general machinery construction.

The braking chopper is already integrated in frame sizes FSD to FSF. For frame size FSGX, an optional pluggable Braking Module can be ordered (see section "DC link components").

The permissible cable lengths between inverter and motor are limited. Longer cables can be used if output reactors are connected (see section "Load-side power components").

Line reactors are available to minimize line harmonics as well as voltage and current peaks (see section "Line-side power components").

The PM240 Power Module is suitable for safety-oriented applications. In conjunction with a fail-safe Control Unit, the drive can be transformed into a Safety Integrated Drive (see section "Control Units").

PM240 Power Modules in frame size FSGX (i.e. 160 kW/250 hp and higher) are approved only for the Basic Safety functions (STO, SS1 and SBC).

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

Note:

Shield plates and shield connection kits are available. These can be used in the wiring installation for the Control Units and Power Modules to ensure that it complies with EMC guidelines. For further information, see Shield connection kits and shield plates for Control Units and Power Modules in section Supplementary system components.

Overview

PM250 Power Modules – 7.5 kW to 75 kW (10 hp to 100 hp), IP20 degree of protection

PM250 Power Modules, frame sizes FSC to FSF

PM250 Power Modules are suitable for many applications in general machinery construction. Any braking energy is directly fed back into the line supply (four quadrant applications – a braking chopper is not required).

The PM250 Power Module features an absolutely unique technology – Efficient Infeed Technology. This feature provides the ability to feed energy back into the supply system in the generator mode (electronic braking) so that the energy is not wasted in a braking resistor. This saves space in the control cabinet. The time-consuming process of dimensioning the braking resistor and the expense of the extra wiring are eliminated. Furthermore, heat losses in the control cabinet are reduced.

Additional information is provided in chapter Highlights, section Efficient Infeed Technology.

Further, the innovative circuit design reduces the line harmonics. There is no need to use an optional line reactor at the supply infeed. This saves space and costs for engineering and procurement.

The permissible cable lengths between inverter and motor are limited. Longer cables can be used if output reactors are connected (see section "Load-side power components").

Frame sizes FSD to FSF of the PM250 Power Modules are available both with as well as without integrated line filter class A.

For frame size FSC of the PM250 Power Module with an integrated line filter class A, an additional base filter of class B is available for achieving class B (see section "Line-side power components").

The PM250 Power Module is also designed for safety-oriented applications. In conjunction with a fail-safe Control Unit, the drive can be transformed into a Safety Integrated Drive (see section "Control Units").

The PM250 Power Modules with integrated line filter class A are suitable for connection to TN supply systems. Power Modules without integrated line filter can be connected to grounded TN/TT systems and non-grounded IT systems.

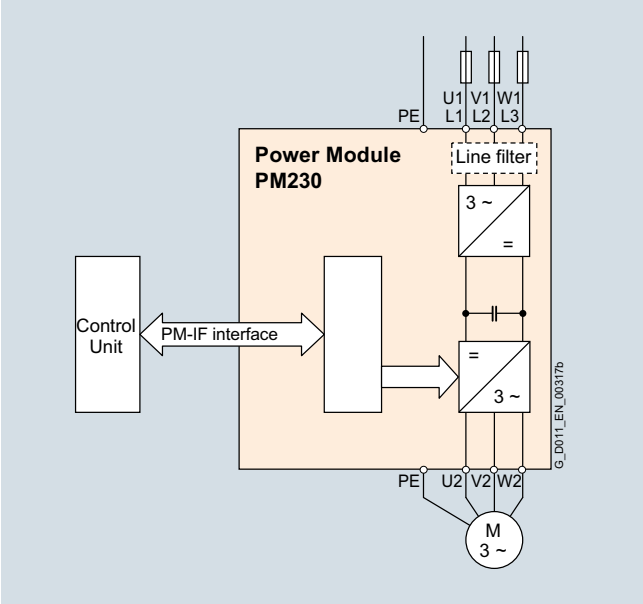
Note:

Shield plates and shield connection kits are available. These can be used in the wiring installation for the Control Units and Power Modules to ensure that it complies with EMC guidelines. For further information, see Shield connection kits and shield plates for Control Units and Power Modules in section Supplementary system components.

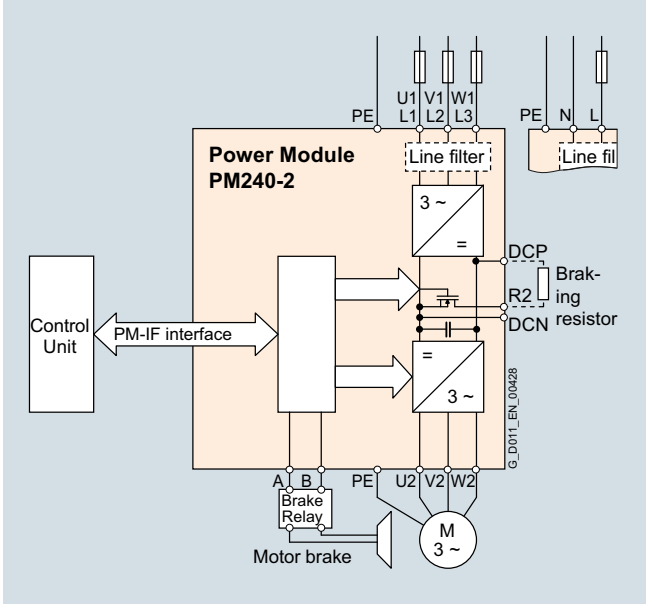
Integration

All Power Modules have the following connections and interfaces:

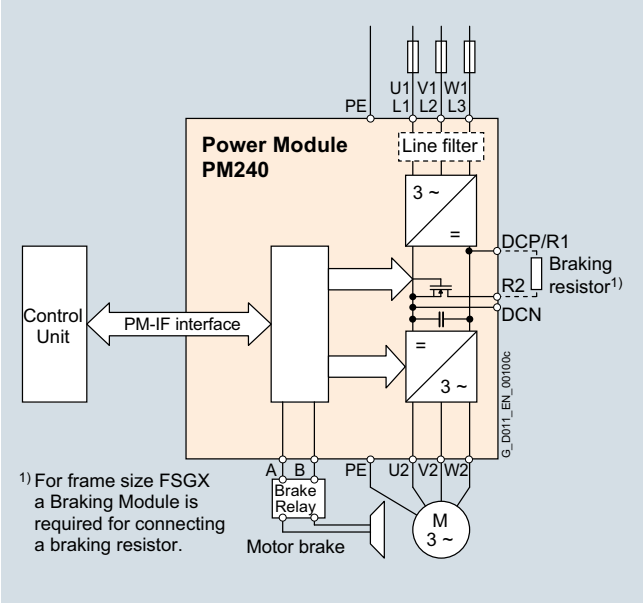
- PM-IF interface to connect the Power Module to the Control Unit. The Power Module also supplies power to the Control Unit using an integrated power supply
- Motor connection using screw terminals or screw studs
- 2 PE/protective conductor connections
- Shield connection plate



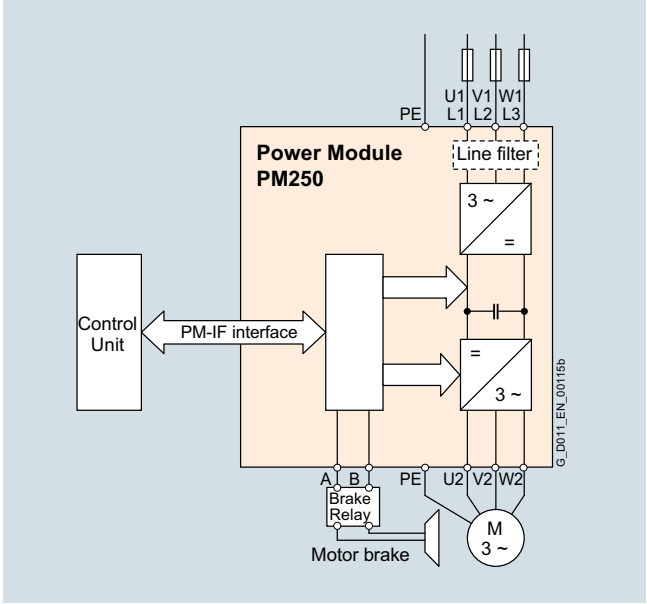
Connection diagram for PM230 Power Module with or without integrated line filter class A



Connection diagram for PM240 Power Module with or without integrated line filter class A



Connection diagram for PM240-2 Power Module with or without integrated line filter class A



Connection diagram for PM250 Power Module with or without integrated line filter class A

Integration

Power and DC link components that are optionally available depending on the Power Module used

The following line-side power components, DC link components and load-side power components are optionally available in the appropriate frames sizes for the Power Modules:

	Frame size						
	FSA	**FSB**	**FSC**	**FSD**	**FSE**	**FSF**	**FSGX**
PM230 Power Module (IP20)							
Available frame sizes	✓	✓	✓	✓	✓	✓	–
Line-side power components							
Line filter class A	F	F	F	F	F	F	–
Line filter class B	U [2]	U [2]	U [2]	S	S	S	–
Line reactor [1]	– [1]	– [1]	– [1]	– [1]	– [1]	– [1]	–
Load-side power components							
Output reactor	S	S	S	S	S	S	–
Sine-wave filter	–	–	–	S	S	S	–
PM240-2 Power Module with integrated braking chopper							
Available frame sizes	✓	✓	✓	–	–	–	–
Line-side power components							
Line filter class A	I	I	I	–	–	–	–
Line filter class B [3]	U [2] [3]	U [2] [3]	U [2] [3]	–	–	–	–
Line reactor (only for 3-AC devices)	S	S	S	–	–	–	–
DC link components							
Braking resistor [3]	S [3]	S [3]	S [3]	–	–	–	–
Braking Module	–	–	–	–	–	–	–
Load-side power components							
Output reactor	S	S	S	–	–	–	–
Sine-wave filter	–	–	–	–	–	–	–
PM240 Power Module with integrated braking chopper							**without integrated braking chopper**
Available frame sizes	–	–	–	✓	✓	✓	✓
Line-side power components							
Line filter class A	–	–	–	F	F	F/S [4]	S [4]
Line filter class B	–	–	–	–	–	–	–
Line reactor	–	–	–	U	U	S	S
DC link components							
Braking resistor	–	–	–	S	S	S	S
Braking Module	–	–	–	–	–	–	I (option)
Load-side power components							
Output reactor	–	–	–	S	S	S	S
Sine-wave filter	–	–	–	S	S	S	S
PM250 Power Module with line-commutated energy recovery							
Available frame sizes	–	–	✓	✓	✓	✓	–
Line-side power components							
Line filter class A	–	–	I	F	F	F	–
Line filter class B	–	–	U	–	–	–	–
Line reactor [1]	–	–	– [1]	– [1]	– [1]	– [1]	–
DC link components							
Braking resistor [5]	–	–	– [5]	– [5]	– [5]	– [5]	–
Load-side power components							
Output reactor	–	–	U	S	S	S	–
Sine-wave filter	–	–	U	S	S	S	–

U = Base component
S = Lateral mounting
I = Integrated
F = Power Modules available with and without integrated class A filter
– = Not possible

[1] A line reactor is not required and must not be used in conjunction with a PM230 or PM250 Power Module.

[2] Lateral mounting is the only possible option for Push Through variants.

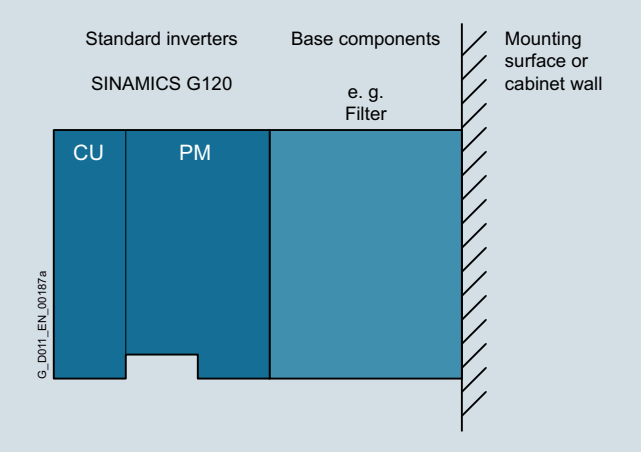
[3] Line filter class B or braking resistor for PM240-2 400 V variants only.

[4] PM240 Power Modules in frame size FSF from 110 kW and higher and frame size FSGX are available only without an integrated filter class A. An optional line filter class A for lateral mounting is available instead.

[5] A PM250 Power Module is capable of line-commutated energy feedback. A braking resistor cannot be connected and is not necessary.

Integration

General design information



Inverter comprising a Power Module (PM) and a Control Unit (CU) and base components (side view)

- If at all possible, the line filter should be mounted directly below the inverter [1].
- With lateral mounting, the line-side components have to be mounted on the left side of the inverter, and the load-side components on the right side.
- Braking resistors have to be mounted directly on the control cabinet wall due to heating issues.

Recommended installation combinations of the inverter and optional power and DC link components

Power Module Frame size	Base	Lateral mounting **Left of the inverter (for line-side power components)**	**Right of the inverter (for load-side power components and DC link components)**
FSA and FSB	Line filter	Line reactor	Output reactor and/or braking resistor
FSC	Line filter [1]	Line reactor	Output reactor and/or braking resistor
FSD and FSE	Line reactor	Line filter	Output reactor or sine-wave filter and/or braking resistor
FSF	–	Line filter and/or line reactor	Output reactor or sine-wave filter and/or braking resistor
FSGX	–	Line filter and/or line reactor	Output reactor or sine-wave filter and/or braking resistor

[1] With the PM250 Power Module, frame size FSC, the output reactor and sine-wave filter cannot be installed as base components. The output reactor or sine-wave filter should be mounted under the line filter.

Integration

Maximum permissible cable lengths from the motor to the inverter when using output reactors or filters depending on the voltage range and the Power Module being used

The following load-side power components in the appropriate frame sizes are optionally available for the Power Modules and result in the following maximum cable lengths:

	Maximum permissible motor cable lengths (shielded/unshielded) in m (ft)						
Frame size	**FSA**	**FSB**	**FSC**	**FSD**	**FSE**	**FSF**	**FSGX**
PM230 Power Module degree of protection IP20							
Available frame sizes	✓	✓	✓	✓	✓	✓	–
Without output reactor/ sine-wave filter	25/100 (82/328)	25/100 (82/328)	25/100 (82/328)	25/100 (82/328)	25/100 (82/328)	25/100 (82/328)	–
With optional output reactor							
• At 380 ... 415 V 3 AC	150/225 (492/738)	150/225 (492/738)	150/225 (492/738)	–	–	–	–
• At 440 ... 480 V 3 AC	100/150 (328/492)	100/150 (328/492)	100/150 (328/492)	–	–	–	–
• At 380 -10 % ... 400 V 3 AC	–	–	–	200/300 (656/984)	200/300 (656/984)	200/300 (656/984)	–
• At 401 ... 480 V 3 AC +10 %	–	–	–	200/300 (656/984)	200/300 (656/984)	200/300 (656/984)	–
With optional sine-wave filter							
• At 380 -10 % ... 400 V 3 AC	–	–	–	200/300 (656/984)	200/300 (656/984)	200/300 (656/984)	–
• At 401 ... 480 V 3 AC +10 %	–	–	–	200/300 (656/984)	200/300 (656/984)	200/300 (656/984)	–
With integrated line filter class A (EMC category C3)							
• At 380 ... 415 V 3 AC	50/– (164/–)	50/– (164/–)	50/– (164/–)	50/– (164/–)	50/– (164/–)	50/– (164/–)	–
• At 440 ... 480 V 3 AC	50/– (164/–)	50/– (164/–)	50/– (164/–)	50/– (164/–)	50/– (164/–)	50/– (164/–)	–
With optional external line filter class B (EMC category C1 [1]), with unfiltered Power Module, maintains the limit values acc. to EN 61800-3)							
• At 380 ... 415 V 3 AC	50/– (164/–)	50/– (164/–)	50/– (164/–)	50/– (164/–)	50/– (164/–)	50/– (164/–)	–
• At 440 ... 480 V 3 AC	50/– (164/–)	50/– (164/–)	50/– (164/–)	50/– (164/–)	50/– (164/–)	50/– (164/–)	–
With optional external line filter class B and output reactor (EMC category C2 [1]), with unfiltered Power Module, maintains the limit values acc. to EN 61800-3)							
• At 380 ... 415 V 3 AC	150/– (492/–)	150/– (492/–)	150/– (492/–)	–	–	–	–
• At 440 ... 480 V 3 AC	100/– (328/–)	100/– (328/–)	100/– (328/–)	–	–	–	–
PM240-2 Power Module with integrated braking chopper							
Available frame sizes	✓	✓	✓	–	–	–	–
Without output reactor/ sine-wave filter	50/100 (164/328)	50/100 (164/328)	50/100 (164/328)	–	–	–	–
With optional output reactor							
• At 200 -10 % ... 240 V 1 AC/3 AC	150/225 (492/738)	150/225 (492/738)	150/225 (492/738)	–	–	–	–
• At 380 ... 415 V 3 AC	150/225 (492/738)	150/225 (492/738)	150/225 (492/738)	–	–	–	–
• At 440 ... 480 V 3 AC	100/150 (328/492)	100/150 (328/492)	100/150 (328/492)	–	–	–	–
With optional sine-wave filter							
• At 380 -10 % ... 400 V 3 AC	–	–	–	–	–	–	–
• At 401 ... 480 V 3 AC +10 %	–	–	–	–	–	–	–
With integrated line filter class A (EMC category C2)							
• At 200 -10 % ... 240 V 1 AC/3 AC	50/– (164/–)	50/– (164/–)	50/– (164/–)	–	–	–	–
• At 380 ... 415 V 3 AC	50/– (164/–)	50/– (164/–)	50/– (164/–)	–	–	–	–
• At 440 ... 480 V 3 AC	50/– (164/–)	50/– (164/–)	50/– (164/–)	–	–	–	–

[1] Additional information is available on the Internet at www.siemens.com/sinamics-g120/documentation

Integration

Frame size	Maximum permissible motor cable lengths (shielded/unshielded) in m **FSA**	**FSB**	**FSC**	**FSD**	**FSE**	**FSF**	**FSGX**
PM240-2 Power Module with integrated braking chopper (continued)							
With optional external line filter class B (EMC category C1 [1]), with unfiltered Power Module, maintains the limit values acc. to EN 61800-3)							
• At 380 ... 415 V 3 AC	50/– (164/–)	50/– (164/–)	50/– (164/–)	–	–	–	–
• At 440 ... 480 V 3 AC	50/– (164/–)	50/– (164/–)	50/– (164/–)	–	–	–	–
With optional external line filter class B and output reactor (EMC category C2 [1]), with unfiltered Power Module, maintains the limit values acc. to EN 61800-3)							
• At 380 ... 415 V 3 AC	150/– (492/–)	150/– (492/–)	150/– (492/–)	–	–	–	–
• At 440 ... 480 V 3 AC	100/– (328/–)	100/– (328/–)	100/– (328/–)	–	–	–	–
PM240 Power Module with integrated braking chopper							**Without integrated braking chopper**
Available frame sizes	–	–	–	✓	✓	✓	✓
Without output reactor/ sine-wave filter	–	–	–	50/100 (164/328)	50/100 (164/328)	50/100 (164/328)	200/300 (656/984)
With optional output reactor							
• At 380 -10 % ... 400 V 3 AC	–	–	–	200/300 (656/984)	200/300 (656/984)	200/300 (656/984)	300/450 (984/1476)
• At 401 ... 480 V 3 AC +10 %	–	–	–	200/300 (656/984)	200/300 (656/984)	200/300 (656/984)	300/450 (984/1476)
With optional sine-wave filter							
• At 380 -10 % ... 400 V 3 AC	–	–	–	200/300 (656/984)	200/300 (656/984)	200/300 (656/984)	300/450 (984/1476)
• At 401 ... 480 V 3 AC +10 %	–	–	–	200/300 (656/984)	200/300 (656/984)	200/300 (656/984)	300/450 (984/1476)
PM250 Power Module with line-commutated energy recovery							
Available frame sizes	–	–	✓	✓	✓	✓	–
Without output reactor/ sine-wave filter	–	–	50/100 (164/328)	50/100 (164/328)	50/100 (164/328)	50/100 (164/328)	–
With optional output reactor							
• At 380 -10 % ... 400 V 3 AC	–	–	150/225 (492/738)	200/300 (656/984)	200/300 (656/984)	200/300 (656/984)	–
• At 401 ... 480 V 3 AC +10 %	–	–	100/150 (328/492)	200/300 (656/984)	200/300 (656/984)	200/300 (656/984)	–
With optional sine-wave filter							
• At 380 -10 % ... 400 V 3 AC	–	–	200/300 (656/984)	200/300 (656/984)	200/300 (656/984)	200/300 (656/984)	–
• At 401 ... 480 V 3 AC +10 %	–	–	200/300 (656/984)	200/300 (656/984)	200/300 (656/984)	200/300 (656/984)	–

Derating data

The following inverter output currents can still be achieved with long motor cables without output reactor and sine-wave filter.

Derating for PM240 Power Modules, frame sizes FSD to FSF, for shielded motor cables. Tested were carried out only on the particular main Power Module types. The values also apply to the other Power Modules of the particular frame size.

Rated power [1]		Frame size	Rated output current I_{rated} [2]	Base-load current I_H	Motor connection cross-section	**Current derating of the output current as a % of the base-load current for the cable lengths (MOTION-CONNECT)**			
kW	hp		A	A	mm^2	50 m	100 m	150 m	200 m
30	40	FSD	60	45	35	100 %	95 %	90 %	85 %
45	60	FSE	90	75	35	100 %	100 %	95 %	90 %
90	125	FSF	178	145	95	100 %	100 %	100 %	95 %

– Not possible

[1] Additional information is available on the Internet at www.siemens.com/sinamics-g120/documentation

[2] Rated power based on the rated output current I_{rated}. The rated output current I_{rated} is based on the duty cycle for low overload (LO).

[3] The rated output current I_{rated} is based on the duty cycle for low overload (LO). These current values are valid for 400 V and are specified on the rating plate of the Power Module.

Selection and ordering data

To ensure that a suitable Power Module is selected, the following currents should be used for applications:

- Rated output current for applications with low overload (LO)
- Base-load current for applications with high overload (HO)

With reference to the rated output current, the modules support at least 2-pole to 6-pole low-voltage motors, e.g. the SIMOTICS 1LE1 motor series. The rated power is merely a guide value. For a description of the overload performance, please refer to the general technical specifications of the Power Modules.

PM230 Power Modules degree of protection IP20 standard variant

Rated power [1]		Rated output current I_{rated} [2]	Power based on the base-load current [3]		Base-load current I_H [3]	Frame size	PM230 Power Module degree of protection IP20 standard variant without integrated line filter	PM230 Power Module degree of protection IP20 standard variant with integrated line filter class A
kW	hp	A	kW	hp	A		Article No.	Article No.
380 ... 480 V 3 AC								
0.37	0.5	1.3	**0.25**	0.33	0.9	FSA	NEW **6SL3210-1NE11-3UL1**	NEW **6SL3210-1NE11-3AL1**
0.55	0.75	1.7	**0.37**	0.5	1.3	FSA	NEW **6SL3210-1NE11-7UL1**	NEW **6SL3210-1NE11-7AL1**
0.75	1	2.2	**0.55**	0.75	1.7	FSA	NEW **6SL3210-1NE12-2UL1**	NEW **6SL3210-1NE12-2AL1**
1.1	1.5	3.1	**0.75**	1	2.2	FSA	NEW **6SL3210-1NE13-1UL1**	NEW **6SL3210-1NE13-1AL1**
1.5	2	4.1	**1.1**	1.5	3.1	FSA	NEW **6SL3210-1NE14-1UL1**	NEW **6SL3210-1NE14-1AL1**
2.2	3	5.9	**1.5**	2	4.1	FSA	NEW **6SL3210-1NE15-8UL1**	NEW **6SL3210-1NE15-8AL1**
3	4	7.7	**2.2**	3	5.9	FSA	NEW **6SL3210-1NE17-7UL1**	NEW **6SL3210-1NE17-7AL1**
4	5	10.2	**3**	4	7.7	FSB	NEW **6SL3210-1NE21-0UL1**	NEW **6SL3210-1NE21-0AL1**
5.5	7.5	13.2	**4**	5	10.2	FSB	NEW **6SL3210-1NE21-3UL1**	NEW **6SL3210-1NE21-3AL1**
7.5	10	18	**5.5**	7.5	13.2	FSB	NEW **6SL3210-1NE21-8UL1**	NEW **6SL3210-1NE21-8AL1**
11	15	26	**7.5**	10	18	FSC	NEW **6SL3210-1NE22-6UL1**	NEW **6SL3210-1NE22-6AL1**
15	20	32	**11**	15	26	FSC	NEW **6SL3210-1NE23-2UL1**	NEW **6SL3210-1NE23-2AL1**
18.5	25	38	**15**	20	32	FSC	NEW **6SL3210-1NE23-8UL1**	NEW **6SL3210-1NE23-8AL1**
22	30	45	**18.5**	25	38	FSD	**6SL3210-1NE24-5UL0**	**6SL3210-1NE24-5AL0**
30	40	60	**22**	30	45	FSD	**6SL3210-1NE26-0UL0**	**6SL3210-1NE26-0AL0**
37	50	75	**30**	40	60	FSE	**6SL3210-1NE27-5UL0**	**6SL3210-1NE27-5AL0**
45	60	90	**37**	50	75	FSE	**6SL3210-1NE28-8UL0**	**6SL3210-1NE28-8AL0**
55	75	110	**45**	60	90	FSF	**6SL3210-1NE31-1UL0**	**6SL3210-1NE31-1AL0**
75	100	145	**55**	75	110	FSF	**6SL3210-1NE31-5UL0**	**6SL3210-1NE31-5AL0**

PM230 Power Modules degree of protection IP20 push-through variant

Rated power [1]		Rated output current I_{rated} [2]	Power based on the base-load current [3]		Base-load current I_H [3]	Frame size	PM230 Power Module degree of protection IP20 push-through variant without integrated line filter	PM230 Power Module degree of protection IP20 push-through variant with integrated line filter class A
kW	hp	A	kW	hp	A		Article No.	Article No.
380 ... 480 V 3 AC								
3	4	7.7	**2.2**	3	5.9	FSA	NEW **6SL3211-1NE17-7UL1**	NEW **6SL3211-1NE17-7AL1**
7.5	10	18	**5.5**	7.5	13.2	FSB	NEW **6SL3211-1NE21-8UL1**	NEW **6SL3211-1NE21-8AL1**
18.5	25	38	**15**	20	32	FSC	NEW **6SL3211-1NE23-8UL1**	NEW **6SL3211-1NE23-8AL1**

Note:

PM230 Power Modules with integrated filter class A or class B, degree of protection IP55/UL Type 12, 0.37 kW to 90 kW (0.5 to 125 hp) are integral components of the SINAMICS G120P for pumps, fans and compressors. Detailed information can be found in Catalog D 35.

[1] Rated power based on the rated output current I_{rated}. The rated output current I_{rated} is based on the duty cycle for low overload (LO).

[2] The rated output current I_{rated} is based on the duty cycle for low overload (LO). These current values are valid for 400 V and are specified on the rating plate of the Power Module.

[3] The base-load current I_H is based on the duty cycle for high overload (HO).

Selection and ordering data

PM240-2 Power Modules standard variant

Rated power [1]		Rated output current I_{rated} [2]	Power based on the base-load current [3]		Base-load current I_H [3]	Frame size		PM240-2 Power Module standard variant **without** integrated line filter		PM240-2 Power Module standard variant **with** integrated line filter class A
kW	hp	A	kW	hp	A			Article No.		Article No.
200 ... 240 V 1 AC/3 AC										
0.55	0.75	3.2	**0.37**	0.5	2.3	FSA	NEW	**6SL3210-1PB13-0UL0**	NEW	**6SL3210-1PB13-0AL0**
0.75	1	4.2	**0.55**	0.75	3.2	FSA	NEW	**6SL3210-1PB13-8UL0**	NEW	**6SL3210-1PB13-8AL0**
1.1	1.5	6	**0.75**	1	4.2	FSB	NEW	**6SL3210-1PB15-5UL0**	NEW	**6SL3210-1PB15-5AL0**
1.5	2	7.4	**1.1**	1.5	6	FSB	NEW	**6SL3210-1PB17-4UL0**	NEW	**6SL3210-1PB17-4AL0**
2.2	3	10.4	**1.5**	2	7.4	FSB	NEW	**6SL3210-1PB21-0UL0**	NEW	**6SL3210-1PB21-0AL0**
3	4	13.6	**2.2**	3	10.4	FSC	NEW	**6SL3210-1PB21-4UL0**	NEW	**6SL3210-1PB21-4AL0**
4	5	17.5	**3**	4	13.6	FSC	NEW	**6SL3210-1PB21-8UL0**	NEW	**6SL3210-1PB21-8AL0**
200 ... 240 V 3 AC										
5.5	7.5	22	**4**	5	17.5	FSC	NEW	**6SL3210-1PC22-2UL0**	NEW	**6SL3210-1PC22-2AL0**
7.5	10	28	**5.5**	7.5	22	FSC	NEW	**6SL3210-1PC22-8UL0**	NEW	**6SL3210-1PC22-8AL0**
380 ... 480 V 3 AC [4]										
0.55	0.75	1.7	**0.37**	0.5	1.3	FSA	NEW	**6SL3210-1PE11-8UL1**	NEW	**6SL3210-1PE11-8AL1**
0.75	1	2.2	**0.55**	0.75	1.7	FSA	NEW	**6SL3210-1PE12-3UL1**	NEW	**6SL3210-1PE12-3AL1**
1.1	1.5	3.1	**0.75**	1	2.2	FSA	NEW	**6SL3210-1PE13-2UL1**	NEW	**6SL3210-1PE13-2AL1**
1.5	2	4.1	**1.1**	1.5	3.1	FSA	NEW	**6SL3210-1PE14-3UL1**	NEW	**6SL3210-1PE14-3AL1**
2.2	3	5.9	**1.5**	2	4.1	FSA	NEW	**6SL3210-1PE16-1UL1**	NEW	**6SL3210-1PE16-1AL1**
3	4	7.7	**2.2**	3	5.9	FSA	NEW	**6SL3210-1PE18-0UL1**	NEW	**6SL3210-1PE18-0AL1**
4	5	10.2	**3**	4	7.7	FSB	NEW	**6SL3210-1PE21-1UL0**	NEW	**6SL3210-1PE21-1AL0**
5.5	7.5	13.2	**4**	5	10.2	FSB	NEW	**6SL3210-1PE21-4UL0**	NEW	**6SL3210-1PE21-4AL0**
7.5	10	18	**5.5**	7.5	13.2	FSB	NEW	**6SL3210-1PE21-8UL0**	NEW	**6SL3210-1PE21-8AL0**
11	15	26	**7.5**	10	18	FSC	NEW	**6SL3210-1PE22-7UL0**	NEW	**6SL3210-1PE22-7AL0**
15	20	32	**11**	15	26	FSC	NEW	**6SL3210-1PE23-3UL0**	NEW	**6SL3210-1PE23-3AL0**

PM240-2 Power Modules push-through variant

Rated power [1]		Rated output current I_{rated} [2]	Power based on the base-load current [3]		Base-load current I_H [3]	Frame size		PM240-2 Power Module push-through variant **without** integrated line filter		PM240-2 Power Module push-through variant **with** integrated line filter class A
kW	hp	A	kW	hp	A			Article No.		Article No.
200 ... 240 V 1 AC/3 AC										
0.75	1	4.2	**0.55**	0.75	3.2	FSA	NEW	**6SL3211-1PB13-8UL0**	NEW	**6SL3211-1PB13-8AL0**
2.2	3	10.4	**1.5**	2	7.4	FSB	NEW	**6SL3211-1PB21-0UL0**	NEW	**6SL3211-1PB21-0AL0**
4	5	17.5	**3**	4	13.6	FSC	NEW	**6SL3211-1PB21-8UL0**	NEW	**6SL3211-1PB21-8AL0**
380 ... 480 V 3 AC										
3	4	7.7	**2.2**	7.5	5.9	FSA	NEW	**6SL3211-1PE18-0UL1**	NEW	**6SL3211-1PE18-0AL1**
7.5	10	18	**5.5**	7.5	13.2	FSB	NEW	**6SL3211-1PE21-8UL0**	NEW	**6SL3211-1PE21-8AL0**
15	20	32	**11**	15	26	FSC	NEW	**6SL3211-1PE23-3UL0**	NEW	**6SL3211-1PE23-3AL0**

[1] Rated power based on the rated output current I_{rated}. The rated output current I_{rated} is based on the duty cycle for low overload (LO).

[2] The rated output current I_{rated} is based on the duty cycle for low overload (LO). These current values are valid for 200 V or 400 V and are specified on the rating plate of the Power Module.

[3] The base-load current I_H is based on the duty cycle for high overload (HO).

[4] SIPLUS components for extreme requirements will be available soon. Additional information is available on the Internet at www.siemens.com/siplus-drives

Selection and ordering data

PM240 Power Modules

Rated power [1]		Rated output current I_{rated} [2]	Power based on the base-load current [3]		Base-load current I_H [3]	Frame size	PM240 Power Module without integrated line filter	PM240 Power Module with integrated line filter class A
kW	hp	A	kW	hp	A		Article No.	Article No.
380 ... 480 V 3 AC								
18.5	25	38	**15**	20	32	FSD	**6SL3224-0BE31-5UA0**	**6SL3224-0BE31-5AA0**
22	30	45	**18.5**	25	38	FSD	**6SL3224-0BE31-8UA0**	**6SL3224-0BE31-8AA0**
30	40	60	**22**	30	45	FSD	**6SL3224-0BE32-2UA0**	**6SL3224-0BE32-2AA0**
37	50	75	**30**	40	60	FSE	**6SL3224-0BE33-0UA0**	**6SL3224-0BE33-0AA0**
45	60	90	**37**	50	75	FSE	**6SL3224-0BE33-7UA0**	**6SL3224-0BE33-7AA0**
55	75	110	**45**	60	90	FSF	**6SL3224-0BE34-5UA0**	**6SL3224-0BE34-5AA0**
75	100	145	**55**	75	110	FSF	**6SL3224-0BE35-5UA0**	**6SL3224-0BE35-5AA0**
90	125	178	**75**	100	145	FSF	**6SL3224-0BE37-5UA0**	**6SL3224-0BE37-5AA0**
110	150	205	**90**	125	178	FSF	**6SL3224-0BE38-8UA0**	–
132	200	250	**110**	150	205	FSF	**6SL3224-0BE41-1UA0**	–
160	250	302	**132**	200	250	FSGX	**6SL3224-0XE41-3UA0**	–
200	300	370	**160**	250	302	FSGX	**6SL3224-0XE41-6UA0**	–
250	400	477	**200**	300	370	FSGX	**6SL3224-0XE42-0UA0**	–

PM250 Power Modules

Rated power [1]		Rated output current I_{rated} [2]	Power based on the base-load current [3]		Base-load current I_H [3]	Frame size	PM250 Power Module without integrated line filter	PM250 Power Module with integrated line filter class A
kW	hp	A	kW	hp	A		Article No.	Article No.
380 ... 480 V 3 AC								
7.5	10	18	**5.5**	7.5	13.2	FSC	–	**6SL3225-0BE25-5AA1**
11	15	25	**7.5**	10	19	FSC	–	**6SL3225-0BE27-5AA1**
15	20	32	**11**	15	26	FSC	–	**6SL3225-0BE31-1AA1**
18.5	25	38	**15**	20	32	FSD	**6SL3225-0BE31-5UA0**	**6SL3225-0BE31-5AA0**
22	30	45	**18.5**	25	38	FSD	**6SL3225-0BE31-8UA0**	**6SL3225-0BE31-8AA0**
30	40	60	**22**	30	45	FSD	**6SL3225-0BE32-2UA0**	**6SL3225-0BE32-2AA0**
37	50	75	**30**	40	60	FSE	**6SL3225-0BE33-0UA0**	**6SL3225-0BE33-0AA0**
45	60	90	**37**	50	75	FSE	**6SL3225-0BE33-7UA0**	**6SL3225-0BE33-7AA0**
55	75	110	**45**	60	90	FSF	**6SL3225-0BE34-5UA0**	**6SL3225-0BE34-5AA0**
75	100	145	**55**	75	110	FSF	**6SL3225-0BE35-5UA0**	**6SL3225-0BE35-5AA0**
90	125	178	**75**	100	145	FSF	**6SL3225-0BE37-5UA0**	**6SL3225-0BE37-5AA0**

[1] Rated power based on the rated output current I_{rated}. The rated output current I_{rated} is based on the duty cycle for low overload (LO).

[2] The rated output current I_{rated} is based on the duty cycle for low overload (LO). These current values are valid for 400 V and are specified on the rating plate of the Power Module.

[3] The base-load current I_H is based on the duty cycle for high overload (HO).

Technical specifications

General technical specifications

Power Modules	PM230	PM240-2	PM240	PM250
System operating voltage	380 ... 480 V 3 AC ±10 %	200 ... 240 V ±10 % 1 AC/3 AC 380 ... 480 V 3 AC ±10 %	380 ... 480 V 3 AC ±10 %	380 ... 480 V 3 AC ±10 %
Grid requirement Short-circuit power R_{SC}	>100	>25 400 V: With RSC >100 it is advisable to install a line reactor, or alternatively, to select a Power Module with the next-higher power rating. 200 V: A line reactor is recommended with RSC >50	>25 A line reactor is recommended with RSC >100	>100
Input frequency	47 ... 63 Hz			
Output frequency				
• Control mode V/f	0 ... 650 Hz (due to legal requirements, the maximum output frequency is restricted to 550 Hz with firmware V4.7 and higher)			
• Control type Vector	0 ... 240 Hz			
Pulse frequency	4 kHz Higher pulse frequencies up to 16 kHz, see derating data	4 kHz Higher pulse frequencies up to 16 kHz, see derating data	Up to 75 kW HO: 4 kHz From 90 kW HO: 2 kHz Higher pulse frequencies up to 16 kHz, see derating data	4 kHz (standard) Higher pulse frequencies up to 16 kHz, see derating data
Power factor λ	0.9	0.7	0.7 ... 0.85	0.9
Offset factor cos φ	0.95	0.95	0.95	0.95 capacitive
Inverter efficiency	86 ... 98 %	92 ... 95 %	95 ... 98 %	95 ... 97 %
Output voltage, max. In % of input voltage	95 %	95 %	95 %	87 %
Overload capability				
• Low overload (LO) Note: When the overload capability is used, the base-load current I_L is not reduced.	FSA to FSC: 1.5 × base-load current I_L (i. e. 150 % overload) for 3 s **plus** 1.1 × base-load current I_L (i. e. 110 % overload) for 57 s within a cycle time of 300 s FSD to FSF: 1.1 × base-load current I_L (i.e. 110 % overload) for 60 s within a cycle time of 300 s	1.5 × base-load current I_L (i. e. 150 % overload) for 3 s **plus**1.1 × base-load current I_L (i. e. 110 % overload) for 57 s within a cycle time of 300 s	Up to 90 kW (LO): 1.5 × base-load current I_L (i. e. 150 % overload) for 3 s **plus** 1.1 × base-load current I_L (i. e. 110 % overload) for 57 s within a cycle time of 300 s 110 kW and higher (LO): 1.5 × base-load current I_L (i. e. 150 % overload) for 1 s **plus** 1.1 × base-load current I_L (i. e. 110 % overload) for 59 s within a cycle time of 300 s	1.5 × base-load current I_L (i. e. 150 % overload) for 3 s **plus**1.1 × base-load current I_L (i. e. 110 % overload) for 57 s within a cycle time of 300 s
• High overload (HO) Note: When the overload capability is used, the base-load current I_H is not reduced.	FSA to FSC: 2 × base-load current I_H (i. e. 200 % overload) for 3 s **plus** 1.5 × base-load current I_H (i. e. 150 % overload) for 57 s within a cycle time of 300 s FSD to FSF: 1.5 × base-load current I_H (i.e. 150 % overload) for 60 s within a cycle time of 300 s	2 × base-load current I_H (i. e. 200 % overload) for 3 s **plus**1.5 × base-load current I_H (i. e. 150 % overload) for 57 s within a cycle time of 300 s	Up to 75 kW (HO): 2 × base-load current I_H (i. e. 200 % overload) for 3 s **plus** 1.5 × base-load current I_H (i. e. 150 % overload) for 57 s within a cycle time of 300 s 90 kW and higher (HO): 1.6 × base-load current I_H (i. e. 160 % overload) for 3 s **plus** 1.36 × base-load current I_H (i. e. 136 % overload) for 57 s within a cycle time of 300 s	2 × base-load current I_H (i. e. 200 % overload) for 3 s **plus**1.5 × base-load current I_H (i. e. 150 % overload) for 57 s within a cycle time of 300 s
Possible braking methods	DC braking Compound braking	DC braking Compound braking Dynamic braking with integrated braking chopper	DC braking Compound braking Dynamic braking with integrated braking chopper (optional for frame size FSGX)	Regenerative feedback in generator mode

Technical specifications

Power Modules	PM230	PM240-2	PM240	PM250
Degree of protection	IP20 (standard or push-through)	IP20 (standard or push-through)	IP20	IP20
Operating temperature				
• Low overload (LO)	0 ... 40 °C (32 ... 104 °F) without derating >40 ... 60 °C (>104 ... 140 °F) see derating characteristics	0 ... 40 °C (32 ... 104 °F) without derating >40 ... 60 °C (>104 ... 140 °F) see derating characteristics	Frame sizes FSD to FSF: 0 ... 40 °C (32 ... 104 °F) without derating >40 ... 60 °C (>104 ... 140 °F) see derating characteristics Frame size FSGX: 0 ... 40 °C (32 ... 104 °F) without derating >40 ... 55 °C (>104 ... 131 °F) see derating characteristics	0 ... 40 °C (32 ... 104 °F) without derating >40 ... 60 °C (>104 ... 140 °F) see derating characteristics
• High overload (HO)	0 ... 50 °C (32 ... 122 °F) without derating >50 ... 60 °C (>122 ... 140 °F) see derating characteristics	0 ... 50 °C (32 ... 122 °F) without derating >50 ... 60 °C (>122 ... 140 °F) see derating characteristics	Frame sizes FSD to FSF: 0 ... 50 °C (32 ... 122 °F) without derating >50 ... 60 °C (>122 ... 140 °F) see derating characteristics Frame size FSGX: 0 ... 40 °C (32 ... 104 °F) without derating >40 ... 55 °C (>104 ... 131 °F) see derating characteristics	0 ... 50 °C (32 ... 122 °F) without derating >50 ... 60 °C (>122 ... 140 °F) see derating characteristics
Storage temperature	-40 ... +70 °C (-40 ... +158 °F)			
Relative humidity	< 95 % RH, condensation not permissible			
Cooling	Power units with increased air cooling using integrated fans	Internal ventilation, power units with increased air cooling by built-in fans	Internal ventilation, power units with increased air cooling by built-in fans	Internal ventilation, power units with increased air cooling by built-in fans
Installation altitude	Up to 1000 m above sea level without derating, > 1000 m see derating characteristics	Up to 1000 m above sea level without derating, >1000 m see derating characteristics	Up to 1000 m above sea level without derating, >1000 m see derating characteristics	Up to 1000 m above sea level without derating, >1000 m see derating characteristics
Protection functions	• Undervoltage • Overvoltage • Overload • Ground fault • Short-circuit • Stall protection • Motor blocking protection • Motor overtemperature • Inverter overtemperature • Parameter locking			
Short Circuit Current Rating (SCCR) according to UL [1]	IP20 degree of protection: 65 kA	400 V: 65 kA 230 V: 40 kA	65 kA	FSC: 40 kA FSD to FSF: 42 kA
Compliance with standards	UL, cUL [2], CE, C-Tick, SEMI F47	UL, cUL, CE, C-Tick, SEMI F47	UL, cUL, CE, C-Tick, SEMI F47	UL [3], cUL [3], CE, C-Tick, SEMI F47
CE marking	According to Low-Voltage Directive 2006/95/EC, EMC Directive 2004/108/EC			

[1] Applies to industrial control panel installations to NEC article 409 or UL 508A.

[2] Applies to PM230 Power Modules, frame sizes FSA to FSC.

[3] Applies to all PM250 Power Modules with integrated line filter class A.

Technical specifications

PM230 Power Modules degree of protection IP20 standard variant

Line voltage 380 ... 480 V 3 AC		**PM230 Power Modules degree of protection IP20 standard variant**				
Without integrated line filter		6SL3210-1NE11-3UL1	6SL3210-1NE11-7UL1	6SL3210-1NE12-2UL1	6SL3210-1NE13-1UL1	6SL3210-1NE14-1UL1
With integrated line filter class A		6SL3210-1NE11-3AL1	6SL3210-1NE11-7AL1	6SL3210-1NE12-2AL1	6SL3210-1NE13-1AL1	6SL3210-1NE14-1AL1
Output current at 50 Hz 400 V 3 AC						
• Rated current I_{rated} [1]	A	1.3	1.7	2.2	3.1	4.1
• Base-load current I_L [1]	A	1.3	1.7	2.2	3.1	4.1
• Base-load current I_H [2]	A	0.9	1.3	1.7	2.2	3.1
• Maximum current I_{max}	A	2	2.6	3.4	4.7	6.2
Rated power						
• Based on I_L	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)	0.25 (0.33)	0.37 (0.5)	0.55 (0.75)	0.75 (1)	1.1 (1.5)
Rated pulse frequency	kHz	4	4	4	4	4
Efficiency η		0.89	0.93	0.93	0.94	0.95
Power loss [3] At rated current	kW	0.031	0.034	0.041	0.049	0.06
Cooling air requirement	m^3/s	0.002	0.002	0.005	0.005	0.005
Sound pressure level L_{pA} (1 m)	dB	<50	<50	<50	<50	<50
24 V DC power supply for Control Unit	A	1	1	1	1	1
Input current [4]						
• Rated current	A	1.3	1.8	2.3	3.2	4.2
• Based on I_H	A	0.9	1.3	1.8	2.3	3.2
Line supply connection U1/L1, V1/L2, W1/L3		Screw terminals, plug-in	Screw terminals, plug-in	Screw terminals, plug-in	Screw terminals, plug-in	Screw terminals, plug-in
• Conductor cross-section	mm^2	1 ... 2.5	1 ... 2.5	1 ... 2.5	1 ... 2.5	1 ... 2.5
Motor connection U2, V2, W2		Screw terminals, plug-in	Screw terminals, plug-in	Screw terminals, plug-in	Screw terminals, plug-in	Screw terminals, plug-in
• Conductor cross-section	mm^2	1 ... 2.5	1 ... 2.5	1 ... 2.5	1 ... 2.5	1 ... 2.5
Motor cable length, max. [5]						
• Shielded	m (ft)	25 (82)	25 (82)	25 (82)	25 (82)	25 (82)
• 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)	73 (2.87)	73 (2.87)	73 (2.87)	73 (2.87)	73 (2.87)
• Height	mm (in)	196 (7.72)	196 (7.72)	196 (7.72)	196 (7.72)	196 (7.72)
• Depth						
- Without operator panel	mm (in)	165 (6.50)	165 (6.50)	165 (6.50)	165 (6.50)	165 (6.50)
- With operator panel, max.	mm (in)	245 (9.65)	245 (9.65)	245 (9.65)	245 (9.65)	245 (9.65)
Frame size		FSA	FSA	FSA	FSA	FSA
Weight, approx.						
• Without integrated line filter	kg (lb)	1.4 (3.09)	1.4 (3.09)	1.4 (3.09)	1.4 (3.09)	1.4 (3.09)
• With integrated line filter	kg (lb)	1.6 (3.53)	1.6 (3.53)	1.6 (3.53)	1.6 (3.53)	1.6 (3.53)

[1] The rated output current I_{rated} and the base-load current I_L are based on the duty cycle for low overload (LO).

[2] The base-load current I_H is based on the duty cycle for high overload (HO).

[3] Typical values. You can find more information on the Internet at http://support.automation.siemens.com/WW/view/en/94059311

[4] The input current depends on the motor load and line impedance and applies for a line impedance corresponding to u_K = 1 %. The rated input currents apply for a load at rated power (based on I_{rated}) – these current values are specified on the rating plate.

[5] Max. motor cable length 25 m (82 ft) (shielded) for PM230 Power Modules with integrated line filter to maintain the limit values acc. to EN 61800-3 Category C2. With unshielded cables, Category C2 is not achieved.

Technical specifications

Line voltage 380 ... 480 V 3 AC		PM230 Power Modules degree of protection IP20 standard variant				
Without integrated line filter		6SL3210-1NE15-8UL1	6SL3210-1NE17-7UL1	6SL3210-1NE21-0UL1	6SL3210-1NE21-3UL1	6SL3210-1NE21-8UL1
With integrated line filter class A		6SL3210-1NE15-8AL1	6SL3210-1NE17-7AL1	6SL3210-1NE21-0AL1	6SL3210-1NE21-3AL1	6SL3210-1NE21-8AL1
Output current at 50 Hz 400 V 3 AC						
• Rated current I_{rated} [1]	A	5.9	7.7	10.2	13.2	18
• Base-load current I_L [1]	A	5.9	7.7	10.2	13.2	18
• Base-load current I_H [2]	A	4.1	5.9	7.7	10.2	13.2
• Maximum current I_{max}	A	8.9	11.8	15.4	20.4	27
Rated power						
• Based on I_L	kW (hp)	2.2 (3)	3 (4)	4 (5)	5.5 (7.5)	7.5 (10)
• Based on I_H	kW (hp)	1.5 (2)	2.2 (3)	3 (4)	4 (5)	5.5 (7.5)
Rated pulse frequency	kHz	4	4	4	4	4
Efficiency η		0.96	0.96	0.97	0.97	0.97
Power loss [3] At rated current	kW	0.078	0.102	0.13	0.165	0.224
Cooling air requirement	m^3/s	0.005	0.005	0.009	0.009	0.009
Sound pressure level L_{pA} (1 m)	dB	<50	<50	<62	<62	<62
24 V DC power supply for Control Unit	A	1	1	1	1	1
Input current [4]						
• Rated current	A	6.1	8	11	14	19
• Based on I_H	A	4.2	6.1	8	11	14
Line supply connection U1/L1, V1/L2, W1/L3		Screw terminals, plug-in	Screw terminals, plug-in	Screw terminals, plug-in	Screw terminals, plug-in	Screw terminals, plug-in
• Conductor cross-section	mm^2	1.5 ... 2.5	1.5 ... 2.5	1.5 ... 6	1.5 ... 6	1.5 ... 6
Motor connection U2, V2, W2		Screw terminals, plug-in	Screw terminals, plug-in	Screw terminals, plug-in	Screw terminals, plug-in	Screw terminals, plug-in
• Conductor cross-section	mm^2	1.5 ... 2.5	1.5 ... 2.5	1.5 ... 6	1.5 ... 6	1.5 ... 6
Motor cable length, max. [5]						
• Shielded	m (ft)	25 (82)	25 (82)	25 (82)	25 (82)	25 (82)
• 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)	73 (2.87)	73 (2.87)	100 (3.94)	100 (3.94)	100 (3.94)
• Height	mm (in)	196 (7.72)	196 (7.72)	292 (11.5)	292 (11.5)	292 (11.5)
• Depth						
- Without operator panel	mm (in)	165 (6.50)	165 (6.50)	165 (6.50)	165 (6.50)	165 (6.50)
- With operator panel, max.	mm (in)	245 (9.65)	245 (9.65)	245 (9.65)	245 (9.65)	245 (9.65)
Frame size		FSA	FSA	FSB	FSB	FSB
Weight, approx.						
• Without integrated line filter	kg (lb)	1.4 (3.09)	1.4 (3.09)	2.8 (6.17)	2.8 (6.17)	2.8 (6.17)
• With integrated line filter	kg (lb)	1.6 (3.53)	1.6 (3.53)	3 (6.62)	3 (6.62)	3 (6.62)

[1] The rated output current I_{rated} and the base-load current I_L are based on the duty cycle for low overload (LO).

[2] The base-load current I_H is based on the duty cycle for high overload (HO).

[3] Typical values. You can find more information on the Internet at http://support.automation.siemens.com/WW/view/en/94059311

[4] The input current depends on the motor load and line impedance and applies for a line impedance corresponding to u_K = 1 %. The rated input currents apply for a load at rated power (based on I_{rated}) – these current values are specified on the rating plate.

[5] Max. motor cable length 25 m (82 ft) (shielded) for PM230 Power Modules with integrated line filter to maintain the limit values acc. to EN 61800-3 Category C2. With unshielded cables, Category C2 is not achieved.

Technical specifications

Line voltage 380 ... 480 V 3 AC		**PM230 Power Modules degree of protection IP20 standard variant**				
Without integrated line filter		6SL3210-1NE22-6UL1	6SL3210-1NE23-2UL1	6SL3210-1NE23-8UL1	6SL3210-1NE24-5UL0	6SL3210-1NE26-0UL0
With integrated line filter class A		6SL3210-1NE22-6AL1	6SL3210-1NE23-2AL1	6SL3210-1NE23-8AL1	6SL3210-1NE24-5AL0	6SL3210-1NE26-0AL0
Output current at 50 Hz 400 V 3 AC						
• Rated current I_{rated} [1]	A	26	32	38	45	60
• Base-load current I_L [1]	A	26	32	38	45	60
• Base-load current I_H [2]	A	18	26	32	38	45
• Maximum current I_{max}	A	39	52	64	57	67
Rated power						
• Based on I_L	kW (hp)	11 (15)	15 (20)	18.5 (25)	22 (30)	30 (40)
• Based on I_H	kW (hp)	7.5 (10)	11 (15)	15 (20)	18.5 (25)	22 (30)
Rated pulse frequency	kHz	4	4	4	4	4
Efficiency η		0.97	0.97	0.98	0.98	0.97
Power loss [3] At rated current	kW	0.291	0.355	0.423	0.539	0.726
Cooling air requirement	m^3/s	0.019	0.019	0.019	0.08	0.08
Sound pressure level L_{pA} (1 m)	dB	<65	<65	<65	<60	<60
24 V DC power supply for Control Unit	A	1	1	1	1	1
Input current [4]						
• Rated current	A	27	33	39	42	56
• Based on I_H	A	19	27	33	36	42
Line supply connection U1/L1, V1/L2, W1/L3		Screw terminals, plug-in	Screw terminals, plug-in	Screw terminals, plug-in	M6 screw stud	M6 screw stud
• Conductor cross-section	mm^2	6 ... 16	6 ... 16	6 ... 16	16 ... 35	16 ... 35
Motor connection U2, V2, W2		Screw terminals, plug-in	Screw terminals, plug-in	Screw terminals, plug-in	M6 screw stud	M6 screw stud
• Conductor cross-section	mm^2	6 ... 16	6 ... 16	6 ... 16	16 ... 35	16 ... 35
Motor cable length, max. [5]						
• Shielded	m (ft)	25 (82)	25 (82)	25 (82)	25 (82)	25 (82)
• 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)	140 (5.51)	140 (5.51)	140 (5.51)	275 (10.83)	275 (10.83)
• Height						
- Without integrated line filter	mm (in)	355 (13.98)	355 (13.98)	355 (13.98)	419 (16.50)	419 (16.50)
- With integrated line filter	mm (in)	355 (13.98)	355 (13.98)	355 (13.98)	512 (20.16)	512 (20.16)
• Depth						
- Without operator panel	mm (in)	165 (6.50)	165 (6.50)	165 (6.50)	204 (8.03)	204 (8.03)
- With operator panel, max.	mm (in)	245 (9.65)	245 (9.65)	245 (9.65)	275 (10.83)	275 (10.83)
Frame size		FSC	FSC	FSC	FSD	FSD
Weight, approx.						
• Without integrated line filter	kg (lb)	4.5 (10)	4.5 (10)	4.5 (10)	11 (24.3)	11 (24.3)
• With integrated line filter	kg (lb)	5.1 (11.3)	5.1 (11.3)	5.1 (11.3)	14 (30.9)	14 (30.9)

[1] The rated output current I_{rated} and the base-load current I_L are based on the duty cycle for low overload (LO).

[2] The base-load current I_H is based on the duty cycle for high overload (HO).

[3] Typical values. You can find more information on the Internet at http://support.automation.siemens.com/WW/view/en/94059311

[4] The input current depends on the motor load and line impedance and applies for a line impedance corresponding to u_K = 1 %. The rated input currents apply for a load at rated power (based on I_{rated}) – these current values are specified on the rating plate.

[5] Max. motor cable length 25 m (82 ft) (shielded) for PM230 Power Modules with integrated line filter to maintain the limit values acc. to EN 61800-3 Category C2. With unshielded cables, Category C2 is not achieved.

Technical specifications

Line voltage 380 ... 480 V 3 AC		PM230 Power Modules degree of protection IP20 standard variant			
Without integrated line filter		6SL3210-1NE27-5UL0	6SL3210-1NE28-8UL0	6SL3210-1NE31-1UL0	6SL3210-1NE31-5UL0
With integrated line filter class A		6SL3210-1NE27-5AL0	6SL3210-1NE28-8AL0	6SL3210-1NE31-1AL0	6SL3210-1NE31-5AL0
Output current at 50 Hz 400 V 3 AC					
• Rated current I_{rated} [1]	A	75	90	110	145
• Base-load current I_L [1]	A	75	90	110	145
• Base-load current I_H [2]	A	60	75	90	110
• Maximum current I_{max}	A	90	112	135	165
Rated power					
• Based on I_L	kW (hp)	37 (50)	45 (60)	55 (75)	75 (100)
• Based on I_H	kW (hp)	30 (40)	37 (50)	45 (60)	55 (75)
Rated pulse frequency	kHz	4	4	4	4
Efficiency η		0.97	0.97	0.97	0.97
Power loss [3] At rated current	kW	0.791	0.976	1.237	1.69
Cooling air requirement	m^3/s	0.08	0.08	0.15	0.15
Sound pressure level L_{pA} (1 m)	dB	<60	<60	<60	<60
24 V DC power supply for Control Unit	A	1	1	1	1
Input current [4]					
• Rated current	A	70	84	102	135
• Based on I_H	A	56	70	84	102
Line supply connection U1/L1, V1/L2, W1/L3		M6 screw stud	M6 screw stud	M8 screw stud	M8 screw stud
• Conductor cross-section	mm^2	25 ... 50	25 ... 50	35 ... 120	35 ... 120
Motor connection U2, V2, W2		M6 screw stud	M6 screw stud	M8 screw stud	M8 screw stud
• Conductor cross-section	mm^2	25 ... 50	25 ... 50	35 ... 120	35 ... 120
Motor cable length, max. [5]					
• Shielded	m (ft)	25 (82)	25 (82)	25 (82)	25 (82)
• Unshielded	m (ft)	100 (328)	100 (328)	100 (328)	100 (328)
Degree of protection		IP20	IP20	IP20	IP20
Dimensions					
• Width	mm (in)	275 (10.83)	275 (10.83)	350 (13.78)	350 (13.78)
• Height					
- Without integrated line filter	mm (in)	499 (19.65)	499 (19.65)	634 (24.96)	634 (24.96)
- With integrated line filter	mm (in)	635 (25.0)	635 (25.0)	934 (36.77)	934 (36.77)
• Depth					
- Without operator panel	mm (in)	204 (8.03)	204 (8.03)	316 (12.44)	316 (12.44)
- With operator panel, max.	mm (in)	275 (10.83)	275 (10.83)	387 (15.24)	387 (15.24)
Frame size		FSE	FSE	FSF	FSF
Weight, approx.					
• Without integrated line filter	kg (lb)	15 (33.1)	15 (33.1)	34 (75)	34 (75)
• With integrated line filter	kg (lb)	22 (48.5)	22 (48.5)	46 (101)	46 (101)

1) The rated output current I_{rated} and the base-load current I_L are based on the duty cycle for low overload (LO).

2) The base-load current I_H is based on the duty cycle for high overload (HO).

3) Typical values. You can find more information on the Internet at http://support.automation.siemens.com/WW/view/en/94059311

4) The input current depends on the motor load and line impedance and applies for a line impedance corresponding to u_K = 1 %. The rated input currents apply for a load at rated power (based on I_{rated}) – these current values are specified on the rating plate.

5) Max. motor cable length 25 m (82 ft) (shielded) for PM230 Power Modules with integrated line filter to maintain the limit values acc. to EN 61800-3 Category C2. With unshielded cables, Category C2 is not achieved.

Technical specifications

PM230 Power Modules degree of protection IP20 push-through variant

Line voltage 380 ... 480 V 3 AC		**PM230 Power Modules degree of protection IP20 push-through variant**		
Without integrated line filter		6SL3211-1NE17-7UL1	6SL3211-1NE21-8UL1	6SL3211-1NE23-8UL1
With integrated line filter class A		6SL3211-1NE17-7AL1	6SL3211-1NE21-8AL1	6SL3211-1NE23-8AL1
Output current at 50 Hz 400 V 3 AC				
• Rated current I_{rated} [1]	A	7.7	18	38
• Base-load current I_L [1]	A	7.7	18	38
• Base-load current I_H [2]	A	5.9	13.2	32
• Maximum current I_{max}	A	11.8	27	64
Rated power				
• Based on I_L	kW (hp)	3 (4)	7.5 (10)	18.5 (25)
• Based on I_H	kW (hp)	2.2 (3.0)	5.5 (7.5)	15 (20)
Rated pulse frequency	kHz	4	4	4
Efficiency η		0.96	0.97	0.98
Power loss [3] At rated current	kW	0.102	0.224	0.423
Cooling air requirement	m^3/s	0.005	0.009	0.019
Sound pressure level L_{pA} (1 m)	dB	<56	<62	<65
24 V DC power supply for Control Unit	A	1	1	1
Input current [4]				
• Rated current	A	8	19	39
• Based on I_H	A	6.1	14	33
Line supply connection U1/L1, V1/L2, W1/L3		Screw terminals, plug-in	Screw terminals, plug-in	Screw terminals, plug-in
• Conductor cross-section	mm^2	1.5 ... 2.5	4 ... 6	6 ... 16
Motor connection U2, V2, W2		Screw terminals, plug-in	Screw terminals, plug-in	Screw terminals, plug-in
• Conductor cross-section	mm^2	1 ... 2.5	4 ... 6	10 ... 16
Motor cable length, max. [5]				
• Shielded	m (ft)	25 (82)	25 (82)	25 (82)
• Unshielded	m (ft)	100 (328)	100 (328)	100 (328)
Degree of protection		IP20	IP20	IP20
Dimensions				
• Width	mm (in)	126 (4.96)	154 (6.06)	200 (7.87)
• Height	mm (in)	238 (9.37)	345 (13.58)	411 (16.18)
• Depth				
- Without operator panel	mm (in)	171 (6.73)	171 (6.73)	171 (6.73)
- With operator panel, max.	mm (in)	251 (9.88)	251 (9.88)	251 (9.88)
Frame size		FSA	FSB	FSC
Weight, approx. With integrated line filter				
• Without integrated line filter	kg (lb)	1.7 (3.75)	3.4 (7.50)	5.4 (11.9)
• With integrated line filter	kg (lb)	1.9 (4.19)	3.6 (7.94)	6 (13.2)

[1] The rated output current I_{rated} and the base-load current I_L are based on the duty cycle for low overload (LO).

[2] The base-load current I_H is based on the duty cycle for high overload (HO).

[3] Typical values. You can find more information on the Internet at http://support.automation.siemens.com/WW/view/en/94059311

[4] The input current depends on the motor load and line impedance and applies for a line impedance corresponding to u_K = 1 %. The rated input currents apply for a load at rated power (based on I_{rated}) – these current values are specified on the rating plate.

[5] Max. motor cable length 25 m (82 ft) (shielded) for PM230 Power Modules with integrated line filter to maintain the limit values acc. to EN 61800-3 Category C2. With unshielded cables, Category C2 is not achieved.

Technical specifications

PM240-2 Power Modules standard variant

Line voltage 200 ... 240 V 1 AC/3 AC		PM240-2 Power Modules standard variant				
Without integrated line filter		6SL3210-1PB13-0UL0	6SL3210-1PB13-8UL0	6SL3210-1PB15-5UL0	6SL3210-1PB17-4UL0	6SL3210-1PB21-0UL0
With integrated line filter class A		6SL3210-1PB13-0AL0	6SL3210-1PB13-8AL0	6SL3210-1PB15-5AL0	6SL3210-1PB17-4AL0	6SL3210-1PB21-0AL0
Output current at 50 Hz 230 V 1 AC						
• Rated current I_{rated} [1]	A	3.2	4.2	6	7.4	10.4
• Base-load current I_L [1]	A	3.2	4.2	6	7.4	10.4
• Base-load current I_H [2]	A	2.3	3.2	4.2	6	7.4
• Maximum current I_{max}	A	4.8	6.4	9	12	15.6
Rated power						
• Based on I_L	kW (hp)	0.55 (0.75)	0.75 (1)	1.1 (1.5)	1.5 (2)	2.2 (3)
• Based on I_H	kW (hp)	0.37 (0.5)	0.55 (0.75)	0.75 (1)	1.1 (1.5)	1.5 (2)
Rated pulse frequency	kHz	4	4	4	4	4
Efficiency η		>96	>96	>96	>96	>96
Power loss [3] At rated current	kW	0.04	0.04	0.05	0.07	0.12
Cooling air requirement	m^3/s	0.005	0.005	0.0092	0.0092	0.0092
Sound pressure level L_{pA} (1 m)	dB	<50	<50	<62	<62	<62
24 V DC power supply for Control Unit	A	1	1	1	1	1
Input current [4]						
• Rated current 1 AC/3 AC	A	7.5/4.3	9.6/5.5	13.5/7.8	18.1/10.5	24/13.9
• Based on I_H 1 AC/3 AC	A	6.6/3.8	8.4/4.8	11.8/6.8	15.8/9.1	20.9/12.1
Line supply connection U1/L1, V1/L2, W1/L3		Terminal connector	Terminal connector	Terminal connector	Terminal connector	Terminal connector
• Conductor cross-section	mm^2	1.5 ... 2.5	1.5 ... 2.5	1.5 ... 6	1.5 ... 6	1.5 ... 6
Motor connection U2, V2, W2		Terminal connector	Terminal connector	Terminal connector	Terminal connector	Terminal connector
• Conductor cross-section	mm^2	1.5 ... 2.5	1.5 ... 2.5	1.5 ... 6	1.5 ... 6	1.5 ... 6
PE connection		Included in terminal connector	Included in terminal connector	Included in terminal connector	Included in terminal connector	Included in terminal connector
Motor cable length, max.						
• Shielded	m (ft)	50 (164)	50 (164)	50 (164)	50 (164)	50 (164)
• 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)	73 (2.87)	73 (2.87)	100 (3.94)	100 (3.94)	100 (3.94)
• Height	mm (in)	196 (7.72)	196 (7.72)	291 (11.46)	291 (11.46)	291 (11.46)
• Depth						
- Without operator panel	mm (in)	165 (6.50)	165 (6.50)	165 (6.50)	165 (6.50)	165 (6.50)
- With operator panel, max.	mm (in)	248 (9.76)	248 (9.76)	248 (9.76)	248 (9.76)	248 (9.76)
Frame size		FSA	FSA	FSB	FSB	FSB
Weight, approx.						
• Without integrated line filter	kg (lb)	1.4 (3.09)	1.4 (3.09)	2.9 (6.39)	2.9 (6.39)	2.9 (6.39)
• With integrated line filter	kg (lb)	1.6 (3.53)	1.6 (3.53)	3.1 (6.84)	3.1 (6.84)	3.1 (6.84)

[1] The rated output current I_{rated} and the base-load current I_L are based on the duty cycle for low overload (LO).

[2] The base-load current I_H is based on the duty cycle for high overload (HO).

[3] Typical values. You can find more information on the Internet at http://support.automation.siemens.com/WW/view/en/94059311

[4] The input current depends on the motor load and line impedance. The input currents apply for a load at rated power (based on I_{rated}) for a line impedance corresponding to u_K = 1 %. The current values are specified on the rating plate of the Power Module.

Technical specifications

Line voltage 200 ... 240 V 1 AC/3 AC		**PM240-2 Power Modules standard variant**	
Without integrated line filter		6SL3210-1PB21-4UL0	6SL3210-1PB21-8UL0
With integrated line filter class A		6SL3210-1PB21-4AL0	6SL3210-1PB21-8AL0
Output current at 50 Hz 230 V 1 AC			
• Rated current I_{rated} [1]	A	13.6	17.5
• Base-load current I_L [1]	A	13.6	17.5
• Base-load current I_H [2]	A	10.4	13.6
• Maximum current I_{max}	A	20.8	27.2
Rated power			
• Based on I_L	kW (hp)	3 (4)	4 (5)
• Based on I_H	kW (hp)	2.2 (3)	3 (4)
Rated pulse frequency	kHz	4	4
Efficiency η		>96	>96
Power loss [3] At rated current	kW	0.14	0.18
Cooling air requirement	m^3/s	0.0185	0.0185
Sound pressure level L_{pA} (1 m)	dB	<65	<65
24 V DC power supply for Control Unit	A	1	1
Input current [4]			
• Rated current 1 AC/3 AC	A	35.9/20.7	43/24.8
• Based on I_H 1 AC/3 AC	A	31.3/18.1	37.5/21.7
Line supply connection U1/L1, V1/L2, W1/L3		Terminal connector	Terminal connector
• Conductor cross-section	mm^2	6 ... 16	6 ... 16
Motor connection U2, V2, W2		Terminal connector	Terminal connector
• Conductor cross-section	mm^2	6 ... 16	6 ... 16
PE connection		Included in terminal connector	Included in terminal connector
Motor cable length, max.			
• Shielded	m (ft)	50 (164)	50 (164)
• Unshielded	m (ft)	100 (328)	100 (328)
Degree of protection		IP20	IP20
Dimensions			
• Width	mm (in)	140 (5.51)	140 (5.51)
• Height	mm (in)	355 (13.98)	355 (13.98)
• Depth			
- Without operator panel	mm (in)	165 (6.50)	165 (6.50)
- With operator panel, max.	mm (in)	248 (9.76)	248 (9.76)
Frame size		FSC	FSC
Weight, approx.			
• Without integrated line filter	kg (lb)	5 (11)	5 (11)
• With integrated line filter	kg (lb)	5.2 (11.5)	5.2 (11.5)

[1] The rated output current I_{rated} and the base-load current I_L are based on the duty cycle for low overload (LO).

[2] The base-load current I_H is based on the duty cycle for high overload (HO).

[3] Typical values. You can find more information on the Internet at http://support.automation.siemens.com/WW/view/en/94059311

[4] The input current depends on the motor load and line impedance. The input currents apply for a load at rated power (based on I_{rated}) for a line impedance corresponding to u_K = 1 %. The current values are specified on the rating plate of the Power Module.

Technical specifications

Line voltage 200 ... 240 V 3 AC		**PM240-2 Power Modules standard variant**	
Without integrated line filter		6SL3210-1PC22-2UL0	6SL3210-1PC22-8UL0
With integrated line filter class A		6SL3210-1PC22-2AL0	6SL3210-1PC22-8AL0
Output current at 50 Hz 230 V 3 AC			
• Rated current I_{rated} [1]	A	22	28
• Base-load current I_L [1]	A	22	28
• Base-load current I_H [2]	A	17.5	22
• Maximum current I_{max}	A	35	44
Rated power			
• Based on I_L	kW (hp)	5.5 (7.5)	7.5 (10)
• Based on I_H	kW (hp)	4 (5)	5.5 (7.5)
Rated pulse frequency	kHz	4	4
Efficiency η		>97	>97
Power loss [3] At rated current	kW	0.2	0.26
Cooling air requirement	m^3/s	0.0185	0.0185
Sound pressure level L_{pA} (1 m)	dB	<65	<65
24 V DC power supply for Control Unit	A	1	1
Input current [4]			
• Rated current	A	29	37
• Based on I_H	A	26.2	33
Line supply connection U1/L1, V1/L2, W1/L3		Terminal connector	Terminal connector
• Conductor cross-section	mm^2	6 ... 16	6 ... 16
Motor connection U2, V2, W2		Terminal connector	Terminal connector
• Conductor cross-section	mm^2	6 ... 16	6 ... 16
PE connection		Included in terminal connector	Included in terminal connector
Motor cable length, max.			
• Shielded	m (ft)	50 (164)	50 (164)
• Unshielded	m (ft)	100 (328)	100 (328)
Degree of protection		IP20	IP20
Dimensions			
• Width	mm (in)	140 (5.51)	140 (5.51)
• Height	mm (in)	355 (13.98)	355 (13.98)
• Depth			
- Without operator panel	mm (in)	165 (6.50)	156 (6.14)
- With operator panel, max.	mm (in)	248 (9.76)	248 (9.76)
Frame size		FSC	FSC
Weight, approx.			
• Without integrated line filter	kg (lb)	5 (11)	5 (11)
• With integrated line filter	kg (lb)	5.2 (11.5)	5.2 (11.5)

1) The rated output current I_{rated} and the base-load current I_L are based on the duty cycle for low overload (LO).

2) The base-load current I_H is based on the duty cycle for high overload (HO).

3) Typical values. You can find more information on the Internet at http://support.automation.siemens.com/WW/view/en/94059311

4) The input current depends on the motor load and line impedance. The input currents apply for a load at rated power (based on I_{rated}) for a line impedance corresponding to u_K = 1 %. The current values are specified on the rating plate of the Power Module.

Technical specifications

Line voltage 380 ... 480 V 3 AC		**PM240-2 Power Modules standard variant**					
Without integrated line filter		6SL3210-1PE11-8UL1	6SL3210-1PE12-3UL1	6SL3210-1PE13-2UL1	6SL3210-1PE14-3UL1	6SL3210-1PE16-1UL1	6SL3210-1PE18-0UL1
With integrated line filter class A		6SL3210-1PE11-8AL1	6SL3210-1PE12-3AL1	6SL3210-1PE13-2AL1	6SL3210-1PE14-3AL1	6SL3210-1PE16-1AL1	6SL3210-1PE18-0AL1
Output current at 50 Hz 400 V 3 AC							
• Rated current I_{rated} [1]	A	1.7	2.2	3.1	4.1	5.9	7.7
• Base-load current I_L [1]	A	1.7	2.2	3.1	4.1	5.9	7.7
• Base-load current I_H [2]	A	1.3	1.7	2.2	3.1	4.1	5.9
• Maximum current I_{max}	A	2.6	3.4	4.7	6.2	8.9	11.8
Rated power							
• Based on I_L	kW (hp)	0.55 (0.75)	0.75 (1)	1.1 (1.5)	1.5 (2)	2.2 (3)	3 (4)
• Based on I_H	kW (hp)	0.37 (0.5)	0.55 (0.75)	0.55 (0.75)	1.1 (1.5)	1.5 (2)	2.2 (3)
Rated pulse frequency	kHz	4	4	4	4	4	4
Efficiency η		>0.96	>0.96	>0.96	>0.96	>0.96	>0.96
Power loss [3] At rated current	kW	0.033	0.038	0.048	0.061	0.085	0.113
Cooling air requirement	m^3/s	0.005	0.005	0.005	0.005	0.005	0.005
Sound pressure level L_{pA} (1 m)	dB	<50	<50	<50	<50	<50	<50
24 V DC power supply for Control Unit	A	1	1	1	1	1	1
Input current [4]							
• Rated current	A	2.3	2.9	4.1	5.5	7.7	10.1
• Based on I_H	A	2	2.6	3.3	4.7	6.1	8.8
Line supply connection U1/L1, V1/L2, W1/L3		Terminal connector	Terminal connector	Terminal connector	Terminal connector	Terminal connector	Terminal connector
• Conductor cross-section	mm^2	1 ... 2.5	1 ... 2.5	1 ... 2.5	1 ... 2.5	1 ... 2.5	1 ... 2.5
Motor connection U2, V2, W2		Terminal connector	Terminal connector	Terminal connector	Terminal connector	Terminal connector	Terminal connector
• Conductor cross-section	mm^2	1 ... 2.5	1 ... 2.5	1 ... 2.5	1 ... 2.5	1 ... 2.5	1 ... 2.5
PE connection		Included in terminal connector	Included in terminal connector	Included in terminal connector	Included in terminal connector	Included in terminal connector	Included in terminal connector
Motor cable length, max.							
• Shielded	m (ft)	50 (164)	50 (164)	50 (164)	50 (164)	50 (164)	50 (164)
• Unshielded	m (ft)	100 (328)	100 (328)	100 (328)	100 (328)	100 (328)	100 (328)
Degree of protection		IP20	IP20	IP20	IP20	IP20	IP20
Dimensions							
• Width	mm (in)	73 (2.87)	73 (2.87)	73 (2.87)	73 (2.87)	73 (2.87)	73 (2.87)
• Height	mm (in)	196 (7.72)	196 (7.72)	196 (7.72)	196 (7.72)	196 (7.72)	196 (7.72)
• Depth		165 (6.50)	165 (6.50)	165 (6.50)	165 (6.50)	165 (6.50)	165 (6.50)
- Without operator panel	mm (in)	165 (6.50)	165 (6.50)	165 (6.50)	165 (6.50)	165 (6.50)	165 (6.50)
- With operator panel, max.	mm (in)	248 (9.76)	248 (9.76)	248 (9.76)	248 (9.76)	248 (9.76)	248 (9.76)
Frame size		FSA	FSA	FSA	FSA	FSA	FSA
Weight, approx.							
• Without integrated line filter	kg (lb)	1.4 (3.09)	1.4 (3.09)	1.4 (3.09)	1.4 (3.09)	1.4 (3.09)	1.4 (3.09)
• With integrated line filter	kg (lb)	1.5 (3.31)	1.5 (3.31)	1.5 (3.31)	1.5 (3.31)	1.5 (3.31)	1.5 (3.31)

1) The rated output current I_{rated} and the base-load current I_L are based on the duty cycle for low overload (LO).

2) The base-load current I_H is based on the duty cycle for high overload (HO).

3) Typical values. You can find more information on the Internet at http://support.automation.siemens.com/WW/view/en/94059311

4) The input current depends on the motor load and line impedance. The input currents apply for a load at rated power (based on I_{rated}) for a line impedance corresponding to u_K = 1 %. The current values are specified on the rating plate of the Power Module.

Technical specifications

Line voltage 380 ... 480 V 3 AC		**PM240-2 Power Modules standard variant**				
Without integrated line filter		6SL3210-1PE21-1UL0	6SL3210-1PE21-4UL0	6SL3210-1PE21-8UL0	6SL3210-1PE22-7UL0	6SL3210-1PE23-3UL0
With integrated line filter class A		6SL3210-1PE21-1AL0	6SL3210-1PE21-4AL0	6SL3210-1PE21-8AL0	6SL3210-1PE22-7AL0	6SL3210-1PE23-3AL0
Output current at 50 Hz 400 V 3 AC						
• Rated current I_{rated} [1]	A	10.2	13.2	18	26	32
• Base-load current I_L [1]	A	10.2	13.2	18	26	32
• Base-load current I_H [2]	A	7.7	10.2	13.2	18	26
• Maximum current I_{max}	A	15.4	20.4	27	39	52
Rated power						
• Based on I_L	kW (hp)	4 (5)	5.5 (7.5)	7.5 (10)	11 (15)	15 (20)
• Based on I_H	kW (hp)	3 (4)	4 (5)	5.5 (7.5)	7.5 (10)	11 (15)
Rated pulse frequency	kHz	4	4	4	4	4
Efficiency η		>97	>97	>97	>97	>97
Power loss [3] At rated current	kW	0.14	0.184	0.239	0.333	0.385
Cooling air requirement	m^3/s	0.0092	0.0092	0.0092	0.0185	0.0185
Sound pressure level L_{pA} (1 m)	dB	<62	<62	<62	<65	<65
24 V DC power supply for Control Unit	A	1	1	1	1	1
Input current [4]						
• Rated current	A	13.3	17.2	22.2	32.6	39.9
• Based on I_H	A	11.6	15.3	19.8	27	36
Line supply connection U1/L1, V1/L2, W1/L3		Terminal connector	Terminal connector	Terminal connector	Terminal connector	Terminal connector
• Conductor cross-section	mm^2	1.5 ... 6	1.5 ... 6	1.5 ... 6	6 ... 16	6 ... 16
Motor connection U2, V2, W2		Terminal connector	Terminal connector	Terminal connector	Terminal connector	Terminal connector
• Conductor cross-section	mm^2	1.5 ... 6	1.5 ... 6	1.5 ... 6	6 ... 16	6 ... 16
PE connection		Included in terminal connector	Included in terminal connector	Included in terminal connector	Included in terminal connector	Included in terminal connector
Motor cable length, max.						
• Shielded	m (ft)	50 (164)	50 (164)	50 (164)	50 (164)	50 (164)
• 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)	100 (3.94)	100 (3.94)	100 (3.94)	140 (5.51)	140 (5.51)
• Height	mm (in)	291 (11.46)	291 (11.46)	291 (11.46)	355 (13.98)	355 (13.98)
• Depth						
- Without operator panel	mm (in)	165 (6.50)	165 (6.50)	165 (6.50)	165 (6.50)	165 (6.50)
- With operator panel, max.	mm (in)	248 (9.76)	248 (9.76)	248 (9.76)	248 (9.76)	248 (9.76)
Frame size		FSB	FSB	FSB	FSC	FSC
Weight, approx.						
• Without integrated line filter	kg (lb)	2.9 (6.39)	2.9 (6.39)	3 (6.62)	4.7 (10.4)	4.8 (10.6)
• With integrated line filter	kg (lb)	3.1 (6.84)	3.1 (6.84)	3.2 (7.06)	5.3 (11.7)	5.4 (11.9)

1) The rated output current I_{rated} and the base-load current I_L are based on the duty cycle for low overload (LO).

2) The base-load current I_H is based on the duty cycle for high overload (HO).

3) Typical values. You can find more information on the Internet at http://support.automation.siemens.com/WW/view/en/94059311

4) The input current depends on the motor load and line impedance. The input currents apply for a load at rated power (based on I_{rated}) for a line impedance corresponding to u_K = 1 %. The current values are specified on the rating plate of the Power Module.

Technical specifications

PM240-2 Power Modules push-through variant

Line voltage 200 ... 240 V 1 AC/3 AC		**PM240-2 Power Modules push-through variant**		
Without integrated line filter		6SL3211-1PB13-8UL0	6SL3211-1PB21-0UL0	6SL3211-1PB21-8UL0
With integrated line filter class A		6SL3211-1PB13-8AL0	6SL3211-1PB21-0AL0	6SL3211-1PB21-8AL0
Output current At 50 Hz 230 V 1 AC/3 AC				
• Rated current I_{rated} [1]	A	4.2	10.4	17.5
• Base-load current I_L [1]	A	4.2	10.4	17.5
• Base-load current I_H [2]	A	3.2	7.4	13.6
• Maximum current I_{max}	A	6.4	15.6	27.2
Rated power				
• Based on I_L	kW (hp)	0.75 (1)	2.2 (3)	4 (5)
• Based on I_H	kW (hp)	0.55 (0.75)	1.5 (2)	3 (4)
Rated pulse frequency	kHz	4	4	4
Efficiency η		>96	>96	>96
Power loss [3] At rated current	kW	0.04	0.12	0.18
Cooling air requirement	m^3/s	0.005	0.0092	0.0185
Sound pressure level L_{pA} (1 m)	dB	<56	<62	<65
24 V DC power supply for Control Unit	A	1	1	1
Input current [4]				
• Rated current 1 AC/3 AC	A	9.6/5.5	24/13.9	43/24.8
• Based on I_H 1 AC/3 AC	A	8.4/4.8	20.9/12.1	37.5/21.7
Line supply connection U1/L1, V1/L2, W1/L3		Screw terminals, plug-in	Screw terminals, plug-in	Screw terminals, plug-in
• Conductor cross-section	mm^2	1.5 ... 2.5	1.5 ... 6	6 ... 16
Motor connection U2, V2, W2		Screw terminals, plug-in	Screw terminals, plug-in	Screw terminals, plug-in
• Conductor cross-section	mm^2	1.5 ... 2.5	1.5 ... 6	6 ... 16
Motor cable length, max.				
• Shielded	m (ft)	50 (164)	50 (164)	50 (164)
• Unshielded	m (ft)	100 (328)	100 (328)	100 (328)
Degree of protection		IP20	IP20	IP20
Dimensions				
• Width	mm (in)	126 (4.96)	154 (6.06)	200 (7.87)
• Height	mm (in)	238 (9.37)	345 (13.58)	411 (16.18)
• Depth				
- Without operator panel	mm (in)	171 (6.73)	171 (6.73)	171 (6.73)
- With operator panel, max.	mm (in)	254 (10)	254 (10)	254 (10)
Frame size		FSA	FSB	FSC
Weight, approx. With integrated line filter				
• Without integrated line filter	kg (lb)	1.8 (3.97)	3.4 (7.50)	5.8 (12.8)
• With integrated line filter	kg (lb)	2 (4.41)	3.7 (8.16)	6.3 (13.9)

[1] The rated output current I_{rated} and the base-load current I_L are based on the duty cycle for low overload (LO).

[2] The base-load current I_H is based on the duty cycle for high overload (HO).

[3] Typical values. You can find more information on the Internet at http://support.automation.siemens.com/WW/view/en/94059311

[4] The input current depends on the motor load and line impedance and applies for a line impedance corresponding to u_K = 1 %. The rated input currents apply for a load at rated power (based on I_{rated}) – these current values are specified on the rating plate.

Technical specifications

Line voltage 380 ... 480 V 3 AC		**PM240-2 Power Modules push-through variant**		
Without integrated line filter		6SL3211-1PE18-0UL1	6SL3211-1PE21-8UL0	6SL3211-1PE23-3UL0
With integrated line filter class A		6SL3211-1PE18-0AL1	6SL3211-1PE21-8AL0	6SL3211-1PE23-3AL0
Output current at 50 Hz 400 V 3 AC				
• Rated current I_{rated} [1]	A	7.7	18	32
• Base-load current I_L [1]	A	7.7	18	32
• Base-load current I_H [2]	A	5.9	13.2	26
• Maximum current I_{max}	A	11.8	27	52
Rated power				
• Based on I_L	kW (hp)	3 (4)	7.5 (10)	15 (20)
• Based on I_H	kW (hp)	2.2 (3)	5.5 (7.5)	11 (15)
Rated pulse frequency	kHz	4	4	4
Efficiency η		>96	>97	>97
Power loss [3] At rated current	kW	0.113	0.239	0.385
Cooling air requirement	m^3/s	0.007	0.0092	0.0185
Sound pressure level L_{pA} (1 m)	dB	<56	<62	<65
24 V DC power supply for Control Unit	A	1	1	1
Input current [4]				
• Rated current	A	10.1	22.2	39.9
• Based on I_H	A	8.8	19.8	36
Line supply connection U1/L1, V1/L2, W1/L3		Screw terminals, plug-in	Screw terminals, plug-in	Screw terminals, plug-in
• Conductor cross-section	mm^2	1.5 ... 2.5	1.5 ... 6	6 ... 16
Motor connection U2, V2, W2		Screw terminals, plug-in	Screw terminals, plug-in	Screw terminals, plug-in
• Conductor cross-section	mm^2	1.5 ... 2.5	1.5 ... 6	6 ... 16
Motor cable length, max.				
• Shielded	m (ft)	25 (82)	25 (82)	25 (82)
• Unshielded	m (ft)	100 (328)	100 (328)	100 (328)
Degree of protection		IP20	IP20	IP20
Dimensions				
• Width	mm (in)	126 (4.96)	154 (6.06)	200 (7.87)
• Height	mm (in)	238 (9.37)	345 (13.58)	411 (16.18)
• Depth				
- Without operator panel	mm (in)	171 (6.73)	171 (6.73)	171 (6.73)
- With operator panel, max.	mm (in)	254 (10)	254 (10)	254 (10)
Frame size		FSA	FSB	FSC
Weight, approx. With integrated line filter				
• Without integrated line filter	kg (lb)	1.7 (3.75)	3.6 (7.94)	5.8 (12.8)
• With integrated line filter	kg (lb)	1.8 (3.97)	3.9 (8.60)	6.3 (13.9)

[1] The rated output current I_{rated} and the base-load current I_L are based on the duty cycle for low overload (LO).

[2] The base-load current I_H is based on the duty cycle for high overload (HO).

[3] Typical values. You can find more information on the Internet at http://support.automation.siemens.com/WW/view/en/94059311

[4] The input current depends on the motor load and line impedance and applies for a line impedance corresponding to u_K = 1 %. The rated input currents apply for a load at rated power (based on I_{rated}) – these current values are specified on the rating plate.

Technical specifications

PM240 Power Modules

Line voltage 380 ... 480 V 3 AC		**PM240 Power Modules**				
Without integrated line filter		6SL3224-0BE31-5UA0	6SL3224-0BE31-8UA0	6SL3224-0BE32-2UA0	6SL3224-0BE33-0UA0	6SL3224-0BE33-7UA0
With integrated line filter		6SL3224-0BE31-5AA0	6SL3224-0BE31-8AA0	6SL3224-0BE32-2AA0	6SL3224-0BE33-0AA0	6SL3224-0BE33-7AA0
Output current at 50 Hz 400 V 3 AC						
• Rated current I_{rated} [1]	A	38	45	60	75	90
• Base-load current I_L [1]	A	38	45	60	75	90
• Base-load current I_H [2]	A	32	38	45	60	75
• Maximum current I_{max}	A	64	76	90	124	150
Rated power						
• Based on I_L	kW (hp)	18.5 (25)	22 (30)	30 (40)	37 (50)	45 (60)
• Based on I_H	kW (hp)	15 (20)	18.5 (25)	22 (30)	30 (40)	37 (50)
Rated pulse frequency	kHz	4	4	4	4	4
Efficiency η		>0.97	>0.97	>0.97	>0.97	>0.97
Power loss [3] At rated current	kW	0.53	0.633	0.827	0.907	1.116
Cooling air requirement	m^3/s	0.055	0.055	0.055	0.055	2 × 0.055
Sound pressure level L_{pA} (1 m)	dB	<60	<60	<61	<60	<62
24 V DC power supply for Control Unit	A	1	1	1	1	1
Rated input current [4]						
• With line reactor	A	40	47	63	78	94
• Without line reactor	A	46	53	72	88	105
Length of cable to braking resistor, max.	m (ft)	15 (49)	15 (49)	15 (49)	15 (49)	15 (49)
Line supply 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 ... 50	10 ... 50	10 ... 50	10 ... 50	10 ... 50
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 ... 50	10 ... 50	10 ... 50	10 ... 50	10 ... 50
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 ... 50	10 ... 50	10 ... 50	10 ... 50	10 ... 50
PE connection		On housing with M6 screw	On housing with M6 screw	On housing with M6 screw	On housing with M6 screw	On housing with M6 screw
Motor cable length [5], **max.**						
• Shielded	m (ft)	50 (164)	50 (164)	50 (164)	50 (164)	50 (164)
• 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						
- Without integrated line filter	mm (in)	419 (16.50)	419 (16.50)	419 (16.50)	499 (19.65)	499 (19.65)
- With integrated line filter	mm (in)	512 (20.16)	512 (20.16)	512 (20.16)	635 (25)	635 (25)
• Depth						
- Without operator panel	mm (in)	204 (8.03)	204 (8.03)	204 (8.03)	204 (8.03)	204 (8.03)
- With operator panel, max.	mm (in)	278 (10.94)	278 (10.94)	278 (10.94)	278 (10.94)	278 (10.94)
Frame size		FSD	FSD	FSD	FSE	FSE
Weight, approx.						
• Without integrated line filter	kg (lb)	13 (28.7)	13 (28.7)	13 (28.7)	16 (35.3)	16 (35.3)
• With integrated line filter	kg (lb)	16 (35.3)	16 (35.3)	16 (35.3)	23 (50.7)	23 (50.7)

[1] The rated output current I_{rated} and the base-load current I_L are based on the duty cycle for low overload (LO).

[2] The base-load current I_H is based on the duty cycle for high overload (HO).

[3] Typical values. You can find more information on the Internet at http://support.automation.siemens.com/WW/view/en/94059311

[4] The input current depends on the motor load and line impedance. The input currents apply for a load at rated power (based on I_{rated}) for a line impedance corresponding to u_K = 1 %. These current values without line reactor are specified on the rating plate of the Power Module.

[5] Max. motor cable length 25 m (shielded) for PM240 Power Modules with integrated line filter to maintain the limit values according to EN 61800-3 Category C2.

Technical specifications

Line voltage 380 ... 480 V 3 AC		PM240 Power Modules				
Without integrated line filter		6SL3224-0BE34-5UA0	6SL3224-0BE35-5UA0	6SL3224-0BE37-5UA0	6SL3224-0BE38-8UA0	6SL3224-0BE41-1UA0
With integrated line filter		6SL3224-0BE34-5AA0	6SL3224-0BE35-5AA0	6SL3224-0BE37-5AA0	–	–
Output current at 50 Hz 400 V 3 AC						
• Rated current I_{rated} [1]	A	110	145	178	205	250
• Base-load current I_L [1]	A	110	145	178	205	250
• Base-load current I_H [2]	A	90	110	145	178	205
• Maximum current I_{max}	A	180	220	290	308	375
Rated power						
• Based on I_L	kW (hp)	55 (75)	75 (100)	90 (125)	110 (150)	132 (200)
• Based on I_H	kW (hp)	45 (60)	55 (75)	75 (100)	90 (125)	110 (150)
Rated pulse frequency	kHz	4	4	4	2	2
Efficiency η		>0.97	>0.97	>0.97	>0.97	>0.97
Power loss [3] At rated current	kW	1.484	2.079	2.376	2.274	2.964
Cooling air requirement	m^3/s	0.15	0.15	0.15	0.15	0.15
Sound pressure level L_{pA} (1 m)	dB	<60	<60	<65	<65	<65
24 V DC power supply for Control Unit	A	1	1	1	1	1
Rated input current [4]						
• With line reactor	A	115	151	186	210	250
• Without line reactor	A	129	168	204	245 (9.65)	299
Length of cable to braking resistor, max.	m (ft)	15 (49)	15 (49)	15 (49)	15 (49)	15 (49)
Line supply connection U1/L1, V1/L2, W1/L3		M8 screw stud	M8 screw stud	M8 screw stud	M8 screw stud	M8 screw stud
• Conductor cross-section	mm^2	25 ... 120	25 ... 120	25 ... 120	25 ... 120	25 ... 120
Motor connection U2, V2, W2		M8 screw stud	M8 screw stud	M8 screw stud	M8 screw stud	M8 screw stud
• Conductor cross-section	mm^2	25 ... 120	25 ... 120	25 ... 120	25 ... 120	25 ... 120
DC link connection, connection for braking resistor DCP/R1, DCN, R2		M8 screw stud	M8 screw stud	M8 screw stud	M8 screw stud	M8 screw stud
• Conductor cross-section	mm^2	25 ... 120	25 ... 120	25 ... 120	25 ... 120	25 ... 120
PE connection		On housing with M8 screw	On housing with M8 screw	On housing with M8 screw	On housing with M8 screw	On housing with M8 screw
Motor cable length [5], **max.**						
• Shielded	m (ft)	50 (164)	50 (164)	50 (164)	50 (164)	50 (164)
• 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)	350 (13.78)	350 (13.78)	350 (13.78)	350 (13.78)	350 (13.78)
• Height						
- Without integrated line filter	mm (in)	634 (24.96)	634 (24.96)	634 (24.96)	634 (24.96)	634 (24.96)
- With integrated line filter	mm (in)	934 (36.77)	934 (36.77)	934 (36.77)	–	–
• Depth						
- Without operator panel	mm (in)	316 (12.44)	316 (12.44)	316 (12.44)	316 (12.44)	316 (12.44)
- With operator panel, max.	mm (in)	390 (15.35)	390 (15.35)	390 (15.35)	390 (15.35)	390 (15.35)
Frame size		FSF	FSF	FSF	FSF	FSF
Weight, approx.						
• Without integrated line filter	kg (lb)	36 (79.4)	36 (79.4)	36 (79.4)	39 (86)	39 (86)
• With integrated line filter	kg (lb)	52 (115)	52 (115)	52 (115)	–	–

[1] The rated output current I_{rated} and the base-load current I_L are based on the duty cycle for low overload (LO).

[2] The base-load current I_H is based on the duty cycle for high overload (HO).

[3] Typical values. You can find more information on the Internet at http://support.automation.siemens.com/WW/view/en/94059311

[4] The input current depends on the motor load and line impedance. The input currents apply for a load at rated power (based on I_{rated}) for a line impedance corresponding to u_K = 1 %. These current values without line reactor are specified on the rating plate of the Power Module.

[5] Max. motor cable length 25 m (shielded) for PM240 Power Modules with integrated line filter to maintain the limit values according to EN 61800-3 Category C2.

Technical specifications

Line voltage 380 ... 480 V 3 AC		**PM240 Power Modules**		
Without integrated line filter		6SL3224-0XE41-3UA0	6SL3224-0XE41-6UA0	6SL3224-0XE42-0UA0
Output current at 50 Hz 400 V 3 AC				
• Rated current I_{rated} [1]	A	302	370	477
• Base-load current I_L [1]	A	302	370	477
• Base-load current I_H [2]	A	250	302	370
• Maximum current I_{max}	A	400	483	592
Rated power				
• Based on I_L	kW (hp)	160 (250)	200 (300)	250 (400)
• Based on I_H	kW (hp)	132 (200)	160 (250)	200 (300)
Rated pulse frequency	kHz	2	2	2
Efficiency η		>0.98	>0.98	>0.98
Power loss [3] At rated current	kW	4.163	4.783	5.911
Cooling air requirement	m^3/s	0.36	0.36	0.36
Sound pressure level L_{pA} (1 m)	dB	<69	<69	<69
24 V DC power supply for Control Unit	A	1	1	1
Rated input current [4]				
• With line reactor	A	245 (9.65)	297	354
• Without line reactor	A	297	354	442
Length of cable to braking resistor, max.	m (ft)	50 (164)	50 (164)	50 (164)
Line supply connection U1/L1, V1/L2, W1/L3		M10 screw stud	M10 screw stud	M10 screw stud
• Conductor cross-section	mm^2	2 × 240	2 × 240	2 × 240
Motor connection U2, V2, W2		M10 screw stud	M10 screw stud	M10 screw stud
• Conductor cross-section	mm^2	2 × 240	2 × 240	2 × 240
PE connection		On housing with M10 screw	On housing with M10 screw	On housing with M10 screw
Motor cable length [5]**, max.**				
• Shielded	m (ft)	200 (656)	200 (656)	200 (656)
• Unshielded	m (ft)	300 (984)	300 (984)	300 (984)
Degree of protection		IP20	IP20	IP20
Dimensions				
• Width	mm (in)	326 (12.83)	326 (12.83)	326 (12.83)
• Height	mm (in)	1533 (60.35)	1533 (60.35)	1533 (60.35)
• Depth	mm (in)	547 (21.54)	547 (21.54)	547 (21.54)
Frame size		FSGX	FSGX	FSGX
Weight, approx.	kg (lb)	174 (384)	174 (384)	174 (384)

[1] The rated output current I_{rated} and the base-load current I_L are based on the duty cycle for low overload (LO).

[2] The base-load current I_H is based on the duty cycle for high overload (HO).

[3] Typical values. You can find more information on the Internet at http://support.automation.siemens.com/WW/view/en/94059311

[4] The input current depends on the motor load and line impedance. The input currents apply for a load at rated power (based on I_{rated}) for a line impedance corresponding to u_K = 1 %. These current values without line reactor are specified on the rating plate of the Power Module.

[5] Max. motor cable length 25 m (shielded) for PM240 Power Modules with integrated line filter to maintain the limit values according to EN 61800-3 Category C2.

Power Modules

PM250 Power Modules

Line voltage 380 ... 480 V 3 AC		**PM250 Power Modules**		
With integrated line filter		6SL3225-0BE25-5AA1	6SL3225-0BE27-5AA1	6SL3225-0BE31-1AA1
Output current at 50 Hz 400 V 3 AC				
• Rated current I_{rated} [1]	A	18	25	32
• Base-load current I_L [1]	A	18	25	32
• Base-load current I_H [2]	A	13.2	19	26
• Maximum current I_{max}	A	26.4	38	52
Rated power				
• Based on I_L	kW (hp)	7.5 (10)	11 (15)	15 (20)
• Based on I_H	kW (hp)	5.5 (7.5)	7.5 (10)	11 (15)
Rated pulse frequency	kHz	4	4	4
Efficiency η		0.95	0.95	0.95
Power loss [3] At rated current	kW	0.298	0.488	0.472
Cooling air requirement	m^3/s	0.038	0.038	0.038
Sound pressure level L_{pA} (1 m)	dB	<60	<60	<60
24 V DC power supply for Control Unit	A	1	1	1
Input current [4]				
• Rated current	A	18	25	32
• Based on I_H	A	13.2	19	26
Line supply connection U1/L1, V1/L2, W1/L3		Screw terminals	Screw terminals	Screw terminals
• Conductor cross-section	mm^2	2.5 ... 10	2.5 ... 10	2.5 ... 10
Motor connection U2, V2, W2		Screw terminals	Screw terminals	Screw terminals
• Conductor cross-section	mm^2	2.5 ... 10	2.5 ... 10	2.5 ... 10
PE connection		On housing with M5 screw	On housing with M5 screw	On housing with M5 screw
Motor cable length, max.				
• Shielded	m (ft)	25 (82)	25 (82)	25 (82)
• Unshielded	m (ft)	100 (328)	100 (328)	100 (328)
Degree of protection		IP20	IP20	IP20
Dimensions				
• Width	mm (in)	189 (7.44)	189 (7.44)	189 (7.44)
• Height	mm (in)	334 (13.15)	334 (13.15)	334 (13.15)
• Depth				
- Without operator panel	mm (in)	185 (7.28)	185 (7.28)	185 (7.28)
- With operator panel, max.	mm (in)	268 (10.55)	268 (10.55)	268 (10.55)
Frame size		FSC	FSC	FSC
Weight, approx.	kg (lb)	7.5	7.5	7.5

[1] The rated output current I_{rated} and the base-load current I_L are based on the duty cycle for low overload (LO).

[2] The base-load current I_H is based on the duty cycle for high overload (HO).

[3] Typical values. You can find more information on the Internet at http://support.automation.siemens.com/WW/view/en/94059311

[4] The input current depends on the motor load and line impedance and applies for a line impedance corresponding to u_K = 1 %. The rated input currents apply for a load at rated power (based on I_{rated}) – these current values are specified on the rating plate.

Technical specifications

Line voltage 380 ... 480 V 3 AC		**PM250 Power Modules**		
Without integrated line filter		6SL3225-0BE31-5UA0	6SL3225-0BE31-8UA0	6SL3225-0BE32-2UA0
With integrated line filter		6SL3225-0BE31-5AA0	6SL3225-0BE31-8AA0	6SL3225-0BE32-2AA0
Output current at 50 Hz 400 V 3 AC				
• Rated current I_{rated} [1]	A	38	45	60
• Base-load current I_L [1]	A	38	45	60
• Base-load current I_H [2]	A	32	38	45
• Maximum current I_{max}	A	64	76	90
Rated power				
• Based on I_L	kW (hp)	18.5 (25)	22 (30)	30 (40)
• Based on I_H	kW (hp)	15 (20)	18.5 (25)	22 (30)
Rated pulse frequency	kHz	4	4	4
Efficiency η		>0.97	>0.97	>0.97
Power loss [3] At rated current	kW	0.576	0.693	0.918
Cooling air requirement	m^3/s	0.022	0.022	0.039
Sound pressure level L_{pA} (1 m)	dB	<60	<60	<61
24 V DC power supply for Control Unit	A	1	1	1
Input current [4]				
• Rated current	A	36	42	56
• Based on I_H	A	30	36	42
Line supply connection U1/L1, V1/L2, W1/L3		M6 screw stud	M6 screw stud	M6 screw stud
• Conductor cross-section	mm^2	10 ... 35	10 ... 35	10 ... 35
Motor connection U2, V2, W2		M6 screw stud	M6 screw stud	M6 screw stud
• Conductor cross-section	mm^2	10 ... 35	10 ... 35	10 ... 35
PE connection		On housing with M6 screw	On housing with M6 screw	On housing with M6 screw
Motor cable length [5], **max.**				
• Shielded	m (ft)	50 (164)	50 (164)	50 (164)
• 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				
- Without integrated line filter	mm (in)	419 (16.50)	419 (16.50)	419 (16.50)
- With integrated line filter	mm (in)	512 (20.16)	512 (20.16)	512 (20.16)
• Depth				
- Without operator panel	mm (in)	204 (8.03)	204 (8.03)	204 (8.03)
- With operator panel, max.	mm (in)	278 (10.94)	278 (10.94)	278 (10.94)
Frame size		FSD	FSD	FSD
Weight, approx.				
• Without integrated line filter	kg (lb)	13 (28.7)	13 (28.7)	13 (28.7)
• With integrated line filter	kg (lb)	15 (33.1)	15 (33.1)	16 (35.3)

[1] The rated output current I_{rated} and the base-load current I_L are based on the duty cycle for low overload (LO).

[2] The base-load current I_H is based on the duty cycle for high overload (HO).

[3] Typical values. You can find more information on the Internet at http://support.automation.siemens.com/WW/view/en/94059311

[4] The input current depends on the motor load and line impedance and applies for a line impedance corresponding to u_K = 1 %. The rated input currents apply for a load at rated power (based on I_{rated}) – these current values are specified on the rating plate.

[5] Max. motor cable length 25 m (shielded) for PM250 Power Modules with integrated line filter to maintain the limit values of EN 61800-3 Category C2.

Technical specifications

Line voltage 380 ... 480 V 3 AC		**PM250 Power Modules**				
Without integrated line filter		6SL3225-0BE33-0UA0	6SL3225-0BE33-7UA0	6SL3225-0BE34-5UA0	6SL3225-0BE35-5UA0	6SL3225-0BE37-5UA0
With integrated line filter		6SL3225-0BE33-0AA0	6SL3225-0BE33-7AA0	6SL3225-0BE34-5AA0	6SL3225-0BE35-5AA0	6SL3225-0BE37-5AA0
Output current at 50 Hz 400 V 3 AC						
• Rated current I_{rated} [1]	A	75	90	110	145	178
• Base-load current I_L [1]	A	75	90	110	145	178
• Base-load current I_H [2]	A	60	75	90	110	145
• Maximum current I_{max}	A	120	150	180	220	290
Rated power						
• Based on I_L	kW (hp)	37 (50)	45 (60)	55 (75)	75 (100)	90 (125)
• Based on I_H	kW (hp)	30 (40)	37 (50)	45 (60)	55 (75)	75 (100)
Rated pulse frequency	kHz	4	4	4	4	4
Efficiency η		>0.97	>0.97	>0.97	>0.97	>0.97
Power loss [3] At rated current	kW	1.01	1.217	1.605	2.234	2.638
Cooling air requirement	m^3/s	0.022	0.039	0.094	0.094	0.117
Sound pressure level L_{pA} (1 m)	dB	<60	<62	<60	<60	<65
24 V DC power supply for Control Unit	A	1	1	1	1	1
Input current [4]						
• Rated current	A	70	84	102	135	166
• Based on I_H	A	56	70	84	102	135
Line supply connection U1/L1, V1/L2, W1/L3		M6 screw stud	M6 screw stud	M8 screw stud	M8 screw stud	M8 screw stud
• Conductor cross-section, max.	mm^2	10 ... 50	10 ... 50	25 ... 120	25 ... 120	25 ... 120
Motor connection U2, V2, W2		M6 screw stud	M6 screw stud	M8 screw stud	M8 screw stud	M8 screw stud
• Conductor cross-section, max.	mm^2	10 ... 50	10 ... 50	25 ... 120	25 ... 120	25 ... 120
PE connection		On housing with M6 screw	On housing with M6 screw	On housing with M8 screw	On housing with M8 screw	On housing with M8 screw
Motor cable length [5], **max.**						
• Shielded	m (ft)	50 (164)	50 (164)	50 (164)	50 (164)	50 (164)
• 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)	350 (13.78)	350 (13.78)	350 (13.78)
• Height						
- Without integrated line filter	mm (in)	499 (19.65)	499 (19.65)	634 (24.96)	634 (24.96)	634 (24.96)
- With integrated line filter	mm (in)	635 (25.0)	635 (25.0)	934 (36.77)	934 (36.77)	934 (36.77)
• Depth						
- Without operator panel	mm (in)	204 (8.03)	204 (8.03)	316 (12.44)	316 (12.44)	316 (12.44)
- With operator panel, max.	mm (in)	278 (10.94)	278 (10.94)	390 (15.35)	390 (15.35)	390 (15.35)
Frame size		FSE	FSE	FSF	FSF	FSF
Weight, approx.						
• Without integrated line filter	kg (lb)	14 (30.9)	14 (30.9)	35 (77.2)	35 (77.2)	35 (77.2)
• With integrated line filter	kg (lb)	21 (46.3)	21 (46.3)	51 (112)	51 (112)	51 (112)

[1] The rated output current I_{rated} and the base-load current I_L are based on the duty cycle for low overload (LO).

[2] The base-load current I_H is based on the duty cycle for high overload (HO).

[3] Typical values. You can find more information on the Internet at http://support.automation.siemens.com/WW/view/en/94059311

[4] The input current depends on the motor load and line impedance and applies for a line impedance corresponding to u_K = 1 %. The rated input currents apply for a load at rated power (based on I_{rated}) – these current values are specified on the rating plate.

[5] Max. motor cable length 25 m (shielded) for PM250 Power Modules with integrated line filter to maintain the limit values of EN 61800-3 Category C2.

Characteristic curves

Derating data, PM230 Power Modules

Pulse frequency

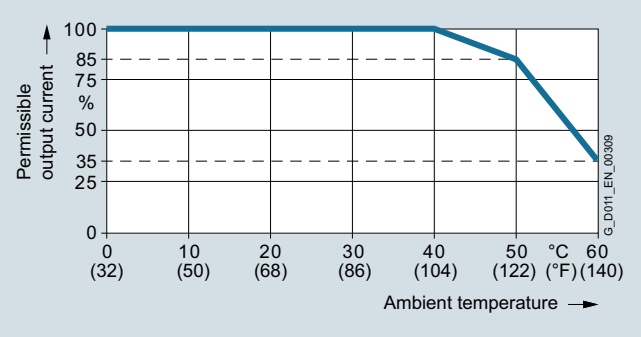
Rated power [1] at 50 Hz 400 V 3 AC		**Rated output current in A** for a pulse frequency of						
kW	hp	4 kHz	6 kHz	8 kHz	10 kHz	12 kHz	14 kHz	16 kHz
0.37	0.5	1.3	1.11	0.91	0.78	0.65	0.59	0.52
0.55	0.75	1.7	1.45	1.19	1.02	0.85	0.77	0.68
0.75	1	2.2	1.87	1.54	1.32	1.1	0.99	0.88
1.1	1.5	3.1	2.64	2.17	1.86	1.55	1.4	1.24
1.5	2	4.1	3.49	2.87	2.46	2.05	1.85	1.64
2.2	3	5.9	5.02	4.13	3.54	2.95	2.66	2.36
3	4	7.7	6.55	5.39	4.62	3.85	3.47	3.08
4	5	10.2	8.67	7.14	6.12	5.1	4.59	4.08
5.5	7.5	13.2	11.22	9.24	7.92	6.6	5.94	5.28
7.5	10	18	15.3	12.6	10.8	9	8.1	7.2
11	15	26	22.1	18.2	15.6	13	11.7	10.4
15	20	32	27.2	22.4	19.2	16	14.4	12.8
18.5	25	38	32.3	26.6	22.8	19	17.1	15.2
22	30	45	38.25	31.5	27	22.5	20.25	18
30	40	60	51	42	36	30	27	24
37	50	75	63.75	52.5	45	37.5	33.75	30
45	60	90	76.5	63	54	45	40.5	36
55	75	110	93.5	77	66	55	49.5	44
75	100	145	123.3	101.5	–	–	–	–

[1] Rated power based on the rated output current I_{rated}. The rated output current I_{rated} is based on the duty cycle for low overload (LO).

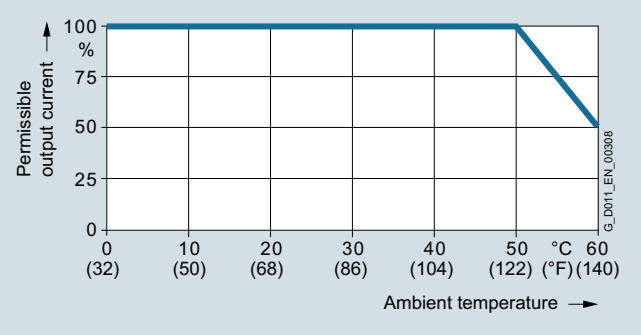
Characteristic curves

Derating data, PM230 Power Modules *(continued)*

Ambient temperature



Low overload (LO) for PM230 Power Modules, frame sizes FSA to FSF



High overload (HO) for PM230 Power Modules, frame sizes FSA to FSF

Note:

The operating temperature ranges of the Control Units should be taken into account. The temperature ranges are specified in the section Technical specifications under Control Units.

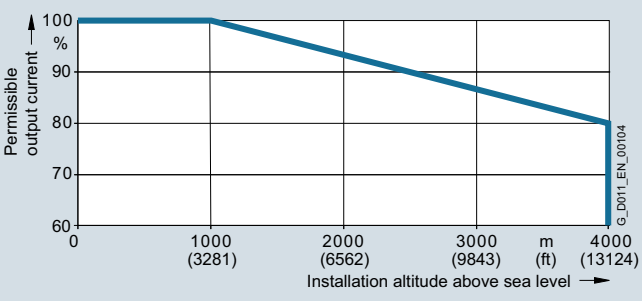
Installation altitude

Permissible line supplies depending on the installation altitude

- Installation altitude up to 2000 m above sea level
  - Connection to every supply system permitted for the inverter
- Installation altitudes between 2000 m and 4000 m above sea level
  - Connection to a TN system with grounded neutral point
  - TN systems with grounded line conductor are not permitted
  - The TN line system with grounded neutral point can also be supplied using an isolation transformer
  - The phase-to-phase voltage does not have to be reduced

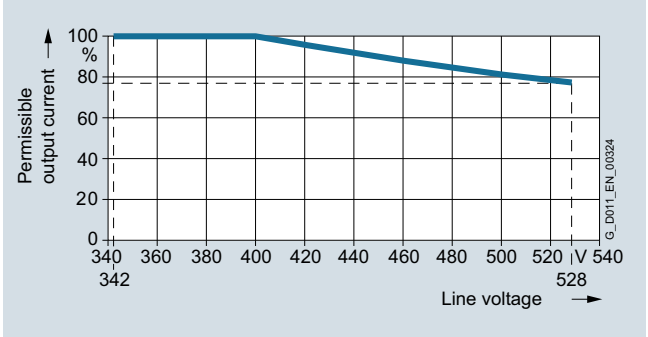
Note:

The connected motors, power elements and components must be considered separately.

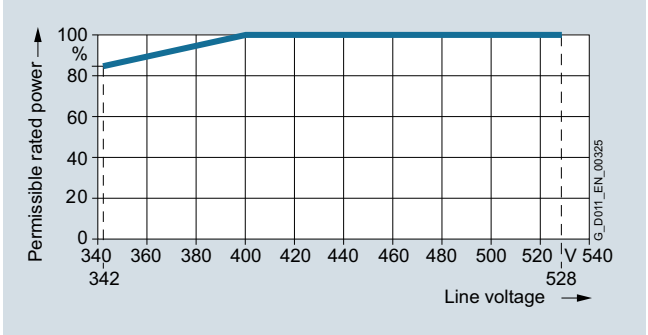


Permissible output current as a function of the installation altitude for PM230 Power Modules, frame sizes FSA to FSF

System operating voltage



Permissible output current as a function of the line voltage for PM230 Power Modules, frame sizes FSA to FSF



Permissible rated power as a function of the line voltage for PM230 Power Modules, frame sizes FSA to FSF

Characteristic curves

Derating data, PM240-2 Power Modules

Pulse frequency

Rated power [1] at 50 Hz 200 V 1 AC/3 AC		**Rated output current in A** for a pulse frequency of						
kW	hp	4 kHz	6 kHz	8 kHz	10 kHz	12 kHz	14 kHz	16 kHz
0.55	0.75	3.2	2.6	2.1	1.8	1.5	1.4	1.2
0.75	1	4.2	3.3	2.7	2.3	2	1.8	1.6
1.1	1.5	6	4.7	3.9	3.3	2.8	2.5	2.2
1.5	2	7.4	6.3	5.2	4.4	3.7	3.3	3
2.2	3	10.4	8.8	7.3	6.2	5.2	4.7	4.2
3	4	13.6	11.6	9.5	8.2	6.8	6.1	5.4
4	5	17.5	14.9	12.3	10.5	8.8	7.9	7
5.5	7.5	22	18.7	15.4	13.2	11	9.9	8.8
7.5	10	28	23.8	19.6	16.8	14	12.6	11.2

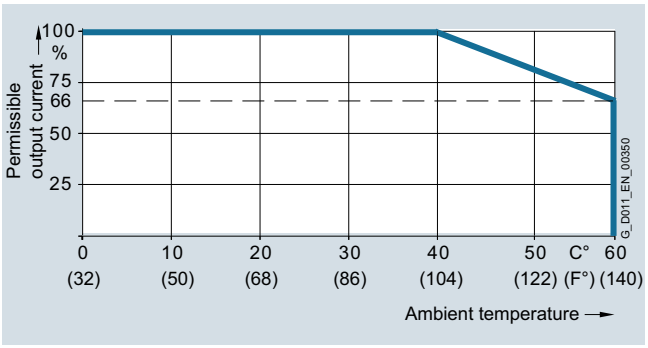
Rated power [1] at 50 Hz 400 V 3 AC		**Rated output current in A** for a pulse frequency of						
kW	hp	4 kHz	6 kHz	8 kHz	10 kHz	12 kHz	14 kHz	16 kHz
0.55	0.75	1.7	1.45	1.19	1.02	0.85	0.77	0.68
0.75	1	2.2	1.87	1.54	1.32	1.1	0.99	0.88
1.1	1.5	3.1	2.64	2.17	1.86	1.55	1.4	1.24
1.5	2	4.1	3.49	2.87	2.46	2.05	1.85	1.64
2.2	3	5.9	5.02	4.13	3.54	2.95	2.66	2.36
3	4	7.7	6.55	5.39	4.62	3.85	3.47	3.08
4	5	10.2	8.7	7.1	6.1	5.1	4.6	4.1
5.5	7.5	13.2	11.2	9.2	7.9	6.6	5.9	5.3
7.5	10	18	15.3	12.6	10.8	9	8.1	7.2
11	15	26	22.1	18.2	15.6	13	11.7	10.4
15	20	32	27.2	22.4	19.2	16	14.4	12.8

[1] Rated power based on the rated output current I_{rated}. The rated output current I_{rated} is based on the duty cycle for low overload (LO).

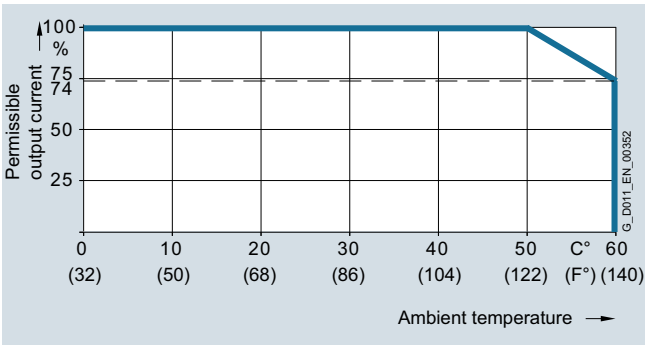
Characteristic curves

Derating data, PM240-2 Power Modules *(continued)*

Ambient temperature



Low overload (LO) for PM240-2 Power Modules



High overload (HO) for PM240-2 Power Modules

Note:

The operating temperature ranges of the Control Units should be taken into account. The temperature ranges are specified in the section Technical specifications under Control Units.

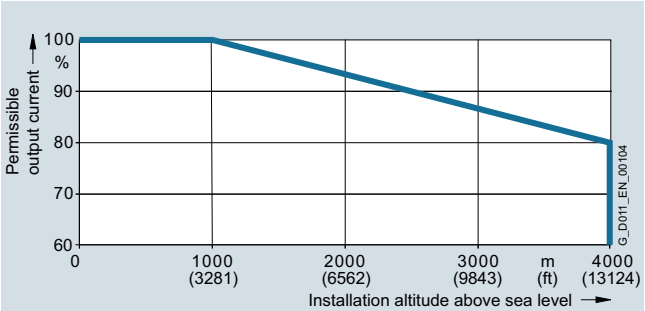
Installation altitude

Permissible line supplies depending on the installation altitude

- Installation altitude up to 2000 m above sea level
  - Connection to every supply system permitted for the inverter
- Installation altitudes between 2000 m and 4000 m above sea level
  - Connection to a TN system with grounded neutral point
  - TN systems with grounded line conductor are not permitted
  - The TN line system with grounded neutral point can also be supplied using an isolation transformer
  - The phase-to-phase voltage does not have to be reduced

Note:

The connected motors, power elements and components must be considered separately.



Permissible output current as a function of the installation altitude for PM240-2 Power Modules

System operating voltage

The rated output current remains constant over the 380 V to 480 V 3 AC voltage range.

Derating data, PM240 Power Modules

Pulse frequency

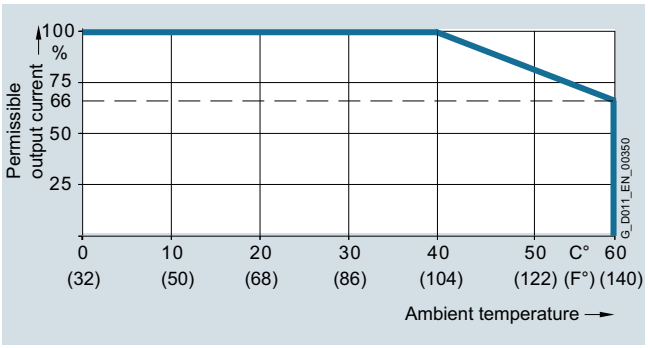
Rated power at 400 V 3 AC		**Rated output current in A** for a pulse frequency of							
kW	hp	2 kHz	4 kHz	6 kHz	8 kHz	10 kHz	12 kHz	14 kHz	16 kHz
18.5	25	–	38	32.3	26.6	22.8	19	17.1	15.2
22	30	–	45	38.3	31.5	27	22.5	20.3	18
30	40	–	62	52.7	43.4	37.2	31	27.9	24.8
37	50	–	75	63.8	52.5	45	37.5	33.8	30
45	60	–	90	76.5	63	54	45	40.5	36
55	75	–	110	93.5	77	–	–	–	–
75	100	–	145	123.3	101.5	–	–	–	–
90	125	–	178	151.3	124.6	–	–	–	–
110	150	205 [1]	178	–	–	–	–	–	–
132	200	250 [1]	202	–	–	–	–	–	–
160	250	302 [1]	250	–	–	–	–	–	–
200	300	370 [1]	302	–	–	–	–	–	–
250	400	477 [1]	370	–	–	–	–	–	–

[1] The pulse frequency can only be switched over from 4 kHz (default) to 2 kHz for the low overload (LO) duty cycle.

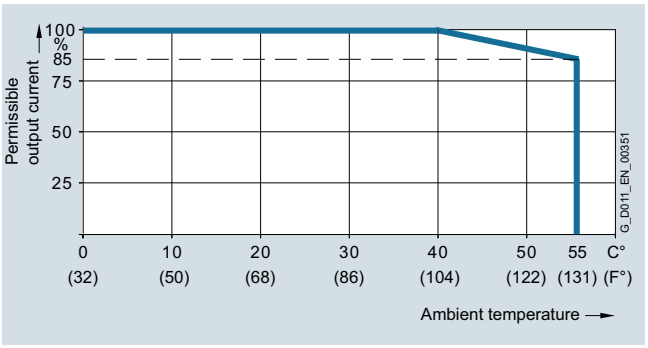
Characteristic curves

Derating data, PM240 Power Modules *(continued)*

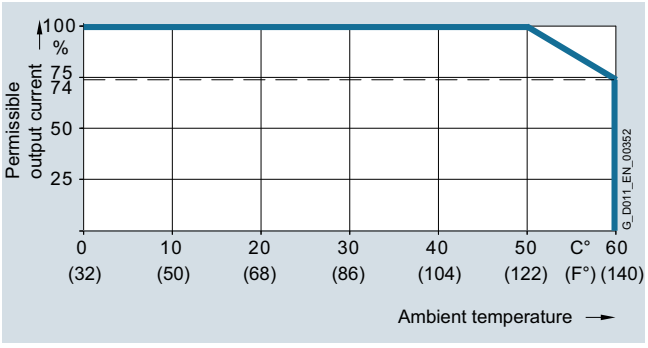
Ambient temperature



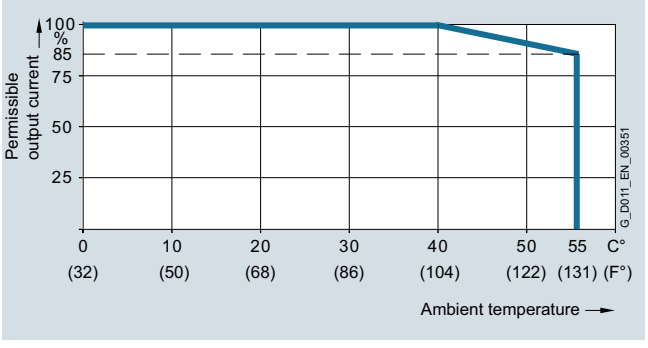
Low overload (LO) for PM240 Power Modules frame sizes FSD to FSF



Low overload (LO) for PM240 Power Modules, frame size FSGX



High overload (HO) for PM240 Power Modules, frame sizes FSD to FSF



High overload (HO) for PM240 Power Modules, frame size FSGX

Note:

The operating temperature ranges of the Control Units should be taken into account. The temperature ranges are specified in the section Technical specifications under Control Units.

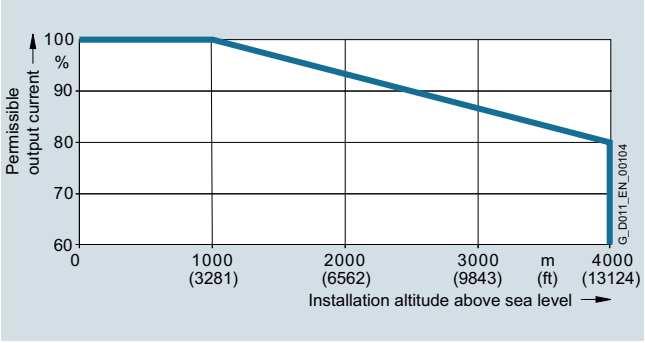
Installation altitude

Permissible line supplies depending on the installation altitude

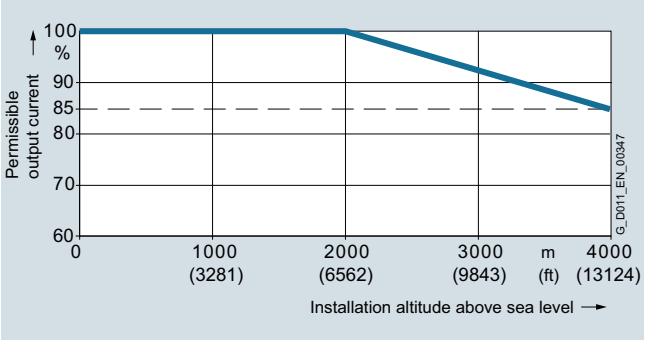
- Installation altitude up to 2000 m above sea level
  - Connection to every supply system permitted for the inverter
- Installation altitudes between 2000 m and 4000 m above sea level
  - Connection to a TN system with grounded neutral point
  - TN systems with grounded line conductor are not permitted
  - The TN line system with grounded neutral point can also be supplied using an isolation transformer
  - The phase-to-phase voltage does not have to be reduced

Note:

The connected motors, power elements and components must be considered separately.



Permissible output current as a function of the installation altitude for PM240 Power Modules, frame sizes FSD to FSF



Permissible output current as a function of the installation altitude for PM240 Power Modules, frame size FSGX

System operating voltage

The rated output current remains constant over the 380 V to 480 V 3 AC voltage range.

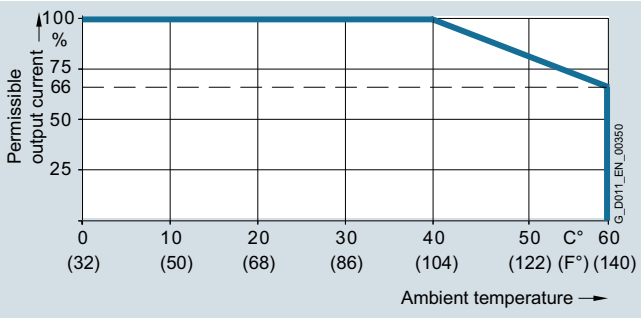
Characteristic curves

Derating data, PM250 Power Modules

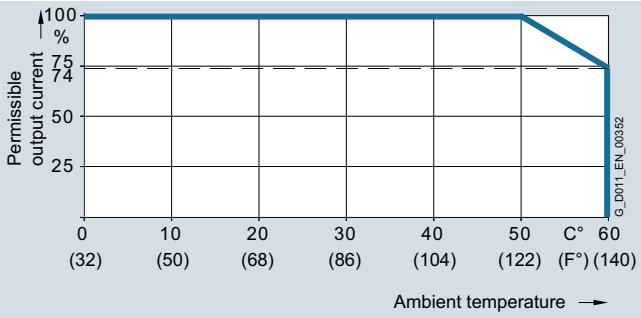
Pulse frequency

Rated power at 400 V 3 AC		**Rated output current in A** for a pulse frequency of						
kW	hp	4 kHz	6 kHz	8 kHz	10 kHz	12 kHz	14 kHz	16 kHz
7.5	10	18	12.5	11.9	10.6	9.2	7.9	6.6
11	15	25	18.1	17.1	15.2	13.3	11.4	9.5
15	20	32	24.7	23.4	20.8	18.2	15.6	13
18.5	25	38	32	27	23	19	17	15
22	30	45	38	32	27	23	20	18
30	40	60	51	42	36	30	27	24
37	50	75	64	53	45	38	34	30
45	60	90	77	63	54	45	41	36
55	75	110	94	77	–	–	–	–
75	100	145	123	102	–	–	–	–
90	125	178	151	125	–	–	–	–

Ambient temperature



Low overload (LO) for PM250 Power Modules, frame sizes FSC to FSF



High overload (HO) for PM250 Power Modules, frame sizes FSC to FSF

Note:

The operating temperature ranges of the Control Units should be taken into account. The temperature ranges are specified in the section Technical specifications under Control Units.

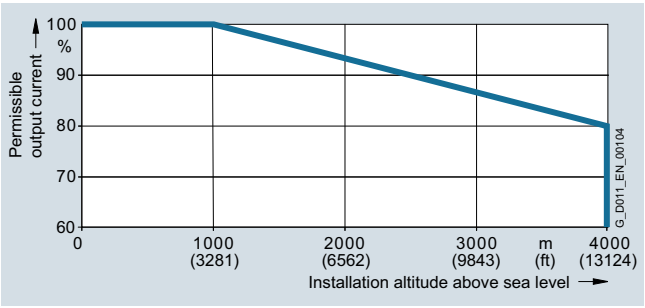
Installation altitude

Permissible line supplies depending on the installation altitude

- Installation altitude up to 2000 m above sea level
  - Connection to every supply system permitted for the inverter
- Installation altitudes between 2000 m and 4000 m above sea level
  - Connection to a TN system with grounded neutral point
  - TN systems with grounded line conductor are not permitted
  - The TN line system with grounded neutral point can also be supplied using an isolation transformer
  - The phase-to-phase voltage does not have to be reduced

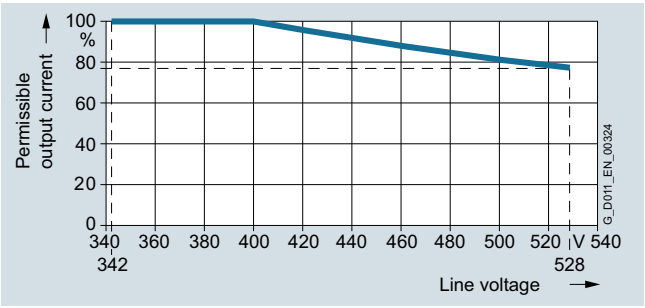
Note:

The connected motors, power elements and components must be considered separately.

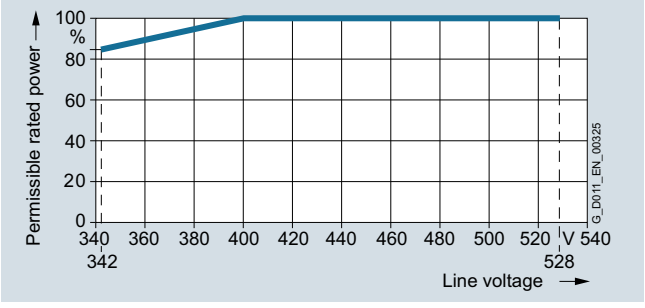


Permissible output current as a function of the installation altitude for PM250 Power Modules, frame sizes FSC to FSF

System operating voltage



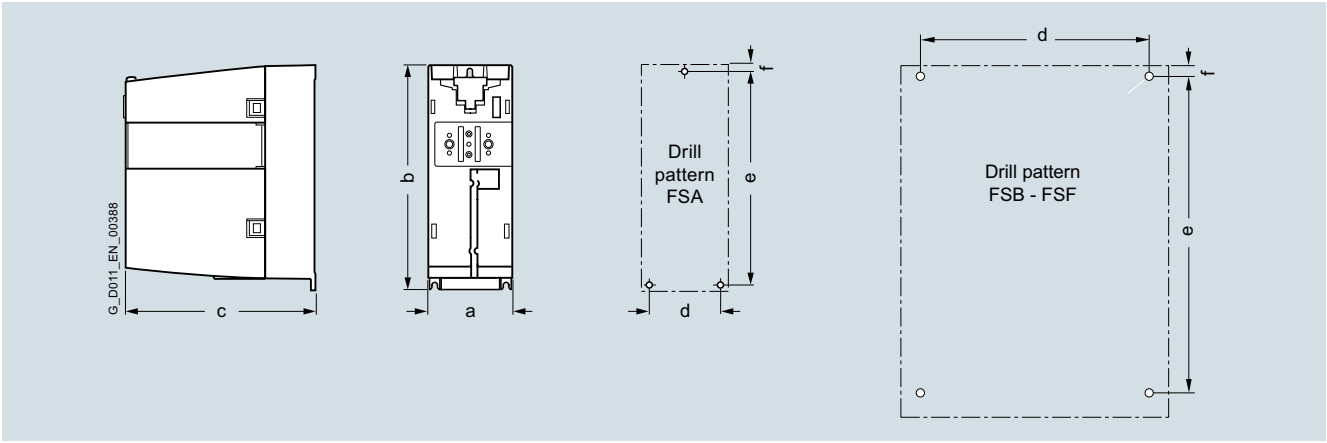
Permissible output current as a function of the line voltage for PM250 Power Modules, frame sizes FSC to FSF



Permissible rated power as a function of the line voltage for PM250 Power Modules, frame sizes FSC to FSF

Dimensional drawings

PM230 Power Modules, degree of protection IP20, standard variant and PM240-2 Power Modules, standard variant



Principle dimension drawing and drill pattern for PM230 Power Modules, degree of protection IP20, standard variant, with/without integrated line filter class A and PM240-2 Power Modules, standard variant, with/without integrated line filter class A

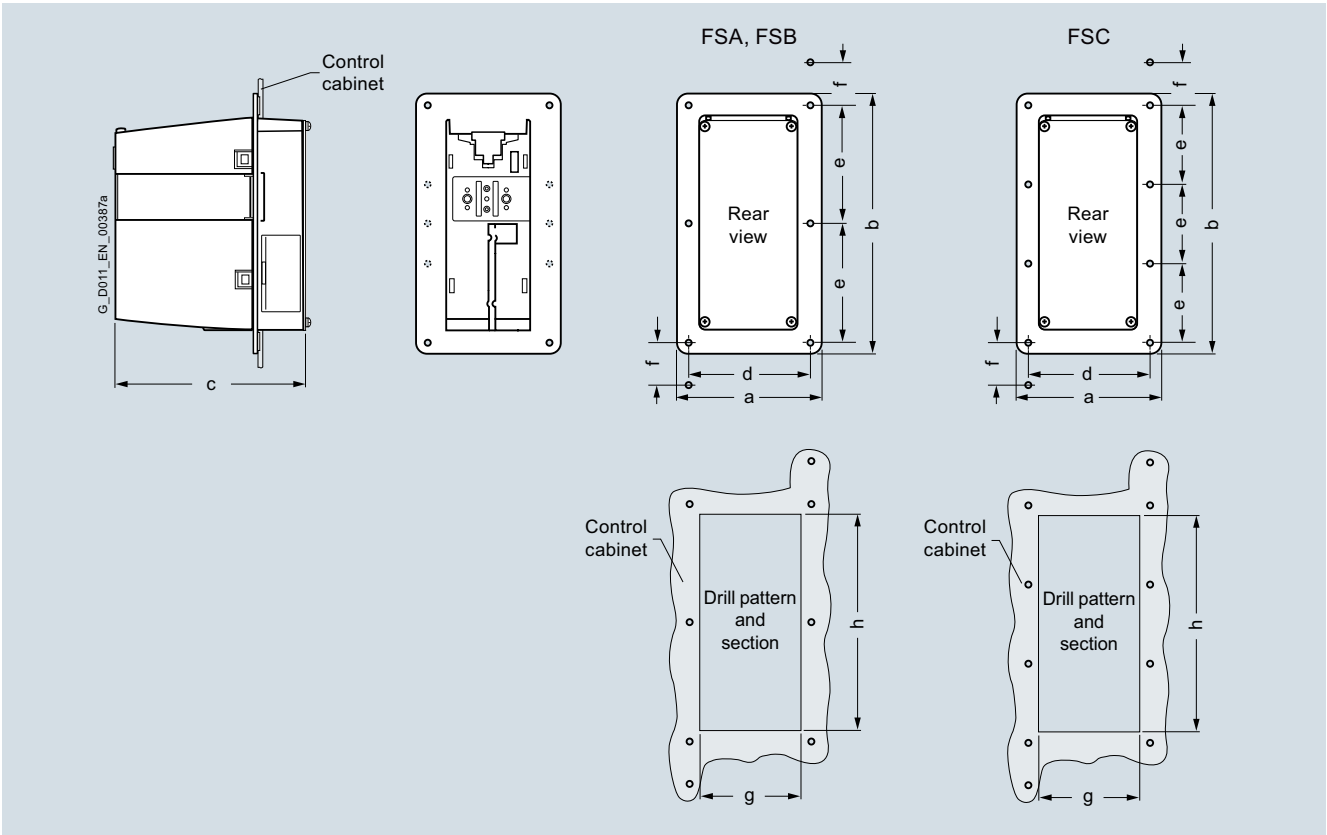
Frame size	**Dimensions** in mm (inches)			**Drilling dimensions** in mm (inches)			**Cooling clearance** in mm (inches)			**Mounting**
	a (width)	b (height)	c (depth) [1]	d	e	f	top	bottom	side [2]	With bolts
PM230 Power Modules, degree of protection IP20, standard variant, with/without integrated line filter class A										
FSA	73 (2.87)	196 (7.72)	165 (6.5)	62.3 (2.45)	186 (7.32)	6 (0.24)	80 (3.15)	100 (3.94)	0 (0)	3 × M4
FSB	100 (3.94)	292 (11.5)	165 (6.5)	80 (3.15)	281 (11.06)	6 (0.24)	80 (3.15)	100 (3.94)	0 (0)	4 × M4
FSC	140 (5.51)	355 (13.98)	165 (6.5)	120 (4.72)	343 (13.5)	6 (0.24)	80 (3.15)	100 (3.94)	0 (0)	4 × M5
FSD	275 (10.83)	419/512 (16.50/20.16)	204 (8.03)	235 (9.25)	325/419 (12.8/16.5)	11 (0.43)	300 (11.81)	300 (11.81)	0 (0)	4 × M6
FSE	275 (10.83)	499/635 (19.65/25)	204 (8.03)	235 (9.25)	405/541 (15.94/21.3)	11 (0.43)	300 (11.81)	300 (11.81)	0 (0)	4 x M6
FSF	350 (13.78)	634/934 (24.96/36.77)	316 (12.44)	300 (11.81)	598/899 (23.54/35.39)	11 (0.43)	350 (13.78)	350 (13.78)	0 (0)	4 × M8
PM240-2 Power Modules, standard variant, with/without integrated line filter class A										
FSA	73 (2.87)	196 (7.72)	165 (6.5)	62.3 (2.45)	186 (7.32)	6 (0.24)	80 (3.15)	100 (3.94)	0 (0)	3 × M4
FSB	100 (3.94)	291 (11.46)	165 (6.5)	80 (3.15)	281 (11.06)	6 (0.24)	80 (3.15)	100 (3.94)	0 (0)	4 × M4
FSC	140 (5.51)	355 (13.98)	165 (6.5)	120 (4.72)	343 (13.5)	6 (0.24)	80 (3.15)	100 (3.94)	0 (0)	4 × M5

[1] Increased depth:
- When the CU230P-2 Control Unit is plugged in, the depth increases by 58 mm (2.28 in) with frame sizes FSA to FSC and by 49 mm (1.93 in) with frame sizes FSD to FSF
- When the CU240B-2 or CU240E-2 Control Unit is plugged in, the depth increases by 40 mm (1.57 in) with frame sizes FSA to FSC and by 31 mm (1.22 in) with frame sizes FSD to FSF
- When the CU250S-2 Control Unit is plugged in, the depth increases by 61 mm (2.4 in) with frame sizes FSA to FSC and by 52 mm (2.05 in) with frame sizes FSD to FSF
- When the IOP is plugged in, the depth increases by a further 22 mm (0.87 in)
- When the BOP-2 is plugged in, the depth increases by a further 12 mm (0.47 in)

[2] The Power Modules can be mounted side by side. A side clearance of 1 mm (0.04 in) is recommended for tolerance-related reasons.

Dimensional drawings

PM230 Power Modules, degree of protection IP20, push-through variant and PM240-2 Power Modules, push-through variant



Principle dimension drawing and drill pattern for PM230 Power Modules, degree of protection IP20, push-through variant, with/without integrated line filter class A and PM240-2 Power Modules, push-through variant, with/without integrated line filter class A

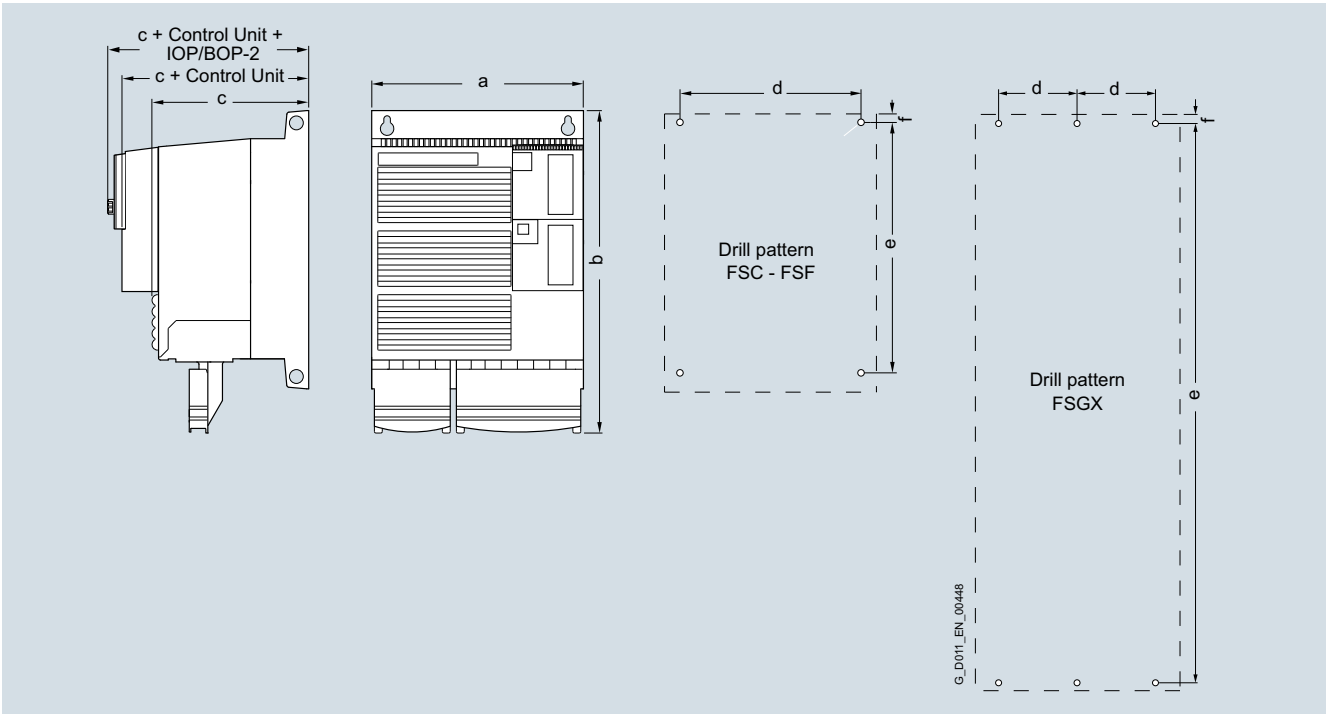
Frame size	**Dimensions** in mm (inches)			**Drilling dimensions** in mm (inches)			**Section of cabinet** in mm (inches)		**Cooling clearance** in mm (inches)			**Mounting**
	a (width)	b (height)	c (depth) [1]	d	e	f	g (width)	h (height)	top	bottom	side [2]	With bolts
PM230 and PM240-2 Power Modules, degree of protection IP20, push-through variant, with/without integrated line filter class A												
FSA	125.9 (4.96)	238 (9.37)	171 (6.73)	106 (4.17)	103 (4.06)	27 (1.06)	88 (3.46)	198 (7.8)	80 (3.15)	100 (3.94)	0 (0)	M5
FSB	153.9 (6.06)	345 (13.58)	171 (6.73)	134 (5.28)	147.5 (5.81)	34.5 (1.36)	116 (4.57)	304 (11.97)	80 (3.15)	100 (3.94)	0 (0)	M5
FSC	200 (7.87)	410.5 (16.16)	171 (6.73)	174 (6.85)	123 (4.84)	30.5 (1.2)	156 (6.14)	365 (14.37)	80 (3.15)	100 (3.94)	0 (0)	M5

[1] Overall depth, of which 117.7 mm (4.63 in) is inside and 53.1 mm (2.09 in) is outside the control cabinet. Increased depth:
- When the CU230P-2 Control Unit is plugged on, the depth increases by 58 mm (2.28 in).
- When the CU240B-2 or CU240E-2 Control Unit is plugged on, the depth increases by 40 mm (1.57 in).
- When the CU250S-2 Control Unit is plugged in, the depth increases by 61 mm (2.4 in).
- When the IOP is plugged in, the depth increases by a further 22 mm (0.87 in)
- When the BOP-2 is plugged in, the depth increases by a further 12 mm (0.47 in)

[2] The Power Modules can be mounted side by side (mounting frame to mounting frame). A side clearance of 1 mm (0.04 in) is recommended for tolerance-related reasons.

Dimensional drawings

PM240 and PM250 Power Modules, IP20 degree of protection



Principle dimension drawing and drill pattern for PM240 and PM250 Power Modules, degree of protection IP20, with/without integrated line filter class A

Frame size	**Dimensions** in mm (inches)			**Drilling dimensions** in mm (inches)			**Cooling clearance** in mm (inches)			**Mounting**
	a (width)	b (height)	c (depth) [1]	d	e	f	top/bottom	front	side	With bolts, nuts and washers
PM240 Power Modules, degree of protection IP20, with/without integrated line filter class A										
FSD	275 (10.83)	419/512 (16.5/20.16)	204 (8.03)	235 (9.25)	325/419 (12.8/16.5)	11 (0.43)	300 (11.81)	0 (0)	0 (0)	4 × M8
FSE	275 (10.83)	499/635 (19.65/25)	204 (8.03)	235 (9.25)	405/541 (15.94/21.3)	11 (0.43)	300 (11.81)	0 (0)	0 (0)	4 × M8
FSF	350 (13.78)	634/934 (24.96/36.77)	316 (12.44)	300 (11.81)	598/899 (23.54/35.39)	11 (0.43)	350 (13.78)	0 (0)	0 (0)	4 × M8
FSGX	326 (12.9)	1533 (60.35)	547 (21.6)	125 (4.92)	1506 (59.29)	14.5 (0.57)	250/150 (9.84/5.91)	50 (1.97)	0 (0)	6 x M8
PM250 Power Modules, degree of protection IP20, with/without integrated line filter class A										
FSC	189 (7.44)	334 (13.15)	185 (7.28)	167 (6.57)	323 (12.72)	6 (0.24)	125 (4.92)	0 (0)	50 (1.97) [2]	4 × M5
FSD	275 (10.83)	419/512 (16.5/20.16)	204 (8.03)	235 (9.25)	325/419 (12.8/16.5)	11 (0.43)	300 (11.81)	0 (0)	0 (0)	4 × M8
FSE	275 (10.83)	499/635 (19.65/25)	204 (8.03)	235 (9.25)	405/541 (15.94/21.3)	11 (0.43)	300 (11.81)	0 (0)	0 (0)	4 × M8
FSF	350 (13.78)	634/934 (24.96/36.77)	316 (12.44)	300 (11.81)	598/899 (23.54/35.39)	11 (0.43)	350 (13.78)	0 (0)	0 (0)	4 × M8

[1] Increased depth:
- When the CU230P-2 Control Unit is plugged in, the depth increases by 58 mm (2.28 in) with frame size FSC and by 49 mm (1.93 in) with frame sizes FSD to FSF
- When the CU240B-2 or CU240E-2 Control Unit is plugged in, the depth increases by 40 mm (1.57 in) with frame size FSC and by 31 mm (1.22 in) with frame sizes FSD to FSF
- When the CU250S-2 Control Unit is plugged in, the depth increases by 61 mm (2.4 in) with frame size FSC and by 52 mm (2.05 in) with frame sizes FSD to FSF
- When the IOP is plugged in, the depth increases by a further 22 mm (0.87 in)
- When the BOP-2 is plugged in, the depth increases by a further 12 mm (0.47 in)
- With the PM240 Power Module, frame size FSGX, the depth does not increase when devices are plugged on.

[2] Up to 40 °C (104 °F) without any lateral clearance.

Overview

Line filter for PM240 Power Modules frame size FSGX

With one of the additional line filters, the Power Module reaches a higher radio interference class.

Integration

Frame sizes FSA to FSF of the PM230 Power Module in degree of protection IP20 are available both with and without an integrated line filter class A.

An external line filter class A is available for frame size FSGX of the PM240 Power Module.

Frame sizes FSC of the PM250 Power Module are available only with integrated line filter class A. To achieve class B, PM250 Power Modules must be additionally fitted with a base filter class B.

Line filters that are optionally available depending on the Power Module used

	Frame size						
	FSA	**FSB**	**FSC**	**FSD**	**FSE**	**FSF**	**FSGX**
PM230 Power Module degree of protection IP20							
Available frame sizes	✓	✓	✓	✓	✓	✓	–
Line-side power components							
Line filter class A	F	F	F	F	F	F	–
Line filter class B	U [1]	U [1]	U [1]	S	S	S	–
PM240-2 Power Module with integrated braking chopper							
Available frame sizes	✓	✓	✓	–	–	–	–
Line-side power components							
Line filter class A	I	I	I	–	–	–	–
Line filter class B [2]	U [1] [2]	U [1] [2]	U [1] [2]	–	–	–	–
PM240 Power Module with integrated braking chopper							**Without integrated braking chopper**
Available frame sizes	–	–	–	✓	✓	✓	✓
Line-side power components							
Line filter class A	–	–	–	F	F	F/S [3]	S [3]
Line filter class B	–	–	–	–	–	–	–
PM250 Power Module with line-commutated energy recovery							
Available frame sizes	–	–	✓	✓	✓	✓	–
Line-side power components							
Line filter class A	–	–	I	F	F	F	–
Line filter class B	–	–	U	–	–	–	–

U = Base component
S = Lateral mounting
I = Integrated
F = Power Modules available with and without integrated class A filter
– = Not possible

[1] Lateral mounting is the only possible option for Push Through variants.

[2] Line filter class B for PM240-2 400 V variants only.

[3] PM240 FSF Power Modules from 110 kW and higher and FSGX are available only without an integrated filter class A. An optional line filter class A for lateral mounting is available instead.

Selection and ordering data

Rated power		PM230 Power Module degree of protection IP20 standard variant			Line filter class B according to EN 55011
kW	hp	Type 6SL3210-...	Frame size		Article No.
380 ... 480 V 3 AC					
0.37	0.5	1NE11-3UL1	FSA	NEW	**6SL3203-0BE17-7BA0**
0.55	0.75	1NE11-7UL1			
0.75	1	1NE12-2UL1			
1.1	1.5	1NE13-1UL1			
1.5	2	1NE14-1UL1			
2.2	3	1NE15-8UL1			
3	4	1NE17-7UL1			
4	5	1NE21-0UL1	FSB	NEW	**6SL3203-0BE21-8BA0**
5.5	7.5	1NE21-3UL1			
7.5	10	1NE21-8UL1			
11	15	1NE22-6UL1	FSC	NEW	**6SL3203-0BE23-8BA0**
15	20	1NE23-2UL1			
18.5	25	1NE23-8UL1			
22	30	1NE24-5UL0	FSD	NEW	**6SL3203-0BE27-5BA0**
30	40	1NE26-0UL0			
37	50	1NE27-5UL0	FSE	NEW	**6SL3203-0BE31-1BA0**
45	60	1NE28-8UL0			
55	75	1NE31-1UL0	FSF	NEW	**6SL3203-0BE31-8BA0**
75	100	1NE31-5UL0			

Rated power		PM230 Power Module degree of protection IP20 push-through variant			Line filter class B according to EN 55011
kW	hp	Type 6SL3211-...	Frame size		Article No.
380 ... 480 V 3 AC					
3	4	1NE17-7UL1	FSA	NEW	**6SL3203-0BE17-7BA0**
7.5	10	1NE21-8UL1	FSB	NEW	**6SL3203-0BE21-8BA0**
18.5	25	1NE23-8UL1	FSC	NEW	**6SL3203-0BE23-8BA0**

Rated power		PM240-2 Power Module standard variant			Line filter class B according to EN 55011
kW	hp	Type 6SL3210-...	Frame size		Article No.
380 ... 480 V 3 AC					
0.55	0.75	1PE11-8UL1	FSA	NEW	**6SL3203-0BE17-7BA0**
0.75	1	1PE12-3UL1			
1.1	1.5	1PE13-2UL1			
1.5	2	1PE14-3UL1			
2.2	3	1PE16-1UL1			
3	4	1PE18-0UL1			
4	5	1PE21-1UL0	FSB	NEW	**6SL3203-0BE21-8BA0**
5.5	7.5	1PE21-4UL0			
7.5	10	1PE21-8UL0			
11	15	1PE22-7UL0	FSC	NEW	**6SL3203-0BE23-8BA0**
15	20	1PE23-3UL0			

Selection and ordering data

Rated power		PM240-2 Power Module push-through variant			Line filter class B according to EN 55011
kW	hp	Type 6SL3211-...	Frame size		Article No.
380 ... 480 V 3 AC					
3	4	1PE18-0UL1	FSA	NEW	**6SL3203-0BE17-7BA0**
7.5	10	1PE21-8UL0	FSB	NEW	**6SL3203-0BE21-8BA0**
15	20	1PE23-3UL0	FSC	NEW	**6SL3203-0BE23-8BA0**

Rated power		PM240 Power Module		Line filter class A according to EN 55011
kW	hp	Type 6SL3224-...	Frame size	Article No.
380 ... 480 V 3 AC				
110	150	0BE38-8UA0	FSF	**6SL3203-0BE32-5AA0**
132	200	0BE41-1UA0		
160	250	0XE41-3UA0	FSGX	**6SL3000-0BE34-4AA0**
200	300	0XE41-6UA0		
250	400	0XE42-0UA0	FSGX	**6SL3000-0BE36-0AA0**

Rated power		PM250 Power Module		Line filter class B according to EN 55011
kW	hp	Type 6SL3225-...	Frame size	Article No.
380 ... 480 V 3 AC				
7.5	10	0BE25-5AA1	FSC	**6SL3203-0BD23-8SA0**
11	15	0BE27-5AA1		
15	20	0BE31-1AA1		

Technical specifications

Line voltage 380 ... 480 V 3 AC		**Line filter class A**		
		6SL3203-0BE32-5AA0	6SL3000-0BE34-4AA0	6SL3000-0BE36-0AA0
Rated current	A	250	440	600
Line supply connection L1, L2, L3		On housing via M8 screw stud	1 × hole for M10 Provided for busbar connection	1 × hole for M10 Provided for busbar connection
• Conductor cross-section	mm^2	–	–	–
Load connection U, V, W		On housing via M8 screw stud	On housing via M10 screw stud	On housing via M10 screw stud
• Conductor cross-section	mm^2	–	–	–
• Length	m (ft)	–	–	–
PE connection		Flat connector for M10 screw	1 × hole for M8	1 × hole for M10
Degree of protection		IP00	IP00	IP00
Dimensions				
• Width	mm (in)	240 (9.45)	360 (14.17)	400 (15.75)
• Height	mm (in)	360 (14.17)	240 (9.45)	265 (10.43)
• Depth	mm (in)	116 (4.57)	116 (4.57)	140 (5.51)
Possible as base component		No	No	No
Weight, approx.	kg (lb)	12.4 (27.3)	12.3 (27.1)	19 (41.9)
Suitable for **PM240 Power Module**	Type	6SL3224-0BE38-8UA0 6SL3224-0BE41-1UA0	6SL3224-0XE41-3UA0 6SL3224-0XE41-6UA0	6SL3224-0XE42-0UA0
Suitable for **PM250 Power Module**		–	–	–
• Frame size		FSF	FSGX	FSGX

Line voltage 380 ... 480 V 3 AC		**Line filter class B**
		6SL3203-0BD23-8SA0
Rated current	A	39.4
Line supply connection L1, L2, L3		Screw terminals
• Conductor cross-section	mm^2	4
Load connection U, V, W		Shielded cable
• Conductor cross-section	mm^2	3 × 4
• Length	m (ft)	0.4 (1.31)
PE connection		On housing via M4 screw stud
Degree of protection		IP20
Dimensions		
• Width	mm (in)	190 (7.48)
• Height	mm (in)	362 (14.25)
• Depth	mm (in)	55 (2.17)
Possible as base component		Yes
Weight, approx.	kg (lb)	2.3 (5.07)
Suitable for **PM250 Power Module**		6SL3225-0BE25-5AA1 6SL3225-0BE27-5AA1 6SL3225-0BE31-1AA1
• Frame size		FSC

Technical specifications

Line voltage 380 ... 480 V 3 AC		Line filter class B					
		6SL3203-0BE17-7BA0	6SL3203-0BE21-8BA0	6SL3203-0BE23-8BA0	6SL3203-0BE27-5BA0	6SL3203-0BE31-1BA0	6SL3203-0BE31-8BA0
Rated current	A	11.4	23.5	49.4	72	105	204
Pulse frequency	kHz	4 ... 16	4 ... 16	4 ... 16	4 ... 16	4 ... 16	4 ... 8
Line supply connection L1, L2, L3		Screw terminals	Screw terminals	Screw terminals	Screw terminals	Screw terminals	Screw terminals
• Conductor cross-section	mm^2	1 ... 2.5	2.5 ... 6	6 ... 16	16 ... 50	16 ... 50	35 ... 150
Load connection U, V, W		Shielded cable	Shielded cable	Shielded cable	Shielded cable	Shielded cable	Shielded cable
• Cable cross-section	mm^2	1.5	4	10	16	35	50
• Length	m (ft)	0.45 (1.48)	0.5 (1.64)	0.54 (1.77)	1 (3.28)	1 (3.28)	1.1 (3.68)
PE connection		On housing via M5 screw stud	On housing via M5 screw stud	On housing via M6 screw stud	On housing via M6 screw stud	On housing via M8 screw stud	On housing via M10 screw stud
• Conductor cross-section	mm^2	1 ... 2.5	2.5 ... 6	6 ... 16	16 ... 50	35 ... 50	50 ... 150
Degree of protection		IP20	IP20	IP20	IP20	IP20	IP20
Dimensions							
• Width	mm (in)	73 (2.87)	100 (3.94)	140 (5.51)	100 (3.94)	110 (4.33)	150 (5.91)
• Height	mm (in)	202 (7.95)	297 (11.69)	359 (14.13)	400 (15.75)	480 (18.90)	517 (20.35)
• Depth	mm (in)	65 (2.56)	85 (3.35)	95 (3.74)	140 (5.51)	140 (5.51)	230 (9.06)
Possible as base component		Yes	Yes	Yes	No	No	No
Weight, approx.	kg (lb)	1.75	4 (8.82)	7.3 (16.1)	7.6 (16.8)	11.9 (26.2)	21.7 (47.9)
Suitable for PM230 Power Module degree of protection IP20 standard variant	Type	6SL3210-1NE11-3UL1 6SL3210-1NE11-7UL1 6SL3210-1NE12-2UL1 6SL3210-1NE13-1UL1 6SL3210-1NE14-1UL1 6SL3210-1NE15-8UL1 6SL3210-1NE17-7UL1	6SL3210-1NE21-0UL1 6SL3210-1NE21-3UL1 6SL3210-1NE21-8UL1	6SL3210-1NE22-6UL1 6SL3210-1NE23-2UL1 6SL3210-1NE23-8UL1	6SL3210-1NE24-5UL0 6SL3210-1NE26-0UL0	6SL3210-1NE27-5UL0 6SL3210-1NE28-8UL0	6SL3210-1NE31-1UL0 6SL3210-1NE31-5UL0
Suitable for PM230 Power Module degree of protection IP20 push-through variant (lateral mounting only)	Type	6SL3211-1NE17-7UL1	6SL3211-1NE21-8UL1	6SL3211-1NE23-8UL1	–	–	–
Suitable for PM240-2 Power Module standard variant 3 AC 380 ... 480 V	Type	6SL3210-1PE11-8UL1 6SL3210-1PE12-3UL1 6SL3210-1PE13-2UL1 6SL3210-1PE14-3UL1 6SL3210-1PE16-1UL1 6SL3210-1PE18-0UL1	6SL3210-1PE21-1UL0 6SL3210-1PE21-4UL0 6SL3210-1PE21-8UL0	6SL3210-1PE22-7UL0 6SL3210-1PE23-3UL0	–	–	–
Suitable for PM240-2 Power Module push-through variant 3 AC 380 ... 480 V (lateral mounting only)	Type	6SL3211-1PE18-0UL1	6SL3211-1PE21-8UL0	6SL3211-1PE23-3UL0	–	–	–
• Frame size		FSA	FSB	FSC	FSD	FSE	FSF

Overview

Line reactor for PM240-2 Power Modules, frame size FSA

Line reactor for PM240 Power Modules, frame size FSGX

Line reactors for PM240 Power Modules frame sizes FSD and FSE

Line reactors smooth the current drawn by the inverter and thus reduce harmonic components in the line current. Through the reduction of the current harmonics, the thermal load on the power components in the rectifier and in the DC-link capacitors is reduced as well as the harmonic effects on the supply. The use of a line reactor increases the service life of the inverter.

Integration

The line reactors for PM240 Power Modules of frame sizes FSD and 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 supply through terminals.

Line reactors that are optionally available depending on the Power Module used

	Frame size						
	FSA	**FSB**	**FSC**	**FSD**	**FSE**	**FSF**	**FSGX**
PM230 Power Module degree of protection IP20							
Available frame sizes	✓	✓	✓	✓	✓	✓	–
Line-side power components							
Line reactor [1]	– [1]	– [1]	– [1]	– [1]	– [1]	– [1]	–
PM240-2 Power Module with integrated braking chopper							
Available frame sizes	✓	✓	✓	–	–	–	–
Line-side power components							
Line rector (for 3-AC devices only)	S	S	S	–	–	–	–
PM240 Power Module with integrated braking chopper							**Without integrated braking chopper**
Available frame sizes	–	–	–	✓	✓	✓	✓
Line-side power components							
Line reactor	–	–	–	U	U	S	S
PM250 Power Module with line-commutated energy recovery							
Available frame sizes	–	–	✓	✓	✓	✓	–
Line-side power components							
Line reactor [1]	–	–	– [1]	– [1]	– [1]	– [1]	–

U = Base component
S = Lateral mounting
– = Not possible

[1] A line reactor is not required and must not be used in conjunction with a PM230 or PM250 Power Module.

Selection and ordering data

Rated power		PM240-2 Power Module standard variant		Line reactor
kW	hp	Type 6SL3210-...	Frame size	Article No.
200 ... 240 V 3 AC				
0.55	0.75	1PB13-0 . L0	FSA	**6SL3203-0CE13-2AA0**
0.75	1	1PB13-8 . L0		
1.1	1.5	1PB15-5 . L0	FSB	**6SL3203-0CE21-0AA0**
1.5	2	1PB17-4 . L0		
2.2	3	1PB21-0 . L0		
3	4	1PB21-4 . L0	FSC	**6SL3203-0CE21-8AA0**
4	5	1PB21-8 . L0		
5.5	7.5	1PC22-2 . L0	FSC	**6SL3203-0CE23-8AA0**
7.5	10	1PC22-8 . L0		
380 ... 480 V 3 AC				
0.55	0.75	1PE11-8 . L1	FSA	**6SL3203-0CE13-2AA0**
0.75	1	1PE12-3 . L1		
1.1	1.5	1PE13-2 . L1		
1.5	2	1PE14-3 . L1	FSA	**6SL3203-0CE21-0AA0**
2.2	3	1PE16-1 . L1		
3	4	1PE18-0 . L1		
4	5	1PE21-1 . L0	FSB	**6SL3203-0CE21-8AA0**
5.5	7.5	1PE21-4 . L0		
7.5	10	1PE21-8 . L0		
11	15	1PE22-7 . L0	FSC	**6SL3203-0CE23-8AA0**
15	20	1PE23-3 . L0		

Rated power		PM240-2 Power Module push-through variant		Line reactor
kW	hp	Type 6SL3211-...	Frame size	Article No.
200 ... 240 V 3 AC				
0.75	1	1PB13-8 . L0	FSA	**6SL3203-0CE13-2AA0**
2.2	3	1PB21-0 . L0	FSB	**6SL3203-0CE21-0AA0**
4	5	1PB21-8 . L0	FSC	**6SL3203-0CE21-8AA0**
380 ... 480 V 3 AC				
3	4	1PE18-0 . L1	FSA	**6SL3203-0CE21-0AA0**
7.5	10	1PE21-8 . L0	FSB	**6SL3203-0CE21-8AA0**
15	20	1PE23-3 . L0	FSC	**6SL3203-0CE23-8AA0**

Rated power		PM240 Power Module		Line reactor
kW	hp	Type 6SL3224-...	Frame size	Article No.
380 ... 480 V 3 AC				
18.5	25	0BE31-5 . A0	FSD	**6SL3203-0CJ24-5AA0**
22	30	0BE31-8 . A0		
30	40	0BE32-2 . A0	FSD	**6SL3203-0CD25-3AA0**
37	50	0BE33-0 . A0	FSE	**6SL3203-0CJ28-6AA0**
45	60	0BE33-7 . A0		
55	75	0BE34-5 . A0	FSF	**6SE6400-3CC11-2FD0**
75	100	0BE35-5 . A0		
90	125	0BE37-5 . A0	FSF	**6SE6400-3CC11-7FD0**
110	150	0BE38-8UA0	FSF	**6SL3000-0CE32-3AA0**
132	200	0BE41-1UA0	FSF	**6SL3000-0CE32-8AA0**
160	250	0XE41-3UA0	FSGX	**6SL3000-0CE33-3AA0**
200	300	0XE41-6UA0	FSGX	**6SL3000-0CE35-1AA0**
250	400	0XE42-0UA0		

Technical specifications

Line voltage 200 ... 240 V 3 AC or 380 ... 480 V 3 AC		Line reactor			
		6SL3203-0CE13-2AA0	6SL3203-0CE21-0AA0	6SL3203-0CE21-8AA0	6SL3203-0CE23-8AA0
Rated current	A	4	11.3	22.3	47
Power loss at 50/60 Hz	W	23/26	36/40	53/59	88/97
Line supply/load connection 1L1, 1L2, 1L3 2L1, 2L2, 2L3		Screw terminals	Screw terminals	Screw terminals	Screw terminals
• Conductor cross-section	mm^2	4	4	10	16
PE connection		M4 × 8; U washer; spring lock washer	M4 × 8; U washer; spring lock washer	M5 × 10; U washer; spring lock washer	M5 × 10; U washer; spring lock washer
Degree of protection		Control cabinet built-in unit IP20	Control cabinet built-in unit IP20	Control cabinet built-in unit IP20	Control cabinet built-in unit IP20
Dimensions					
• Width	mm (in)	125 (4.92)	125 (4.92)	125 (4.92)	190 (7.48)
• Height	mm (in)	120 (4.72)	140 (5.51)	145 (5.71)	220 (8.66)
• Depth	mm (in)	71 (2.80)	71 (2.80)	91 (3.58)	91 (3.58)
Weight, approx.	kg (lb)	1.1 (2.43)	2.1 (4.63)	2.95 (6.5)	7.8 (17.2)
Suitable for PM240-2 Power Module standard variant 200 ... 240 V 3 AC	Type	6SL3210-1PB13-0 . L0 6SL3210-1PB13-8 . L0	6SL3210-1PB15-5 . L0 6SL3210-1PB17-4 . L0 6SL3210-1PB21-0 . L0	6SL3210-1PB21-4 . L0 6SL3210-1PB21-8 . L0	6SL3210-1PC22-2 . L0 6SL3210-1PC22-8 . L0
• Frame size		FSA	FSB	FSC	FSC
Suitable for PM240-2 Power Module standard variant 380 ... 480 V 3 AC	Type	6SL3210-1PE11-8 . L1 6SL3210-1PE12-3 . L1 6SL3210-1PE13-2 . L1	6SL3210-1PE14-3 . L1 6SL3210-1PE16-1 . L1 6SL3210-1PE18-0 . L1	6SL3210-1PE21-1 . L0 6SL3210-1PE21-4 . L0 6SL3210-1PE21-8 . L0	6SL3210-1PE22-7 . L0 6SL3210-1PE23-3 . L0
• Frame size		FSA	FSA	FSB	FSC
Suitable for PM240-2 Power Module push-through variant 200 ... 240 V 3 AC	Type	6SL3211-1PB13-8 . L0	6SL3211-1PB21-0 . L0	6SL3211-1PB21-8 . L0	–
• Frame size		FSA	FSB	FSC	–
Suitable for PM240-2 Power Module push-through variant 380 ... 480 V 3 AC	Type	–	6SL3211-1PE18-0 . L1	6SL3211-1PE21-8 . L0	6SL3211-1PE23-3 . L0
• Frame size		–	FSA	FSB	FSC

Line voltage 380 ... 480 V 3 AC		Line reactor		
		6SL3203-0CJ24-5AA0	6SL3203-0CD25-3AA0	6SL3203-0CJ28-6AA0
Rated current	A	47	63	95
Power loss at 50/60 Hz, approx.	W	90/115	90/115	170/215
Line supply connection U1, V1, W1		Screw terminals	Screw terminals	Screw terminals
• Conductor cross-section	mm^2	16	16	50
Load connection		Cable	Cable	Cable
• Conductor cross-section		4 × 16 mm^2	4 × 16	4 × 35
• Length, approx.	m (ft)	0.7 (2.3)	0.7 (2.3)	0.7 (2.3)
PE connection		On housing with M8 screw	On housing with M8 screw	On housing with M8 screw
Degree of protection		IP20	IP20	IP20
Dimensions				
• Width	mm (in)	275 (10.83)	275 (10.83)	275 (10.83)
• Height	mm (in)	455 (17.91)	455 (17.91)	577 (22.72)
• Depth	mm (in)	84 (3.31)	84 (3.31)	94 (3.70)
Possible as base component		Yes	Yes	Yes
Weight, approx.	kg (lb)	13 (28.7)	13 (28.7)	19 (41.9)
Suitable for PM240 Power Module	Type	6SL3224-0BE31-5 . A0 6SL3224-0BE31-8 . A0	6SL3224-0BE32-2 . A0	6SL3224-0BE33-0 . A0 6SL3224-0BE33-7 . A0
• Frame size		FSD	FSD	FSE

Technical specifications

Line voltage 380 ... 480 V 3 AC		Line reactor			
		6SE6400-3CC11-2FD0	6SE6400-3CC11-7FD0	6SL3000-0CE32-3AA0	6SL3000-0CE32-8AA0
Rated current	A	151	186	224	278
Power loss at 50/60 Hz, approx.	W	280/360	280/360	240/270	210/250
Line supply connection U1, V1, W1		Flat connector for M10 cable lug	Flat connector for M10 cable lug	Flat connector for M10 screw	Flat connector for M10 screw
• Conductor cross-section	mm^2	–	–	–	–
Load connection		Flat connector for M10 cable lug	Flat connector for M10 cable lug	Flat connector for M10 screw	Flat connector for M10 screw
• Conductor cross-section	mm^2	–	–	–	–
• Length, approx.	m (ft)	–	–	–	–
PE connection		On housing with M8 screw stud	On housing with M8 screw stud	M6 screw	M6 screw
Degree of protection		IP00	IP00	IP00	IP00
Dimensions					
• Width	mm (in)	240 (9.45)	240 (9.45)	270 (10.63)	270 (10.63)
• Height	mm (in)	228 (8.98)	228 (8.98)	248 (9.76)	248 (9.76)
• Depth	mm (in)	141 (5.55)	141 (5.55)	200 (7.87)	200 (7.87)
Weight, approx.	kg (lb)	25 (55.1)	25 (55.1)	24 (52.9)	24 (52.9)
Suitable for PM240 Power Module	Type	6SL3224-0BE34-5 . A0 6SL3224-0BE35-5 . A0	6SL3224-0BE37-5 . A0	6SL3224-0BE38-8UA0	6SL3224-0BE41-1UA0
• Frame size		FSF	FSF	FSF	FSF

Line voltage 380 ... 480 V 3 AC		Line reactor	
		6SL3000-0CE33-3AA0	6SL3000-0CE35-1AA0
Rated current	A	331	508
Power loss at 50/60 Hz, approx.	W	267	365
Line supply connection U1, V1, W1		1 × hole for M10 Provided for busbar connection	1 × hole for M12 Provided for busbar connection
Load connection		Provided for busbar connection	Provided for busbar connection
PE connection		M6 screw	M6 screw
Degree of protection		IP00	IP00
Dimensions			
• Width	mm (in)	270 (10.63)	300 (11.81)
• Height	mm (in)	248 (9.76)	269 (10.59)
• Depth	mm (in)	200 (7.87)	212 (8.35)
Weight, approx.	kg (lb)	27.8 (61.3)	38.0 (83.8)
Suitable for PM240 Power Module	Type	6SL3224-0XE41-3UA0	6SL3224-0XE41-6UA0 6SL3224-0XE42-0UA0
• Frame size		FSGX	FSGX

Selection and ordering data

The following tables list recommendations for additional line-side components, such as fuses and circuit breakers. The values in the table take into account the overload capability of the inverter.

Notes for use in compliance with IEC standards:

3NA3 or 3NE1 fuses and 3RV motor starter protectors or 3VL circuit breakers are recommended for European countries.

Notes for use in compliance with UL regulations:

UL-listed fuses Class J (with rated voltage 250 V AC or 600 V AC) or 3NE1 (UL-compliant – corresponds to UL) are required for North America.

Short Circuit Current Rating (SCCR)
according to UL

Applies to industrial control panel installations to NEC Article 409 or UL 508A/508C

- PM230: 65 kA (variants with IP20 degree of protection)
- PM240-2: 65 kA (400 V variants), 40 kA (200 V variants)
- PM240: 65 kA
- PM250: 40 kA (frame size FSC), 42 kA (frame sizes FSD to FSF)

Notes regarding installations in Canada:

Overvoltage protection devices in accordance with overvoltage category III and with the following ratings must be connected on the line side of the inverter:

- Rated voltage 480 V (phase-phase) and 480 V (phase-ground)
- Voltage limit 4 kV (phase-phase) and 6 kV (phase-ground)

All overvoltage protection devices used must comply with Canadian standards for industrial installations.

Additional information about the listed fuses and circuit breakers can be found in Catalogs LV 10, IC 10 and IC 10 AO.

Rated power [1]		**PM230 Power Module degree of protection IP20 standard variant**		**IEC-compliant**		**UL/cUL-compliant**		
				Fuse		**Fuse**	**Fuse type** Rated voltage 600 V AC	
		Type		Current	**Type 3NE1 (UL)**	**Type 3NE1 (UL)**		Current
kW	hp	6SL3210-...	Frame size	A	Article No.	Article No.	Class	A
380 ... 480 V 3 AC								
0.37	0.50	1NE11-3 . L1	FSA	16	**3NE1813-0**	**3NE1813-0**	J	15
0.55	0.75	1NE11-7 . L1	FSA					
0.75	1	1NE12-2 . L1	FSA					
1.1	1.5	1NE13-1 . L1	FSA					
1.5	2	1NE14-1 . L1	FSA					
2.2	3	1NE15-8 . L1	FSA					
3	4	1NE17-7 . L1	FSA					
4	5	1NE21-0 . L1	FSB	25	**3NE1815-0**	**3NE1815-0**	J	25
5.5	7.5	1NE21-3 . L1	FSB					
7.5	10	1NE21-8 . L1	FSB					
11	15	1NE22-6 . L1	FSC	50	**3NE1817-0**	**3NE1817-0**	J	50
15	20	1NE23-2 . L1	FSC					
18.5	25	1NE23-8 . L1	FSC					
22	30	1NE24-5 . L0	FSD	63	**3NE1818-0**	**3NE1818-0**	–	–
30	40	1NE26-0 . L0	FSD	80	**3NE1820-0**	**3NE1820-0**	–	–
37	50	1NE27-5 . L0	FSE	100	**3NE1021-0**	**3NE1021-0**	–	–
45	60	1NE28-8 . L0	FSE	125	**3NE1022-0**	**3NE1022-0**	–	–
55	75	1NE31-1 . L0	FSF	160	**3NE1224-0**	**3NE1224-0**	–	–
75	100	1NE31-5 . L0	FSF	200	**3NE1225-0**	**3NE1225-0**	–	–

[1] Rated power based on the rated output current I_{rated}. The rated output current I_{rated} is based on the duty cycle for low overload (LO).

Selection and ordering data

Rated power [1]		**PM230 Power Module degree of protection IP20 push-through variant**		**IEC-compliant**		**UL/cUL-compliant**		
				Fuse		**Fuse**	**Fuse type** Rated voltage 600 V AC	
		Type		Current	**Type 3NE1 (UL)**	**Type 3NE1 (UL)**		Current
kW	hp	6SL3211-...	Frame size	A	Article No.	Article No.	Class	A
380 ... 480 V 3 AC								
3	4	1NE17-7 . L1	FSA	16	**3NE1813-0**	**3NE1813-0**	J	15
7.5	10	1NE21-8 . L1	FSB	25	**3NE1815-0**	**3NE1815-0**	J	25
18.5	25	1NE23-8 . L1	FSC	50	**3NE1817-0**	**3NE1817-0**	J	50

Rated power [1]		**PM240-2 Power Module standard variant**		**IEC-compliant**			**UL/cUL-compliant**	
				Fuse		**Circuit breaker**	**Fuse type** Rated voltage 250 V AC or 600 V AC	
		Type		Current				Current
kW	hp	6SL3210-...	Frame size	A	Article No.	Article No.	Class	A
200 ... 240 V 1 AC/3 AC								
0.55	0.75	1PB13-0 . L0	FSA	10	**3NA3803**	–	J	15
0.75	1	1PB13-8 . L0	FSA	16	**3NA3805**	–	J	15
1.1	1.5	1PB15-5 . L0	FSB	20	**3NE1814-0**	–	J	35
1.5	2	1PB17-4 . L0	FSB	25	**3NE1815-0**	–	J	35
2.2	3	1PB21-0 . L0	FSB	35	**3NE1803-0**	–	J	35
3	4	1PB21-4 . L0	FSC	50	**3NE1817-0**	–	J	50
4	5	1PB21-8 . L0	FSC	63	**3NE1818-0**	–	J	50
200 ... 240 V 3 AC								
5.5	7.5	1PC22-2 . L0	FSC	40	**3NE1802-0**	–	J	50
7.5	10	1PC22-8 . L0	FSC	50	**3NE1817-0**	–	J	50
380 ... 480 V 3 AC								
0.55	0.75	1PE11-8 . L1	FSA	4	**3NA3804**	–	J	10
0.75	1	1PE12-3 . L1	FSA			–		
1.1	1.5	1PE13-2 . L1	FSA	6	**3NA3801**	–	J	15
1.5	2	1PE14-3 . L1	FSA	10	**3NA3803**	–	J	20
2.2	3	1PE16-1 . L1	FSA			–	J	30
3	4	1PE18-0 . L1	FSA	16	**3NA3805**	–		
4	5	1PE21-1 . L0	FSB	20	**3NE1814-0**	–	J	35
5.5	7.5	1PE21-4 . L0	FSB	25	**3NE1815-0**	–		
7.5	10	1PE21-8 . L0	FSB	35	**3NE1803-0**	–		
11	15	1PE22-7 . L0	FSC	50	**3NE1817-0**	–	J	50
15	20	1PE23-3 . L0	FSC			–		

[1] Rated power based on the rated output current I_{rated}. The rated output current I_{rated} is based on the duty cycle for low overload (LO).

Selection and ordering data

Rated power [1]		PM240-2 Power Module push-through variant		IEC-compliant			UL/cUL-compliant	
				Fuse		Circuit breaker	Fuse type Rated voltage 250 V AC or 600 V AC	
		Type		Current				Current
kW	hp	6SL3211-...	Frame size	A	Article No.	Article No.	Class	A
200 ... 240 V 1 AC/3 AC								
0.75	1	1PB13-8 . L0	FSA	16	**3NA3805**	–	J	15
2.2	3	1PB21-0 . L0	FSB	35	**3NE1803-0**	–	J	35
4	5	1PB21-8 . L0	FSC	63	**3NE1818-0**	–	J	50
380 ... 480 V 3 AC								
3	4	1PE18-0 . L1	FSA	16	**3NA3805**	–	J	30
7.5	10	1PE21-8 . L0	FSB	35	**3NE1803-0**	–	J	35
15	20	1PE23-3 . L0	FSC	50	**3NE1817-0**	–	J	50

Rated power [1]		PM240 Power Module		IEC-compliant			UL/cUL-compliant		
				Fuse		Circuit breaker	Fuse	Fuse type Rated voltage 600 V AC	
		Type		Current	Type 3NA3		Type 3NE1 (UL)		Current
kW	hp	6SL3224-...	Frame size	A	Article No.	Article No.	Article No.	Class	A
380 ... 480 V 3 AC									
18.5	25	0BE31-5 . A0	FSD	50	**3NA3820**	**3RV1042-4KA10**	**3NE1817-0**	–	–
22	30	0BE31-8 . A0	FSD	63	**3NA3822**		**3NE1818-0**	–	–
30	40	0BE32-2 . A0	FSD	80	**3NA3824**	**3RV1042-4MA10**	**3NE1820-0**	–	–
37	50	0BE33-0 . A0	FSE	100	**3NA3830**	**3VL1712-.DD33-....** *)	**3NE1021-0**	–	–
45	60	0BE33-7 . A0	FSE	125	**3NA3832**	**3VL1716-.DD33-....** *)	**3NE1022-0**	–	–
55	75	0BE34-5 . A0	FSF	160	**3NA3836**	**3VL3720-.DC36-....** *)	**3NE1224-0**	J	150
75	100	0BE35-5 . A0	FSF	200	**3NA3140**	**3VL3725-.DC36-....** *)	**3NE1225-0**	J	200
90	125	0BE37-5 . A0	FSF	250	**3NA3144**	**3VL4731-.DC36-....** *)	**3NE1227-0**	J	250
110	150	0BE38-8UA0	FSF	–	–			J	300
132	200	0BE41-1UA0	FSF	–	–		**3NE1230-0**	J	400
160	250	0XE41-3UA0	FSGX	355	**3NA3254**	**3VL4740-.DC36-....** *)	**3NE1333-2**	–	–
200	300	0XE41-6UA0	FSGX	400	**3NA3260**	**3VL5750-.DC36-....** *)		–	–
250	400	0XE42-0UA0	FSGX	630	**3NA3372**		**3NE1436-2**	–	–

[1] Rated power based on the rated output current I_{rated}. The rated output current I_{rated} is based on the duty cycle for low overload (LO).

*) See Catalog LV 10 for Article No. supplements.

Selection and ordering data

Rated power [1]		**PM250 Power Module**		**IEC-compliant**			**UL/cUL-compliant**		
				Fuse		**Circuit breaker**	**Fuse**	**Fuse type** Rated voltage 600 V AC	
		Type		Current	**Type 3NA3**		**Type 3NE1** (cULus)		Current
kW	hp	6SL3225-...	Frame size	A	Article No.	Article No.	Article No.	Class	A
380 ... 480 V 3 AC									
7.5	10	0BE25-5AA1	FSC	20	**3NA3807**	**3RV1031-4EA10**	–	K5 [2]	50
11	15	0BE27-5AA1	FSC	32	**3NA3812**	**3RV1031-4FA10**	–	K5 [2]	50
15	20	0BE31-1AA1	FSC	35	**3NA3814**	**3RV1031-4HA10**	–	K5 [2]	50
18.5	25	0BE31-5UA0	FSD	50	**3NA3820**	**3RV1042-4KA10**	–	–	–
		0BE31-5AA0					**3NE1817-0**	–	–
22	30	0BE31-8UA0	FSD	63	**3NA3822**	**3RV1042-4KA10**	–	–	–
		0BE31-8AA0					**3NE1818-0**	–	–
30	40	0BE32-2UA0	FSD	80	**3NA3824**	**3RV1042-4MA10**	–	–	–
		0BE32-2AA0					**3NE1820-0**	–	–
37	50	0BE33-0UA0	FSE	100	**3NA3830**	**3VL1712-.DD33-....** [*]	–	–	–
		0BE33-0AA0					**3NE1021-0**	–	–
45	60	0BE33-7UA0	FSE	125	**3NA3832**	**3VL1716-.DD33-....** [*]	–	–	–
		0BE33-7AA0					**3NE1022-0**	–	–
55	75	0BE34-5UA0	FSF	160	**3NA3836**	**3VL3720-.DC36-....** [*]	–	–	–
		0BE34-5AA0					**3NE1224-0**	J	150
75	100	0BE35-5UA0	FSF	200	**3NA3140**	**3VL3725-.DC36-....** [*]	–	–	–
		0BE35-5AA0					**3NE1225-0**	J	200
90	125	0BE37-5UA0	FSF	250	**3NA3144**	**3VL4731-.DC36-....** [*]	–	–	–
		0BE37-5AA0					**3NE1227-0**	J	250

[1] Rated power based on the rated output current I_{rated}. The rated output current I_{rated} is based on the duty cycle for low overload (LO).

[2] Any UL-listed fuse may be used, e.g. Class K5, Class J, etc.

[*] See Catalog LV 10 for Article No. supplements.

Overview

Braking resistor for PM240 Power Modules frame size FSD

Braking resistor for PM240 Power Modules, frame size FSGX

Excess energy in the DC link is dissipated in the braking resistor. The braking resistors are intended for use with PM240 and PM240-2 Power Modules (400 V variants) which feature an integrated braking chopper, but cannot regenerate energy to the supply system. There is an optional plug-in Braking Module for frame size FSGX. For regenerative operation, e.g. the braking of a rotating mass with high moment of inertia, a braking resistor must be connected to convert the resulting energy into heat.

The braking resistors can be installed laterally next to the PM240 and PM240-2 Power Modules (400 V variants). The braking resistors for the PM240 Power Modules, frame sizes FSD to FSGX, should be placed outside the control cabinet or outside the switchgear room so that the heat is dissipated away from the Power Modules. The level of air conditioning required is therefore reduced.

Every braking resistor has a temperature switch (UL-listed). The temperature switch should be evaluated to prevent consequential damage if the braking resistor overheats.

Integration

Braking resistors that are optionally available depending on the Power Module used

	Frame size						
	FSA	**FSB**	**FSC**	**FSD**	**FSE**	**FSF**	**FSGX**
PM240-2 Power Module with integrated braking chopper							
Available frame sizes	✓	✓	✓	–	–	–	–
DC link components							
Braking resistor [1]	[1]	[1]	[1]	–	–	–	–
PM240 Power Module with integrated braking chopper							**Without integrated braking chopper**
Available frame sizes	–	–	–	✓	✓	✓	✓
DC link components							
Braking resistor	–	–	–	S	S	S	S
PM250 Power Module with line-commutated energy recovery							
Available frame sizes	–	–	✓	✓	✓	✓	–
DC link components							
Braking resistor [2]	–	–	– [2]	– [2]	– [2]	– [2]	–

S = Lateral mounting
– = Not possible

[1] Braking resistor for PM240-2 400 V variants only.

[2] A PM250 Power Module is capable of line-commutated energy feedback. A braking resistor cannot be connected and is not necessary.

Selection and ordering data

Rated power		PM240-2 Power Module standard variant		Braking resistor
kW	hp	Type 6SL3210-...	Frame size	Article No.
380 ... 480 V 3 AC				
0.55	0.75	1PE11-8 . L1	FSA	**6SL3201-0BE14-3AA0**
0.75	1	1PE12-3 . L1		
1.1	1.5	1PE13-2 . L1		
1.5	2	1PE14-3 . L1		
2.2	3	1PE16-1 . L1	FSA	**6SL3201-0BE21-0AA0**
3	4	1PE18-0 . L1		
4	5	1PE21-1 . L0	FSB	**6SL3201-0BE21-8AA0**
5.5	7.5	1PE21-4 . L0		
7.5	10	1PE21-8 . L0		
11	15	1PE22-7 . L0	FSC	**6SL3201-0BE23-8AA0**
15	20	1PE23-3 . L0		

Rated power		PM240-2 Power Module push-through variant		Braking resistor
kW	hp	Type 6SL3211-...	Frame size	Article No.
380 ... 480 V 3 AC				
3	4	1PE18-0 . L1	FSA	**6SL3201-0BE21-0AA0**
7.5	10	1PE21-8 . L0	FSB	**6SL3201-0BE21-8AA0**
15	20	1PE23-3 . L0	FSC	**6SL3201-0BE23-8AA0**

Rated power		PM240 Power Module		Braking resistor
kW	hp	Type 6SL3224-...	Frame size	Article No.
380 ... 480 V 3 AC				
18.5	25	0BE31-5 . A0	FSD	**6SE6400-4BD21-2DA0**
22	30	0BE31-8 . A0		
30	40	0BE32-2 . A0		
37	50	0BE33-0 . A0	FSE	**6SE6400-4BD22-2EA1**
45	60	0BE33-7 . A0		
55	75	0BE34-5 . A0	FSF	**6SE6400-4BD24-0FA0**
75	100	0BE35-5 . A0		
90	125	0BE37-5 . A0		
110	150	0BE38-8UA0	FSF	**6SE6400-4BD26-0FA0**
132	200	0BE41-1UA0		
160	250	0XE41-3UA0	FSGX [1]	**6SL3000-1BE31-3AA0**
200	300	0XE41-6UA0	FSGX [1]	**6SL3000-1BE32-5AA0**
250	400	0XE42-0UA0		

[1] A Braking Module must be additionally ordered for connection.

Technical specifications

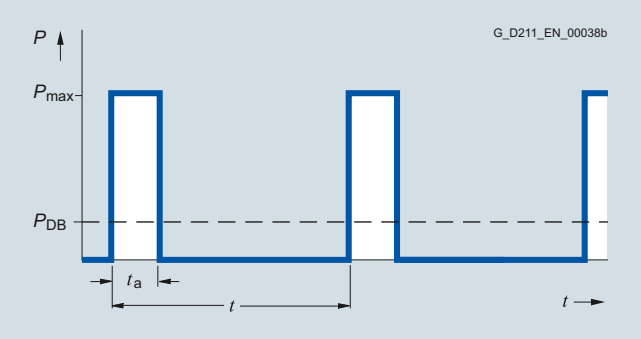
Line voltage 380 ... 480 V 3 AC		Braking resistor			
		6SL3201-0BE14-3AA0	6SL3201-0BE21-0AA0	6SL3201-0BE21-8AA0	6SL3201-0BE23-8AA0
Resistance	Ω	370	140	75	30
Rated power P_{DB} (Continuous braking power)	kW	0.075	0.2	0.375	0.925
Peak power P_{max} (load duration t_a = 12 s with period t = 240 s)	kW (hp)	1.5 (2)	4 (5)	7.5 (10)	18.5 (25)
Power connection		Terminal block	Terminal block	Terminal block	Terminal block
• Conductor cross-section	mm^2	2.5	2.5	2.5	6
Thermostatic switch		NC contact	NC contact	NC contact	NC contact
• Contact load, max.		250 V AC/2.5 A	250 V AC/2.5 A	250 V AC/2.5 A	250 V AC/2.5 A
• Conductor cross-section	mm^2	2.5	2.5	2.5	2.5
PE connection					
• Via terminal block		Yes	Yes	Yes	Yes
• PE connection on housing		M4 screw	M4 screw	M4 screw	M4 screw
Degree of protection		IP20	IP20	IP20	IP20
Dimensions					
• Width	mm (in)	105 (4.13)	105 (4.13)	175 (6.89)	250 (9.84)
• Height	mm (in)	295 (11.61)	345 (13.58)	345 (13.58)	490 (19.29)
• Depth	mm (in)	100 (3.94)	100 (3.94)	100 (3.94)	140 (5.51)
Weight, approx.	kg (lb)	1.48 (3.26)	1.8 (3.97)	2.73 (6.02)	6.2 (13.7)
Suitable for PM240-2 Power Module standard variant 3 AC 380 ... 480 V	Type	6SL3210-1PE11-8 . L1 6SL3210-1PE12-3 . L1 6SL3210-1PE13-2 . L1 6SL3210-1PE14-3 . L1	6SL3210-1PE16-1 . L1 6SL3210-1PE18-0 . L1	6SL3210-1PE21-1 . L0 6SL3210-1PE21-4 . L0 6SL3210-1PE21-8 . L0	6SL3210-1PE22-7 . L0 6SL3210-1PE23-3 . L0
Suitable for PM240-2 Power Module push-through variant 3 AC 380 ... 480 V	Type	–	6SL3211-1PE18-0 . L1	6SL3211-1PE21-8 . L0	6SL3211-1PE23-3 . L0
• Frame size		FSA	FSA	FSB	FSC

Line voltage 380 V ... 480 V 3 AC		Braking resistor			
		6SE6400-4BD21-2DA0	6SE6400-4BD22-2EA1	6SE6400-4BD24-0FA0	6SE6400-4BD26-0FA0
Resistance	Ω	27	15	8.2	5.5
Rated power P_{DB} (Continuous braking power)	kW	1.2	2.2	4	5.6
Peak power P_{max} (load duration t_a = 12 s with period t = 240 s)	kW	24	44	80	120
Power connections		M6 screw stud	M6 screw stud	M6 screw stud	M6 screw stud
Thermostatic switch		NC contact	NC contact	NC contact	NC contact
• Contact load, max.		250 V AC/2.5 A	250 V AC/2.5 A	250 V AC/2.5 A	250 V AC/2.5 A
Degree of protection		IP20	IP20	IP20	IP20
Frame size		FSD	FSE	FSF	FSF
Dimensions					
• Width	mm (in)	270 (10.63)	326 (12.83)	395 (15.55)	526 (20.71)
• Height	mm (in)	515 (20.28)	301 (11.85)	650 (25.59)	301 (11.85)
• Depth	mm (in)	175 (6.89)	484 (19.06)	315 (12.40)	484 (19.06)
Possible as base component		No	No	No	No
Weight, approx.	kg (lb)	7.4 (16.3)	11 (24.3)	16.7 (36.8)	17.5 (38.6)
Suitable for PM240 Power Module	Type	6SL3224-0BE31-5 . A0 6SL3224-0BE31-8 . A0 6SL3224-0BE32-2 . A0	6SL3224-0BE33-0 . A0 6SL3224-0BE33-7 . A0	6SL3224-0BE34-5 . A0 6SL3224-0BE35-5 . A0 6SL3224-0BE37-5 . A0	6SL3224-0BE38-8UA0 6SL3224-0BE41-1UA0
• Frame size		FSD	FSE	FSF	FSF

Technical specifications

Line voltage 380 V … 480 V 3 AC		Braking resistor	
		6SL3000-1BE31-3AA0	6SL3000-1BE32-5AA0
Resistance	Ω	4.4	2.2
Rated power P_{DB} (Continuous braking power)	kW	25	50
Peak power P_{max} (load duration t_a = 15 s with period t = 90 s)	kW	125	250
Power connections		M10 screw stud	M10 screw stud
Thermostatic switch		NC contact	NC contact
• Contact load, max.		250 V AC/2.5 A	250 V AC/2.5 A
Degree of protection		IP20	IP20
Frame size		FSGX	FSGX
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)
Possible as base component		No	No
Weight, approx.	kg (lb)	50 (110)	120 (265)
Suitable for PM240 Power Module	Type	6SL3224-0XE41-3UA0	6SL3224-0XE41-6UA0 6SL3224-0XE42-0UA0
• Frame size		FSGX	FSGX

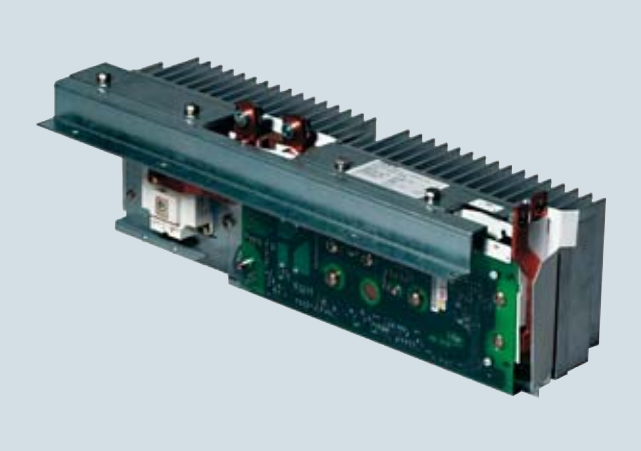
Characteristic curves



Load diagram for the braking resistors

t_a = 12 s (frame sizes FSA to FSF)
t = 240 s (frame sizes FSA to FSF)
t_a = 15 s (frame size FSGX)
t = 90 s (frame size FSGX)

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 to limit the DC link voltage during a short period of generator operation. The Braking Module includes the power electronics and the associated control circuit. During operation, the DC link power is converted into heat loss in an external braking resistor. Braking Modules function autonomously.

The Braking Module is designed for installation in the PM240 Power Modules, frame size FSGX, and is cooled using the Power Module fan. The supply voltage for the electronics is taken from the DC link. The Braking Module is connected to the DC link using the busbar sets included in the scope of delivery.

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

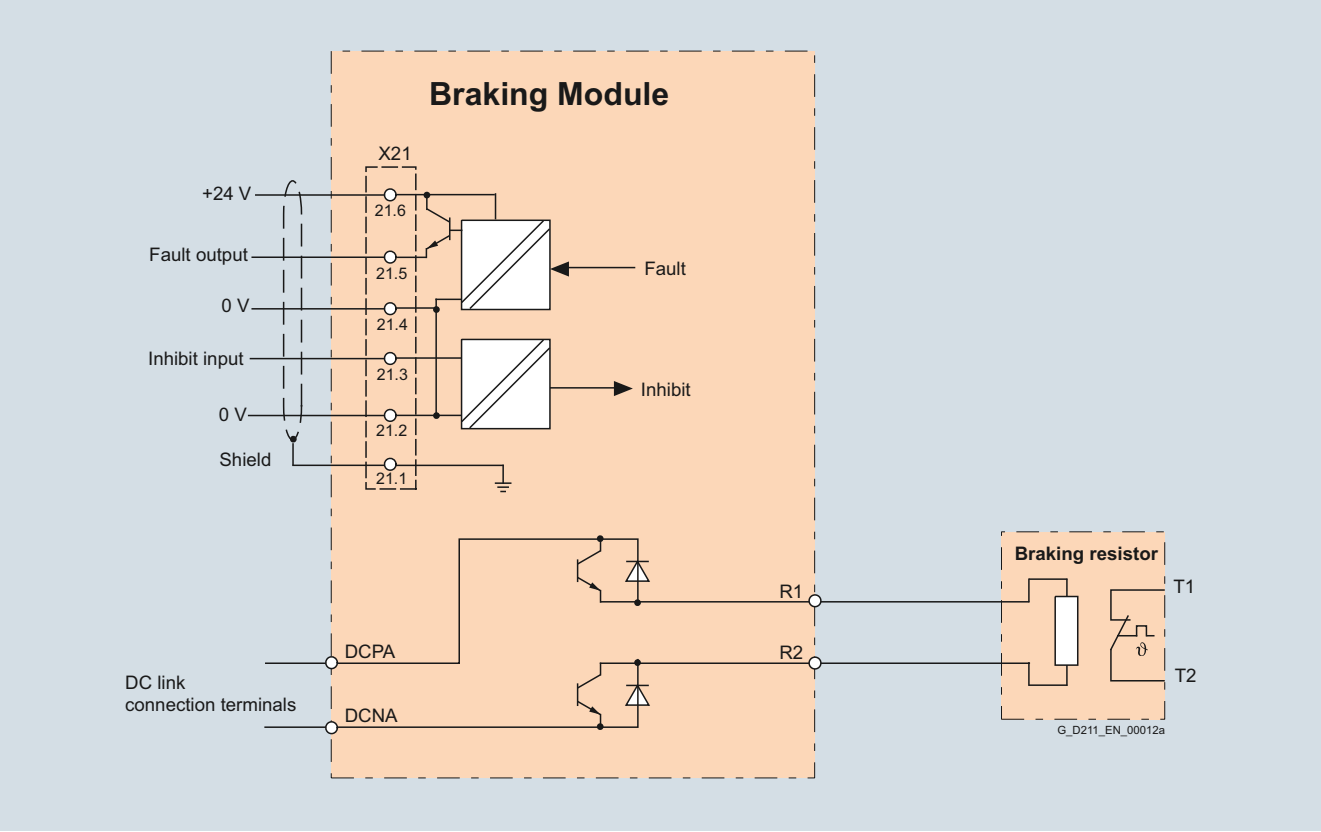
The Braking Module has the following interfaces as standard:

- 1 DC link connection
- 1 braking resistor connection
- 1 digital input (inhibit Braking Module/acknowledge faults)
- 1 digital output (Braking Module inhibited)
- 1 DIP switch for adjusting the activation threshold

Selection and ordering data

Description	Article No.
DC link voltage 510 ... 720 V DC	
Braking Module 50 kW/250 kW	**6SL3300-1AE32-5AA0**

Integration

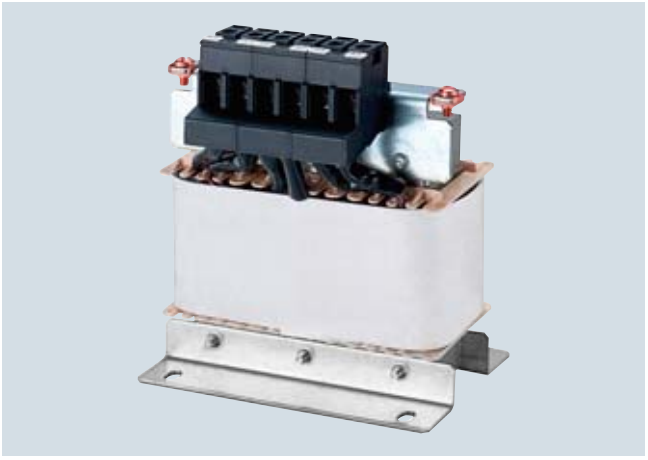


Connection example of a Braking Module

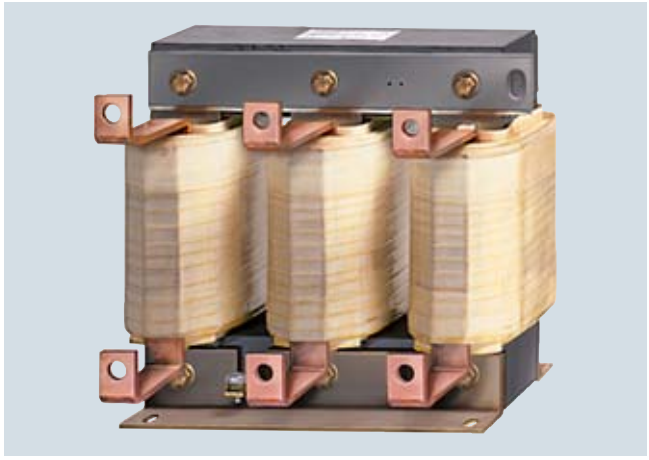
Technical specifications

DC link voltage **510 ... 720 V DC**	**Braking Module** 6SL3300-1AE32-5AA0
Power	
• Rated power P_{DB}	50 kW
• Peak power P_{15}	250 kW
• Power P_{20}	200 kW
• Power P_{40}	100 kW
Activation thresholds Adjustable via DIP switch	774 V (factory setting) or 673 V
Cable length to braking resistor, max.	50 m
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
• Conductor cross-section, max.	1.5 mm^2
Digital outputs continuously short-circuit-proof	
• Voltage	24 V DC
• Load current per digital output, max.	500 mA
• Conductor cross-section, max.	1.5 mm^2
R1/R2 connection	M8 screw
• Conductor cross-section, max.	50 mm^2
Weight, approx.	7.3 kg
Approvals	cURus
Suitable for installation in a PM240 Power Module	Frame size FSGX

Overview



Output reactor for PM230 Power Modules frame size FSA and PM240-2 Power Modules frame size FSA



Output reactor for PM240 Power Modules, frame size FSGX

Output reactors reduce the rate of voltage rise (*dv/dt*) and the height of the current peaks, and enable longer motor cables to be connected.

Owing to the high rates of voltage rise of the fast-switching IGBTs, the capacitance of long motor cables reverses polarity very quickly with every switching operation in the inverter. As a result, the inverter is loaded with additional current peaks of substantial magnitude.

Output reactors reduce the magnitude of these additional peaks because the cable capacitance reverses polarity more slowly across the reactor inductance, thereby attenuating the amplitudes of the current peaks.

When using output reactors, the following should be observed:

- Max. permissible output frequency 150 Hz (PM240) or 200 Hz (PM230 and PM240-2)
- Max. permissible pulse frequency 4 kHz
- The output reactor must be installed as close as possible to the Power Module

Integration

Output reactors that are optionally available depending on the Power Module used

The following line-side power components, DC link components and load-side power components are optionally available in the appropriate frames sizes for the Power Modules:

	Frame size						
	FSA	**FSB**	**FSC**	**FSD**	**FSE**	**FSF**	**FSGX**
PM230 Power Module degree of protection IP20							
Available frame sizes	–	–	–	✓	✓	✓	–
Load-side power components							
Output reactor	S	S	S	S	S	S	–
PM240-2 Power Module with integrated braking chopper							
Available frame sizes	✓	✓	✓	–	–	–	–
Load-side power components							
Output reactor	S	S	S	–	–	–	–
PM240 Power Module with integrated braking chopper							**Without integrated braking chopper**
Available frame sizes	–	–	–	✓	✓	✓	✓
Load-side power components							
Output reactor	–	–	–	S	S	S	S
PM250 Power Module with line-commutated energy recovery							
Available frame sizes	–	–	✓	✓	✓	✓	–
Load-side power components							
Output reactor	–	–	U	S	S	S	–

U = Base component
S = Lateral mounting
– = Not possible

Selection and ordering data

Rated power		PM230 Power Module degree of protection IP20			Output reactor
kW	hp	Type 6SL3210-...	Frame size		Article No.
380 ... 480 V 3 AC					
0.37	0.5	1NE11-3 . L1	FSA	NEW	**6SL3202-0AE16-1CA0**
0.55	0.75	1NE11-7 . L1			
0.75	1	1NE12-2 . L1			
1.1	1.5	1NE13-1 . L1			
1.5	2	1NE14-1 . L1			
2.2	3	1NE15-8 . L1			
3	4	1NE17-7 . L1	FSA	NEW	**6SL3202-0AE18-8CA0**
4	5	1NE21-0 . L1	FSB	NEW	**6SL3202-0AE21-8CA0**
5.5	7.5	1NE21-3 . L1			
7.5	10	1NE21-8 . L1			
11	15	1NE22-6 . L1	FSC	NEW	**6SL3202-0AE23-8CA0**
15	20	1NE23-2 . L1			
18.5	25	1NE23-8 . L1			
22	30	1NE24-5 . L0	FSD		**6SE6400-3TC03-8DD0**
30	40	1NE26-0 . L0	FSD		**6SE6400-3TC05-4DD0**
37	50	1NE27-5 . L0	FSE		**6SE6400-3TC08-0ED0**
45	60	1NE28-8 . L0	FSE		**6SE6400-3TC07-5ED0**
55	75	1NE31-1 . L0	FSF		**6SE6400-3TC14-5FD0**
75	100	1NE31-5 . L0	FSF		**6SE6400-3TC15-4FD0**

Rated power		PM230 Power Module degree of protection IP20 push-through variant			Output reactor
kW	hp	Type 6SL3211-...	Frame size		Article No.
380 ... 480 V 3 AC					
3	4	1NE17-7 . L1	FSA	NEW	**6SL3202-0AE18-8CA0**
7.5	10	1NE21-8 . L1	FSB	NEW	**6SL3202-0AE21-8CA0**
18.5	25	1NE23-8 . L1	FSC	NEW	**6SL3202-0AE23-8CA0**

Rated power		PM240-2 Power Module standard variant			Output reactor
kW	hp	Type 6SL3210-...	Frame size		Article No.
200 ... 240 V 1 AC/3 AC					
0.55	0.75	1PB13-0 . L0	FSA	NEW	**6SL3202-0AE16-1CA0**
0.75	1	1PB13-8 . L0			
1.1	1.5	1PB15-5 . L0	FSB	NEW	**6SL3202-0AE16-1CA0**
1.5	2	1PB17-4 . L0	FSB	NEW	**6SL3202-0AE18-8CA0**
2.2	3	1PB21-0 . L0	FSB	NEW	**6SL3202-0AE21-8CA0**
3	4	1PB21-4 . L0	FSC	NEW	**6SL3202-0AE21-8CA0**
4	5	1PB21-8 . L0			
200 ... 240 V 3 AC					
5.5	7.5	1PC22-2 . L0	FSC	NEW	**6SL3202-0AE23-8CA0**
7.5	10	1PC22-8 . L0			
380 ... 480 V 3 AC					
0.55	0.75	1PE11-8 . L1	FSA	NEW	**6SL3202-0AE16-1CA0**
0.75	1	1PE12-3 . L1			
1.1	1.5	1PE13-2 . L1			
1.5	2	1PE14-3 . L1			
2.2	3	1PE16-1 . L1			
3	4	1PE18-0 . L1	FSA	NEW	**6SL3202-0AE18-8CA0**
4	5	1PE21-1 . L0	FSB	NEW	**6SL3202-0AE21-8CA0**
5.5	7.5	1PE21-4 . L0			
7.5	10	1PE21-8 . L0			
11	15	1PE22-7 . L0	FSC	NEW	**6SL3202-0AE23-8CA0**
15	20	1PE23-3 . L0			

Selection and ordering data

Rated power		PM240-2 Power Module push-through variant			Output reactor
kW	hp	Type 6SL3211-...	Frame size		Article No.
200 ... 240 V 1 AC/3 AC					
0.75	1	1PB13-8 . L0	FSA	NEW	**6SL3202-0AE16-1CA0**
2.2	3	1PB21-0 . L0	FSB	NEW	**6SL3202-0AE21-8CA0**
4	5	1PB21-8 . L0	FSC	NEW	**6SL3202-0AE21-8CA0**
380 ... 480 V 3 AC					
3	4	1PE18-0 . L1	FSA	NEW	**6SL3202-0AE18-8CA0**
7.5	10	1PE21-8 . L0	FSB	NEW	**6SL3202-0AE21-8CA0**
15	20	1PE23-3 . L0	FSC	NEW	**6SL3202-0AE23-8CA0**

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Rated power		PM240 Power Module		Output reactor
kW	hp	Type 6SL3224-...	Frame size	Article No.
380 ... 480 V 3 AC				
18.5	25	0BE31-5 . A0	FSD	**6SE6400-3TC05-4DD0**
22	30	0BE31-8 . A0	FSD	**6SE6400-3TC03-8DD0**
30	40	0BE32-2 . A0	FSD	**6SE6400-3TC05-4DD0**
37	50	0BE33-0 . A0	FSE	**6SE6400-3TC08-0ED0**
45	60	0BE33-7 . A0	FSE	**6SE6400-3TC07-5ED0**
55	75	0BE34-5 . A0	FSF	**6SE6400-3TC14-5FD0**
75	100	0BE35-5 . A0	FSF	**6SE6400-3TC15-4FD0**
90	125	0BE37-5 . A0	FSF	**6SE6400-3TC14-5FD0**
110	150	0BE38-8UA0	FSF	**6SL3000-2BE32-1AA0**
132	200	0BE41-1UA0	FSF	**6SL3000-2BE32-6AA0**
160	250	0XE41-3UA0	FSGX	**6SL3000-2BE33-2AA0**
200	300	0XE41-6UA0	FSGX	**6SL3000-2BE33-8AA0**
250	400	0XE42-0UA0	FSGX	**6SL3000-2BE35-0AA0**

Rated power		PM250 Power Module		Output reactor
kW	hp	Type 6SL3225-...	Frame size	Article No.
380 ... 480 V 3 AC				
7.5	10	0BE25-5AA1	FSC	**6SL3202-0AJ23-2CA0**
11	15	0BE27-5AA1		
15	20	0BE31-1AA1		
18.5	25	0BE31-5 . A0	FSD	**6SE6400-3TC05-4DD0**
22	30	0BE31-8 . A0	FSD	**6SE6400-3TC03-8DD0**
30	40	0BE32-2 . A0	FSD	**6SE6400-3TC05-4DD0**
37	50	0BE33-0 . A0	FSE	**6SE6400-3TC08-0ED0**
45	60	0BE33-7 . A0	FSE	**6SE6400-3TC07-5ED0**
55	75	0BE34-5 . A0	FSF	**6SE6400-3TC14-5FD0**
75	100	0BE35-5 . A0	FSF	**6SE6400-3TC15-4FD0**
90	125	0BE37-5 . A0	FSF	**6SE6400-3TC14-5FD0**

Technical specifications

Line voltage 200 ... 240 V 1 AC/3 AC or 380 ... 480 V 3 AC		**Output reactor (for a 4 kHz pulse frequency)**			
		6SL3202-0AE16-1CA0	6SL3202-0AE18-8CA0	6SL3202-0AE21-8CA0	6SL3202-0AE23-8CA0
Rated current	A	6.1	9	18.5	39
Power loss	kW	0.09	0.08	0.08	0.11
Connection to the Power Module/ motor connection		Screw terminals	Screw terminals	Screw terminals	Screw terminals
• Conductor cross-section	mm^2	4	4	10	16
PE connection		M4 screw stud	M4 screw stud	M5 screw stud	M5 screw stud
Cable length, max. between output reactor and motor					
• 3 AC 200 -10 % ... 240 V +10 % and 3 AC 380 -10 % ... 415 V +10 %					
- Shielded	m (ft)	150 (492)	150 (492)	150 (492)	150 (492)
- Unshielded	m (ft)	225 (738)	225 (738)	225 (738)	225 (738)
• 440 ... 480 V 3 AC +10 %					
- Shielded	m (ft)	100 (328)	100 (328)	100 (328)	100 (328)
- Unshielded	m (ft)	150 (492)	150 (492)	150 (492)	150 (492)
Dimensions					
• Width	mm (in)	207 (8.15)	207 (8.15)	247 (9.72)	257 (10.12)
• Height	mm (in)	175 (6.89)	180 (7.09)	215 (8.46)	235 (9.25)
• Depth	mm (in)	72.5 (2.85)	72.5 (2.85)	100 (3.94)	114.7 (4.52)
Degree of protection		Control cabinet built-in unit IP20	Control cabinet built-in unit IP20	Control cabinet built-in unit IP20	Control cabinet built-in unit IP20
Weight, approx.	kg (lb)	3.4 (7.50)	3.9 (8.60)	10.1 (22.3)	11.2 (24.7)
Suitable for PM230 Power Module degree of protection IP20	Type	6SL3210-1NE11-3 . L1 6SL3210-1NE11-7 . L1 6SL3210-1NE12-2 . L1 6SL3210-1NE13-1 . L1 6SL3210-1NE14-1 . L1 6SL3210-1NE15-8 . L1	6SL3210-1NE17-7 . L1	6SL3210-1NE21-0 . L1 6SL3210-1NE21-3 . L1 6SL3210-1NE21-8 . L1	6SL3210-1NE22-6 . L1 6SL3210-1NE23-2 . L1 6SL3210-1NE23-8 . L1
Suitable for PM230 Power Module degree of protection IP20 Push Through variant	Type	–	6SL3211-1NE17-7 . L1	6SL3211-1NE21-8 . L1	6SL3211-1NE23-8 . L1
Suitable for PM240-2 standard variant 200 ... 240 V 1 AC/3 AC	Type	6SL3210-1PB13-0 . L0 6SL3210-1PB13-8 . L0 6SL3210-1PB15-5 . L0	6SL3210-1PB17-4 . L0	6SL3210-1PB21-0 . L0 6SL3210-1PB21-4 . L0 6SL3210-1PB21-8 . L0	6SL3210-1PC22-2 . L0 6SL3210-1PC22-8 . L0
Suitable for PM240-2 standard variant 380 ... 480 V 3 AC	Type	6SL3210-1PE11-8 . L1 6SL3210-1PE12-3 . L1 6SL3210-1PE13-2 . L1 6SL3210-1PE14-3 . L1 6SL3210-1PE16-1 . L1	6SL3210-1PE18-0 . L1	6SL3210-1PE21-1 . L0 6SL3210-1PE21-4 . L0 6SL3210-1PE21-8 . L0	6SL3210-1PE22-7 . L0 6SL3210-1PE23-3 . L0
Suitable for PM240-2 push-through variant 200 ... 240 V 1 AC/3 AC	Type	6SL3211-1PB13-8 . L0	–	6SL3211-1PB21-0 . L0 6SL3211-1PB21-8 . L0	–
Suitable for PM240-2 push-through variant 380 ... 480 V 3 AC	Type	–	6SL3211-1PE18-0 . L1	6SL3211-1PE21-8 . L0	6SL3211-1PE23-3 . L0
• Frame size		FSA	FSA	FSB	FSC

Technical specifications

Line voltage 380 ... 480 V 3 AC		**Output reactor (for a 4 kHz pulse frequency)** 6SL3202-0AJ23-2CA0		
Rated current	A	32	32	32
Power loss	kW	0.06	0.06	0.06
Connection to the Power Module		Cable	Cable	Cable
• Conductor cross-section		4 × AWG14 (1.5 mm^2)	4 × AWG14 (1.5 mm^2)	4 × AWG14 (1.5 mm^2)
• Length, approx.	m (ft)	0.35 (1.15)	0.35 (1.15)	0.35 (1.15)
Motor connection		Screw terminals	Screw terminals	Screw terminals
• Conductor cross-section	mm^2	6	6	6
PE connection		M5 screw stud	M5 screw stud	M5 screw stud
Cable length, max. between output reactor and motor				
• 380 -10 % ... 400 V 3 AC				
- Shielded	m (ft)	150 (492)	150 (492)	150 (492)
- Unshielded	m (ft)	225 (738)	225 (738)	225 (738)
• 401 ... 480 V 3 AC +10 %				
- Shielded	m (ft)	100 (328)	100 (328)	100 (328)
- Unshielded	m (ft)	150 (492)	150 (492)	150 (492)
Dimensions				
• Width	mm (in)	189 (7.44)	189 (7.44)	189 (7.44)
• Height	mm (in)	334 (13.15)	334 (13.15)	334 (13.15)
• Depth	mm (in)	80 (3.15)	80 (3.15)	80 (3.15)
Possible as base component		Yes	Yes	Yes
Degree of protection		IP00	IP00	IP00
Weight, approx.	kg (lb)	9.1 (20.1)	9.1 (20.1)	9.1 (20.1)
Suitable for PM250 Power Module	Type	6SL3225-0BE25-5AA1	6SL3225-0BE27-5AA1	6SL3225-0BE31-1AA1
• Rated power of the Power Module	kW (hp)	7.5 (10)	11 (15)	15 (20)
• Rated current I_{rated} of the Power Module	A	18	25	32
• Frame size		FSC	FSC	FSC

Technical specifications

Line voltage 380 ... 480 V 3 AC		**Output 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 [1]	45 [1]	68 [1]	104 [1]	90 [1]
Power loss	kW	0.2	0.2	0.2	0.17	0.27
Connection to the Power Module		Flat connector for M6 cable lug	Flat connector for M6 cable lug	Flat connector for M6 cable lug	Flat connector for M6 cable lug	Flat connector for M6 cable lug
Motor connection		Flat connector for M6 cable lug	Flat connector for M6 cable lug	Flat connector for M6 cable lug	Flat connector for M6 cable lug	Flat connector for M6 cable lug
PE connection		M6 screw	M6 screw	M6 screw	M6 screw	M6 screw
Cable length, max. between output reactor and motor						
• 380 -10 % ... 400 V 3 AC						
- 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)
• 401 ... 480 V 3 AC +10 %						
- 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)
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)	150 (5.91)	179 (7.05)	150 (5.91)	150 (5.91)	209 (8.23)
Degree of protection		IP00	IP00	IP00	IP00	IP00
Weight, approx.	kg (lb)	10.7 (23.6)	16.1 (35.5)	10.7 (23.6)	10.4 (22.9)	24.9 (54.9)
Suitable for PM230 Power Module degree of protection IP20	Type	–	6SL3210-1NE24-5UL0 6SL3210-1NE24-5AL0	6SL3210-1NE26-0UL0 6SL3210-1NE26-0AL0	6SL3210-1NE27-5UL0 6SL3210-1NE27-5AL0	6SL3210-1NE28-8UL0 6SL3210-1NE28-8AL0
Suitable for PM240 Power Module	Type	6SL3224-0BE31-5UA0 6SL3224-0BE31-5AA0	6SL3224-0BE31-8UA0 6SL3224-0BE31-8AA0	6SL3224-0BE32-2UA0 6SL3224-0BE32-2AA0	6SL3224-0BE33-0UA0 6SL3224-0BE33-0AA0	6SL3224-0BE33-7UA0 6SL3224-0BE33-7AA0
Suitable for PM250 Power Module	Type	6SL3225-0BE31-5 . A0	6SL3225-0BE31-8 . A0	6SL3225-0BE32-2 . A0	6SL3225-0BE33-0 . A0	6SL3225-0BE33-7 . A0
• Rated power of the Power Module	kW (hp)	18.5 (25)	22 (30)	30 (40)	37 (50)	45 (60)
• Rated current I_{rated} of the Power Module	A	38	45	60	75	90
• Frame size		FSD	FSD	FSD	FSE	FSE

[1] On the rating plate of the reactor the current is specified according to the duty cycle for high overload (HO). This is lower than the current specified according to the duty cycle for low overload (LO) of the Power Module.

Technical specifications

Line voltage 380 ... 480 V 3 AC		Output reactor (for a 4 kHz pulse frequency)				
		6SE6400-3TC14-5FD0	6SE6400-3TC15-4FD0	6SE6400-3TC14-5FD0	6SL3000-2BE32-1AA0	6SL3000-2BE32-6AA0
Rated current	A	178 [1]	178 [1]	178 [1]	210	260
Power loss	kW	0.47	0.25	0.47	0.49	0.5
Connection to the Power Module		Flat connector for M8 cable lug	Flat connector for M8 cable lug	Flat connector for M8 cable lug	Flat connector for M10 screw	Flat connector for M10 screw
Motor connection		Flat connector for M8 cable lug	Flat connector for M8 cable lug	Flat connector for M8 cable lug	Flat connector for M10 screw	Flat connector for M10 screw
PE connection		M8 screw	M6 screw	M8 screw	M8 screw	M8 screw
Cable length, max. between output reactor and motor						
• 380 -10 % ... 400 V 3 AC						
- 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)
• 401 ... 480 V 3 AC +10 %						
- 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)
Dimensions						
• Width	mm (in)	350 (13.78)	270 (10.63)	350 (13.78)	300 (11.81)	300 (11.81)
• Height	mm (in)	321 (12.64)	248 (9.76)	321 (12.64)	285 (11.22)	315 (12.40)
• Depth	mm (in)	288 (11.34)	209 (8.23)	288 (11.34)	257 (10.12)	277 (10.91)
Degree of protection		IP00	IP00	IP00	IP00	IP00
Weight, approx.	kg (lb)	51.5 (114)	24 (52.9)	51.5 (114)	60 (132)	66 (146)
Suitable for PM230 Power Module degree of protection IP20	Type	6SL3210-1NE31-1UL0 6SL3210-1NE31-1AL0	6SL3210-1NE31-5UL0 6SL3210-1NE31-5AL0	–	–	–
Suitable for PM240 Power Module	Type	6SL3224-0BE34-5UA0 6SL3224-0BE34-5AA0	6SL3224-0BE35-5UA0 6SL3224-0BE35-5AA0	6SL3224-0BE37-5UA0 6SL3224-0BE37-5AA0	6SL3224-0BE38-8UA0	6SL3224-0BE41-1UA0
Suitable for PM250 Power Module	Type	6SL3225-0BE34-5 . A0	6SL3225-0BE35-5 . A0	6SL3225-0BE37-5 . A0	–	–
• Rated power of the Power Module	kW (hp)	55 (75)	75 (100)	90 (125)	110 (150)	132 (200)
• Rated current I_{rated} of the Power Module	A	110	145	178	205	250
• Frame size		FSF	FSF	FSF	FSF	FSF

[1] On the rating plate of the reactor the current is specified according to the duty cycle for high overload (HO). This is lower than the current specified according to the duty cycle for low overload (LO) of the Power Module.

Technical specifications

Line voltage 380 ... 480 V 3 AC		**Output reactor (for a 4 kHz pulse frequency)**		
		6SL3000-2BE33-2AA0	6SL3000-2BE33-8AA0	6SL3000-2BE35-0AA0
Rated current	A	310	380	490
Power loss	kW	0.47	0.5	0.5
Connection to the Power Module		1 x hole for M10	1 × hole for M10	1 × hole for M12
Motor connection		1 × hole for M10	1 × hole for M10	1 × hole for M12
PE connection		M6 screw	M6 screw	M6 screw
Cable length, max. between output reactor and motor				
• 380 -10 % ... 400 V 3 AC				
- Shielded	m (ft)	300 (984)	300 (984)	300 (984)
- Unshielded	m (ft)	450 (1476)	450 (1476)	450 (1476)
• 401 ... 480 V 3 AC +10 %				
- Shielded	m (ft)	300 (984)	300 (984)	300 (984)
- Unshielded	m (ft)	450 (1476)	450 (1476)	450 (1476)
Dimensions				
• Width	mm (in)	300 (11.81)	300 (11.81)	300 (11.81)
• Height	mm (in)	285 (11.22)	285 (11.22)	365 (14.37)
• Depth	mm (in)	257 (10.12)	277 (10.91)	277 (10.91)
Degree of protection		IP00	IP00	IP00
Weight, approx.	kg (lb)	66 (146)	73 (161)	100 (221)
Suitable for PM240 Power Module	Type	6SL3224-0XE41-3UA0	6SL3224-0XE41-6UA0	6SL3224-0XE42-0UA0
Suitable for PM250 Power Module	Type	–	–	–
• Rated power of the Power Module	kW (hp)	160 (250)	200 (300)	250 (400)
• Rated current I_{rated} of the Power Module	A	302	370	477
• Frame size		FSGX	FSGX	FSGX

Overview

Sine-wave filter for PM240 Power Modules, frame size FSGX

Sine-wave filters limit the rate of voltage rise (*dv/dt*) and the peak voltages on the motor winding. Similar to an output reactor, they enable the connection of longer motor cables.

Bearing currents are also reduced significantly. Using these filters therefore allows standard motors with standard insulation and without insulated bearings to be operated on SINAMICS. As a result, the voltage load on the motor winding is virtually identical to the load on windings of directly mains-fed motors.

Owing to the very low rates of voltage rise on the motor cable, the sine-wave filter also has a positive impact in terms of electromagnetic compatibility which means that it is not absolutely essential to use shielded cables for short motor cables to achieve the required standard of EMC.

Since the voltage applied to the motor is not pulsed, the inverter-related stray losses and additional noise in the motor are also reduced considerably and the noise level of the motor is similar to the level produced by directly mains-fed motors.

When using sine-wave filters, the following should be observed:

- Pulse frequencies of between 4 kHz and 8 kHz are permissible for rated outputs up to and including 90 kW.
  4 kHz is the only permissible pulse frequency for rated outputs of 110 kW or higher with a PM240 Power Module. Note additional current derating as compared with rated pulse frequency of 2 kHz (see derating data)
- The output frequency is limited to 150 Hz
- Operation and commissioning may only be performed with the motor connected as the sine-wave filter is not no-load proof
- It must be ensured that the automatic pulse frequency reduction functions are also deactivated
- 80 % of the line input voltage is available as an output voltage for PM230 Power Modules
- A derating of 5 % must be observed when a PM240 Power Module is selected

Integration

Sine-wave filters that are optionally available depending on the Power Module used

	Frame size						
	FSA	**FSB**	**FSC**	**FSD**	**FSE**	**FSF**	**FSGX**
PM230 Power Module degree of protection IP20							
Available frame sizes	✓	✓	✓	✓	✓	✓	–
Load-side power components							
Sine-wave filter	–	–	–	S	S	S	–
PM240 Power Module with integrated braking chopper							**Without integrated braking chopper**
Available frame sizes	–	–	–	✓	✓	✓	✓
Load-side power components							
Sine-wave filter	–	–	–	S	S	S	S
PM250 Power Module with line-commutated energy recovery							
Available frame sizes	–	–	✓	✓	✓	✓	–
Load-side power components							
Sine-wave filter	–	–	U	S	S	S	–

U = Base component
S = Lateral mounting
I = Integrated
– = Not possible

Selection and ordering data

Rated power		**PM230 Power Module degree of protection IP20**		**Sine-wave filter**
kW	hp	Type 6SL3210-...	Frame size	Article No.
380 ... 480 V 3 AC				
22	30	1NE24-5 . L0	FSD	**6SL3202-0AE24-6SA0**
30	40	1NE26-0 . L0	FSD	**6SL3202-0AE26-2SA0**
37	50	1NE27-5 . L0	FSE	**6SL3202-0AE28-8SA0**
45	60	1NE28-8 . L0		
55	75	1NE31-1 . L0	FSF	**6SL3202-0AE31-5SA0**
75	100	1NE31-5 . L0		

Rated power		**PM240 Power Module**		**Sine-wave filter**
kW	hp	Type 6SL3224-...	Frame size	Article No.
380 ... 480 V 3 AC				
18.5	25	0BE31-5 . A0	FSD	**6SL3202-0AE24-6SA0**
22	30	0BE31-8 . A0		
30	40	0BE32-2 . A0	FSD	**6SL3202-0AE26-2SA0**
37	50	0BE33-0 . A0	FSE	**6SL3202-0AE28-8SA0**
45	60	0BE33-7 . A0		
55	75	0BE34-5 . A0	FSF	**6SL3202-0AE31-5SA0**
75	100	0BE35-5 . A0		
90	125	0BE37-5 . A0	FSF	**6SL3202-0AE31-8SA0**
110	150	0BE38-8UA0	FSF	**6SL3000-2CE32-3AA0**
132	200	0BE41-1UA0		
160	250	0XE41-3UA0	FSGX	**6SL3000-2CE32-8AA0**
200	300	0XE41-6UA0	FSGX	**6SL3000-2CE33-3AA0**
250	400	0XE42-0UA0	FSGX	**6SL3000-2CE34-1AA0**

Rated power		**PM250 Power Module**		**Sine-wave filter**
kW	hp	Type 6SL3225-...	Frame size	Article No.
380 ... 480 V 3 AC				
7.5	10	0BE25-5AA1	FSC	**6SL3202-0AE22-0SA0**
11	15	0BE27-5AA1	FSC	**6SL3202-0AE23-3SA0**
15	20	0BE31-1AA1		
18.5	25	0BE31-5 . A0	FSD	**6SL3202-0AE24-6SA0**
22	30	0BE31-8 . A0		
30	40	0BE32-2 . A0	FSD	**6SL3202-0AE26-2SA0**
37	50	0BE33-0 . A0	FSE	**6SL3202-0AE28-8SA0**
45	60	0BE33-7 . A0		
55	75	0BE34-5 . A0	FSF	**6SL3202-0AE31-5SA0**
75	100	0BE35-5 . A0		
90	125	0BE37-5 . A0	FSF	**6SL3202-0AE31-8SA0**

Technical specifications

Line voltage 380 ... 480 V 3 AC		Sine-wave filter		
		6SL3202-0AE22-0SA0	6SL3202-0AE23-3SA0	
Rated current	A	20	33	33
Power loss	kW	0.099	0.151	0.151
Connection to the Power Module		Cable	Cable	Cable
• Conductor cross-section	mm^2	10	10	10
• Length, approx.	m (ft)	0.5 (1.64)	0.5 (1.64)	0.5 (1.64)
Motor connection		Screw terminals	Screw terminals	Screw terminals
• Conductor cross-section	mm^2	6	6	6
PE connection		M5 screw stud	M5 screw stud	M5 screw stud
Cable length, max. between sine-wave filter and motor				
• 380 ... 480 V 3 AC ±10 %				
- Shielded	m (ft)	200 (656)	200 (656)	200 (656)
- Unshielded	m (ft)	300 (984)	300 (984)	300 (984)
Dimensions				
• Width	mm (in)	189 (7.44)	189 (7.44)	189 (7.44)
• Height	mm (in)	336 (13.23)	336 (13.23)	336 (13.23)
• Depth	mm (in)	140 (5.51)	140 (5.51)	140 (5.51)
Possible as base component		Yes	Yes	Yes
Degree of protection		IP20	IP20	IP20
Weight, approx.	kg (lb)	12 (26.5)	23 (50.7)	23 (50.7)
Suitable for PM250 Power Module	Type	6SL3225-0BE25-5AA1	6SL3225-0BE27-5AA1	6SL3225-0BE31-1AA1
• Rated power of the Power Module	kW	7.5	11	15
• Rated current I_{rated} of the Power Module	A	18	25	32
• Frame size		FSC	FSC	FSC

Line voltage 380 ... 480 V 3 AC		Sine-wave filter				
		6SL3202-0AE24-6SA0		6SL3202-0AE26-2SA0	6SL3202-0AE28-8SA0	
Rated current	A	47	47	61.8	92	92
Power loss	kW	0.185	0.185	0.152	0.251	0.251
Connection to the Power Module		Screw terminals	Screw terminals	Screw terminals	Screw terminals	Screw terminals
• Conductor cross-section	mm^2	50	50	50	95	95
Motor connection		Screw terminals	Screw terminals	Screw terminals	Screw terminals	Screw terminals
• Conductor cross-section	mm^2	50	50	50	95	95
PE connection		M6 screw	M6 screw	M6 screw	M8 screw	M8 screw
Cable length, max. between sine-wave filter and motor						
• 380 ... 480 V 3 AC ±10 %						
- 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)
Dimensions						
• Width	mm (in)	250 (9.84)	250 (9.84)	250 (9.84)	275 (10.83)	275 (10.83)
• Height	mm (in)	315 (12.40)	315 (12.40)	305 (12.01)	368 (14.49)	368 (14.49)
• Depth	mm (in)	262 (10.31)	262 (10.31)	262 (10.31)	275 (10.83)	275 (10.83)
Degree of protection		IP00	IP00	IP00	IP00	IP00
Weight, approx.	kg (lb)	24 (52.9)	24 (52.9)	34 (75)	45 (99.2)	45 (99.2)
Suitable for PM230 Power Module degree of protection IP20	Type	–	6SL3210-1NE24-5UL0 6SL3210-1NE24-5AL0	6SL3210-1NE26-0UL0 6SL3210-1NE26-0AL0	6SL3210-1NE27-5UL0 6SL3210-1NE27-5AL0	6SL3210-1NE28-8UL0 6SL3210-1NE28-8AL0
Suitable for PM240 Power Module	Type	6SL3224-0BE31-5UA0 6SL3224-0BE31-5AA0	6SL3224-0BE31-8UA0 6SL3224-0BE31-8AA0	6SL3224-0BE32-2UA0 6SL3224-0BE32-2AA0	6SL3224-0BE33-0UA0 6SL3224-0BE33-0AA0	6SL3224-0BE33-7UA0 6SL3224-0BE33-7AA0
Suitable for PM250 Power Module	Type	6SL3225-0BE31-5 . A0	6SL3225-0BE31-8 . A0	6SL3225-0BE32-2 . A0	6SL3225-0BE33-0 . A0	6SL3225-0BE33-7 . A0
• Rated power of the Power Module	kW	18.5	22	30	37	45
• Rated current I_{rated} of the Power Module	A	38	45	60	75	90
• Frame size		FSD	FSD	FSD	FSE	FSE

Technical specifications

Line voltage 380 ... 480 V 3 AC		**Sine-wave filter (for pulse frequencies 4 ... 8 kHz, only 4 kHz permissible at 110 kW and above – note additional current derating as compared with rated pulse frequency of 2 kHz,** see derating data)				
		6SL3202-0AE31-5SA0		6SL3202-0AE31-8SA0	6SL3000-2CE32-3AA0	
Rated current	A	150	150	182	225	225
Power loss	kW	0.43	0.43	0.47	0.221	0.221
Connection to the Power Module		Screw terminals	Screw terminals	Screw terminals	1 × hole for M10	1 × hole for M10
• Conductor cross-section	mm^2	150	150	150		
Motor connection		Screw terminals	Screw terminals	Screw terminals	1 × hole for M10	1 × hole for M10
• Conductor cross-section	mm^2	150	150	150		
PE connection		M8 screw	M6 screw	M8 screw	1 × hole for M10	1 × hole for M10
Cable length, max. between sine-wave filter and motor						
• 380 ... 480 V 3 AC ±10 %						
- Shielded	m (ft)	200 (656)	200 (656)	200 (656)	300 (984)	300 (984)
- Unshielded	m (ft)	300 (984)	300 (984)	300 (984)	450 (1476)	450 (1476)
Dimensions						
• Width	mm (in)	350 (13.78)	350 (13.78)	350 (13.78)	620 (24.41)	620 (24.41)
• Height	mm (in)	440 (17.32)	440 (17.32)	468 (18.43)	300 (11.81)	300 (11.81)
• Depth	mm (in)	305 (12.01)	305 (12.01)	305 (12.01)	320 (12.60)	320 (12.60)
Degree of protection		IP00	IP00	IP00	IP00	IP00
Weight, approx.	kg (lb)	63 (139)	63 (139)	80 (176)	124 (273)	124 (273)
Suitable for PM230 Power Module degree of protection IP20	Type	6SL3210-1NE31-1UL0 6SL3210-1NE31-1AL0	6SL3210-1NE31-5UL0 6SL3210-1NE31-5AL0	–	–	–
Suitable for PM240 Power Module	Type	6SL3224-0BE34-5UA0 6SL3224-0BE34-5AA0	6SL3224-0BE35-5UA0 6SL3224-0BE35-5AA0	6SL3224-0BE37-5UA0 6SL3224-0BE37-5AA0	6SL3224-0BE38-8UA0	6SL3224-0BE41-1UA0
Suitable for PM250 Power Module	Type	6SL3225-0BE34-5 . A0	6SL3225-0BE35-5 . A0	6SL3225-0BE37-5 . A0	–	–
• Rated power of the Power Module	kW	55	75	90	110	132
• Rated current I_{rated} of the Power Module	A	110	145	178	205	250
• Frame size		FSF	FSF	FSF	FSF	FSF

Line voltage 380 ... 480 V 3 AC		**Sine-wave filter (permissible for 4 kHz pulse frequency – note additional current derating as compared with rated pulse frequency of 2 kHz,** see derating data)		
		6SL3000-2CE32-8AA0	6SL3000-2CE33-3AA0	6SL3000-2CE34-1AA0
Rated current	A	276	333	408
Power loss	kW	0.235	0.245	0.34
Connection to the Power Module		1 × hole for M10	1 × hole for M10	1 × hole for M10
Motor connection		1 × hole for M10	1 × hole for M10	1 × hole for M10
PE connection		1 × hole for M10	1 × hole for M10	1 × hole for M10
Cable length, max. between sine-wave filter and motor				
• 380 ... 480 V 3 AC ±10 %				
- Shielded	m (ft)	300 (984)	300 (984)	300 (984)
- Unshielded	m (ft)	450 (1476)	450 (1476)	450 (1476)
Dimensions				
• Width	mm (in)	620 (24.41)	620 (24.41)	620 (24.41)
• Height	mm (in)	300 (11.81)	370 (14.57)	370 (14.57)
• Depth	mm (in)	320 (12.60)	360 (14.17)	360 (14.17)
Degree of protection		IP00	IP00	IP00
Weight, approx.	kg (lb)	127 (280)	136 (300)	198 (437)
Suitable for PM240 Power Module	Type	6SL3224-0XE41-3UA0	6SL3224-0XE41-6UA0	6SL3224-0XE42-0UA0
• Rated power of the Power Module	kW	160	200	250
• Rated current I_{rated} of the Power Module	A	302	370	477
• Frame size		FSGX	FSGX	FSGX

5

Overview

Operator panel	Intelligent Operator Panel IOP and IOP Handheld	Basic Operator Panel BOP-2
Description	  Thanks to the large plain text display, menu-based operation and the application wizards, commissioning of the standard drives is easy. Integrated application wizards guide the user interactively through the commissioning process for important applications such as pumps, fans, compressors and conveyor systems.	 Commissioning of standard drives is easy with the menu-prompted dialog on a 2-line display. Simultaneous display of the parameter and parameter value, as well as parameter filtering, means that basic commissioning of a drive can be performed easily and, in most cases, without a printed parameter list.
Possible applications	• For direct mounting on the Control Unit • Can be mounted in the control cabinet door using a door mounting kit (achievable degree of protection is IP54/UL Type 12) • Available as handheld version • The IOP supports the following languages [1]: German, English, French, Italian, Spanish, Portuguese, Dutch, Swedish, Russian, Czech, Polish, Turkish, Finnish.	• For direct mounting on the Control Unit • Can be mounted in the control cabinet door using a door mounting kit (achievable degree of protection is IP54/UL Type 12)
Quick commissioning without expert knowledge	• Standard commissioning using the clone function • User-defined parameter list with a reduced number of self-selected parameters • Simple commissioning of standard applications using application-specific wizards; it is not necessary to know the parameter structure • Simple local commissioning using the handheld version • Commissioning largely without documentation	• Standard commissioning using the clone function
High degree of operator friendliness and intuitive operation	• Direct manual operation of the drive – you can simply toggle between the automatic and manual modes	• Direct manual operation of the drive – you can simply toggle between the automatic and manual modes
	• Intuitive navigation using a rotary knob – just like in everyday applications	–
	• Graphic display to show status values such as pressure or flow in bar-type diagrams	• 2-line display for showing up to 2 process values with text
	• Status display with freely selectable units to specify physical values	• Status display of predefined units
Minimization of maintenance times	• Diagnostics using plain text display, can be used locally on-site without documentation • Simple update of languages, wizards and firmware updates via USB	• Diagnostics with menu prompting with 7-segment display

[1] You can find more information at
http://support.automation.siemens.com/WW/view/en/67273266

Overview

Intelligent Operator Panel IOP

Intelligent Operator Panel IOP

The Intelligent Operator Panel IOP is a very user-friendly and powerful operator panel for the SINAMICS G120, SINAMICS G120C, SINAMICS G120P, SINAMICS G110D, SINAMICS G120D, SINAMICS G110M and SINAMICS S110 standard drives.

The IOP supports both entry-level personnel and drive experts. Thanks to the large plain text display, the menu-based operation and the application wizards, it is easy to commission standard drives. A drive can be essentially commissioned without having to use a printed parameter list – as the parameters are displayed in plain text, and explanatory help texts and the parameter filtering function are provided.

Application wizards interactively guide you when commissioning important applications such as conveyor technology, pumps, fans and compressors. There is a basic commissioning wizard for general commissioning.

The drives are easily controlled manually using directly assigned buttons and the navigation wheel. The IOP has a dedicated switchover button to switch from automatic to manual mode.

The inverter can be diagnosed in a user-friendly fashion using the plain text display of faults and alarms. Help texts can be obtained by pressing the INFO button.

Up to 2 process values can be displayed graphically or numerically on the status screen/status display. Process values can also be displayed in technological units.

The IOP supports standard commissioning of identical drives. For this purpose, a parameter list can be copied from an inverter into the IOP and downloaded into other drive units of the same type as required.

The IOP supports the following languages [1]: German, English, French, Italian, Spanish, Portuguese, Dutch, Swedish, Russian, Czech, Polish, Turkish, Finnish.

The IOP can be installed in control cabinet doors using the optionally available door mounting kit.

The operating temperature of the IOP is 0 ... 50 °C (32 ... 122 °F).

IOP Handheld

IOP Handheld

A handheld version of the IOP can be ordered for mobile use. In addition to the IOP, this includes a housing with rechargeable batteries, charging unit and RS232 connecting cable. The charging unit is supplied with connector adapters for Europe, the US and UK. When the batteries are fully charged, the operating time is up to 8 hours.

To connect the IOP handheld to SINAMICS G110D, SINAMICS G120D or SINAMICS G110M, the RS232 connecting cable with optical interface is required in addition.

Updating the IOP

The IOP can be updated and expanded using the integrated USB interface.

Data to support future drive systems can be transferred from the PC to the IOP. Further, the USB interface allows user languages and wizards that will become available in the future to be subsequently downloaded and the firmware to be updated for the IOP [1].

The IOP is supplied with power via the USB interface during an update.

[1] You can find more information at http://support.automation.siemens.com/WW/view/en/67273266

Selection and ordering data

Description	Article No.
Intelligent Operator Panel IOP	**6SL3255-0AA00-4JA1**
IOP Handheld For use with SINAMICS G120, SINAMICS G120C, SINAMICS G120P, SINAMICS G110D, SINAMICS G120D, SINAMICS G110M and SINAMICS S110 Included in the scope of delivery: • IOP • Handheld housing • Rechargeable batteries (4 × AA) • Charging unit (international) • RS232 connecting cable (length 3 m, used in combination with SINAMICS G120, SINAMICS G120C, SINAMICS G120P and SINAMICS S110 [1]) • USB cable (1 m/3.28 ft long)	**6SL3255-0AA00-4HA0**
Accessories	
Door mounting kit For mounting an operator panel in control cabinet doors with sheet steel thicknesses of 1 ... 3 mm (0.04 in ... 0.12 in) IP54 degree of protection for IOP IP55 degree of protection for BOP-2 Included in the scope of delivery: • Seal • Mounting material • Connecting cable (5 m/16.41 ft long, also supplies voltage to the IOP directly via the Control Unit)	**6SL3256-0AP00-0JA0**
RS232 connecting cable With optical interface to connect the SINAMICS G110D, SINAMICS G120D or SINAMICS G110M inverters to the IOP Handheld (2.5 m long)	**3RK1922-2BP00**

Benefits

- Simple commissioning of standard applications using wizards, it is not necessary to know the parameter structure
- Diagnostics using plain text display; can be used locally on-site without documentation
- Direct manual operation of the drive – you can toggle between automatic and manual modes
- Status display with freely selectable units; display of real physical values
- Intuitive, navigation using a wheel – just like in everyday applications
- Graphic display with bar charts, e.g. for status values such as pressure or flowrate
- Quickly and simply mounted in the door – mechanically and electrically
- Simple local commissioning on-site using the handheld version
- Commissioning without documentation using the integrated help function
- Standard commissioning using the clone function (parameter set data is saved for fast replacement)
- User-defined parameter list with a reduced number of self-selected parameters (to generate your own commissioning screens)
- The IOP supports the following languages [2]: German, English, French, Italian, Spanish, Portuguese, Dutch, Swedish, Russian, Czech, Polish, Turkish, Finnish
- Simple update of languages, wizards and firmware updates via USB [2]

[1] For use in combination with SINAMICS G110D, SINAMICS G120D and SINAMICS G110M, the RS232 connecting cable with optical interface is required (Article No.: 3RK1922-2BP00). The cable must be ordered separately.

[2] You can find more information at http://support.automation.siemens.com/WW/view/en/67273266

Integration

Using the IOP with the inverters

	SINAMICS G120 with CU230P-2, CU240B-2, CU240E-2 or CU250S-2 Control Unit	SINAMICS G120P (PM230) with CU230P-2 Control Unit	SINAMICS G110D, SINAMICS G120D and SINAMICS G110M	SINAMICS S110
Plugging the IOP onto the inverter (power supply from the Control Unit)	✓	✓	–	–
Door mounting with door mounting kit (power supply directly from the Control Unit) For this purpose, the IOP must be connected up by means of the connecting cable supplied with the door mounting kit.	✓	✓ (for PM230 IP20)	–	✓
Mobile use of the IOP Handheld (supplied from rechargeable batteries)	✓	✓ (for PM230 IP20)	✓ (RS232 connecting cable with optical interface required, 3RK1922-2BP00)	✓

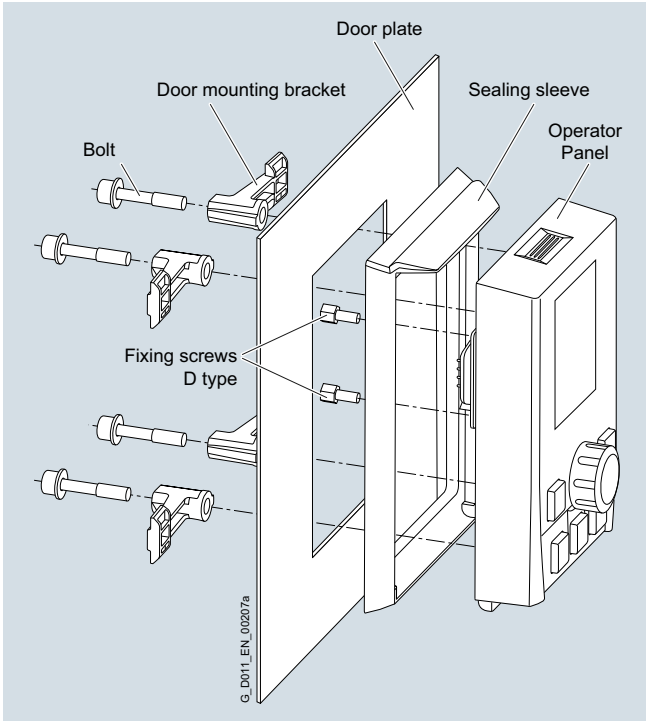
Mounting the IOP on a CU230P-2, CU240B-2, CU240E-2 or CU250S-2 Control Unit

The IOP can be directly mounted on a Control Unit "-2" (e.g. CU230P-2, CU240B-2, CU240E-2, CU250S-2).

CU230P-2 Control Unit with plugged-on IOP

Door mounting

Using the optionally available door mounting kit, an IOP can be simply mounted in a control cabinet door with just a few manual operations. Degree of protection IP54/UL Type 12 is achieved for door mounting.



Door mounting kit with plugged-on IOP

Overview

Basic Operator Panel BOP-2

The Basic Operator Panel BOP-2 can be used to commission drives, monitor drives in operation and input individual parameter settings.

Commissioning of standard drives is easy with the menu-prompted dialog on a 2-line display. Simultaneous display of the parameter and parameter value, as well as parameter filtering, means that basic commissioning of a drive can be performed easily and, in most cases, without a printed parameter list.

The drives are easily controlled manually using directly assigned navigation buttons. The BOP-2 has a dedicated switchover button to switch from automatic to manual mode.

Diagnostics can easily be performed on the connected inverter by following the menus.

Up to two process values can be numerically visualized simultaneously.

BOP-2 supports standard commissioning of identical drives. For this purpose, a parameter list can be copied from an inverter into the BOP-2 and when required, downloaded into other drive units of the same type.

The operating temperature of the BOP-2 is 0 ... 50 °C (32 ... 122 °F).

Selection and ordering data

Description	Article No.
Basic Operator Panel BOP-2	**6SL3255-0AA00-4CA1**
Accessories	
Door mounting kit For mounting an operator panel in control cabinet doors with sheet steel thicknesses of 1 ... 3 mm (0.04 ... 0.12 in) IP54 degree of protection for IOP IP55 degree of protection for BOP-2 Included in the scope of delivery: • Seal • Mounting material • Connecting cable (5 m/16.41 ft long, also supplies voltage to the BOP-2 directly via the Control Unit)	**6SL3256-0AP00-0JA0**

Benefits

- Shorten commissioning times – Easy commissioning of standard drives using basic commissioning wizards (setup)
- Minimize standstill times – Fast detection and rectification of faults (Diagnostics)
- Greater transparency in the process – The status display of the BOP-2 makes process variable monitoring easy (Monitoring)
- Direct mounting on the Control Unit (also see IOP)
- User-friendly user interface:
  - Easy navigation using clear menu structure and clearly assigned control keys
  - Two-line display

Integration

Using the BOP-2 with SINAMICS G120 inverters

	CU230P-2	CU240B-2	CU240E-2	CU250S-2
Plugging the BOP-2 onto the inverter	✓	✓	✓	✓
Door mounting with door mounting kit	✓	✓	✓	✓

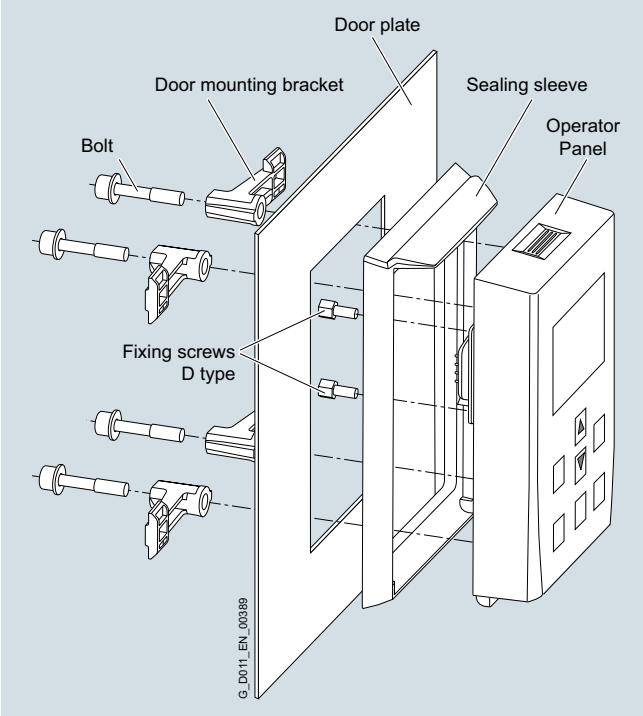
Mounting the BOP-2 on a CU230P-2, CU240B-2, CU240E-2 or CU250S-2 Control Unit

The BOP-2 can be directly mounted on a Control Unit "-2" (e.g. CU230P-2, CU240B-2, CU240E-2, CU250S-2).

CU240E-2 Control Unit with plugged-on BOP-2

Door mounting

Using the optionally available door mounting kit, a BOP-2 can be simply mounted in a control cabinet door with just a few manual operations. Degree of protection IP55 is achieved for door mounting.



Door mounting kit with plugged-on BOP-2

Supplementary system components > Push-through mounting frame for PM230 and PM240-2 Power Modules

Overview

It is advisable to use an optionally available mounting frame to install the push-through unit in a control cabinet. This mounting frame includes the necessary seals and frame to ensure compliance with degree of protection IP54.

If the Power Module is installed without use of the optional mounting frame, the user is responsible for ensuring that the requisite degree of protection is provided.

Tightening torque for fixing the mounting frame and the inverter: 3 ... 3.5 Nm.

Selection and ordering data

Description	Article No.
Push-through mounting frame	
• For PM230 and PM240-2 Power Modules degree of protection IP20, push-through variants	
- Frame size FSA	**6SL3260-6AA00-0DA0**
- Frame size FSB	**6SL3260-6AB00-0DA0**
- Frame size FSC	**6SL3260-6AC00-0DA0**

Supplementary system components > Memory cards

5

Overview

SINAMICS memory card (SD card)

The parameter settings for an inverter can be stored on the SINAMICS SD card. When service is required, e.g. after the inverter has been replaced and the data have been downloaded from the memory card the drive system is immediately ready for use again.

- Parameter settings can be written from the memory card to the inverter or saved from the inverter to the memory card.
- Up to 100 parameter sets can be stored.
- The memory card supports standard commissioning without the use of an operator panel such as the IOP, BOP-2 or the STARTER commissioning tools and SINAMICS Startdrive.
- If firmware is stored on the memory card and a Control Unit is installed, the firmware can be upgraded/downgraded during power-up [1].

Note:

The memory card is not required for operation and does not have to remain inserted.

Licenses can be optionally ordered for CU250S-2 Control Units in order to implement safety technology and positioning capability via the SINAMICS SD card. For further information, refer to section "Control Units".

Selection and ordering data

Description	Article No.
SINAMICS SD card 512 MB	**6SL3054-4AG00-2AA0**
Optional firmware memory cards	
SINAMICS SD card NEW **512 MB + firmware V4.5** (Multicard V4.5)	**6SL3054-7EF00-2BA0**
SINAMICS SD card NEW **512 MB + firmware V4.6** (Multicard V4.6)	**6SL3054-7EG00-2BA0**
SINAMICS SD card NEW **512 MB + firmware V4.7** (Multicard V4.7)	**6SL3054-7EH00-2BA0**

For further information about firmware V4.6:

http://support.automation.siemens.com/WW/view/en/72841234

For further information about firmware V4.6:

http://support.automation.siemens.com/WW/view/en/67385235

For further information about firmware V4.7:

http://support.automation.siemens.com/WW/view/en/92554110

[1] You can find more information about firmware upgrades/downgrades on the Internet at
http://support.automation.siemens.com/WW/view/en/67364620

Overview

The Brake Relay allows the Power Module to be connected to an electromechanical motor brake, thereby allowing the motor brake to be driven directly by the Control Unit.

Selection and ordering data

Description	Article No.
Brake Relay Including cable harness for connection with the Power Module	**6SL3252-0BB00-0AA0**

Technical specifications

	Brake Relay 6SL3252-0BB00-0AA0
Switching capability of the NO contact, max.	440 V AC / 3.5 A 30 V DC / 12 A
Conductor cross-section, max.	2.5 mm^2
Degree of protection	IP20
Dimensions	
• Width	68 mm
• Height	63 mm
• Depth	33 mm
Weight, approx.	0.17 kg

Integration

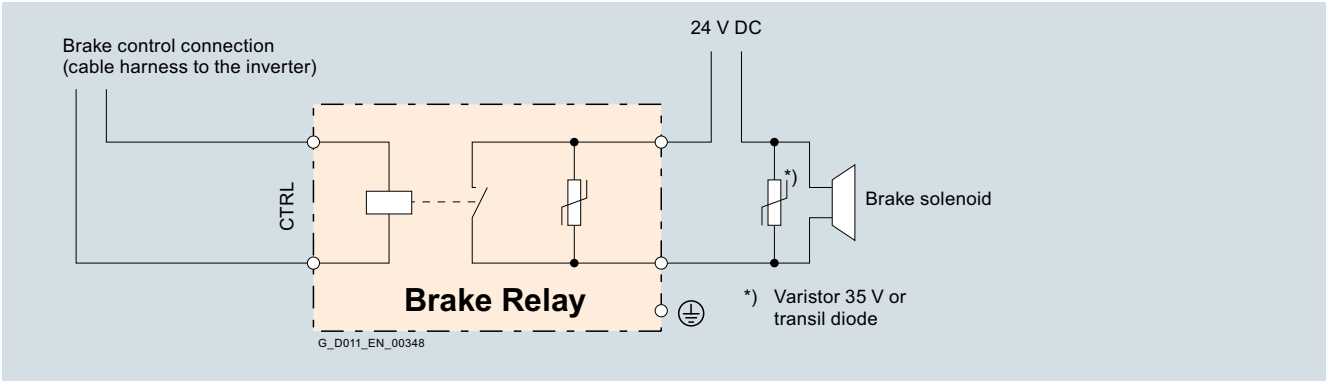
The Brake Relay has the following interfaces:

- A switch contact (NO contact) to control the motor brake solenoid
- A connection for the cable harness (CTRL) for connection to the Power Module

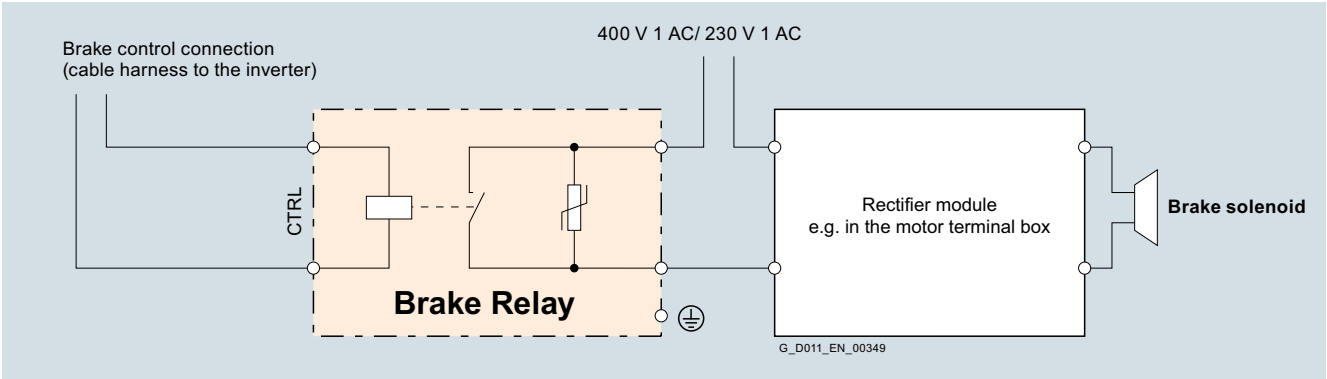
The Brake Relay can be installed on the shield bonding plate near the power terminals of the Power Module.

The supplied Brake Relay includes the cable harness for connection with the Power Module.

The 24 V DC solenoid of the motor brake is connected via an external power supply. For 24 V DC, external surge arrestors are required (e.g. varistor, transil diode).



Connection example of 24 V DC Brake Relay



Connection example of 230 ... 400 V 1 AC Brake Relay

5

Overview

With the Safe Brake Relay function, the brake is controlled in accordance with IEC 61508 SIL 2 and EN ISO 13849-1 PL d and Category 3.

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 delivery of a Safe Brake Relay includes the following:

- 2 cable harnesses for connecting to the CTRL socket of the 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

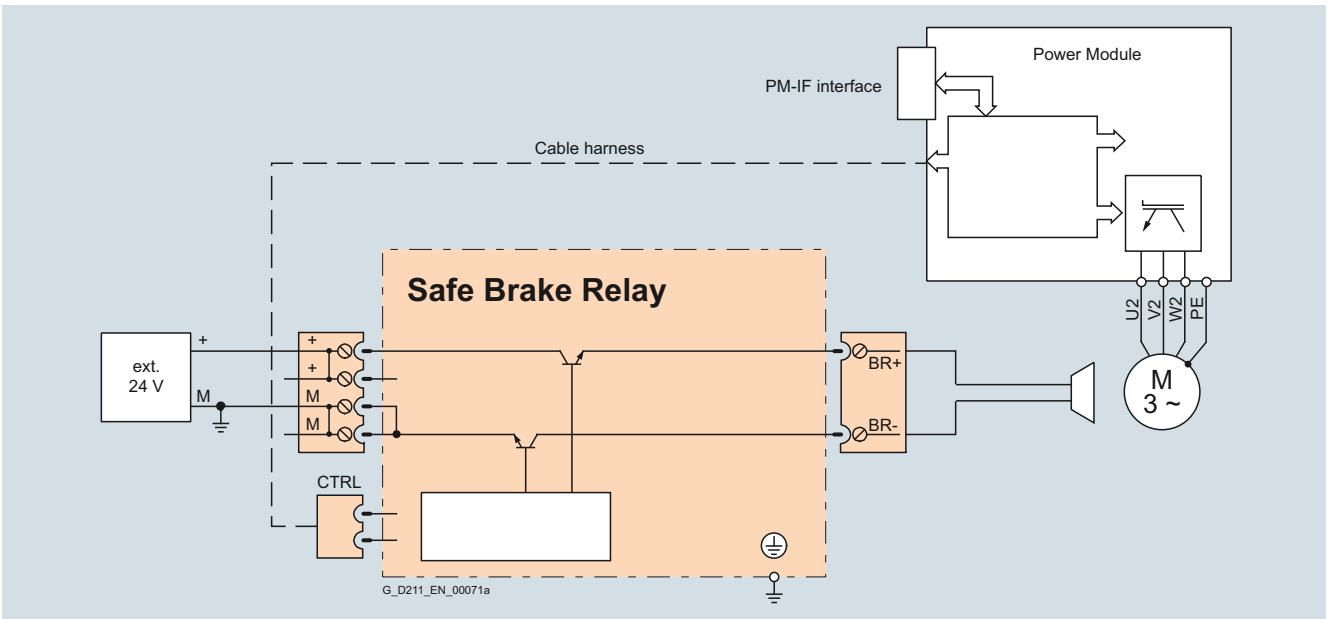
Selection and ordering data

Description	Article No.
Safe Brake Relay Including cable harness for connection to Power Module	**6SL3252-0BB01-0AA0**

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
• At 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)

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.

Application

Inverters for 400 V / 500 V and 690 V are required in the chemical industry that meet the special demands and requirements of this industry. The essential requirements and demands of the chemical industry are fulfilled using the SINAMICS G120 series of inverters supplemented by the CM240NE chemical industry module (with ATEX-certified PTC evaluation and a NAMUR terminal strip).

CM240NE chemical industry module

Design

- Isolated analog inputs and outputs in the chemical industry module (1 setpoint / 2 measured values)
- Isolated digital inputs and outputs in the Control Unit
- Protective separation of the motor sensor cable with respect to the enclosure and other connections using reinforced insulation of the creepage and clearances (rated impulse voltage 12 kV) according to EN 60664 1
- Certified power disconnection (94/9/EC, ATEX) of the inverter without main contactor
- Forced inverter inhibit (EMERGENCY STOP function via STO)
- NAMUR terminal strip according to NE 37

The CM240NE chemical industry module has the following interfaces:

Designation	Description
PROFIBUS	9-pin, SUB-D connector or socket to connect PROFIBUS [1]
X11 and X12	Parallel connection of the CM240NE chemical industry module with the Control Unit
X2	Terminal strip in accordance with NAMUR recommendation NE 37 (2.5 mm^2 screw terminals) • Digital inputs and outputs • Analog inputs and outputs
X3	Terminal strip in accordance with NAMUR recommendation NE 37 (2.5 mm^2 screw terminals) to connect the motor temperature sensor

[1] Cannot be used with CU250S-2 (must be mounted on a DIN rail).

Function

- Thermal motor protection (TMP) using the PTC thermistor integrated in the motor (incl. protective separation up to 690 V line supplies)
- The analog inputs and outputs are electrically isolated (MW1 to 3)
- Provision of NAMUR terminal strip (-X2; -X3)

Integration

A chemical industry inverter comprises a SINAMICS G120 inverter (Power Module and Control Unit) and the CM240NE chemical industry module.

The CU250S-2 DP is a suitable Control Unit for this application. This is a Control Unit with integrated safety-related functions and PROFIBUS DP interface.

The following Power Module versions are used:

- PM240 Power Module with DC braking function and braking chopper, 400 V line supply voltage
- PM250 Power Module with energy recovery capability, 400 V line supply voltage

Depending on the power unit, additional components may be necessary to complete the system.

Chemical industry inverter comprising PM240 Power Module, CU250S-2 Control Unit and CM240NE chemical industry module

Selection and ordering data

	Article No.
CM240NE chemical industry module	**6SL3255-0BT01-0PA0**
Accessories	
Supplementary kit for rail mounting contains • Adapter for rail mounting (according to DIN 50022, 35 × 15 mm) • Long cable harness	**6SL3260-4TA00-1AA6**

More information

A script file to parameterize the interconnections in line with the NAMUR assignment is available as a download to commission the system using the STARTER commissioning tool.

http://support.automation.siemens.com/WW/view/en/37141544

Overview

PC inverter connection kit 2

For controlling and commissioning an inverter directly from a PC if the STARTER [1] commissioning tool or SINAMICS Startdrive has been installed on the PC. With this, the inverter can be

- parameterized (commissioning, optimization)
- monitored (diagnostics)
- controlled (master control via the STARTER or SINAMICS Startdrive commissioning tool for test purposes)

A USB cable (3 m/9.84 ft) is included in the scope of delivery.

The PC inverter connection kit 2 is compatible with the following Control Units and inverters (all communication methods):

- SINAMICS G120C
- SINAMICS G120 Control Units
  - CU230P-2
  - CU240B-2
  - CU240E-2
  - CU250S-2
- SINAMICS G110M Control Units
  - CU240M
- SINAMICS G120D Control Units
  - CU240D-2
  - CU250D-2

Selection and ordering data

Description	Article No.
PC inverter connection kit 2 USB cable (length 3 m) for • SINAMICS G120C • SINAMICS G120 Control Units • SINAMICS G110M Control Units • SINAMICS G120D Control Units - CU230P-2 - CU240B-2 - CU240E-2 - CU250S-2 • SINAMICS G110M Control Units - CU240M • SINAMICS G120D Control Units - CU240D-2 - CU250D-2	**6SL3255-0AA00-2CA0**

[1] STARTER commissioning tool is available on the Internet at http://support.automation.siemens.com/WW/view/en/10804985/133100

Supplementary system components > Shield connection kits for Control Units

Overview

The shield connection kit offers for all signal and communication cables

- Optimum shield connection
- Strain relief

It contains the following:

- A matching shield bonding plate
- All of the necessary connecting and retaining elements for mounting

The shield connection kits are compatible with the following SINAMICS G120 Control Units:

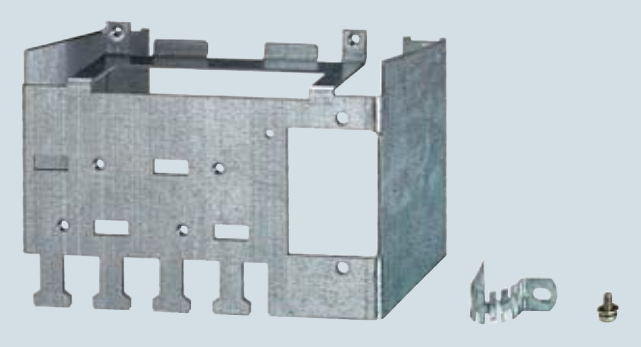
- CU230P-2
- CU240B-2
- CU240E-2
- CU250S-2

Selection and ordering data

Description	Article No.
Shield connection kit 1 For CU230P-2 HVAC/DP/CAN Control Units	**6SL3264-1EA00-0FA0**
Shield connection kit 2 For CU240B-2 and CU240E-2 Control Units	**6SL3264-1EA00-0HA0**
Shield connection kit 3 For CU230P-2 PN, CU240E-2 PN and CU240E-2 PN-F Control Units	**6SL3264-1EA00-0HB0**
Shield connection kit 4 NEW for CU250S-2 Control Units	**6SL3264-1EA00-0LA0**

Supplementary system components > Shield connection kits and shield plates for Power Modules

Overview



Shield connection kit for Power Module frame size FSB

The shield connection kit

- makes it easier to connect the shields of supply and control cables
- provides mechanical strain relief
- ensures optimum EMC performance
- is used to attach the Brake Relay

The shield connection kit includes

- A shield bonding plate for the required Power Module
- Connection elements and clamps for mounting
- Mounting device for Brake Relay, frame sizes FSD to FSF

PM230 Power Modules, frame sizes FSA to FSC, in degree of protection IP20, and PM240-2 Power Modules, frame sizes FSA to FSC (for both standard and push-through variants) are supplied with a shield plate for motor and signal cables.

Shield connection kits are available for PM230 Power Modules frame sizes FSD to FSF in degree of protection IP20, PM240 Power Modules and PM250 Power Modules.

Selection and ordering data

Description	Article No.
Shield plate For PM230 Power Module degree of protection IP20 standard and push-through variants	
• Frame sizes FSA to FSC	Supplied with the Power Modules, available as a spare part
Shield connection kit for PM230 Power Module degree of protection IP20	
• Frame sizes FSD and FSE	**6SL3262-1AD00-0DA0**
• Frame size FSF	**6SL3262-1AF00-0DA0**
Shield connection kit for PM240-2 Power Modules	
• Frame sizes FSA to FSC	Supplied with the Power Modules, available as a spare part
Shield connection kit for PM250 Power Modules	
• Frame size FSC	**6SL3262-1AC00-0DA0**
Shield connection kit for PM240 and PM250 Power Modules	
• Frame sizes FSD and FSE	**6SL3262-1AD00-0DA0**
• Frame size FSF	**6SL3262-1AF00-0DA0**

Spare parts > Spare Parts Kit for Control Units

Overview

The Spare Parts Kit contains small parts for all variants of the following SINAMICS G120 Control Units:

- CU230P-2
- CU240B-2
- CU240E-2
- CU240E-2 F
- CU250S-2

Included in the scope of delivery:

- Label set for all variants of CU230P-2, CU240B-2, CU240E-2, CU240E-2 F and CU250S-2 Control Units
- 2x replacement doors (top/bottom)
- 2x labeling strips for use on the doors
- 1x 4, 5, 6, 7, 8, 9, 10 and 11-pole terminal blocks
- 1x protective element for memory card slot
- 1x screw for SUB-D interface

Selection and ordering data

Description		Article No.
Spare Parts Kit for Control Units CU230P-2, CU240B-2, CU240E-2, CU240E-2 F and CU250S-2	NEW	**6SL3200-0SK01-0AA0**

Spare parts > Shield connection kits for PM240-2 Power Modules

Overview

A shield connection kit is supplied as standard with PM240-2 Power Modules in frame sizes FSA to FSC. This shield connection kit is also available as a spare part.

Selection and ordering data

Description	Article No.
Shield connection kit for PM240-2 Power Module	
• Frame size FSA	**6SL3262-1AA00-0BA0**
• Frame size FSB	**6SL3262-1AB00-0DA0**
• Frame size FSC	**6SL3262-1AC00-0DA0**

Spare parts > Shield plate for PM230 Power Modules

Overview

PM230 Power Modules, frame sizes FSA to FSC, in degree of protection IP20 are supplied with a shield plate for motor and signal cables. This shield plate is also available as a spare part.

Selection and ordering data

Description	Article No.
Shield plate for PM230 Power Module degree of protection IP20	
• Frame size FSA	**6SL3266-1EA00-0KA0**
• Frame size FSB	**6SL3266-1EB00-0KA0**
• Frame size FSC	**6SL3266-1EC00-0KA0**

Spare parts > Mounting set for PM230 Power Modules

Overview

The following parts are supplied from the factory for each PM230 Power Module in frame sizes FSA to FSC with degree of protection IP20.

- 1 SUB-D connector with mounting material for connecting the CU230P-2 HVAC/DP/PN/CAN Control Units to the operator panel (e.g. IOP)
- 1 motor connector and 1 power supply connector
- 2 serrated strips including mounting material for connecting the shield
- 3 sleeves for inserting in the cutouts for the signal cables of the cable bonding plate
- Ferrite cores
  (only necessary for devices with integrated line filter class B)
- 2-page Quick Start Guide with mounting instructions

A **mounting set** can be ordered for all frame sizes with degree of protection IP20. It contains the following parts:

- 1 SUB-D connector with mounting material
- 1 motor connector and 1 power supply connector
- 2 serrated strips including mounting material for connecting the shield
- 3 sleeves for inserting in the cutouts for the signal cables of the cable bonding plate
- Ferrite cores
  (only necessary for devices with integrated line filter class B)
- Screws for fixing the cable bonding plate and the cover

Selection and ordering data

Description	Article No.
Mounting set for PM230 Power Module, degree of protection IP20	
• Frame size FSA	**6SL3200-0SK02-0AA0**
• Frame size FSB	**6SL3200-0SK03-0AA0**
• Frame size FSC	**6SL3200-0SK04-0AA0**

Spare parts > Replacement door for PM240 Power Modules, frame size FSGX

Overview

Complete replacement door for the PM240 Power Module, frame size FSGX

Selection and ordering data

Description	Article No.
Replacement door for PM240 Power Modules, frame size FSGX	**6SL3200-0SM10-0AA0**

Spare parts > Terminal cover kit for frame sizes FSD and FSE

Overview

The terminal cover kit includes a replacement cover for the connecting terminals.

The terminal cover kit is suitable for the following SINAMICS G120 Power Modules in frame sizes FSD and FSE:

- PM230 degree of protection IP20 standard variant
- PM240
- PM250

Selection and ordering data

Description	Article No.
Terminal cover kit For frame sizes FSD and FSE	**6SL3200-0SM11-0AA0**

Spare parts > Terminal cover kit for frame size FSF

Overview

The terminal cover kit includes a replacement cover for the connecting terminals.

The terminal cover kit is suitable for the following SINAMICS G120 Power Modules in frame size FSF:

- PM230 degree of protection IP20 standard variant
- PM240
- PM250

Selection and ordering data

Description	Article No.
Terminal cover kit For frame size FSF	**6SL3200-0SM12-0AA0**

Spare parts > Replacement connectors

Overview

A set of replacement connectors for the line feeder cable, braking resistor and motor cable is available for SINAMICS G120 PM240-2 Power Modules (and SINAMICS G120C).

Selection and ordering data

Description	Article No.
Replacement connectors	
• For SINAMICS G120 PM240-2 and SINAMICS G120C in frame size FSA	**6SL3200-0ST05-0AA0**
• For SINAMICS G120 PM240-2 and SINAMICS G120C in frame size FSB	**6SL3200-0ST06-0AA0**
• For SINAMICS G120 PM240-2 and SINAMICS G120C in frame size FSC	**6SL3200-0ST07-0AA0**

Overview

The Power Module fans are designed for extra long service life. For special requirements, replacement fans are available that can be exchanged quickly and easily.

Selection and ordering data

Rated power		PM230 Power Module degree of protection IP20 standard variant		External fan unit
kW	hp	Type 6SL3210-...	Frame size	Article No.
380 ... 480 V 3 AC				
0.75	1	1NE12-2 . L1	FSA	**6SL3200-0SF12-0AA0**
1.1	1.5	1NE13-1 . L1		
1.5	2	1NE14-1 . L1		
2.2	3	1NE15-8 . L1		
3	4	1NE17-7 . L1		
4	5	1NE21-0 . L1	FSB	**6SL3200-0SF13-0AA0**
5.5	7.5	1NE21-3 . L1		
7.5	10	1NE21-8 . L1		
11	15	1NE22-6 . L1	FSC	**6SL3200-0SF14-0AA0**
15	20	1NE23-2 . L1		
18.5	25	1NE23-8 . L1		
22	30	1NE24-5 . L0	FSD	**6SL3200-0SF05-0AA0**
30	40	1NE26-0 . L0		
37	50	1NE27-5 . L0	FSE	
45	60	1NE28-8 . L0		
55	75	1NE31-1 . L0	FSF	**6SL3200-0SF08-0AA0**
75	100	1NE31-5 . L0		

Rated power		PM230 Power Module degree of protection IP20 push-through variant		External fan unit
kW	hp	Type 6SL3211-...	Frame size	Article No.
380 ... 480 V 3 AC				
3	4	1NE17-7 . L1	FSA	**6SL3200-0SF21-0AA0**
7.5	10	1NE21-8 . L1	FSB	**6SL3200-0SF22-0AA0**
18.5	25	1NE23-8 . L1	FSC	**6SL3200-0SF23-0AA0**

Selection and ordering data

Rated power		PM240-2 Power Module standard variant		External fan unit
kW	hp	Type 6SL3210-...	Frame size	Article No.
200 ... 240 V 1 AC/3 AC				
0.75	1	1PB13-8 . L0	FSA	**6SL3200-0SF12-0AA0**
1.1	1.5	1PB15-5 . L0	FSB	**6SL3200-0SF13-0AA0**
1.5	2	1PB17-4 . L0		
2.2	3	1PB21-0 . L0		
3	4	1PB21-4 . L0	FSC	**6SL3200-0SF14-0AA0**
4	5	1PB21-8 . L0		
200 ... 240 V 3 AC				
5.5	7.5	1PC22-2 . L0	FSC	**6SL3200-0SF14-0AA0**
7.5	10	1PC22-8 . L0		
380 ... 480 V 3 AC				
0.75	1	1PE12-3 . L1	FSA	**6SL3200-0SF12-0AA0**
1.1	1.5	1PE13-2 . L1		
1.5	2	1PE14-3 . L1		
2.2	3	1PE16-1 . L1		
3	4	1PE18-0 . L1		
4	5	1PE21-1 . L0	FSB	**6SL3200-0SF13-0AA0**
5.5	7.5	1PE21-4 . L0		
7.5	10	1PE21-8 . L0		
11	15	1PE22-7 . L0	FSC	**6SL3200-0SF14-0AA0**
15	20	1PE23-3 . L0		

Rated power		PM240-2 Power Module push-through variant		External fan unit
kW	hp	Type 6SL3211-...	Frame size	Article No.
200 ... 240 V 1 AC/3 AC				
0.75	1	1PB13-8 . L0	FSA	**6SL3200-0SF12-0AA0**
2.2	3	1PB21-0 . L0	FSB	**6SL3200-0SF13-0AA0**
4	5	1PB21-8 . L0	FSC	**6SL3200-0SF14-0AA0**
380 ... 480 V 3 AC				
3	4	1PE18-0 . L1	FSA	**6SL3200-0SF12-0AA0**
7.5	10	1PE21-8 . L0	FSB	**6SL3200-0SF13-0AA0**
15	20	1PE23-3 . L0	FSC	**6SL3200-0SF14-0AA0**

Overview

The Power Module fans are designed for extra long service life.
Replacement fans can be ordered.

Selection and ordering data

Rated power		**PM240 Power Module**		**Replacement fan**
kW	hp	Type 6SL3224-...	Frame size and number of fans	Article No.
380 ... 480 V 3 AC				
18.5	25	0BE31-5 . A0	FSD, 2 fans	**6SL3200-0SF04-0AA0** (includes 2 replacement fans)
22	30	0BE31-8 . A0		
30	40	0BE32-2 . A0		**6SL3200-0SF05-0AA0** (includes 2 replacement fans)
37	50	0BE33-0 . A0	FSE, 2 fans	**6SL3200-0SF04-0AA0** (includes 2 replacement fans)
45	60	0BE33-7 . A0		**6SL3200-0SF05-0AA0** (includes 2 replacement fans)
55	75	0BE34-5 . A0	FSF, 2 fans	**6SL3200-0SF06-0AA0** (includes 2 replacement fans)
75	100	0BE35-5 . A0		
90	125	0BE37-5 . A0		**6SL3200-0SF07-0AA0** (includes 2 replacement fans)
110	150	0BE38-8UA0		**6SL3200-0SF08-0AA0** (includes 2 replacement fans)
132	200	0BE41-1UA0		
160	250	0XE41-3UA0	FSGX, 2 fans	**6SL3362-0AG00-0AA1** (includes 2 replacement fans)
200	300	0XE41-6UA0		
250	400	0XE42-0UA0		

Rated power		**PM250 Power Module**		**Replacement fan**
kW	hp	Type 6SL3225-...	Frame size and number of fans	Article No.
380 ... 480 V 3 AC				
7.5	10	0BE25-5AA1	FSC, 2 fans [1]	**6SL3200-0SF03-0AA0** (includes 1 replacement fan)
11	15	0BE27-5AA1		
15	20	0BE31-1AA1		
18.5	25	0BE31-5 . A0	FSD, 2 fans	**6SL3200-0SF04-0AA0** (includes 2 replacement fans)
22	30	0BE31-8 . A0		
30	40	0BE32-2 . A0		**6SL3200-0SF05-0AA0** (includes 2 replacement fans)
37	50	0BE33-0 . A0	FSE, 2 fans	**6SL3200-0SF04-0AA0** (includes 2 replacement fans)
45	60	0BE33-7 . A0		**6SL3200-0SF05-0AA0** (includes 2 replacement fans)
55	75	0BE34-5 . A0	FSF, 2 fans	**6SL3200-0SF06-0AA0** (includes 2 replacement fans)
75	100	0BE35-5 . A0		
90	125	0BE37-5 . A0		**6SL3200-0SF08-0AA0** (includes 2 replacement fans)

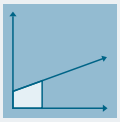
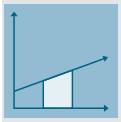
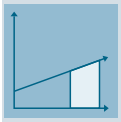
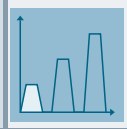
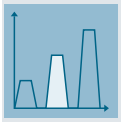
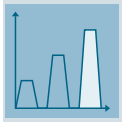
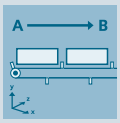
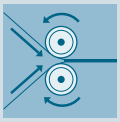
[1] Recommendation: Even if only one fan on the Power Module is defective, it is advisable to replace both. In this case, the order quantity must be doubled.

SINAMICS G110M distributed inverters
0.37 kW to 4 kW (0.5 hp to 5 hp)

6

Introduction

Application

Use	Requirements for torque accuracy/speed accuracy/position accuracy/coordination of axes/functionality					
	Continuous motion			Non-continuous motion		
	Basic	Medium	High	Basic	Medium	High
						
Pumping, ventilating, compressing	Centrifugal pumps Radial / axial fans Compressors	Centrifugal pumps Radial / axial fans Compressors	Eccentric screw pumps	Hydraulic pumps Metering pumps	Hydraulic pumps Metering pumps	Descaling pumps Hydraulic pumps
	V20 G110 G120C G120P	G120P G130/G150 G180 [1]	S120	G120	S110	S120
Moving	Conveyor belts Roller conveyors Chain conveyors	Conveyor belts Roller conveyors Chain conveyors Lifting/lowering devices Elevators Escalators/moving walkways Indoor cranes Marine drives Cable railways	Elevators Container cranes Mining hoists Excavators for open-cast mining Test bays	Acceleration conveyors Storage and retrieval machines	Acceleration conveyors Storage and retrieval machines Cross cutters Reel changers	Storage and retrieval machines Robotics Pick & place Rotary index tables Cross cutters Roll feeds Engagers/ disengagers
	V20 G110 G110D **G110M** G120C	G120 G120D G130/G150 G180 [1]	S120 S150 DCM	G120 G120D	S110 DCM	S120 DCM
Processing	Mills Mixers Kneaders Crushers Agitators Centrifuges	Mills Mixers Kneaders Crushers Agitators Centrifuges Extruders Rotary furnaces	Extruders Winders/unwinders Lead/follower drives Calenders Main press drives Printing machines	Tubular bagging machines Single-axis motion control such as • Position profile • Path profile	Tubular bagging machines Single-axis motion control such as • Position profile • Path profile	Servo presses Rolling mill drives Multi-axis motion control such as • Multi-axis positioning • Cams • Interpolations
	V20 G120C	G120 G130/G150 G180 [1]	S120 S150 DCM	G120	S110	S120 DCM
Machining	Main drives for • Turning • Milling • Drilling	Main drives for • Drilling • Sawing	Main drives for • Turning • Milling • Drilling • Gear cutting • Grinding	Axis drives for • Turning • Milling • Drilling	Axis drives for • Drilling • Sawing	Axis drives for • Turning • Milling • Drilling • Lasering • Gear cutting • Grinding • Nibbling and punching
	S110	S110 S120	S120	S110	S110 S120	S120

SINAMICS G110M fulfills all requirements that plant manufacturers demand from their frequency inverters in drives for conveyor system applications. The inverter is supplied as a motor integrated unit in degree of protection IP66 and sets standards in efficiency – from the installation phase to commissioning and handling. SINAMICS G110M is also suitable for pump and fan applications in which a motor integrated inverter is required as a distributed system.

Practical application examples and descriptions are available on the Internet at

www.siemens.com/sinamics-applications
www.siemens.com/conveyor-technology

More information

You may also be interested in these frequency drives:

- Simple applications with AS-Interface in IP65 degree of protection ⇒ SINAMICS G110D
- More performance for the control cabinet in IP20 degree of protection ⇒ SINAMICS G120, SINAMICS G120C
- With enhanced functionality, with positioning function in IP65 degree of protection ⇒ SINAMICS G120D
- With positioning function in the control cabinet in IP20 degree of protection ⇒ SINAMICS G120

[1] Industry-specific inverters.

Overview

The SINAMICS G110M distributed frequency inverters are the solution for drive tasks in which a motor integrated frequency inverter is required. With different device versions (frame sizes FSA to FSB) in a power range from 0.37 kW to 4 kW (0.5 hp to 5 hp), the SINAMICS G110M is suitable for a wide variety of drive solutions. SINAMICS G110M supports continuous speed control of three-phase asynchronous motors and fulfills all the requirements of conveyor system applications from simple speed control through to demanding sensorless vector control. It can be integrated seamlessly into the system thanks to its compact design in IP65/IP66 degree of protection.

Through the integrated functions such as quick stop and the limit switch function, the SINAMICS G110M is particularly suited for conveyor system applications.

For applications that require safety engineering, the SINAMICS G110M has the integrated STO (Safe Torque Off [1]) function, which can be implemented without further external components. Integration via PROFIBUS, PROFINET or USS into a higher-level SIMATIC controller is very easy thanks to the full TIA Portal integration [1] – one tool, one operating concept, one data storage.

SINAMICS G110M CU240M PN Control Unit, cable gland and PM240M Power Module FSA 1.5 kW (2 hp)

SINAMICS G110M CU240M PN Control Unit, plug-in and PM240M Power Module FSA 1.5 kW (2 hp)

Reasons for using distributed drive systems

- Modular drive solutions – thus standardized mechatronic elements that can be individually tested
- No need for a cabinet, resulting in a smaller space requirement and less cooling
- Long cables between the inverter and motor can be avoided (which means lower power losses, reduced interference emission and lower costs for shielded cables and additional filters)
- Considerable benefits for conveyor systems with their extensive coverage (e.g. in the automotive and logistics industries)

Siemens family of distributed drives

Siemens offers an innovative portfolio of frequency inverters to optimally implement distributed drive solutions. The strengths of the individual members of the drive family permit simple adaptation to the widest range of application demands:

- Identical connection systems
- Standard commissioning and configuration tools

Products from the family of distributed drives:

- SINAMICS G110M frequency inverters
- SINAMICS G110D frequency inverters
- SINAMICS G120D frequency inverters
- SIMATIC ET200pro FC-2 inverters (available soon)
- SIRIUS M200D motor starters

Modularity

SINAMICS G110M is a modular, motor integrated inverter system with IP65/66 degree of protection comprising various function units. The main units are:

- Control Unit (CU)
- Power Module (PM)

The Control Unit controls and monitors the Power Module and the connected motor using several different closed-loop control types that can be selected. The digital and analog inputs and digital outputs on the device support the simple wiring of sensors and actuators directly at the drive. The input signals can either be directly linked within the Control Unit and initiate local responses independently or they can be transferred to the central control via PROFIBUS or PROFINET for further processing within the context of the overall plant.

The Power Module supplies the motor in a performance range from 0.37 kW to 4 kW (0.5 hp to 5 hp). The Power Module is controlled by a microprocessor in the Control Unit. State-of-the-art IGBT technology with pulse width modulation is used for highly reliable and flexible motor operation. Comprehensive protection functions provide a high degree of protection for the Power Module and the motor. The latest technical documentation (catalogs, dimensional drawings, certificates, manuals and operating instructions) is available on the Internet at the following address:

www.siemens.com/sinamics-g110m

and offline on the DVD-ROM CA 01 in the Drive Technology Configurator (DT Configurator). In addition, the DT Configurator can now be used on the Internet without requiring any installation. The DT Configurator can be found in the Siemens Industry Mall at the following address:

www.siemens.com/dt-configurator

[1] Available for firmware version V4.7 or higher.

Overview

Safety Integrated

The distributed SINAMICS G110M inverters are already equipped with the integrated STO safety function (Safe Torque Off [1]), certified in accordance with IEC 61508 SIL 2 as well as EN ISO 13849-1 PL d and Category 3). It can be activated either over PROFIsafe or over the safety input.

Additional information is provided in the Highlights section, subsection Safety Integrated.

STARTER commissioning tool

The STARTER commissioning tool (V4.3 SP3 and higher) supports the commissioning and maintenance of SINAMICS G110M inverters. The operator guidance combined with comprehensive, user-friendly functions for the relevant drive solution allow you to commission the device quickly and easily.

SINAMICS Startdrive commissioning tool (V13 and higher)

SINAMICS Startdrive is a tool for configuring, commissioning, and diagnosing the SINAMICS family of drives and is integrated into the TIA Portal. SINAMICS Startdrive can be used to implement drive tasks with the SINAMICS G110M, SINAMICS G120, SINAMICS G120C, SINAMICS G120D and SINAMICS G120P inverter series. The commissioning tool has been optimized with regard to user friendliness and consistent use of the TIA Portal benefits of a common working environment for PLC, HMI and drives.

Benefits

Fast commissioning

- Preconfigured with SIMOGEAR
- Loop-through of 24 V DC and 400 V 3 AC and communication – no T-distributor necessary
- Internal braking resistors - typical applications can be implemented without external braking resistors
- Rugged, with IP65/66 degree of protection, up to 55 °C ambient temperature
- Commissioning via fieldbus

Fast commissioning on site

- Local commissioning via DIP switch, standard USB interface and potentiometer or Intelligent Operator Panel (IOP)
- Plug-in connections for 400 V 3 AC and 24 V DC, plug-in I/Os and communication
- Local diagnostics with LEDs
- Uploading, saving and cloning of parameters with SINAMICS SD card and IOP Intelligent Operator Panel

Full functionality

- Integrated safety functions (STO locally via F-DI or via PROFIsafe)
- PROFINET communication to PROFIBUS at no extra cost
- Integrated communication: USS, Modbus RTU, PROFIBUS, PROFINET and EtherNet/IP
- Basic PLC functions and additional conveyor technology functions
- I/Os can be used as distributed I/Os of the PLC

Efficient engineering

- Fully integrated in Totally Integrated Automation, Totally Integrated Automation Portal and Integrated Drive System
- Automatic diagnostics in combination with SIMATIC controller

Flexible commissioning

- Integrated, specific software functionality for conveyor systems:
  - Quick stop function for fast reaction times to sensors
  - Limit switch functionality, e.g. for rotary table, corner transfer unit
- Use of the same software tools (STARTER and SINAMICS Startdrive) as for all SINAMICS drives

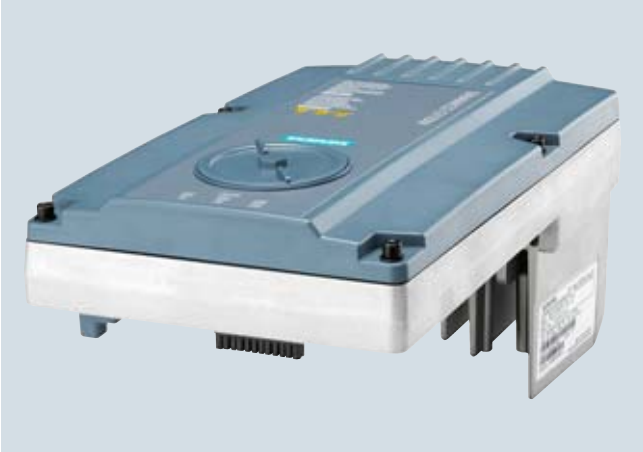
[1] Available for firmware version V4.7 or higher.

Design

The SINAMICS G110M distributed inverters are modular frequency inverters for standard drives. Each SINAMICS G110M comprises two operative units – a Power Module and a Control Unit.

SINAMICS G110M CU240M PN Control Unit plug-in and PM240M Power Module FSA 1.5 kW (2 hp)

Power Modules

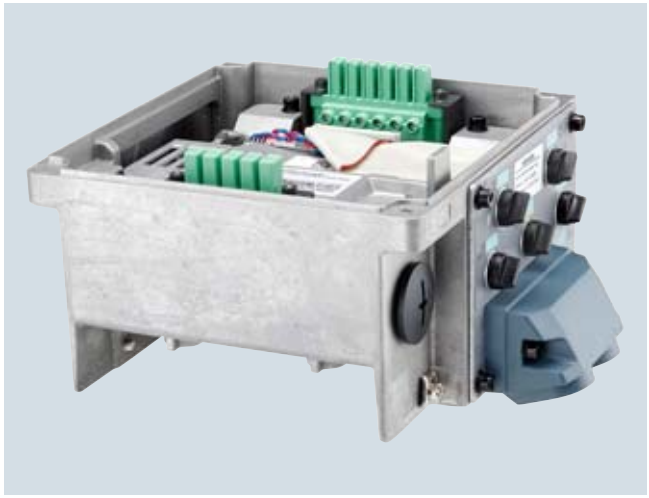


SINAMICS G110M PM240M Power Module FSA 1.5 kW (2 hp)

The following PM240M Power Modules are available for the SINAMICS G110M distributed inverters:

PM240M Power Modules Rated power kW (hp)	Frame size
0.37 (0.5)	FSA
0.75 (1)	FSA
1.1 (1.5)	FSA
1.5 (2)	FSA
2.2 (3)	FSB
3 (4)	FSB
4 (5)	FSB

Control Units



SINAMICS G110M CU240M PN Control Unit cable gland

A Control Unit performs closed-loop control functions for the inverter. In addition to the closed-loop control, it has additional functions that can be adapted to the particular application through parameterization.

The following Control Units are available for SINAMICS G110M distributed inverters:

CU240M Control Units

Several Control Units are available in different versions:

Control Unit	Fieldbus communication via	Connection system	For motor frame sizes
CU240M	USS/ Modbus RTU	Screw-type version	71, 80/90, 100/112
CU240M DP	PROFIBUS	Screw-type version	71, 80/90, 100/112
CU240M DP	PROFIBUS	Plug-in version	71, 80/90, 100/112
CU240M PN	PROFINET, EtherNet/IP	Screw-type version	71, 80/90, 100/112
CU240M PN	PROFINET, EtherNet/IP	Plug-in version	71, 80/90, 100/112

Design

Supplementary system components

Intelligent Operator Panel IOP Handheld

The IOP supports both entry-level personnel and drive experts. Thanks to the large plain text display, menu-based operation and the application wizards, it is easy to commission, diagnose and locally control standard drives.

Memory card

The parameter settings for the inverter can be stored on the SINAMICS SD memory card. When service is required, e.g. after the inverter has been replaced and the data have been downloaded from the memory card, the system is immediately ready for use again.

PC inverter connection kit (mini USB interface cable) for communication with a PC

For controlling and commissioning an inverter directly from a PC if the appropriate software (STARTER commissioning tool V4.3 and higher or SINAMICS Startdrive V13 and higher) has been installed.

Internal braking resistors

Excess energy in the DC link is dissipated in the internal braking resistor.

24 V DC power supply

A 24 V DC power supply is also available for SINAMICS G110M. This is mounted directly on the inverter and supplies the device with 24 V DC, so there is no need to connect an external 24 V DC power supply.

Connecting cable for the Control Units

Flexible plug-in cables to transfer data between the Industrial Ethernet stations or PROFIBUS stations, as well as to supply power to the Control Unit.

Connecting cable for the Power Modules

Connector sets and pre-assembled cables for the line supply can be ordered as accessories.

Installation kits

Different installation kits can be ordered as accessories for the Control Units with plug-in connections and Control Units with cable gland connections.

These kits include covers or cable glands for protecting or connecting the 400 V 3 AC supply, the 24 V DC supply and the mechanical motor brake.

Spare Parts Kit

A Spare Parts Kit is available which comprises small parts such as seals, caps and screws.

Configuration

The following electronic configuring aids and engineering tools are available for the SINAMICS G110M distributed inverters:

Drive Technology Configurator (DT Configurator) within the CA 01

The interactive catalog CA 01 – the offline Industry mall of Siemens on DVD-ROM – contains over 100,000 products with approximately 5 million possible drive system product variants. The Drive Technology Configurator (DT Configurator) has been developed to facilitate selection of the correct motor and/or inverter from the wide spectrum of drives. It is integrated as a selection tool in Catalog CA 01.

Online DT Configurator

In addition, the DT Configurator can now be used on the Internet without requiring any installation. The DT Configurator can be found in the Siemens Industry Mall at the following address:

www.siemens.com/dt-configurator

SIZER for Siemens Drives engineering tool

The SIZER for Siemens Drives engineering tool makes it easy to configure the SINAMICS and MICROMASTER 4 drive family. It provides support when selecting the hardware and firmware components necessary to implement a drive task. SIZER for Siemens Drives is designed to support configuring of the entire drive system.

You can find further information on the SIZER for Siemens Drives engineering tool in the section Engineering Tools.

The SIZER for Siemens Drives engineering tool is available free on the Internet at
www.siemens.com/sizer

STARTER commissioning tool

The STARTER commissioning tool allows menu-prompted commissioning, optimization and diagnostics. Apart from the SINAMICS drives, STARTER is also suitable for the MICROMASTER 4 devices; for SINAMICS G110M , STARTER V4.3 SP3 and higher.

You can find further information on the STARTER commissioning tool in the section Engineering Tools.

Additional information about the STARTER commissioning tool is available on the Internet at
www.siemens.com/starter

SINAMICS Startdrive commissioning tool (V13 and higher)

SINAMICS Startdrive is a tool for configuring, commissioning, and diagnosing the SINAMICS family of drives and is integrated into the TIA Portal. SINAMICS Startdrive can be used to implement drive tasks with the SINAMICS G110M, SINAMICS G120, SINAMICS G120C, SINAMICS G120D and SINAMICS G120P inverter series. The commissioning tool has been optimized with regard to user friendliness and consistent use of the TIA Portal benefits of a common working environment for PLC, HMI and drives.

You can find further information on the SINAMICS Startdrive commissioning tool in the section Engineering Tools.

The SINAMICS Startdrive commissioning tool is available free on the Internet at
www.siemens.com/startdrive

Technical specifications

Unless explicitly specified otherwise, the following technical specifications are valid for all the following SINAMICS G110M distributed inverter components listed here.

SINAMICS G110M	
Mechanical specifications	
Vibratory load	
• Transport acc. to EN 60721-3-2 [1]	Class 1M2
• Operation acc. to EN 60721-3-3	Class 3M3
Shock load	
• Transport acc. to EN 60721-3-2 [1]	Class 1M2
• Operation acc. to EN 60721-3-3	Class 3M3
Ambient conditions	
Protection class according to EN 61800-5-1	Class III (PELV)
Touch protection according to EN 61800-5-1	Class I (with protective conductor system)
Permissible ambient and coolant temperature (air) during operation for Power Modules	-10 ... +40 °C (14 ... 104 °F) without derating >40 ... 55 °C (104 ... 131 °F) see derating characteristics
Permissible ambient and coolant temperature (air) during operation for Control Units	-10 ... +55 °C (14 ... 131 °F) without derating
Humidity, max.	95 % at 40 °C (104 °F)
Ambient temperature	
• Storage [1] acc. to EN 60068-2-1	-40 ... +70 °C (-40 ... +158 °F)
• Transport [1] acc. to EN 60068-2-1	-40 ... +70 °C (-40 ... +158 °F)
• Operation acc. to EN 60068-2-2	-10 ... +40 °C (14 ... 104 °F) without derating
Environmental class/harmful chemical substances	
• Operation acc. to EN 60721-3-3	Class 3C2
Degree of pollution acc. to EN 61800-5-1	2
Certification for fail-safe versions	
• According to IEC 61508	SIL 2
• According to EN ISO 13849-1	PL d and Category 3
Standards	
Compliance with standards	UL 508C (UL list number E121068), cUL, CE, C-Tick
CE marking, according to	Low-Voltage Directive 2006/95/EC
EMC Directive [2]	
• Frame sizes FSA to FSC with integrated line filter class A	Category C2 [3] according to EN 61800-3 Note: The EMC product standard EN 61800-3 does not apply directly to a frequency inverter but to a PDS (Power Drive System), which comprises the complete circuitry, motor and cables in addition to the inverter. The frequency inverters on their own do not generally require identification according to the EMC Directive.

[1] In product packaging.

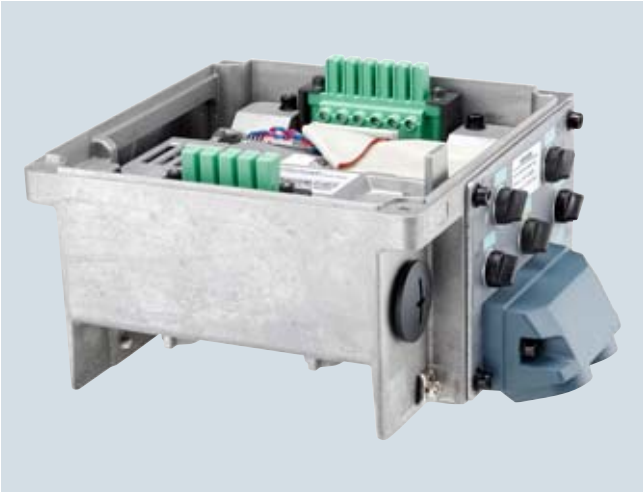
[2] For further general information, see also chapter SINAMICS G120, section Technical specifications, Compliance with standards.

[3] With shielded motor cable up to 5 m (16.41 ft).

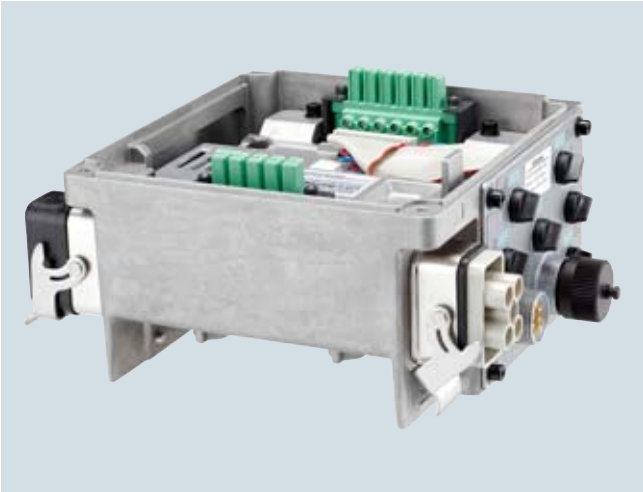
Overview

The Control Unit performs closed-loop control functions for the inverter. In addition to the primary closed-loop control function, it has many additional functions that can be adapted to the particular application through parameterization.

The Control Units are available in two versions for connection to 400 V 3 AC and 24 V DC – screw-type or plug-in. The version in USS fieldbus communication is only available as screw-type. The differences between the screw-type and plug-in versions are presented in the following pictures:



SINAMICS G110M CU240M Control Unit PN cable gland



SINAMICS G110M CU240M Control Unit PN plug-in

Several Control Units are available in different versions:

Control Unit		Communications via	Connection system	For motor frame sizes
CU240M Control Unit, screw-type	CU240M	USS, Modbus RTU	Screw-type	71, 80/90, 100/112
CU240M DP Control Unit, screw-type	CU240M DP	PROFIBUS	Screw-type	71, 80/90, 100/112
CU240M DP Control Unit, plug-in	CU240M DP	PROFIBUS	Plug-in version	71, 80/90, 100/112
CU240M PN Control Unit, screw-type	CU240M PN	PROFINET, EtherNet/IP	Screw-type	71, 80/90, 100/112
CU240M PN Control Unit, plug-in	CU240M PN	PROFINET, EtherNet/IP	Plug-in	71, 80/90, 100/112

Safety Integrated functions

The safety function "Safe Torque Off" (STO [1]) (certified according to IEC 61508 SIL 2 and EN ISO 13849-1 PL d and Category 3) is already integrated into the basic versions of the CU240M series (CU240M, CU240M DP and CU240M PN). It prevents active movement of the drive. It can be activated either over PROFIsafe or over the safety input.

Existing systems in particular can be simply updated with safety technology without the need to change the motor or mechanical system.

[1] Available for firmware version V4.7 or higher

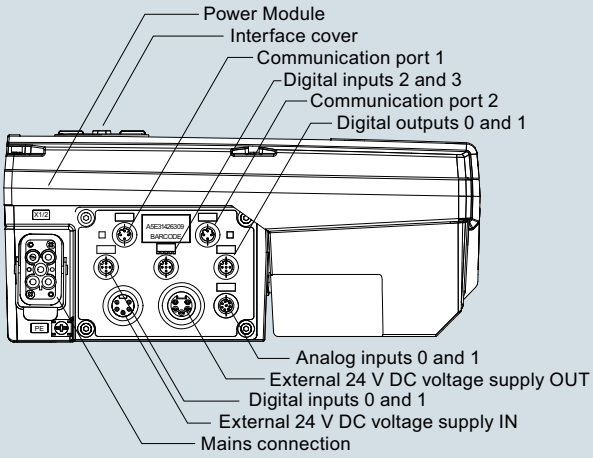
Selection and ordering data

Communication	Digital inputs (number which can be parameterized as fail-safe given below)	Analog inputs (of which can be used optionally as digital input (10 V)	Digital outputs	Safety Integrated functions [1]	Designation of Control Unit	Motor Frame size		**Control Unit** Article No.
CU240M – screw-type								
USS, Modbus RTU	4 (1)	2 (2)	2	STO	CU240M	71	NEW	**6SL3544-0LB02-1BA0**
	4 (1)	2 (2)	2			80/90	NEW	**6SL3544-0MB02-1BA0**
	4 (1)	2 (2)	2			100/112	NEW	**6SL3544-0NB02-1BA0**
CU240M DP – screw-type								
PROFIBUS DP	4 (1)	2 (2)	2	STO	CU240M DP	71	NEW	**6SL3544-0LB02-1PA0**
	4 (1)	2 (2)	2			80/90	NEW	**6SL3544-0MB02-1PA0**
	4 (1)	2 (2)	2			100/112	NEW	**6SL3544-0NB02-1PA0**
CU240M DP – plug-in								
PROFIBUS DP	4 (1)	2 (2)	2	STO	CU240M DP	71	NEW	**6SL3544-0TB02-1PA0**
	4 (1)	2 (2)	2			80/90	NEW	**6SL3544-0PB02-1PA0**
	4 (1)	2 (2)	2			100/112	NEW	**6SL3544-0QB02-1PA0**
CU240M PN – screw-type								
PROFINET, EtherNet/IP	4 (1)	2 (2)	2	STO	CU240M PN	71	NEW	**6SL3544-0LB02-1FA0**
	4 (1)	2 (2)	2			80/90	NEW	**6SL3544-0MB02-1FA0**
	4 (1)	2 (2)	2			100/112	NEW	**6SL3544-0NB02-1FA0**
CU240M PN – plug-in								
PROFINET, EtherNet/IP	4 (1)	2 (2)	2	STO	CU240M PN	71	NEW	**6SL3544-0TB02-1FA0**
	4 (1)	2 (2)	2			80/90	NEW	**6SL3544-0PB02-1FA0**
	4 (1)	2 (2)	2			100/112	NEW	**6SL3544-0QB02-1FA0**

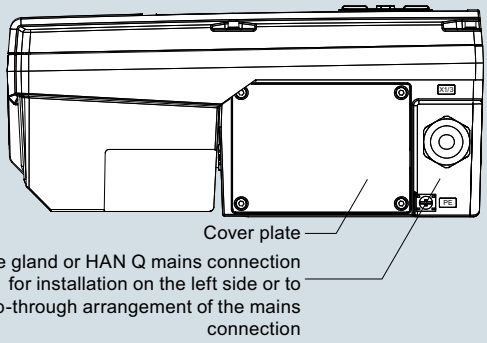
[1] Available for firmware version V4.7 or higher

Design

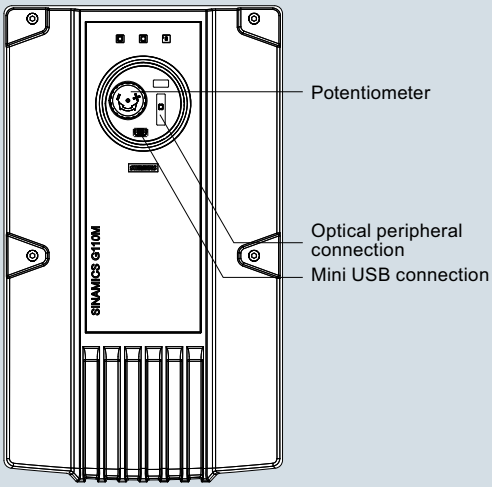
Control Unit and Power Module (view from the right side)



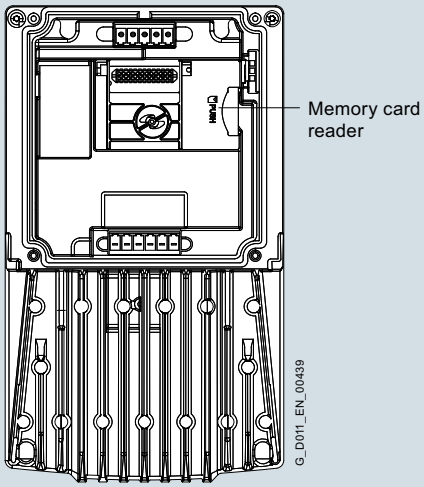
Control Unit and Power Module (view from the left side)



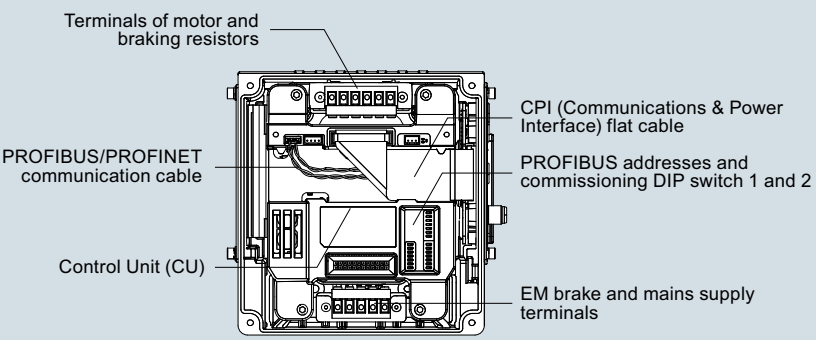
Power Module (top view)



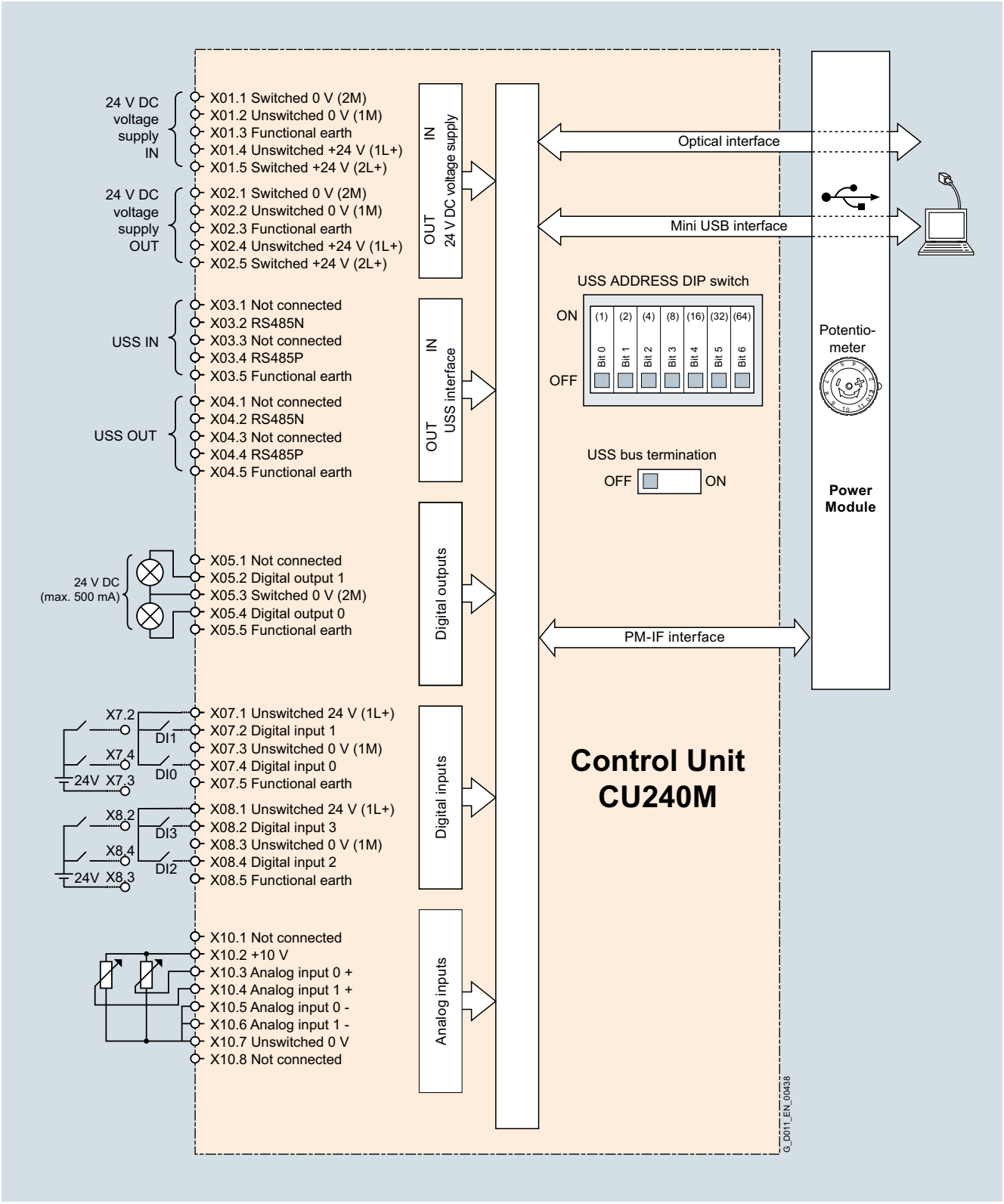
Power Module (inside view)



Control Unit (top view/inside view)

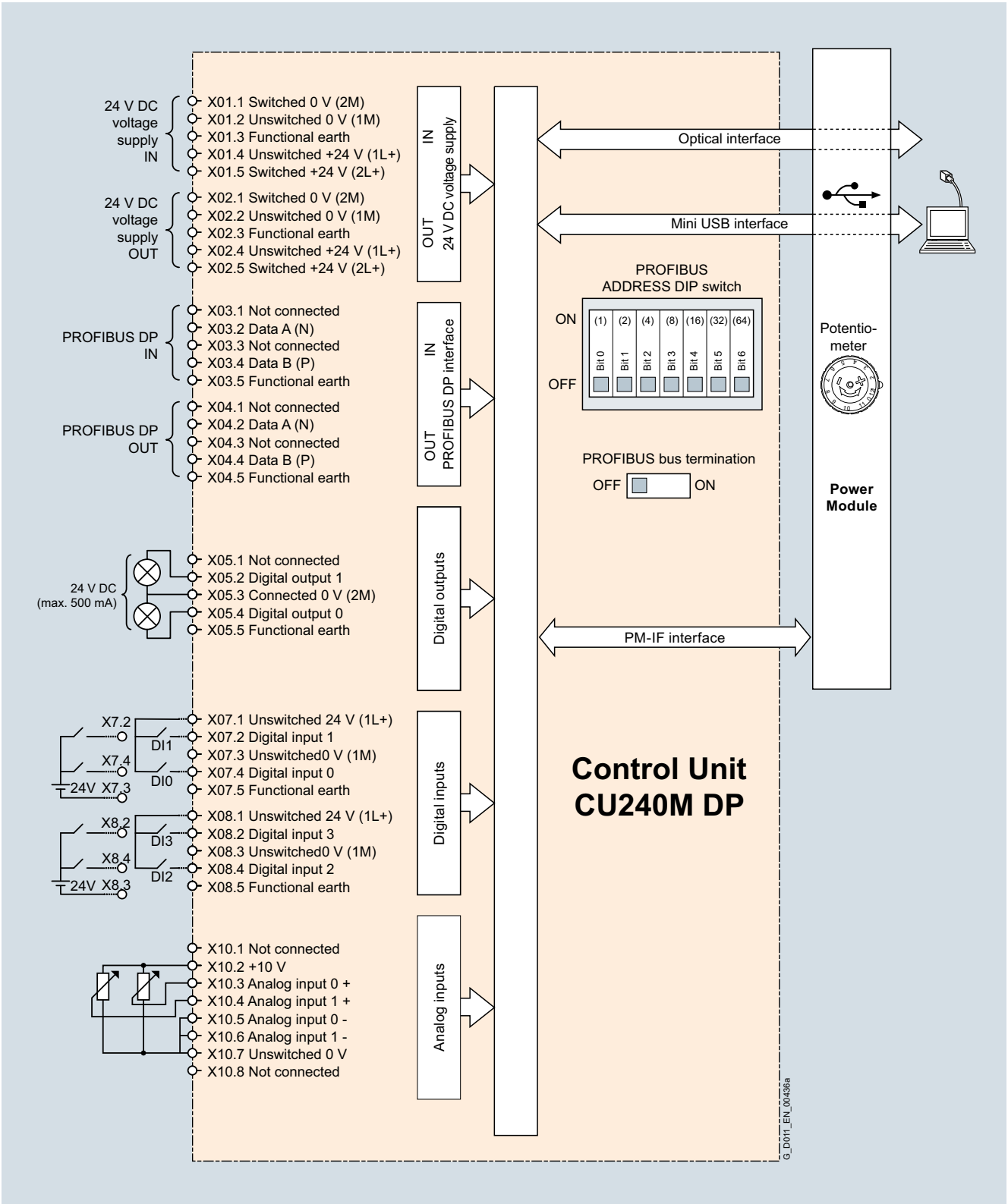


Integration



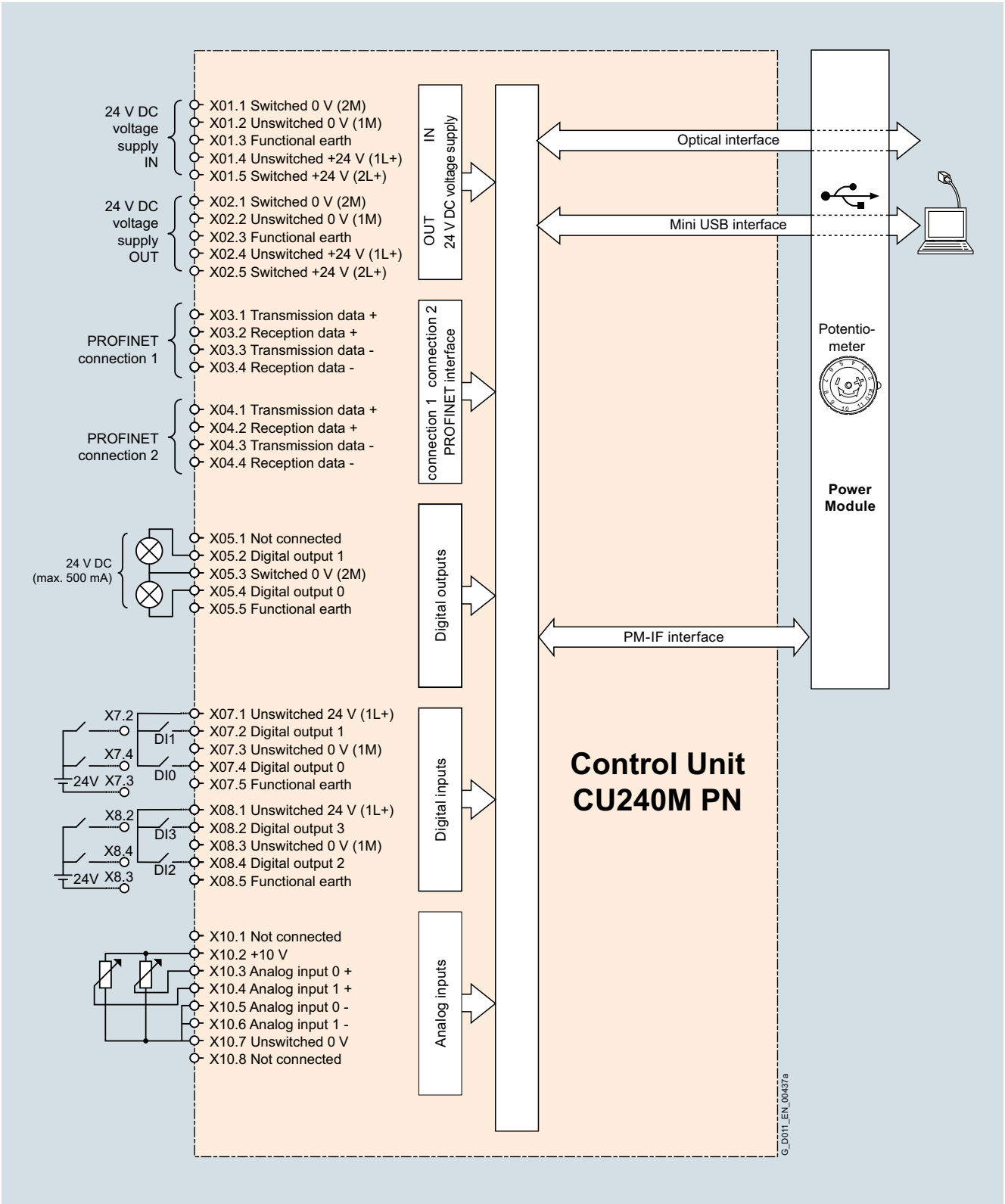
Connection diagram for CU240M Control Units

Integration



Connection diagram for CU240M DP Control Units

Integration



Connection diagram for CU240M PN Control Units

Technical specifications

Control Unit	**CU240M** With screw-type connections 6SL3544-0LB02-1BA0, 6SL3544-0MB02-1BA0, 6SL3544-0NB02-1BA0	**CU240M PROFIBUS** With screw-type connections 6SL3544-0LB02-1PA0, 6SL3544-0MB02-1PA0, 6SL3544-0NB02-1PA0	**CU240M PROFIBUS** With plug-in connections 6SL3544-0TB02-1PA0, 6SL3544-0PB02-1PA0, 6SL3544-0QB02-1PA0	**CU240M PROFINET** With screw-type connections 6SL3544-0LB02-1FA0, 6SL3544-0MB02-1FA0, 6SL3544-0NB02-1FA0	**CU240M PROFINET** With plug-in connections 6SL3544-0TB02-1FA0, 6SL3544-0PB02-1FA0, 6SL3544-0QB02-1FA0
Electrical specifications					
Operating voltage	External 24 V DC ± 15 % power supply with protective extra low voltage PELV acc. to EN 61800-5-1 must be used.	External 24 V DC ± 15 % power supply with protective extra low voltage PELV acc. to EN 61800-5-1 must be used.	External 24 V DC ± 15 % power supply with protective extra low voltage PELV acc. to EN 61800-5-1 must be used.	External 24 V DC ± 15 % power supply with protective extra low voltage PELV acc. to EN 61800-5-1 must be used.	External 24 V DC ± 15 % power supply with protective extra low voltage PELV acc. to EN 61800-5-1 must be used.
Current consumption [1] (from the 24 V DC supply)					
• With Power Module frame size FSA	235 mA	235 mA	235 mA	290 mA	290 mA
• With Power Module frame size FSB	235 mA	235 mA	235 mA	290 mA	290 mA
Interfaces					
Digital inputs (non-isolated)	4 programmable, PNP, SIMATIC compatible	4 programmable, PNP, SIMATIC compatible	4 programmable, PNP, SIMATIC compatible	4 programmable, PNP, SIMATIC compatible	4 programmable, PNP, SIMATIC compatible
• Optionally parameterizable as safe inputs	1	1	1	1	1
Analog inputs (0 ... 10 V or 0 ... 20 mA with 12-bit resolution)	2	2	2	2	2
Digital outputs 24 V DC (0 ... 0.5 A)	2, programmable	2, programmable	2, programmable	2, programmable	2, programmable
Bus interface	USS	PROFIBUS DP	PROFIBUS DP	PROFINET	PROFINET
• Fieldbus protocols	USS Modbus RTU	PROFIBUS DP incl. PROFIsafe	PROFIBUS DP incl. PROFIsafe	PROFINET incl. PROFIsafe EtherNet/IP	PROFINET incl. PROFIsafe EtherNet/IP
• Profile	–	PROFIdrive	PROFIdrive	PROFIdrive PROFIenergy	PROFIdrive PROFIenergy
PTC/KTY interface (connection via Power Module)	✓	✓	✓	✓	✓
• Motor temperature sensor	1 input, sensors that can be connected: PTC, KTY or bimetal	1 input, sensors that can be connected: PTC, KTY or bimetal	1 input, sensors that can be connected: PTC, KTY or bimetal	1 input, sensors that can be connected: PTC, KTY or bimetal	1 input, sensors that can be connected: PTC, KTY or bimetal
Control of a mechanical motor brake (connection via the Control Unit)	✓	✓	✓	✓	✓
Slot for SINAMICS memory card (SD card)	✓	✓	✓	✓	✓
Commissioning interface (mini USB)	✓	✓	✓	✓	✓
Safety functions					
Integrated safety functions [2] acc. to IEC 61508 SIL 2 and EN ISO 13849-1 PL d and Category 3	Safe Torque Off (STO)	Safe Torque Off (STO)	Safe Torque Off (STO)	Safe Torque Off (STO)	Safe Torque Off (STO)
Open-loop/closed-loop control techniques					
V/f linear/square/ parameterizable	✓	✓	✓	✓	✓
V/f with flux current control (FCC)	✓	✓	✓	✓	✓
Vector control, sensorless	✓	✓	✓	✓	✓
Torque control, sensorless	✓	✓	✓	✓	✓

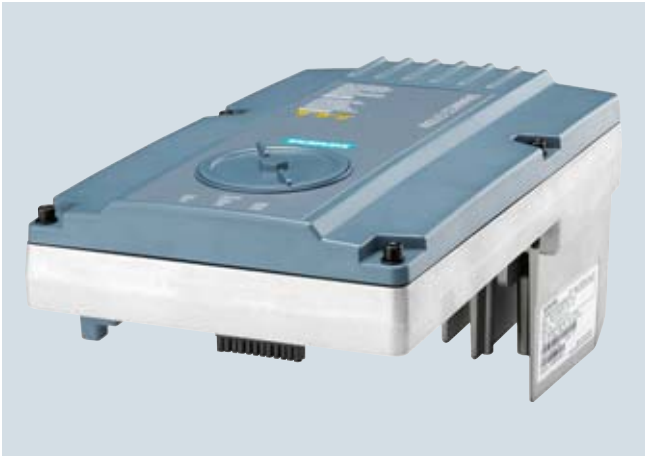
[1] The current consumption of connected sensors (total, max. 200 mA) as well as the current drawn from the digital outputs (total, max. 500 mA).

[2] Available for firmware version V4.7 or higher.

Technical specifications

Control Unit	**CU240M** With screw-type connections	**CU240M PROFIBUS** With screw-type connections	**CU240M PROFIBUS** With plug-in connections	**CU240M PROFINET** With screw-type connections	**CU240M PROFINET** With plug-in connections
	6SL3544-0LB02-1BA0, 6SL3544-0MB02-1BA0, 6SL3544-0NB02-1BA0	6SL3544-0LB02-1PA0, 6SL3544-0MB02-1PA0, 6SL3544-0NB02-1PA0	6SL3544-0TB02-1PA0, 6SL3544-0PB02-1PA0, 6SL3544-0QB02-1PA0	6SL3544-0LB02-1FA0, 6SL3544-0MB02-1FA0, 6SL3544-0NB02-1FA0	6SL3544-0TB02-1FA0, 6SL3544-0PB02-1FA0, 6SL3544-0QB02-1FA0
Software functions					
Fixed frequencies	✓	✓	✓	✓	✓
Signal interconnection with BICO technology	✓	✓	✓	✓	✓
Automatic restart after line supply failure or operational fault	✓	✓	✓	✓	✓
Slip compensation	✓	✓	✓	✓	✓
Free function blocks (FFB) for logical and arithmetic operations	✓	✓	✓	✓	✓
Ramp smoothing	✓	✓	✓	✓	✓
Selectable drive data sets	✓ (4)	✓ (4)	✓ (4)	✓ (4)	✓ (4)
Selectable command data sets (CDS) (manual/auto)	✓ (4)	✓ (4)	✓ (4)	✓ (4)	✓ (4)
Flying restart	✓	✓	✓	✓	✓
JOG	✓	✓	✓	✓	✓
Cyclic recording of ramp-up and ramp-down	✓	✓	✓	✓	✓
Technology controller (PID)	✓	✓	✓	✓	✓
Quick stop	✓	✓	✓	✓	✓
Limit switch logic	✓	✓	✓	✓	✓
Thermal motor protection	✓	✓	✓	✓	✓
Thermal inverter protection	✓	✓	✓	✓	✓
Setpoint input	✓	✓	✓	✓	✓
Motor identification	✓	✓	✓	✓	✓
Motor holding brake	✓	✓	✓	✓	✓
Mechanical specifications and ambient conditions					
Degree of protection	IP66/UL Type 3	IP66/UL Type 3	IP66/UL Type 3	IP66/UL Type 3	IP66/UL Type 3
Operating temperature	-10 ... +55 °C (14 ... 131 °F)	-10 ... +55 °C (14 ... 131 °F)	-10 ... +55 °C (14 ... 131 °F)	-10 ... +55 °C (14 ... 131 °F)	-10 ... +55 °C (14 ... 131 °F)
Air temperature	-40 ... +70 °C (40 ... 158 °F)	-40 ... +70 °C (40 ... 158 °F)	-40 ... +70 °C (40 ... 158 °F)	-40 ... +70 °C (40 ... 158 °F)	-40 ... +70 °C (40 ... 158 °F)
Relative humidity	<95 % RH, condensation not permissible	<95 % RH, condensation not permissible	<95 % RH, condensation not permissible	<95 % RH, condensation not permissible	<95 % RH, condensation not permissible
Dimensions					
• Width	205 mm (8.07 in)	205 mm (8.07 in)	205 mm (8.07 in)	205 mm (8.07 in)	205 mm (8.07 in)
• Height	105 mm (4.13 in)	105 mm (4.13 in)	105 mm (4.13 in)	105 mm (4.13 in)	105 mm (4.13 in)
• Depth	171 mm (6.73 in)	171 mm (6.73 in)	171 mm (6.73 in)	171 mm (6.73 in)	171 mm (6.73 in)
Weight, approx.	1.75 kg	1.85 kg	1.85 kg	1.85 kg	1.85 kg

Overview



SINAMICS G110M PM240M Power Module FSA 1.5 kW (2 hp)

SINAMICS G110M PM240M Power Module FSB 4 kW (5 hp)

The PM240M Power Modules are suitable for safety-related applications. In conjunction with the CU240M Control Unit, the drive can be transformed into a Safety Integrated drive (see Control Units).

The PM240M Power Modules with integrated line filter class A are suitable for connection to TN and TT supply systems.

Selection and ordering data

Rated power [1]		Rated output current [2]	Rated input current [2]	Frame size	PM240M Power Modules
kW	hp	A	A		Article No.
0.37	0.5	1.3	1.3	FSA NEW	6SL3517-1BE11-3AM0
0.75	1	2.2	2	FSA NEW	6SL3517-1BE12-3AM0
1.1	1.5	3.1	2.8	FSA NEW	6SL3517-1BE13-3AM0
1.5	2	4.1	3.6	FSA NEW	6SL3517-1BE14-3AM0
2.2	3	5.6	5.3	FSB NEW	6SL3517-1BE16-3AM0
3	4	7.3	6.9	FSB NEW	6SL3517-1BE17-7AM0
4	5	8.8	8	FSB NEW	6SL3517-1BE21-0AM0

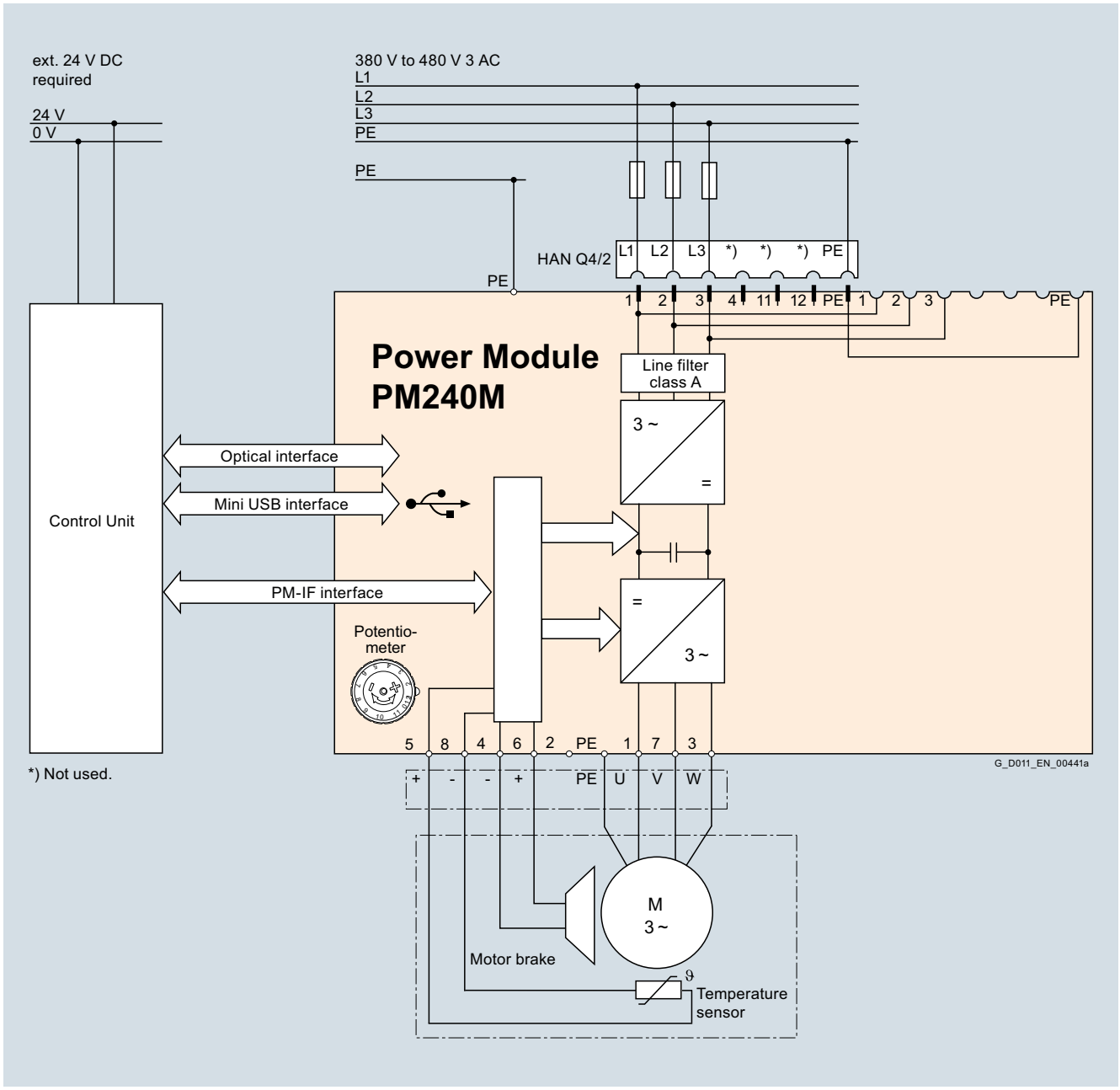
1) Rated power based on the rated output current I_{rated}. The rated output current I_{rated} is based on the duty cycle for high overload (HO).

2) The rated output current I_{rated} is based on the duty cycle for high overload (HO). These current values are valid for 400 V and are specified on the rating plate of the Power Module.

Integration

PM240M Power Modules feature the following interfaces as standard:

- PM-IF interface for connection of the PM240M Power Module and Control Unit
- Motor connection including control of the motor brake and temperature sensor
- Line connection via cable gland or HAN Q4/2 (connector)
- Line supply loop-through via cable gland/terminal or HAN Q4/2 (socket)
- USB connection for connection of a PC
- Analog potentiometer for setting a speed
- SD card slot for the use of memory cards



Connection diagram for PM240M Power Module with integrated line filter class A

Technical specifications

General technical specifications

	PM240M Power Modules
System operating voltage	380 V (-10 %) ... 480 V (+10 %) 3 AC
Line supply requirements Short-circuit power ratio R_{SC}	>100
Input frequency	47 ... 63 Hz
Output frequency	
• Control type V/f	0 ... 650 Hz (due to legal regulations, the maximum output frequency is restricted to 550 Hz with firmware V4.7 and higher)
• Control type Vector	0 ... 200 Hz
Pulse frequency	4 kHz (standard); 4 ... 16 Hz (in steps of 2 kHz) see derating data
Power factor	0.95
Inverter efficiency	95 ... 97 %
Output voltage, max. in % of the input voltage	87 %
Overload capability	
• High overload (HO)	0.37 ... 3 kW (0.5 ... 4 hp): 2 × rated output current for 3 s, followed by 1.5 × rated output current for 57 s, over a cycle time of 300 s (110 % on average) 4 kW (5 hp): 1.6 × rated output current for 3 s, followed by 1.5 × rated output current for 57 s, over a cycle time of 300 s (110 % on average)
Electromagnetic compatibility	Integrated line filter class A according to EN 55011
Possible braking methods	Dynamic braking with internal braking resistors DC brake Integrated brake control supplies DC power supply for the brake

Line input voltage	380 V AC	400 V AC	440 V AC	480 V AC	500 V AC
Resulting brake voltage	171 V DC	180 V DC	198 V DC	216 V DC	225 V DC

	Disconnection on the DC side permits "fast" braking (max. output current 1 A)
Degree of protection	IP65/66 (applicable to Power Module and Control Unit in mounted state)
Operating temperature	-10 ... +55 °C (14 ... +131 °F)
Storage temperature	-40 ... +70 °C (-40 ... +158 °F)
Permissible mounting positions	All
Relative humidity	<95 % RH, condensation not permissible
Cooling	External cooling with motor fan
Installation altitude	Up to 1000 m (3281 ft) above sea level without derating Over 1000 m (3281 ft), see derating data
Short Circuit Current Rating (SCCR) [1]	40 kA
Protection functions	• Undervoltage • Phase failure detection • Overvoltage • Overload • Ground fault • Short-circuit • Stall prevention • Motor blocking protection • Motor overtemperature • Inverter overtemperature • Parameter locking
Compliance with standards	UL, cUL, CE, C-Tick
CE marking, according to	EC Low Voltage Directive 73/23/EEC; filtered variants also: EC Low Voltage Directive 89/336/EEC

[1] Applies to industrial control panel installations to NEC Article 409 or UL 508A.

Technical specifications

Line voltage 380 … 480 V 3 AC		**PM240M Power Modules**			
		6SL3517-1BE11-3AM0	6SL3517-1BE12-3AM0	6SL3517-1BE13-3AM0	6SL3517-1BE14-3AM0
Rated output current I_{rated} [1]	A	1.3	2.2	3.1	4.1
Maximum output current I_{max}	A	2.6	4.4	6.2	8.2
Rated power	kW (hp)	0.37 (0.5)	0.75 (1)	1.1 (1.5)	1.5 (2)
Rated pulse frequency	kHz	4	4	4	4
Efficiency η	%	96.8	98.1	98.2	97.3
Power loss [2] at rated output current	kW	0.025	0.032	0.041	0.052
Cooling air requirement	m^3/s	0.0048	0.0048	0.0048	0.0048
Sound pressure level L_{pA} (1 m)	dB	–	–	–	–
Rated input current [3]	A	1.3	2	2.8	3.6
Line supply connection U1/L1, V1/L2, W1/L3, PE					
• Conductor cross-section (recommended)	mm^2	1 ... 2.5 18 ... 14 AWG	1 ... 2.5 18 ... 14 AWG	1 ... 2.5 18 ... 14 AWG	1 ... 2.5 18 ... 14 AWG
PE connection (external connection)					
• Conductor cross-section (recommended)	mm^2	10	10	10	10
Motor connection U2, V2, W2, PE, motor brake, temperature sensor					
• Conductor cross-section	mm^2	1 ... 2.5 18 ... 14 AWG	1 ... 2.5 18 ... 14 AWG	1 ... 2.5 18 ... 14 AWG	1 ... 2.5 18 ... 14 AWG
Motor cable length, max. Shielded	m	–	–	–	–
Degree of protection		IP66	IP66	IP66	IP66
Dimensions					
• Width	mm (in)	161 (6.34)	161 (6.34)	161 (6.34)	161 (6.34)
• Height	mm (in)	135 (5.31)	135 (5.31)	135 (5.31)	135 (5.31)
• Depth	mm (in)	270 (10.63)	270 (10.63)	270 (10.63)	270 (10.63)
Frame size		FSA	FSA	FSA	FSA
Weight, approx.	kg (lb)	2.1	2.1	2.1	2.1

[1] The rated output current I_{rated} is based on the duty cycle for high overload (HO).

[2] Typical values. Additional information is available on the Internet at http://support.automation.siemens.com/WW/view/en/94059311.

[3] The input current depends on the motor load and line impedance. The input currents apply for loading at rated power with a line impedance corresponding to u_K = 1 %.

Technical specifications

Line voltage 380 … 480 V 3 AC		PM240M Power Modules		
		6SL3517-1BE16-3AM0	6SL3517-1BE17-7AM0	6SL3517-1BE21-0AM0
Rated output current I_{rated} [1]	A	5.6	7.3	8.8
Maximum output current I_{max}	A	11.2	14.6	14.1
Rated power	kW (hp)	2.2 (3)	3 (4)	4 (5)
Rated pulse frequency	kHz	4	4	4
Efficiency η	%	97.6	97.6	97.7
Power loss [2] at rated output current	kW	0.078	0.103	0.126
Cooling air requirement	m^3/s	0.024	0.024	0.024
Sound pressure level L_{pA} (1 m)	dB	–	–	–
Rated input current [3]	A	5.3	6.9	8
Line supply connection U1/L1, V1/L2, W1/L3, PE				
• Conductor cross-section (recommended)	mm^2	1 ... 2.5 18 ... 14 AWG	1 ... 2.5 18 ... 14 AWG	1 ... 2.5 18 ... 14 AWG
PE connection (external connection)				
• Conductor cross-section (recommended)	mm^2	10	10	10
Motor connection U2, V2, W2, PE, motor brake, temperature sensor				
• Conductor cross-section	mm^2	1 ... 2.5 18 ... 14 AWG	1 ... 2.5 18 ... 14 AWG	1 ... 2.5 18 ... 14 AWG
Motor cable length, max. Shielded	m	–	–	–
Degree of protection		IP66	IP66	IP66
Dimensions				
• Width	mm (in)	181 (7.13)	181 (7.13)	181 (7.13)
• Height	mm (in)	135 (5.31)	135 (5.31)	135 (5.31)
• Depth	mm (in)	309 (12.17)	309 (12.17)	309 (12.17)
Frame size		FSB	FSB	FSB
Weight, approx.	kg (lb)	3.4	3.4	3.4

[1] The rated output current I_{rated} is based on the duty cycle for high overload (HO).

[2] Typical values. Additional information is available on the Internet at http://support.automation.siemens.com/WW/view/en/94059311.

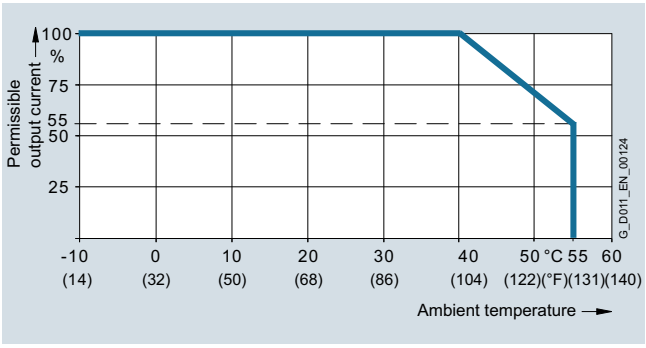
[3] The input current depends on the motor load and line impedance. The input currents apply for loading at rated power with a line impedance corresponding to u_K = 1 %.

Characteristic curves

Derating data

Rated power at 400 V 3 AC		**Rated output current in A** for a pulse frequency of (derating as a function of the pulse frequency [1])						
kW	hp	4 kHz	6 kHz	8 kHz	10 kHz	12 kHz	14 kHz	16 kHz
0.37	0.5	1.3	1.3	1.11	0.91	0.78	0.65	0.59
0.75	1	2.2	1.9	1.5	1.3	1.1	1	0.9
1.1	1.5	3.1	2.6	2.2	1.9	1.6	1.4	1.2
1.5	2	4.1	3.5	2.9	2.5	2.1	1.8	1.6
2.2	3	5.6	4.8	3.9	3.4	2.8	2.5	2.2
3	4	7.3	6.2	5.1	4.4	3.7	3.3	2.9
4	5	8.8	7.5	6.2	5.3	4.4	4	3.5

Ambient temperature

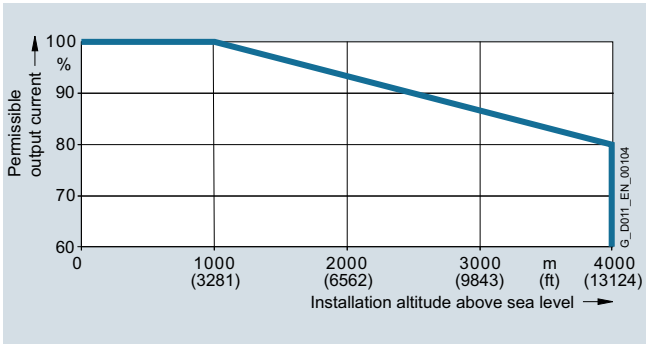


Permissible output current as a function of ambient temperature for PM240M Power Modules, frame sizes FSA and FSB

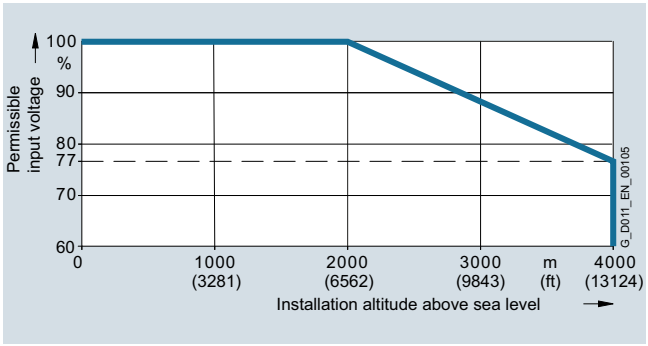
Note:

The operating temperature ranges of the Control Units must be taken into account. The temperature ranges are specified in the technical specifications under Control Units.

Installation altitude



Permissible output current as a function of installation altitude for PM240M Power Modules, frame sizes FSA and FSB

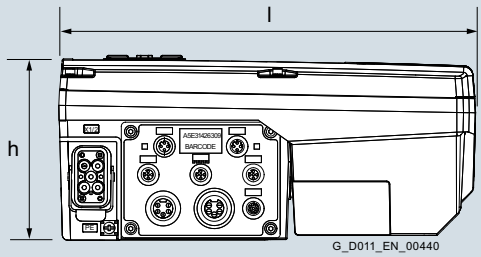


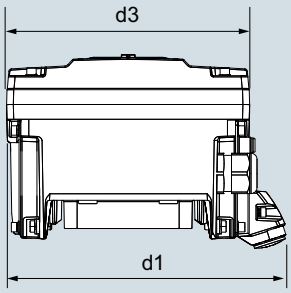
Permissible input voltage as a function of installation altitude for PM240M Power Modules, frame sizes FSA and FSB

[1] The permissible motor cable length also depends on the cable type and the selected pulse frequency.

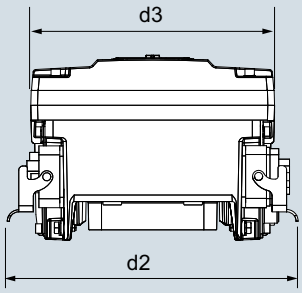
Dimensional drawings

Dimensions of PM240M Power Modules (including CU240M Control Unit)





Screwed version



HAN-Q version

6

Frame size	**Dimensions** in mm (inches)				
	h	l	d1	d2	d3
FSA	135 (5.31)	270 (10.63)	208 (8.19)	216 (8.5)	161 (6.34)
FSB	135 (5.31)	309 (12.17)	208 (8.19)	216 (8.5)	181 (7.13)

Selection and Ordering Data

The following table lists recommendations for additional line-side components, such as fuses and circuit breakers.

Note for use in compliance with IEC standards:
3NA3 type fuses and 3RV type circuit breakers are recommended for European countries. The values in the table take into account the overload capability of the inverter.

Note for use in compliance with UL regulations:
Fuses for use in North America must be UL-certified, Class J fuses with a rated voltage of 600 V AC.

Short Circuit Current Rating (SCCR)
according to UL

Applies to industrial control panel installations according to NEC Article 409 or UL 508A.

- PM240M: 40 kA

Additional information about the listed fuses and circuit breakers can be found in Catalogs LV 10, IC 10 and IC 10 AO.

Individual protection

Rated power		SINAMICS G110M PM240M Power Modules		IEC-compliant			UL/cUL-compliant	
				Fuse		Circuit breaker	Fuse type Rated voltage 600 V AC	
				Current				Current
kW	hp	Type	Frame size	A	Article No.	Article No.	Class	A
380 ... 480 V 3 AC								
0.37	0.5	6SL3517-1BE11-3AM0	FSA	10	**3NA3803**	**3RV2011-1JA10**	J	10
0.75	1	6SL3517-1BE12-3AM0	FSA	10	**3NA3803**	**3RV2011-1JA10**	J	10
1.1	1.5	6SL3517-1BE13-3AM0	FSA	10	**3NA3803**	**3RV2011-1JA10**	J	10
1.5	2	6SL3517-1BE14-3AM0	FSA	10	**3NA3803**	**3RV2011-1JA10**	J	10
2.2	3	6SL3517-1BE16-3AM0	FSB	20	**3NA3807**	**3RV2021-4BA10**	J	20
3	4	6SL3517-1BE17-7AM0	FSB	20	**3NA3807**	**3RV2021-4BA10**	J	20
4	5	6SL3517-1BE21-0AM0	FSB	20	**3NA3807**	**3RV2021-4BA10**	J	20

The SINAMICS G110M system supports an inverter loop-through of line current to several inverters connected in series.

Further information can be found in the operating instructions on the Internet at

www.siemens.com/sinamics-g110m/documentation

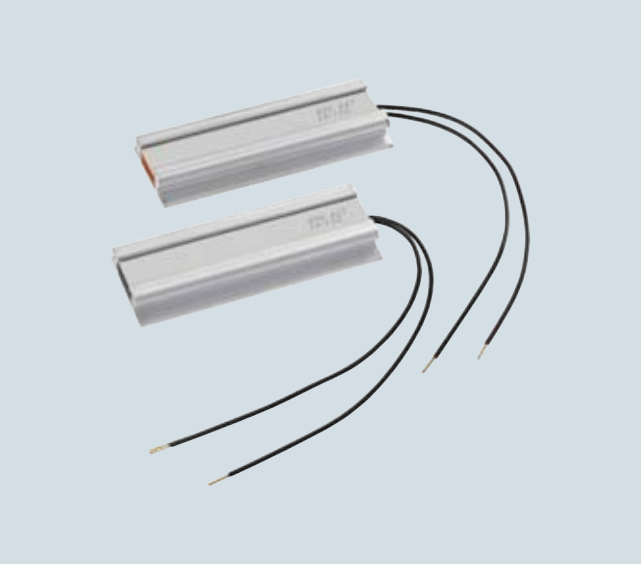
Group protection (installation on power bus)

For installations with several inverters, the inverters are normally supplied from a 400 V power bus.

Further information can be found in the operating instructions on the Internet at

www.siemens.com/sinamics-g110m/documentation

Overview



SINAMICS G110M braking resistors FSA and FSB

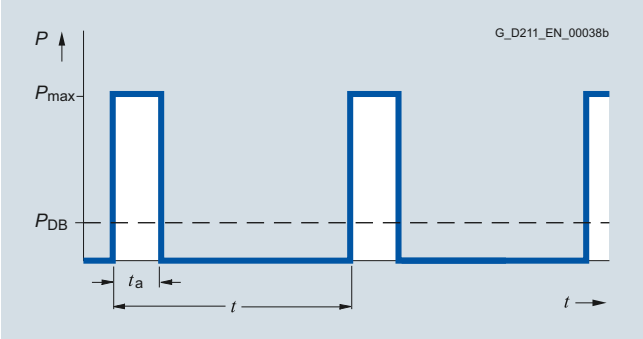
Excess energy in the DC link is dissipated in the braking resistors in regenerative operation.

The braking resistors are intended for use with SINAMICS G110M, which have an integrated braking chopper, but cannot regenerate energy to the line supply. For regenerative operation, e.g. the braking of a rotating mass with high moment of inertia, a braking resistor must be connected to convert the resulting energy into heat.

The braking resistors can be mounted on the side of the Control Unit housing at the bottom. The heat from the braking resistor is dissipated over the Control Unit housing. Every braking resistor is equipped with thermal protection. The thermal protection prevents the braking resistor from being thermally overloaded.

All braking resistors are provided as standard with a cable for connecting to the internal terminals.

Characteristic curves



Load diagram for the breaking resistors
t_a = 12 s
t = 120 s

Selection and ordering data

Rated power kW	Rated power hp	SINAMICS G110M Type 6SL3517-...	SINAMICS G110M Frame size		Braking resistor Article No.
380 ... 500 V 3 AC					
0.37	0.5	1BE11-3AM0	FSA	NEW	**6SL3501-0BE18-8AA0**
0.75	1	1BE12-3AM0	FSA		
1.1	1.5	1BE13-3AM0	FSA		
1.5	2	1BE14-3AM0	FSA		
2.2	3	1BE16-3AM0	FSB	NEW	**6SL3501-0BE22-0AA0**
3	4	1BE17-7AM0	FSB		
4	5	1BE21-0AM0	FSB		

Technical specifications

Line voltage 380 ... 480 V 3 AC		**Braking resistor** 6SL3501-0BE18-8AA0	6SL3501-0BE22-0AA0
Resistance	Ω	350	175
Rated power P_{DB} (continuous braking power)	kW	0.0075	0.02
Peak power P_{max} (load period t_a = 12 s over a period t = 240 s)	kW	0.075	0.2
Degree of protection		IP20	IP20
Dimensions			
• Width	mm (in)	11 (0.43)	11 (0.43)
• Height	mm (in)	34 (1.34)	34 (1.34)
• Length	mm (in)	84 (3.31)	84 (3.31)
Weight, approx.	kg (lb)	0.1	0.1
Suitable for SINAMICS G110M (frame size)		6SL3517-1BE11-3AM0 (FSA) 6SL3517-1BE12-3AM0 (FSA) 6SL3517-1BE13-3AM0 (FSA) 6SL3517-1BE14-3AM0 (FSA)	6SL3517-1BE16-3AM0 (FSB) 6SL3517-1BE17-7AM0 (FSB) 6SL3517-1BE21-0AM0 (FSB)

Overview

24 V DC power supply

24 V DC power supply

The optional 24 V DC power supply enables the internal electronics to be supplied with 24 V DC directly from the DC link. No external cable is needed for the 24 V DC supply and only the 400 V 3 AC line supply has to be connected. The optional 24 V DC power supply supplies power to the internal circuitry of the Control Unit, the low-voltage circuits of the Power Module and all inputs and outputs.

Selection and ordering data

Description		Article No.
24 V DC power supply	NEW	**6SL3555-0PV00-0AA0**

Technical specifications

24 V DC power supply	
Operating voltage	24 V DC ±10 %
Current consumption (from the DC link, with PM, CU and DOs operating at a maximum)	1.2 A
Output current, max.	2 A

Overview

Compatible motors for SINAMICS G110M

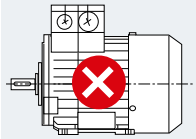
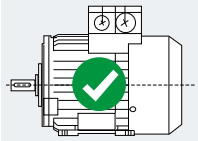
Motors compatible with SINAMICS G110M are listed individually in the table below.

Due to the specific properties of the SINAMICS G110M, the following comments and restrictions apply to the options and devices used with the motors:

- Note mounting position when encoders are used
- The brake lever cannot be positioned at 12 o'clock owing to the position of the inverter terminal enclosure.
- 24 V DC brake voltage not possible.
- 230/400 V AC brake voltage not possible for a motor on which a CU240M Control Unit is mounted
- Standby heating is not permitted for the motor
- External motor fan cannot be mounted if the terminal enclosure is mounted in the 12 o'clock position
- Motor terminal box must be located at NDE

Rules for the use of 2- and 4-pole motors with 50 Hz 400 V 3 AC

- Rated output current of the inverter ≥ rated input current of the motor
- Mechanical execution of the motor: Utilization of SINAMICS G100M only in conjunction with motors SIMOTICS GP-1LA, frame size 71 or SIMOTICS GP-1LE, frame sizes 80, 90, 100 or 112
- This motor configuration is only possible with terminal box at NDE – see figure below. Following options are available when motor is selected - for SIMOTICS GP-1LA motors select option **M64**, for SIMOTICS GP-1LE motors select option **H08** (in preparation for 1LE1 motors with frame sizes 80 and 90).

Terminal box	
Standard DE terminal box (not possible)	
NDE terminal box 1LA motor: Option **M64** 1LE motor: Option **H08** (**H08** in preparation for 1LE1 motors frame sizes 80 and 90).	

Overview

The table below applies to IEC-compliant applications only

SINAMICS G110M characteristics			Motor characteristics									
Output at high overload (HO)	Rated output current	Frame size	**Rating**	**2-pole motors**, 50 Hz 400 V 3 AC				**4-pole motors**, 50 Hz 400 V 3 AC				
				Type	Frame size	Rated current	Efficiency Class	Type	Frame size	Rated current	Efficiency Class
kW (hp)	A		**kW (hp)**		FS	A			FS	A	
0.37 (0.5)	1.3	FSA	**0.37 (0.5)**	1LA7070-2AA	71M	0.99	–	1LA7073-4AB	71M	1.04	–
		FSA	**0.37 (0.5)**	1LA9070-2KA	71M	0.95	–	1LA9073-4KA	71M	0.96	–
0.75 (1)	2.2	FSA	**0.37 (0.5)**	1LA7070-2AA	71M	0.99	–	1LA7073-4AB	71M	1.04	–
		FSA	**0.37 (0.5)**	1LA9070-2KA	71M	0.95	–	1LA9073-4KA	71M	0.96	–
		FSA	**0.75 (1)**	1LE1001-0DA2 [1]	80M	1.67	IE2	1LE1001-0DB3 [1]	80M	1.79	IE2
1.1 (1.5)	3.1	FSA	**0.37 (0.5)**	1LA7070-2AA	71M	0.99	–	1LA7073-4AB	71M	1.04	–
		FSA	**0.37 (0.5)**	1LA9070-2KA	71M	0.95	–	1LA9073-4KA	71M	0.96	–
		FSA	**0.75 (1)**	1LE1001-0DA2 [1]	80M	1.67	IE2	1LE1001-0DB3 [1]	80M	1.79	IE2
		FSA	**1.1 (1.5)**	1LE1001-0DA3 [1]	80M	2.4	IE2	1LE1001-0EB0 [1]	90S	2.5	IE2
1.5 (2)	4.1	FSA	**0.37 (0.5)**	1LA7070-2AA	71M	0.99	–	1LA7073-4AB	71M	1.04	–
		FSA	**0.37 (0.5)**	1LA9070-2KA	71M	0.95	–	1LA9073-4KA	71M	0.96	–
		FSA	**0.75 (1)**	1LE1001-0DA2 [1]	80M	1.67	IE2	1LE1001-0DB3 [1]	80M	1.79	IE2
		FSA	**1.1 (1.5)**	1LE1001-0DA3 [1]	80M	2.4	IE2	1LE1001-0EB0 [1]	90S	2.5	IE2
		FSA	**1.5 (2)**	1LE1001-0EA0 [1]	90S	3.15	IE2	1LE1001-0EB4 [1]	90L	3.3	IE2
2.2 (3)	5.6	FSB	**0.37 (0.5)**	1LA7070-2AA	71M	0.99	–	1LA7073-4AB	71M	1.04	–
		FSB	**0.37 (0.5)**	1LA9070-2KA	71M	0.95	–	1LA9073-4KA	71M	0.96	–
		FSB	**0.75 (1)**	1LE1001-0DA2 [1]	80M	1.67	IE2	1LE1001-0DB3 [1]	80M	1.79	IE2
		FSB	**1.1 (1.5)**	1LE1001-0DA3 [1]	80M	2.4	IE2	1LE1001-0EB0 [1]	90S	2.5	IE2
		FSB	**1.5 (2)**	1LE1001-0EA0 [1]	90S	3.15	IE2	1LE1001-0EB4 [1]	90L	3.3	IE2
		FSB	**2.2 (3)**	1LE1001-0EA4 [1]	90L	4.5	IE2	1LE1001-1AB4	100L	4.65	IE2
3 (4)	7.3	FSB	**0.37 (0.5)**	1LA7070-2AA	71M	0.99	–	1LA7073-4AB	71M	1.04	–
		FSB	**0.37 (0.5)**	1LA9070-2KA	71M	0.95	–	1LA9073-4KA	71M	0.96	–
		FSB	**0.75 (1)**	1LE1001-0DA2 [1]	80M	1.67	IE2	1LE1001-0DB3 [1]	80M	1.79	IE2
		FSB	**1.1 (1.5)**	1LE1001-0DA3 [1]	80M	2.4	IE2	1LE1001-0EB0 [1]	90S	2.5	IE2
		FSB	**1.5 (2)**	1LE1001-0EA0 [1]	90S	3.15	IE2	1LE1001-0EB4 [1]	90L	3.3	IE2
		FSB	**2.2 (3)**	1LE1001-0EA4 [1]	90L	4.5	IE2	1LE1001-1AB4	100L	4.65	IE2
		FSB	**3 (4)**	1LE1001-1AA4	100L	6.1	IE2	1LE1001-1AB5	100L	6.2	IE2
4 (5)	8.8	FSB	**0.37 (0.5)**	1LA7070-2AA	71M	0.99	–	1LA7073-4AB	71M	1.04	–
		FSB	**0.37 (0.5)**	1LA9070-2KA	71M	0.95	–	1LA9073-4KA	71M	0.96	–
		FSB	**0.75 (1)**	1LE1001-0DA2 [1]	80M	1.67	IE2	1LE1001-0DB3 [1]	80M	1.79	IE2
		FSB	**1.1 (1.5)**	1LE1001-0DA3 [1]	80M	2.4	IE2	1LE1001-0EB0 [1]	90S	2.5	IE2
		FSB	**1.5 (2)**	1LE1001-0EA0 [1]	90S	3.15	IE2	1LE1001-0EB4 [1]	90L	3.3	IE2
		FSB	**2.2 (3)**	1LE1001-0EA4 [1]	90L	4.5	IE2	1LE1001-1AB4	100L	4.65	IE2
		FSB	**3 (4)**	1LE1001-1AA4	100L	6.1	IE2	1LE1001-1AB5	100L	6.2	IE2
		FSB	**4 (5)**	1LE1001-1BA2	112M	7.8	IE2	1LE1001-1BB2	112M	8.2	IE2

For further information see Catalog D 81.1.

[1] The option **H08** (terminal box on NDE) is essential when ordering these motors (in preparation).

Overview

SINAMICS G110M CU240M PN Control Unit, plug-in,
PM240M Power Module FSA 1.5 kW (2 hp) and SIMOGEAR geared motor shaft height 90

The SINAMICS G110M is designed for mounting on SIMOGEAR geared motors. It is compatible with versions IE1, IE2 and IE3 of SIMOGEAR geared motors in shaft heights 71 to 112.
For additional information see Catalog MD 50.1 SIMOGEAR Geared Motors and the SIMOGEAR Configurator.

Accessories

Intelligent Operator Panel IOP Handheld

IOP Handheld for mobile use

The Intelligent Operator Panel IOP Handheld is a very user-friendly and powerful operator panel for commissioning and diagnostics as well as local operator control and monitoring of SINAMICS G110D, SINAMICS G120D and SINAMICS G110M distributed inverters.

The IOP supports both entry-level personnel and drive experts. Thanks to the large plain text display, the menu-based operation and the application wizards, it is easy to commission standard drives. A drive can be essentially commissioned without having to use a printed parameter list – as the parameters are displayed in plain text, and explanatory help texts and a parameter filtering function are provided.

Application wizards interactively guide you when commissioning important applications such as conveyor technology, pumps, fans and compressors.

There is a basic commissioning wizard for general commissioning.

The drives are easily controlled manually using directly assigned buttons and the navigation wheel. The IOP Handheld has a dedicated switchover button to switch over from automatic to manual mode.

The inverter can be diagnosed in a user-friendly fashion using the plain text display of faults and alarms. Help texts can be obtained by pressing the INFO button.

Up to 2 process values can be displayed graphically or numerically on the status screen/status display.

Process values can also be displayed in technological units.

The IOP Handheld supports standard commissioning of identical drives. For this purpose, a parameter list can be copied from an inverter into the IOP Handheld and when required, downloaded into other drive units of the same type.

The IOP supports the following languages [1]: German, English, French, Italian, Spanish, Portuguese, Dutch, Swedish, Russian, Czech, Polish, Turkish, Finnish.

In addition to the IOP, the IOP Handheld includes a housing with rechargeable batteries, charging unit and RS232 connecting cable. The charging unit is supplied with connector adapters for Europe, the US and UK. When the batteries are fully charged, the operating time is up to 8 hours.

To connect the IOP handheld to SINAMICS G110D, SINAMICS G120D and SINAMICS G110M, the RS232 connecting cable with optical interface is required in addition.

Updating the IOP Handheld

The IOP Handheld can be updated and expanded using the integrated USB interface.

Data to support future drive systems can be transferred from the PC to the IOP Handheld via drag & drop. Further, the USB interface allows user languages and wizards that will become available in the future to be subsequently downloaded and the firmware to be updated for the IOP Handheld [1].

Selection and ordering data

Description	Article No.
IOP Handheld For use with SINAMICS G120, SINAMICS G120C, SINAMICS G120P, SINAMICS G110D, SINAMICS G120D, SINAMICS G110M and SINAMICS S110 Included in the scope of delivery: • IOP • Handheld housing • Rechargeable batteries (4 × AA) • Charging unit (international) • RS232 connecting cable (3 m (9.84 ft) long, for use with SINAMICS G120, SINAMICS G120C, SINAMICS G120P and SINAMICS S110) • USB cable (1 m (3.28 ft) long)	**6SL3255-0AA00-4HA0**
RS232 connecting cable With optical interface to connect the SINAMICS G110D, SINAMICS G120D or SINAMICS G110M inverters to the IOP Handheld (2.5 m (8.2 ft) long)	**3RK1922-2BP00**

[1] For additional information, see http://support.automation.siemens.com/WW/view/en/67273266

Accessories

Memory card

SINAMICS memory card (SD card)

The parameter settings for an inverter can be stored on the SINAMICS SD memory card. When service is required, e.g. after the inverter has been replaced and the data have been downloaded from the memory card the drive system is immediately ready for use again.

- Parameter settings can be written from the memory card to the inverter or saved from the inverter to the memory card.
- Up to 100 parameter sets can be stored.
- The memory card supports standard commissioning without the use of the Intelligent Operator Panel IOP Handheld or the STARTER and SINAMICS Startdrive commissioning tools.

Note:

The memory card is not required for operation and does not have to remain inserted.

Selection and ordering data

Description	Article No.
SINAMICS memory card (SD card) 512 MB	**6SL3054-4AG00-2AA0**

PC inverter connection kit 2 (mini USB interface cable for communication with a PC)

For controlling and commissioning an inverter directly from a PC via a point-to-point connection if the appropriate software (STARTER commissioning tool[1], V4.3 SP3 and higher or SINAMICS Startdrive V13 and higher) has been installed.

Selection and ordering data

Description	Article No.
PC inverter connection kit 2 USB cable (length 3 m (9.84 ft)) for • SINAMICS G120C • SINAMICS G120 Control Units • SINAMICS G110M Control Units • SINAMICS G120D Control Units - CU230P-2 - CU240B-2 - CU240E-2 - CU250S-2 • SINAMICS G110M Control Units - CU240M • SINAMICS G120D Control Units - CU240D-2 - CU250D-2	**6SL3255-0AA00-2CA0**

Installation kits

Different installation kits can be ordered as accessories for the Control Units with plug-in connections and Control Units with cable gland connections.

These kits include covers or cable glands for protecting or connecting the 400 V 3 AC supply, the 24 V DC supply and the mechanical motor brake.

Selection and ordering data

Description		Article No.
Installation kit for Control Units with cable gland connections Includes cable glands for connecting the 400 V 3 AC supply, the 24 V DC supply and the mechanical motor brake	NEW	**6SL3566-2VA00-0GA0**
Installation kit for Control Units with plug-in connections Includes covers for protecting the 400 V 3 AC and 24 V DC input connectors and a cable gland for connecting the mechanical motor holding brake	NEW	**6SL3566-2LA00-0GA0**

STARTER commissioning tool

The STARTER commissioning tool (V4.3 SP3 and higher) supports the commissioning and maintenance of SINAMICS G110M inverters. The operator guidance combined with comprehensive, user-friendly functions for the relevant drive solution allow you to commission the device quickly and easily.

Selection and ordering data

Description	Article No.
STARTER commissioning tool [1] on DVD-ROM	**6SL3072-0AA00-0AG0**

SINAMICS Startdrive commissioning tool

The SINAMICS Startdrive commissioning tool (V13 and higher) supports the commissioning and maintenance of SINAMICS G110M inverters. SINAMICS Startdrive is part of the TIA Portal engineering platform. It supports the intuitive integration of SINAMICS drives in automation. The same operator control concept, the elimination of interfaces and a high degree of user-friendliness make it possible to quickly integrate SINAMICS into an automation process and start it up with the TIA Portal. The TIA Portal with SINAMICS Startdrive offers you a totally integrated engineering platform for the complete application from the project engineering phase through to commissioning and diagnostics.

Selection and ordering data

Description	Article No.
SINAMICS Startdrive commissioning tool [2] on DVD-ROM	**6SL3072-4DA02-0XG0**

1) STARTER commissioning tool is also available on the Internet at http://support.automation.siemens.com/WW/view/en/10804985/133100

2) The SINAMICS Startdrive commissioning tool is also available on the Internet at http://support.automation.siemens.com/WW/view/en/68034568

Accessories

An overview of all available supplementary products (e.g. connectors and cables) can be found under the following link: www.siemens.com/distributeddrives-supplementaryproducts

Connecting cables for the Control Unit

PROFINET connecting cable

Flexible plug-in cables and plug-in connectors that can be assembled in the field for transmission of data (up to 100 Mbit/s) between Industrial Ethernet stations with IP65 degree of protection.

Selection and ordering data

Description	Article No.
IE connecting cable M12-180/M12-180, axial outlet Pre-assembled IE FC TP trailing cable GP 2 x 2 PROFINET type C with two 4-pole M12 plugs (4-pole, D-coded), IP65/IP67 degree of protection, UL, plug/plug connector (IN/OUT) Length:	
0.3 m (0.98 ft)	**6XV1870-8AE30**
0.5 m (1.64 ft)	**6XV1870-8AE50**
1.0 m (3.28 ft)	**6XV1870-8AH10**
1.5 m (4.92 ft)	**6XV1870-8AH15**
2.0 m (6.56 ft)	**6XV1870-8AH20**
3.0 m (9.84 ft)	**6XV1870-8AH30**
5.0 m (16.41 ft)	**6XV1870-8AH50**
10 m (32.81 ft)	**6XV1870-8AN10**
15 m (49.22 ft)	**6XV1870-8AN15**
IE connecting cable M12-180/IE FC RJ45 Plug 145 axial outlet Pre-assembled IE FC TP Trailing Cable GP 2 x 2 (PROFINET Type C) with M12 plugs (D-coded) and IE FC RJ45 plug, IP65/IP67 degree of protection Length:	
• 2 m (6.56 ft)	**6XV1871-5TH20**
• 3 m (9.84 ft)	**6XV1871-5TH30**
• 5 m (16.41 ft)	**6XV1871-5TH50**
• 10 m (32.81 ft)	**6XV1871-5TN10**
• 15 m(49.22 ft)	**6XV1871-5TN15**
IE M12 Plug PRO axial outlet For assembly in the field, M12 plug-in connector (D-coded), metal enclosure, UL, fast connection method, plug connector	
• 1 unit	**6GK1901-0DB20-6AA0**
• 8 units	**6GK1901-0DB20-6AA8**

PROFIBUS connecting cable

Flexible plug-in cables/connectors for transmission of data (up to 12 Mbit/s) from PROFIBUS stations.

Selection and ordering data

Description	Article No.
PROFIBUS M12 plug-in cable axial outlet Pre-assembled with two 5-pole M12 plug/socket connectors, UL Length:	
0.3 m (0.98 ft)	**6XV1830-3DE30**
0.5 m (1.64 ft)	**6XV1830-3DE50**
1.0 m (3.28 ft)	**6XV1830-3DH10**
1.5 m (4.92 ft)	**6XV1830-3DH15**
2.0 m (6.56 ft)	**6XV1830-3DH20**
3.0 m (9.84 ft)	**6XV1830-3DH30**
5.0 m (16.41 ft)	**6XV1830-3DH50**
10 m (32.81 ft)	**6XV1830-3DN10**
15 m (49.22 ft)	**6XV1830-3DN15**
PROFIBUS M12 plug connector axial outlet 5-pole, B-coded, metal enclosure, 1 package = 5 units	
• Pin insert	**6GK1905-0EA00**
• Female contact insert	**6GK1905-0EB00**

Accessories

Connecting cables/plug-in connectors for supplying the Control Unit with power

Selection and ordering data

Description	Article No.
7/8" plug-in cable, axial outlet For 24 V switched and unswitched, pre-assembled with 2 × 7/8" at both ends (axial), 5 × 1.5 mm², 5-pole plug/socket connectors Length:	
0.3 m (0.98 ft)	**6XV1822-5BE30**
0.5 m (1.64 ft)	**6XV1822-5BE50**
1.0 m (3.28 ft)	**6XV1822-5BH10**
1.5 m (4.92 ft)	**6XV1822-5BH15**
2.0 m (6.56 ft)	**6XV1822-5BH20**
3.0 m (9.84 ft)	**6XV1822-5BH30**
5.0 m (16.41 ft)	**6XV1822-5BH50**
10 m (32.81 ft)	**6XV1822-5BN10**
15 m (49.22 ft)	**6XV1822-5BN15**
7/8" power cable, angled outlet, pre-assembled at one end For 24 V switched and unswitched, pre-assembled with 1 × 7/8" angled at one end, 5 × 1.5 mm² 5-pole socket connector Length:	
• 3 m (9.84 ft)	**3RK1902-3GB30**
• 5 m (16.41 ft)	**3RK1902-3GB50**
• 10 m (32.81 ft)	**3RK1902-3GC10**
7/8" power cable, angled outlet For 24 V switched and unswitched, pre-assembled with 2 × 7/8" angled at both ends, 5 × 1.5 mm², 5-pole plug/socket connectors Length:	
• 3 m (9.84 ft)	**3RK1902-3NB30**
• 5 m (16.41 ft)	**3RK1902-3NB50**
• 10 m (32.81 ft)	**3RK1902-3NC10**
7/8" plug-in connector, axial outlet 5-pole, B-coded, plastic enclosure, 1 package = 5 units	
• Pin insert (OUT)	**6GK1905-0FA00**
• Female contact insert (IN)	**6GK1905-0FB00**
7/8" plug-in connector, angled outlet 5-pole, B-coded, plastic enclosure, 1 package = 5 units	
• Pin insert (OUT)	**3RK1902-3BA00**
• Female contact insert (IN)	**3RK1902-3DA00**

Connecting cables and connectors for digital inputs and outputs

Selection and ordering data

Description	Article No.
M12 plug-in cable pre-assembled at both ends, axial outlet M12 straight plug, M12 straight socket, screw mounting, 3-pole, 3 x 0.34 mm², A-coded, black PUR sheath, max. 4 A Length:	
• 1.5 m (4.92 ft)	**3RK1902-4PB15-3AA0**
M12 connector Y cable for distributed I/Os for dual connection of I/Os using single 5-pole M12 cables, 200 mm (7.87 in)	
• Straight	**6ES7194-6KA00-0XA0**

Connecting cables and connectors for analog inputs

Selection and ordering data

Description	Article No.
M12 cable connector 8-pole plug connector	
• Straight cable outlet	Ordered from and supplied by KnorrTec
T distribution piece To connect two analog inputs 8-pole M12 male connector to 2 × 4-pole M12 socket, angled	Ordered from and supplied by KnorrTec

Connecting cables for Power Modules

Connecting cables pre-assembled at one end and connector sets to connect to the line supply

Selection and ordering data

Description	Article No.
Connecting cable pre-assembled at one end Power supply cable, open at one end, for HAN Q4/2, angled, 4 × 4 mm²	
• 1.5 m (4.92 ft) long	**3RK1911-0DB13**
• 5 m (16.41 ft) long	**3RK1911-0DB33**
Connector set for the power supply Female contact insert HAN Q4/2, 5 socket contacts, grommet housing, angled outlet including screw connection	
• 2.5 mm²	**3RK1911-2BE50**
• 4 mm²	**3RK1911-2BE10**
• 6 mm²	**3RK1911-2BE30**

Connector insert for power loop-through

Selection and ordering data

Description	Article No.
Connector set for power loop-through Plug insert HAN Q4/2, 4 socket contacts, grommet housing, angled outlet including screw connection	
• 2.5 mm²	**3RK1911-2BF50**
• 4 mm²	**3RK1911-2BF10**

Accessories

Power bus distribution 400 V in IP65 degree of protection

Selection and ordering data

Not essential (daisy chaining within device); use is optional.

Description	Article No. (to order, see Solution Partners)
Power T clamp connector for 2.5 ... 6 mm² With attached 7-pole connector, female contact insert, grommet housing, UL Seals for various cable cross-sections must be ordered separately	Ordered from and supplied by Harting
T clamp connector Completely pre-assembled	Ordered from and supplied by KnorrTec
T distributor box, IDC connection power cable Pre-assembled, UL, uncut power cable, 2.5 ... 6 mm² Push-in connection: 1.5 ... 6 mm² Seals for various cable cross-sections must be ordered separately	Ordered from and supplied by Weidmüller
Y distributor For direct connection of 400 V supply line, HAN Q4/2, conductor cross-section 1.5 ... 4 mm²	Ordered from and supplied by Harting

More information

An overview of further supplementary products (e.g. connectors and cables) can be found under the following link:
www.siemens.com/distributeddrives-supplementaryproducts

For further information about the connecting cables and plug-in connectors mentioned above, please refer to Catalog IK PI.

Further selected accessories are available from Siemens Solution Partners.
Please go to the "Solution Partner Finder" and select technology "Distributed Field Installation System".
www.siemens.com/automation/partnerfinder

Overview

A Spare Parts Kit can be ordered, comprising small parts such as replacement seals, caps, PROFIBUS address windows and screws.

Selection and ordering data

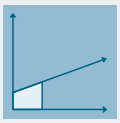
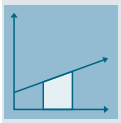
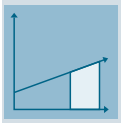
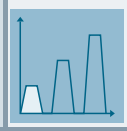
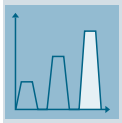
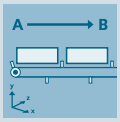
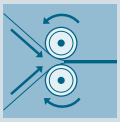
Description		Article No.
Spare Parts Kit for SINAMICS G110M Comprising replacement seals, caps, connectors and screws	NEW	**6SL3500-0TK02-0AA0**

SINAMICS G110D distributed inverters
0.75 kW to 7.5 kW (1 hp to 10 hp)

SINAMICS G110D distributed inverters

0.75 kW to 7.5 kW (1 hp to 10 hp)

Application

Use	Requirements for torque accuracy / speed accuracy / position accuracy / coordination of axes / functionality					
	Continuous motion			Non-continuous motion		
	Basic	Medium	High	Basic	Medium	High
						
Pumping, ventilating, compressing 	Centrifugal pumps Radial / axial fans Compressors	Centrifugal pumps Radial / axial fans Compressors	Eccentric screw pumps	Hydraulic pumps Metering pumps	Hydraulic pumps Metering pumps	Descaling pumps Hydraulic pumps
	V20 G110 G120C G120P	G120P G130/G150 G180 [1]	S120	G120	S110	S120
Moving 	Conveyor belts Roller conveyors Chain conveyors	Conveyor belts Roller conveyors Chain conveyors Lifting/lowering devices Elevators Escalators/moving walkways Indoor cranes Marine drives Cable railways	Elevators Container cranes Mining hoists Excavators for open-cast mining Test bays	Acceleration conveyors Storage and retrieval machines	Acceleration conveyors Storage and retrieval machines Cross cutters Reel changers	Storage and retrieval machines Robotics Pick & place Rotary index tables Cross cutters Roll feeds Engagers/disengagers
	V20 G110 **G110D** G110M G120C	G120 G120D G130/G150 G180 [1]	S120 S150 DCM	G120 G120D	S110 DCM	S120 DCM
Processing 	Mills Mixers Kneaders Crushers Agitators Centrifuges	Mills Mixers Kneaders Crushers Agitators Centrifuges Extruders Rotary furnaces	Extruders Winders/unwinders Lead/follower drives Calenders Main press drives Printing machines	Tubular bagging machines Single-axis motion control such as • Position profile • Path profile	Tubular bagging machines Single-axis motion control such as • Position profile • Path profile	Servo presses Rolling mill drives Multi-axis motion control such as • Multi-axis positioning • Cams • Interpolations
	V20 G120C	G120 G130/G150 G180 [1]	S120 S150 DCM	G120	S110	S120 DCM
Machining 	Main drives for • Turning • Milling • Drilling	Main drives for • Drilling • Sawing	Main drives for • Turning • Milling • Drilling • Gear cutting • Grinding	Axis drives for • Turning • Milling • Drilling	Axis drives for • Drilling • Sawing	Axis drives for • Turning • Milling • Drilling • Lasering • Gear cutting • Grinding • Nibbling and punching
	S110	S110 S120	S120	S110	S110 S120	S120

SINAMICS G110D is ideally suited for basic conveyor system applications in the industrial environment for which a distributed drive with communications capability is required. This applies in particular to distribution logistics and airports.

SINAMICS G110D is also suitable for many additional low-performance applications in many sectors, e.g. in the automotive sector, in the food and beverage industry (without surfactants) and in the packaging industry.

Specific examples and descriptions of applications can be found on the Internet at www.siemens.com/sinamics-applications

More information

You may also be interested in these drives:

- Simple applications in degree of protection IP65, integrated in motor ⇒ SINAMICS G110M
- With positioning function in degree of protection IP65 ⇒ SINAMICS G120D
- More performance, higher functionality for the control cabinet in IP20 degree of protection ⇒ SINAMICS G120, SINAMICS G120C
- With positioning function in the control cabinet in IP20 degree of protection ⇒ SINAMICS S110

[1] Industry-specific inverters.

Overview

The SINAMICS G110D distributed inverter series is the solution for basic drive tasks, especially in the field of conveyor systems. The inverter allows the speed of three-phase asynchronous (induction) motors to be continually controlled and fulfills the requirements of conveyor-related applications with open-loop frequency control. It can be optimally integrated into the system thanks to its compact and low-profile design in an IP65 degree of protection. It can be optimally integrated into the Siemens TIA world of automation via AS-Interface.

With its wide power range from 0.75 kW to 7.5 kW, it is suitable for a wide range of distributed drive solutions.

Example: SINAMICS G110D, frame size FSA

Reasons for using distributed drive systems

- Modular drive solutions – therefore standardized mechatronic elements that can be individually tested
- A control cabinet is not required, resulting in a smaller space requirement and lower cooling requirements
- Long cables between the inverter and motor can be avoided (which means lower power losses, reduced noise emission and lower costs for shielded cables and additional filters)
- Distributed configurations offer considerable benefits for conveyor systems with their extensive coverage (e.g. in the automotive and logistics sectors)

Siemens family of distributed drives

Siemens offers an innovative portfolio of inverters to optimally implement distributed drive solutions. The strengths of the individual members of the drive family permit simple adaptation to the widest range of application demands:

- Identical connection systems
- Identical mounting dimensions for SINAMICS G110D and SINAMICS G120D
- Standard commissioning and configuration tool

Products from the family of distributed drives:

- SINAMICS G110D inverters
- SINAMICS G110M frequency inverters
- SIMATIC ET 200pro FC-2 frequency inverters (available soon)
- SINAMICS G120D inverters
- SIRIUS M200D motor starters

Device design

SINAMICS G110D is a compact inverter in IP65 degree of protection where the Control Unit (CU) and Power Module (PM) function units are combined in one device.

The closed-loop control electronics controls and monitors the power electronics and the connected motor in several different control types that can be selected. The digital inputs and analog inputs on the device mean that sensors can be simply and directly connected at the drive. The input signals can either be directly linked within the closed-loop control or they can be transferred to the central control via AS-Interface for further processing within the context of the overall plant.

The power electronics supplies the motor in the power range from 0.75 kW to 7.5 kW. It is controlled (open-loop) from the microprocessor-based control. State-of-the-art IGBT technology with pulse-width-modulation is used for highly reliable and flexible motor operation. Comprehensive protection functions provide a high degree of protection for the inverter and motor. The unusually low profile mechanical design is optimized so that the device can be directly used in the plant or system. The compact inverter has the same drilling dimensions for all power ratings (standard footprint). Further, the dimensions are identical to those of the SINAMICS G120D inverter. This significantly simplifies the mechanical design, installation and retrofit of a system.

The latest technical documentation (catalogs, dimension drawings, certificates, manuals and operating instructions), are available in the Internet at the following address:

www.siemens.com/sinamics-g110d/documentation

and offline on the DVD-ROM CA 01 in the Drive Technology Configurator (DT Configurator). In addition, the DT Configurator can be used on the Internet without requiring any installation. The DT Configurator can be found in the Siemens Industry Mall at the following address:

www.siemens.com/dt-configurator

STARTER commissioning tool

The STARTER commissioning tool (V4.1.3 and higher) allows menu-prompted commissioning and maintenance of SINAMICS G110D inverters. The operator guidance combined with comprehensive, user-friendly functions for the relevant drive solution allow you to commission the device quickly and easily.

Selection and ordering data

Rated power [1]		Rated output current [2]	Input current	Frame size	**SINAMICS G110D with integrated line filter class A**	**SINAMICS G110D with integrated line filter class A and integrated maintenance switch**
kW	hp	A	A		Article No.	Article No.
380 … 500 V 3 AC [3]						
0.75	1	2.3	2	FSA	**6SL3511-0PE17-5AM0**	**6SL3511-1PE17-5AM0**
1.5	1.5 [4]	4.3	3.8	FSA	**6SL3511-0PE21-5AM0**	**6SL3511-1PE21-5AM0**
3	4	7.7	7	FSA	**6SL3511-0PE23-0AM0**	**6SL3511-1PE23-0AM0**
4	5	10.2	9.1	FSB	**6SL3511-0PE24-0AM0**	**6SL3511-1PE24-0AM0**
5.5	7.5	13.2	12.2	FSC	**6SL3511-0PE25-5AM0**	**6SL3511-1PE25-5AM0**
7.5	10	19	17.9	FSC	**6SL3511-0PE27-5AM0**	**6SL3511-1PE27-5AM0**

Benefits

- Wide power range from 0.75 kW to 7.5 kW
- Fast commissioning and maintenance as well as extended diagnostic functions and communications capability with AS-Interface according to specification 3.0:
  - Reduced number of interfaces
  - Plant-wide engineering
  - Easy to handle
- Mechanical design, installation and retrofit of systems are significantly simplified as a result of the compact and space-saving design with an extremely low profile and with the same drilling dimensions for all power ratings; further, the dimensions are identical with those of the SINAMICS G120D inverter.
- Easy commissioning and maintenance as a result of the same, standardized connectors for the bus, power and I/O connections (ISO 23570) for the complete range of power ratings of SINAMICS G110D and SINAMICS G120D.
- The same connectors are used as for the SIRIUS M200D motor starter
- Simple, standard implementation of completely distributed plant and system concepts by using products in a scalable fashion:
  - SIRIUS M200D (motor starter)
  - SINAMICS G110D (inverter for basic conveyor-related applications)
  - SINAMICS G110M (inverter for conveyor-related applications)
  - SIMATIC ET 200pro FC-2 (inverter for distributed IOs, available soon)
  - SINAMICS G120D (inverter for demanding conveyor-related applications)
- High degree of operator friendliness by using the Intelligent Operator Panel (IOP) to parameterize, diagnose, control (open-loop) and copy drive parameters in the BOP
- Easy to replace thanks to a plug-in design and the use of a memory card, providing the highest degree of service friendliness
- Simple connection, engineering, data management as well as control of the inverter in sophisticated plants and systems as a result of the consequential integration in TIA (Totally Integrated Automation)
- Using the optional maintenance switch, the inverter can be simply disconnected from the line supply when service is required, without any additional components or without additional wiring costs when configuring the system
- Using the optional manual local control, commissioning is fast and can be limited to specific areas, the application can be manually pre-tested on site and the system can be cleared or emptied without requiring comprehensive options.
- By being able to connect up to 5 sensors directly at the unit, practically all of the drive-relevant information can be directly managed; local pre-processing of the signals takes the load off the fieldbus and ensures a fast and reproducible response time
- Integrated EMC filter class A (acc. to EN 55011)
- Integrated brake control, brake voltages supported: 180 V DC and 205 V DC
- Integrated motor protection using a thermal motor model and evaluation of PTC, KTY or bimetal temperature sensors
- Easy replacement of devices and fast copying of parameters to the memory card using the optional memory card holder and the optional memory card
- Engineering and commissioning with standard engineering tools such as SIZER for Siemens Drives (V3.2 and higher), STARTER (V4.1.3 and higher) and Drive ES ensure fast engineering and simple commissioning - STARTER is integrated into STEP 7 with Drive ES Basic, with all the advantages of central data storage and totally integrated communication
- Software parameters for simple adaptation to 50 Hz or 60 Hz motors (IEC or NEMA motors)
- Increased degree of ruggedness and longer service life as the electronic modules are coated
- Globally certified acc. to CE, UL, C-Tick

[1] Rated power based on the rated output current I_{rated}. The rated output current I_{rated} is based on the duty cycle for high overload (HO).

[2] The rated output current I_{rated} is based on the duty cycle for high overload (HO). These current values apply at 400 V and are specified on the rating plate.

[3] With the exception of UL operation, 500 V +10 % is possible.

[4] It is not possible to make any assignment to a particular standard.

Design

The SINAMICS G110D distributed inverters are compact frequency inverters for standard drives. Each SINAMICS G110D includes both the Control Unit as well as the Power Module in one unit.

SINAMICS G110D with integrated maintenance switch and manual local control with keyswitch

SINAMICS G110D features an integrated brake chopper and is suitable for distributed drives without energy recovery capability. If generator energy is produced then this is dissipated in the externally connected braking resistors. The communication is realized via the local inputs (digital and analog) or via the AS-Interface bus integrated as standard.

SINAMICS G110D with integrated maintenance switch

The inverter is available in two versions: With and without maintenance switch. Thanks to the optional maintenance switch (this cannot be retrofitted), when service is required, the inverter can be simply disconnected from the line supply without having to have any additional components or additional wiring costs when configuring.

Accessories

Braking resistors

Excess energy in the DC link is dissipated in the braking resistors. The braking resistors are designed for use with the SINAMICS G110D. This has an integrated brake chopper (electronic switch).

Intelligent Operator Panel IOP Handheld

User-friendly and powerful operator panel for commissioning and diagnostics as well as local operator control and monitoring of SINAMICS G110D.

Manual local control with keyswitch

Master control can be toggled between automatic mode (PLC) and manual local mode using the manual local control. This can also be used to switch off the inverter. Additional functions include switching over between continuous and jog mode, starting the motor including direction of rotation and deactivating the quick stop in the manual mode.

Memory card

The parameter settings for an inverter can be stored on the SINAMICS SD card. When service is required, e.g. after the inverter has been replaced and the data have been downloaded from the memory card, the drive system is immediately ready for use again. The associated memory card holder is not included in the scope of supply of the inverter and must be separately ordered.

Card holder for memory card

To use the SINAMICS SD memory card, a card holder is required that is inserted under the blanking cover or under the manual/automatic control operator panel on the inverter.

RS232 interface cable for communication with a PC

For controlling and commissioning an inverter directly from a PC if the appropriate software (STARTER commissioning tool V4.1.3 and higher) has been installed.

USB interface cable for communication with a PC

For controlling and commissioning an inverter directly from a PC if the appropriate software (STARTER commissioning tool V4.1.3 and higher) has been installed.

Adapter for mounting the SINAMICS G110D instead of a SIRIUS M200D motor starter

Connection board kit to mount a SINAMICS G110D inverter on the connection holes of the SIRIUS M200D motor starter (assuming that there is enough space).

Connector kit for braking resistor

Connector kit for using or connecting different braking resistors.

UL connector kit

Special UL connector kit for UL-compatible applications.

Protection bar

Protection bar for protecting the connector against shearing due to mechanical stress

Connecting cable

Connector sets to connect to the line supply and the outgoing motor feeder are available as accessories as well as pre-assembled motor cables for connection to the motor.

Flexible plug-in cables to transfer data between AS-Interface participants as well as to supply the Control Unit and the Power Module with power.

Spare Parts Kit

A Spare Parts Kit is available which comprises small parts such as seals, caps and screws.

Replacement fan

A replacement fan is available, which comprises a pre-mounted unit with cover, fan and screws.

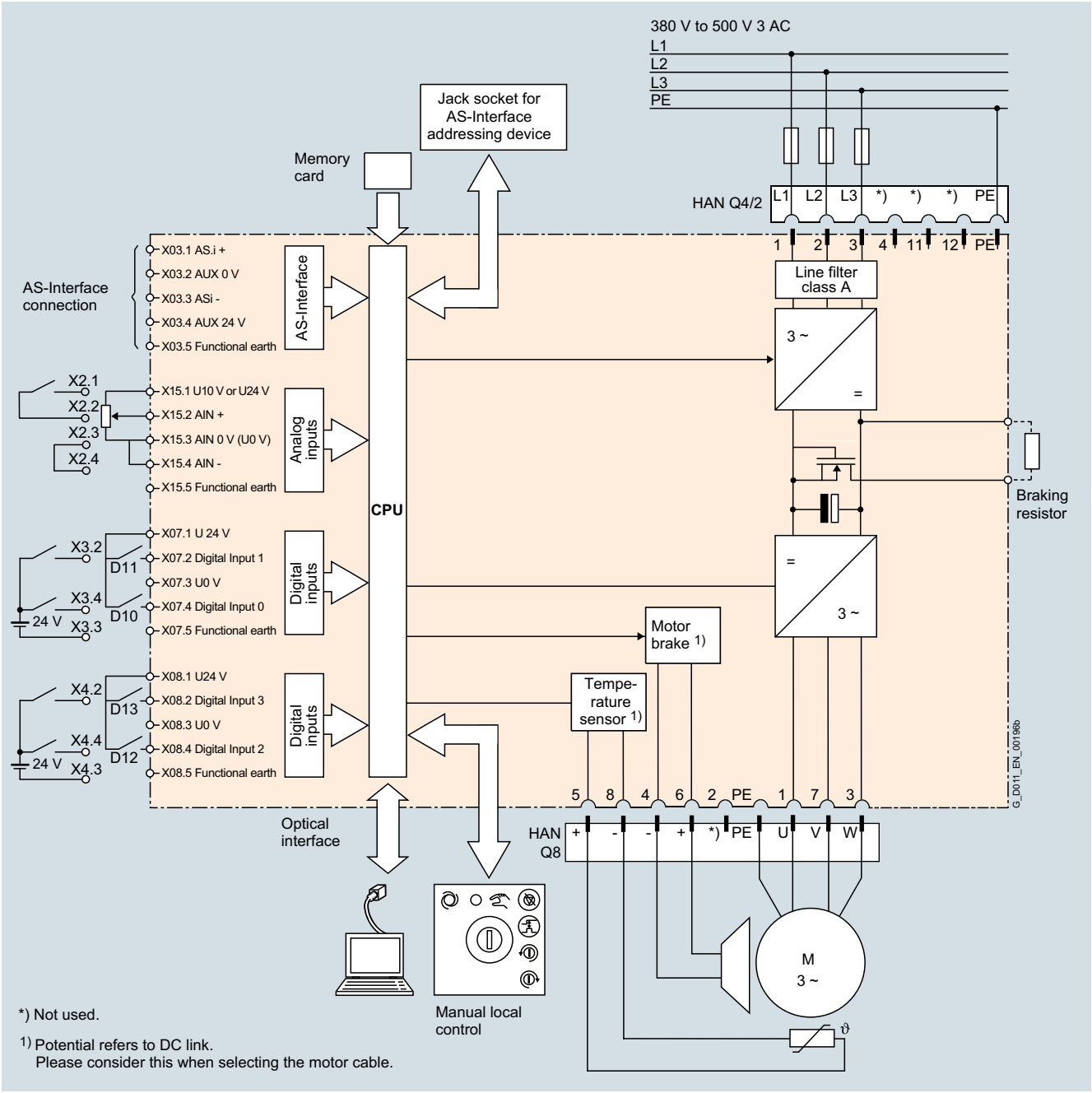
7

Integration

The SINAMICS G110D distributed inverters have, as standard, the following interfaces:

- Motor connection via HAN Q8 (connector) including control of the motor brake and temperature sensor
- Line supply connection via HAN Q4/2 (socket)
- Connection for a braking resistor in IP65 degree of protection through a 3-pin connector
- AS-Interface connection via M12 (connector)
- Connection for 4 digital inputs via M12 (socket)
- Connection for an analog input via M12 (socket); this can also be used as digital input
- Connection for an AS-Interface addressing device via jack socket

The interfaces are identical to those of the SINAMICS G120D distributed inverter and those of the SIRIUS M200D motor starter.



Connection diagram for SINAMICS G110D with integrated line filter class A

Configuration

The following electronic configuring aids and engineering tools are available for the SINAMICS G110D distributed inverters:

Drive Technology Configurator (DT Configurator) within CA 01

The interactive catalog CA 01 – the offline Industry mall of Siemens on DVD-ROM – contains over 100,000 products with approximately 5 million possible drive system product variants. The Drive Technology Configurator (DT Configurator) has been developed to facilitate selection of the correct motor and/or inverter from the wide spectrum of available drives. It is integrated as a selection tool in catalog CA 01.

Online DT Configurator

In addition, the DT Configurator can be used on the Internet without requiring any installation. The DT Configurator can be found in the Siemens Industry Mall at the following address:

www.siemens.com/dt-configurator

STARTER commissioning tool

The STARTER commissioning tool allows menu-prompted commissioning, optimization and diagnostics. Apart from the SINAMICS drives, STARTER is also suitable for the MICROMASTER 4 devices and for SINAMICS G110D with STARTER V4.1.3 and higher.

You can find further information on the STARTER commissioning tool in the section Engineering Tools.

Additional information about the STARTER commissioning tool is also available on the Internet at
www.siemens.com/starter

Drive ES engineering system

Drive ES is the engineering system that can be used to integrate the communication, configuration and data management functions of Siemens drive technology into the SIMATIC automation world easily, efficiently and cost-effectively. The STEP 7 Manager user interface provides the ideal basis for this. A variety of software packages are available for SINAMICS- Drive ES Basic, Drive ES SIMATIC and Drive ES PCS.

You can find further information on the Drive ES engineering system in the section Engineering Tools.

Additional information about the Drive ES engineering system is also available on the Internet at
www.siemens.com/drive-es

Technical specifications

Unless explicitly specified otherwise, the following technical specifications are valid for all SINAMICS G110D distributed inverters.

General technical specifications	
Mechanical specifications	
Vibratory load • Transport acc. to EN 60721-3-2 [1] • Operation acc. to EN 60721-3-3	 Class 1M2 Class 3M2
Shock load • Transport acc. to EN 60721-3-2 [1] • Operation acc. to EN 60721-3-3	 Class 1M2 Class 3M2
Ambient conditions	
Degree of protection	IP65/UL Type 3
Protection class According to EN 61800-5-1	Class III (PELV)
Touch protection According to EN 61800-5-1	Class I (with protective conductor system)
Humidity, max.	95 % at 40 °C (104 °F)
Ambient temperature • Storage [1] acc. to EN 60068-2-1 • Transport [1] acc. to EN 60068-2-1 • Operation acc. to EN 60068-2-2	 -40 ... +70 °C (-40 ... +158 °F) -40 ... +70 °C (-40 ... +158 °F) -10 ... +40 °C (14 ... +104 °F) without derating >40 ... 55 °C (104 ... +131 °F) see derating characteristics
Environmental class/harmful chemical substances • Operation acc. to EN 60721-3-3	 Class 3C2
Pollution degree According to EN 61800-5-1	2
Standards	
Compliance with standards	UL 508C (UL list number E121068), CE, C-Tick
CE marking, according to	Low-Voltage Directive 2006/95/EC
EMC Directive [2] • Frame sizes FSA to FSC with integrated line filter class A	 Category C2 [3] acc. to EN 61800-3
	Note: The EMC product standard EN 61800-3 does not apply directly to a frequency inverter but to a PDS (Power Drive System), which comprises the complete circuitry, motor and cables in addition to the inverter. The frequency inverters on their own do not generally require identification according to the EMC Directive.

[1] In product packaging.

[2] For further general information see also chapter SINAMICS G120, Technical specifications, Compliance with standards.

[3] With shielded motor cable up to 15 m.

Technical specifications

Technical specifications, control electronics	
Electrical specifications	
Operating voltage	External 24 V DC necessary
Current consumption, max. [1] (from the non-switched 24 V DC supply, yellow AS-Interface cable)	320 mA
Current consumption, max. (from the switched 24 V DC supply, black AS-Interface cable)	
• Without supplementary fan	180 mA
• With supplementary fan	350 mA
Fixed frequencies	6, parameterizable
Interfaces	
Digital inputs	4
Analog inputs (0 ... 10 V)	1
Bus interface	AS-Interface
PTC/KTY interface	Connection via Power Modules
• Motor temperature sensor	1 input, sensors that can be connected: PTC, KTY or bimetal
Control of a mechanical motor brake	Connection via Power Modules
Memory card slot	Optional
RS232 interface	Connection with RS232 interface cable via the optical inverter interface
USB interface	Connection with USB interface cable via the optical inverter interface
Open-loop/closed-loop control technique and software	
V/f linear/quadratic/ parameterizable	✓
V/f with flux current control (FCC)	✓
Software functions	• Signal interconnection with BICO technology • Automatic restart after line supply failure or operational fault • Slip compensation • Free function blocks (FFB) for logical operations • Ramp smoothing • 3 selectable drive data sets • 3 selectable command data sets (CDS) (manual/auto) • Flying restart • JOG • Technology controller (PID) • Thermal motor protection • Thermal inverter protection • Setpoint input • Motor identification • Motor holding brake

[1] Contains the current consumption of connected sensors. Analog input uses 0 V to 10 V as voltage input.

Technical specifications

General technical specifications, power electronics						
System operating voltage	380 ... 500 V AC 3 AC ±10 %					
Grid requirement, short-circuit power R_{SC}	No restriction					
Input frequency	47 ... 63 Hz					
Output frequency						
• Control mode V/f	0 ... 650 Hz (a 550 Hz limit is in preparation in order to satisfy legal requirements)					
Pulse frequency	4 kHz (standard), for higher pulse frequencies up to 16 kHz, see derating data					
Power factor λ	0.7 ... 0.85					
Inverter efficiency η	95 %					
Output voltage, max. as % of input voltage	0 ... 87 %					
Overload capability						
• High overload (HO)	• Average maximum rated output current during a cycle time of 300 s • 1.5 × rated output current (i.e. 150 % overload) over 60 s at a cycle time of 300 s • 2 × rated output current (i.e. 200 % overload) over 3 s at a cycle time of 300 s					
Electromagnetic compatibility	Integrated class A line filter according to EN 55011					
Possible braking methods	DC braking Integrated brake control supplies DC power supply for the brake					
	Line voltage	380 V AC	400 V AC	440 V AC	480 V AC	500 V AC
	Rectified brake voltage	171 V DC	180 V DC	198 V DC	216 V DC	225 V DC
	Recommended brake coil voltage for Siemens motors	170 ... 200 V DC	170 ... 200 V DC 184 ... 218 V DC [1]	184 ... 218 V DC [1]	184 ... 218 V DC [1]	–
	Disconnection on the DC side permits "fast" braking.					
• Output current, max.	• 600 mA (with UL approval) • 1 A (without UL approval)					
Permissible mounting position	Horizontal wall mounting and mounting in the horizontal position					
Relative humidity	< 95 % RH, condensation not permissible					
Cooling	• FSA: Convection • FSB and FSC: Air cooling as required using the integrated fan					
Installation altitude	• Up to 1000 m above sea level without derating • >1000 m see derating characteristics					
Short Circuit Current Rating (SCCR) [2]	40 kA					
Protection functions	• Undervoltage • Overvoltage • Overload • Ground fault • Short-circuit • Stall protection • Motor blocking protection • Motor overtemperature • Inverter overtemperature • Parameter locking					
Compliance with standards	UL 508C (UL list number E121068), CE, C-Tick					
CE marking, according to	Low-Voltage Directive 2006/95/EC					

[1] With voltage boost activated.

[2] Applies to industrial control panel installations to NEC article 409 or UL 508A.

Technical specifications

Line voltage 380 ... 500 V 3 AC		**SINAMICS G110D**					
		6SL3511-.PE17-5AM0	6SL3511-.PE21-5AM0	6SL3511-.PE23-0AM0	6SL3511-.PE24-0AM0	6SL3511-.PE25-5AM0	6SL3511-.PE27-5AM0
Rated output current I_{rated} [1]	A	2.3	4.3	7.7	10.2	13.2	19
Maximum output current I_{max}	A	4.6	8.6	15.4	20.4	26.4	38
Rated power	kW	0.75	1.5	3	4	5.5	7.5
Rated pulse frequency	kHz	4	4	4	4	4	4
Efficiency η	%	95	95	95	95	95	95
Power loss [2] at rated output current	kW	0.044	0.068	0.105	0.168	0.196	0.261
Rated input current [3]	A	2	3.8	7	9.1	12.2	17.9
Line supply connection U1/L1, V1/L2, W1/L3, PE		HAN Q4/2 (connector)	HAN Q4/2 (connector)	HAN Q4/2 (connector)	HAN Q4/2 (connector)	HAN Q4/2 (connector)	HAN Q4/2 (connector)
• Conductor cross-section	mm^2	1.5 ... 6	1.5 ... 6	2.5 ... 6	2.5 ... 6	4 ... 6	4 ... 6
Motor connection U2, V2, W2, PE, motor brake, temperature sensor		HAN Q8 (socket)	HAN Q8 (socket)	HAN Q8 (socket)	HAN Q8 (socket)	HAN Q8 (socket)	HAN Q8 (socket)
• Conductor cross-section	mm^2	1 ... 4	1 ... 4	2.5 ... 4	2.5 ... 4	4	4
Motor cable length, max.	m (ft)	15 (49)	15 (49)	15 (49)	15 (49)	15 (49)	15 (49)
Degree of protection		IP65	IP65	IP65	IP65	IP65	IP65
Dimensions							
• Width	mm (in)	445 (17.52)	445 (17.52)	445 (17.52)	445 (17.52)	445 (17.52)	445 (17.52)
• Height	mm (in)	210 (8.27)	210 (8.27)	210 (8.27)	210 (8.27)	210 (8.27)	210 (8.27)
• Depth							
- Without maintenance switch	mm (in)	125 (4.92)	125 (4.92)	125 (4.92)	165 (6.50)	240 (9.45)	240 (9.45)
- With maintenance switch	mm (in)	145 (5.71)	145 (5.71)	145 (5.71)	165 (6.50)	240 (9.45)	240 (9.45)
Frame size		FSA	FSA	FSA	FSB	FSC	FSC
Weight, approx.							
• Without maintenance switch	kg (lb)	6.7 (14.8)	6.7 (14.8)	6.9 (15.2)	7.4 (16.3)	9.4 (20.7)	9.5 (20.9)
• With maintenance switch	kg (lb)	7 (15.4)	7 (15.4)	7.2 (15.9)	7.7 (17)	9.7 (21.4)	9.8 (21.6)

[1] The rated output current I_{rated} is based on the duty cycle for high overload (HO).

[2] Typical values. Additional information is available on the Internet at http://support.automation.siemens.com/WW/view/en/94059311

[3] The input current depends on the motor load and line impedance. The input currents apply for load at rated power for a line impedance corresponding to u_K = 1 %.

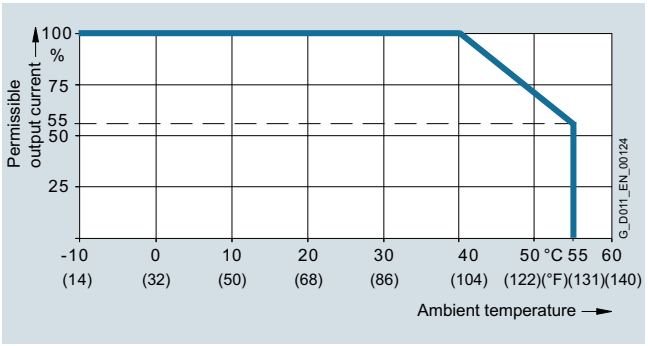
Characteristic curves

Derating data

Pulse frequency

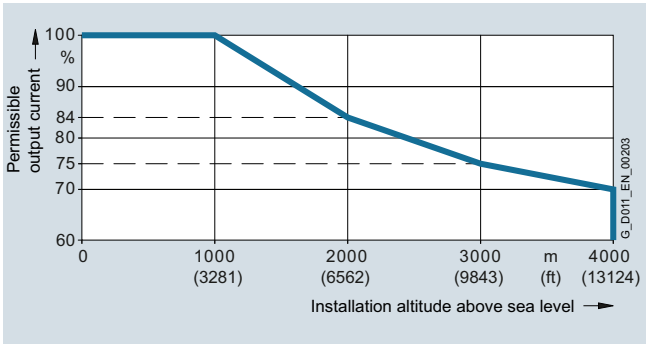
Rated power at 400 V 3 AC		**Rated output current in A** for a pulse frequency of						
kW	hp	4 kHz	6 kHz	8 kHz	10 kHz	12 kHz	14 kHz	16 kHz
0.75	1	2.2	1.9	1.5	1.3	1.1	1	0.9
1.5	1.5 [1)]	4.1	3.5	2.9	2.5	2.1	1.8	1.6
3	4	7.7	6.5	5.4	4.6	3.9	3.5	3.1
4	5	10.2	8.7	7.1	6.1	5.1	4.6	4.1
5.5	7.5	13.2	11.2	9.2	7.9	6.6	5.9	5.3
7.5	10	19	16.2	13.3	11.4	9.5	8.6	7.6

Ambient temperature

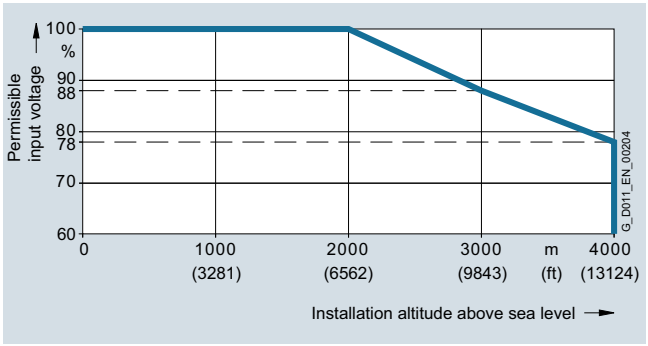


Permissible output current as a function of ambient temperature for frame sizes FSA to FSC

Installation altitude



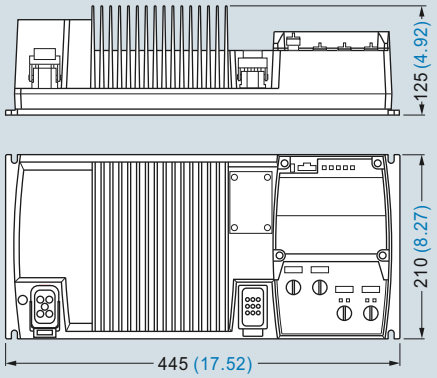
Permissible output current as a function of installation altitude for frame sizes FSA to FSC

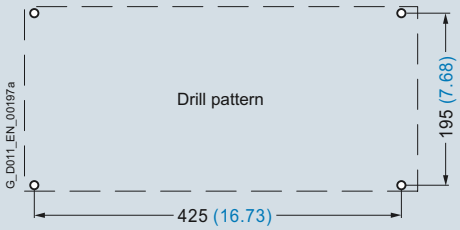


Permissible input voltage as a function of installation altitude for frame sizes FSA to FSC

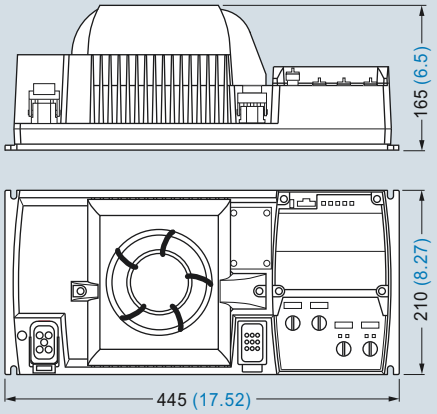
[1)] It is not possible to make any assignment to a particular standard.

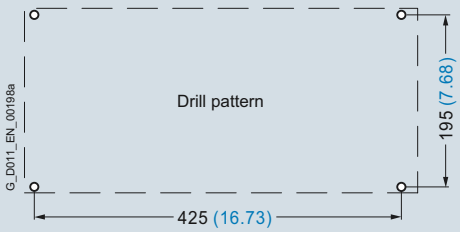
Dimensional drawings



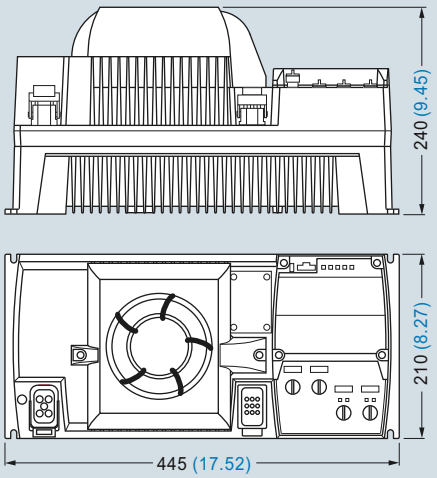


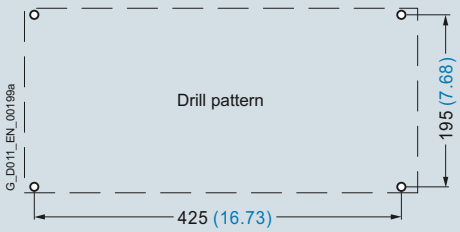
SINAMICS G110D, frame size FSA, with integrated line filter class A





SINAMICS G110D, frame size FSB, with integrated line filter class A

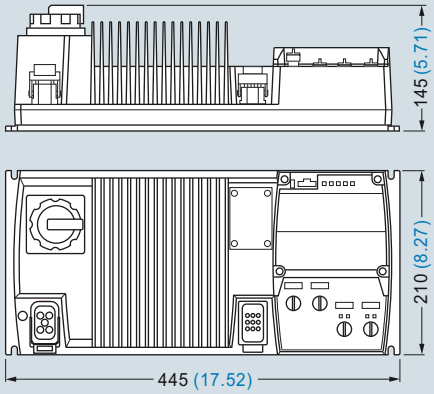


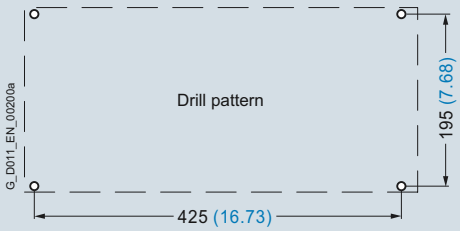


SINAMICS G110D, frame size FSC, with integrated line filter class A

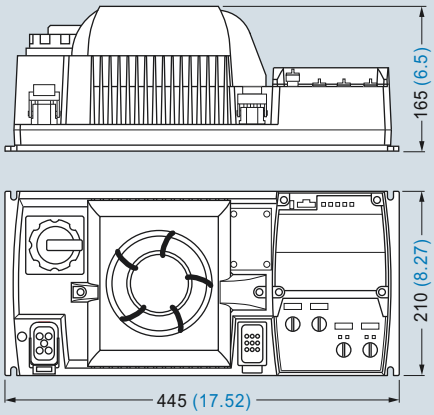
Mounted with 4 M5 studs, 4 M5 nuts, 4 M5 washers.
Ventilation clearance required (for wall mounting) at top and bottom: 150 mm (5.9 inches).
All dimensions in mm (values in brackets are in inches).

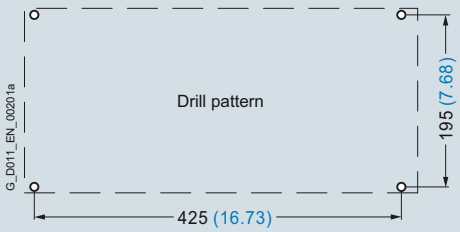
Dimensional drawings



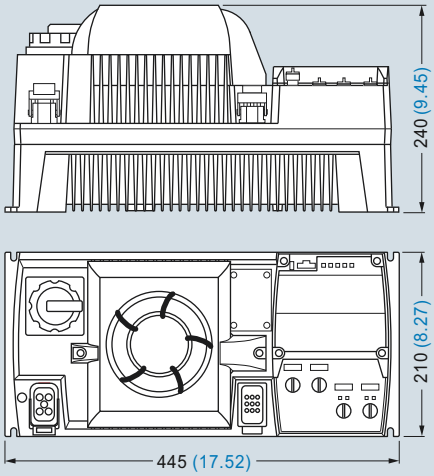


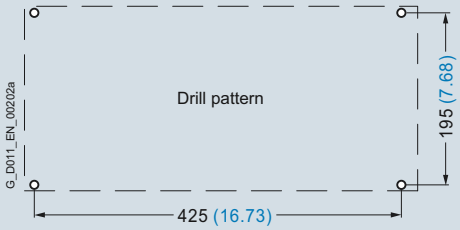
SINAMICS G110D, frame size FSA, with integrated line filter class A and maintenance switch





SINAMICS G110D, frame size FSB, with integrated line filter class A and maintenance switch





SINAMICS G110D, frame size FSC, with integrated line filter class A and maintenance switch

Mounted with 4 M5 studs, 4 M5 nuts, 4 M5 washers.

Ventilation clearance required (for wall mounting) at top and bottom: 150 mm (5.9 inches).

All dimensions in mm (values in brackets are in inches).

Selection and ordering data

The following table lists recommendations for additional line-side components, such as fuses and circuit breakers.

Note for use in compliance with IEC standards:

3NA3 type fuses and 3RV type circuit breakers are recommended for European countries. The values in the table take into account the overload capability of the inverter.

Notes for use in compliance with UL regulations:

Fuses for use in North America must be UL-certified, Class J fuses with a rated voltage of 600 V AC.

Short Circuit Current Rating (SCCR)
according to UL

Applies to industrial control panel installations according to NEC Article 409 or UL 508A

- SINAMICS G110D: 40 kA

Additional information about the listed fuses and circuit breakers can be found in Catalogs LV 10, IC 10 and IC 10 AO.

Individual protection

Rated power		SINAMICS G110D		IEC-compliant			UL-compliant	
				Fuse		Circuit breaker	Fuse type Rated voltage 600 V AC	
				Current				Current
kW	hp	Type 6SL3511-...	Frame size	A	Article No.	Article No.	Class	A
380 ... 500 V 3 AC								
0.75	1	. PE17-5AM0	FSA	10	**3NA3803**	**3RV2011-1FA10**	J	10
1.5	1.5 [1]	. PE21-5AM0	FSA	10	**3NA3803**	**3RV2011-1JA10**	J	10
3	4	. PE23-0AM0	FSA	16	**3NA3805**	**3RV2021-4AA10**	J	16
4	5	. PE24-0AM0	FSB	20	**3NA3807**	**3RV2021-4BA10**	J	20
5.5	7.5	. PE25-5AM0	FSC	20	**3NA3807**	**3RV2021-4EA10**	J	20
7.5	10	. PE27-5AM0	FSC	32	**3NA3812**	**3RV2021-4FA10**	J	32

Group protection (installation on power bus)

For installations with several inverters, the inverters are normally supplied from a 400 V power bus. Further information can be found in the operating instructions on the Internet at
www.siemens.com/sinamics-g110d/documentation

Information about UL-compliant group protection for applications in North America can be found on the Internet at
http://support.automation.siemens.com/WW/view/en/35935349/130000

[1] It is not possible to make any assignment to a particular standard.

Overview

Excess energy in the DC link is dissipated in the braking resistors. The braking resistors are intended for use with SINAMICS G110D, which have an integrated brake chopper, but cannot regenerate energy to the line supply. For regenerative operation, e.g. the braking of a rotating mass with high moment of inertia, a braking resistor must be connected to convert the resulting energy into heat.

The braking resistors can be mounted above and to the side of the SINAMICS G110D distributed inverter. The heat dissipated by the braking resistor must not diminish the inverter cooling. This is the reason that a minimum clearance of 150 mm must be maintained between the inverter and braking resistor.

Every braking resistor is equipped with thermal protection. The thermal protection prevents the braking resistor from being thermally overloaded.

All of the braking resistors are provided as standard with a cable that is pre-assembled and 500 mm long.

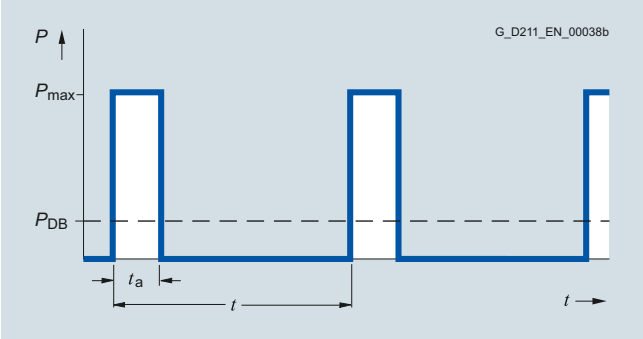
Technical specifications

Line voltage 380 ... 500 V 3 AC		**Braking resistor**		
		6SL3501-0BE08-6AA0	6SL3501-0BE12-1AA0	6SL3501-0BE14-1AA0
Resistance	Ω	400	160	80
Rated power P_{DB} (Continuous braking power)	kW	0.075	0.2	0.375
Peak power P_{max} (load period t_a = 12 s over a period t = 240 s)	kW	1.5	4	7.5
Degree of protection		IP65	IP65	IP65
Dimensions				
• Width	mm (in)	465 (18.31) [1]	465 (18.31) [1]	465 (18.31) [1]
• Height	mm (in)	199 (7.83)	199 (7.83)	259 (10.20)
• Depth	mm (in)	120 (4.72)	120 (4.72)	120 (4.72)
Weight, approx.	kg (lb)	3.5 (7.7)	4.5 (9.9)	7 (15.4)
Suitable for SINAMICS G110D (Frame size)		6SL3511- . PE17-5AM0 (FSA) 6SL3511- . PE21-5AM0 (FSA)	6SL3511- . PE23-0AM0 (FSA) 6SL3511- . PE24-0AM0 (FSB)	6SL3511- . PE25-5AM0 (FSC) 6SL3511- . PE27-5AM0 (FSC)

Selection and ordering data

Rated power		**Suitable for SINAMICS G110D**		**Braking resistor**
kW	hp	Type 6SL3511-...	Frame size	Article No.
380 ... 500 V 3 AC				
0.75	1	. PE17-5AM0	FSA	**6SL3501-0BE08-6AA0**
1.5	1.5 [2]	. PE21-5AM0	FSA	
3	4	. PE23-0AM0	FSA	**6SL3501-0BE12-1AA0**
4	5	. PE24-0AM0	FSB	
5.5	7.5	. PE25-5AM0	FSC	**6SL3501-0BE14-1AA0**
7.5	10	. PE27-5AM0	FSC	

Characteristic curves



Load diagram for the braking resistors
t_a = 12 s
t = 240 s

[1] For the specified width (465 mm) the required bending radius of the braking resistor connecting cable to the SINAMICS G110D has not been taken into account.

[2] It is not possible to make any assignment to a particular standard.

Accessories

Intelligent Operator Panel IOP Handheld

IOP Handheld for mobile use

The IOP Handheld is a very user-friendly and powerful operator panel for commissioning and diagnostics as well as local operator control and monitoring of SINAMICS G110D, SINAMICS G120D and SINAMICS G110M distributed inverters.

The IOP supports both entry-level personnel and drive experts. Thanks to the large plain text display, the menu-based operation and the application wizards, it is easy to commission standard drives. A drive can be essentially commissioned without having to use a printed parameter list - as the parameters are displayed in plain text, and are provided explanatory help texts and the parameter filtering function.

Application wizards interactively guide you when commissioning important applications such as conveyor technology, pumps, fans and compressors.

There is a basic commissioning wizard for general commissioning.

The drives are easily controlled manually using directly assigned buttons and the navigation wheel. The IOP Handheld has a dedicated switchover button to switch over from automatic to manual mode.

The inverter can be diagnosed in a user-friendly fashion using the plain text display of faults and alarms. Help texts can be obtained by pressing the INFO button.

Up to two process values can be displayed graphically or numerically on the status screen/status display.

Process values can also be displayed in technological units.

The IOP Handheld supports standard commissioning of identical drives. For this purpose, a parameter list can be copied from an inverter into the IOP Handheld and downloaded into other drive units of the same type as required.

The IOP supports the following languages [1]: German, English, French, Italian, Spanish, Portuguese, Dutch, Swedish, Russian, Czech, Polish, Turkish, Finnish.

In addition to the IOP, the IOP Handheld includes a housing with the rechargeable batteries, charging unit and RS232 connecting cable. The charging unit is supplied with connector adapters for Europe, the US and UK. When the batteries are fully charged, the operating time is up to 8 hours.

To connect the IOP Handheld to SINAMICS G110D, SINAMICS G120D or SINAMICS G110M, the RS232 connecting cable with optical interface is required in addition.

Updating the IOP Handheld

The IOP Handheld can be updated and expanded using the integrated USB interface.

Data to support future drive systems can be transferred from the PC to the IOP Handheld via drag & drop. Further, the USB interface allows user languages and wizards that will become available in the future to be subsequently downloaded and the firmware to be updated for the IOP Handheld [1].

The IOP is supplied with power via the USB interface during an update.

Selection and ordering data

Description	Article No.
IOP Handheld For use with SINAMICS G120, SINAMICS G120C, SINAMICS G120P, SINAMICS G110D, SINAMICS G120D, SINAMICS G110M and SINAMICS S110 Included in the scope of delivery: • Intelligent Operator Panel IOP • Handheld housing • Rechargeable batteries (4 × AA) • Charging unit (international) • RS232 connecting cable (length 3 m, for use with SINAMICS G120, SINAMICS G120C, SINAMICS G120P and SINAMICS S110) • USB cable (1 m long)	**6SL3255-0AA00-4HA0**
RS232 connecting cable With optical interface to connect the SINAMICS G110D, SINAMICS G120D or SINAMICS G110M inverters to the IOP Handheld (2.5 m long)	**3RK1922-2BP00**

[1] Additional information is available at http://support.automation.siemens.com/WW/view/en/67273266

Accessories

Manual local control with keyswitch

Example: SINAMICS G110D and manual local control with integrated keyswitch

The manual local control is a simple method to locally control and commission the SINAMICS G110D distributed inverter.

To switch over from the automatic to the manual mode or to switch off the inverter, there is a keyswitch from which the key can be withdrawn in each of the three operating modes (Auto/ Off/Local).

- The inverter is controlled via the PLC in "Auto" mode
- In the "Off" state, the device is shut down (however, the line supply voltage is still connected)
- The drive is locally and directly controlled in the "Local" setting. The device is simply controlled using directly assigned buttons. The following functions can be selected:
  - Switching over between continuous operation/jog mode
  - On/Counter-clockwise
  - On/Clockwise
  - Deactivate Quick Stop

The manual local control is mounted on the inverter instead of the standard blanking cover. This means that it can be retrofitted at a later date.

Selection and ordering data

Description	Article No.
Manual local control with keyswitch	**6SL3555-0PL00-2AA0**

Memory card

SINAMICS memory card (SD card)

The parameter settings for an inverter can be stored on the SINAMICS SD card. When service is required, e.g. after the inverter has been replaced and the data have been downloaded from the memory card, the drive system is immediately ready for use again. The card holder is not included in the scope of supply of the inverter and must be separately ordered.

Selection and ordering data

Description	Article No.
SINAMICS memory card (SD card)	**6SL3054-4AG00-2AA0**

Accessories

Card holder for memory card

Use of the SINAMICS SD memory card requires a card holder. This can be subsequently inserted under the blanking cover or under the optional manual local control on the inverter – where it can also remain. In addition, a Secure Digital card (SD) of up to max. 1 GB can also be used.

SINAMICS G110D with integrated card holder (in the open state)

Selection and ordering data

Description	Article No.
Card holder For memory card	**6SL3555-0PM00-0AA0**

RS232 interface cable for communication with a PC

For controlling and commissioning an inverter directly from a PC via a point-to-point connection if the appropriate software (STARTER commissioning tool [1] V4.1.3 and higher) has been installed.

Selection and ordering data

Description	Article No.
RS232 interface cable For communication with a PC	**3RK1922-2BP00**

USB interface cable for communication with a PC

For controlling and commissioning an inverter directly from a PC via a point-to-point connection if the appropriate software (STARTER commissioning tool [1] V4.1.3 and higher) has been installed.

Selection and ordering data

Description	Article No.
USB interface cable For communication with a PC (2.5 m/8.2 ft long)	**6SL3555-0PA00-2AA0**

Adapter for mounting SINAMICS G110D instead of SIRIUS M200D motor starter

For adaptation, there are connection boards that allow SINAMICS G110D to be mounted onto existing connection holes of the SIRIUS M200D motor starter (provided there is sufficient space). This means that a system can be adapted to future changes in requirements.

Selection and ordering data

Description	Article No.
Adapter For mounting SINAMICS G110D instead of SIRIUS M200D motor starter	**6SL3263-1GA20-0GA0**

STARTER commissioning tool

The STARTER commissioning tool (STARTER V4.1.3 and higher) supports the commissioning and maintenance of SINAMICS G110D inverters. The operator guidance combined with comprehensive, user-friendly functions for the relevant drive solution allow you to commission the device quickly and easily.

Selection and ordering data

Description	Article No.
STARTER commissioning tool [1] On DVD-ROM	**6SL3072-0AA00-0AG0**

[1] STARTER commissioning tool is also available on the Internet at http://support.automation.siemens.com/WW/view/en/10804985/133100

Accessories

An overview of all available accessories (e.g. connectors and cables) can be found under the following link:
www.siemens.com/distributeddrives-supplementaryproducts

Connector kit for braking resistor

A connector kit is available for connecting other braking resistors to SINAMICS G110D.

Selection and ordering data

Description	Article No.
Connector kit For braking resistor	**6SL3563-4RA00-0GA0**

UL connector kit

A special UL connector kit is required for using SINAMICS G110D in UL-compatible applications. This comprises all parts that are needed to connect power and the motor (contacts, contact housing, metal connector housing and a cable of about 7 m in length).

Selection and ordering data

Description	Article No.
UL connector kit For power and motor	**6SL3563-4UA00-0GA0**

Protection bar

Protection bars are available for the various frame sizes for protecting the connectors from shearing off in response to mechanical forces. These are mounted above and to the side of the SINAMICS G110D and protect the connectors and the key-switch of the optional manual local control.

Selection and ordering data

Description	Article No.
Protection bar	
• For frame sizes FSA and FSB	**6SL3263-1HA20-0GA0**
• For frame size FSC	**6SL3263-1HC20-0GA0**

Connecting cable and socket for AS-Interface

Selection and ordering data

Description	Article No.
AS-Interface M12 branch To connect the AS-Interface and the V_{Aux} cable to an M12 socket, UL Length:	
• 1 m (3.28 ft)	**3RK1901-1NR21**
• 2 m (6.56 ft)	**3RK1901-1NR22**
M12 socket For screw mounting, 4-pole screw-type connection max. 0.75 mm^2, A-coded, max. 4 A, UL	
• Angled	**3RK1902-4CA00-4AA0**

Connecting cables and connectors for digital inputs

Selection and ordering data

Description	Article No.
M12 plug-in cable With PUR sheath, to connect digital sensors and actuators, pre-assembled at one end, angled, plug connector, 5-pole, 5 × 0.34 mm^2, UL Length:	
• 1.5 m (4.92 ft)	**3RK1902-4HB15-5AA0**
• 5 m (16.41 ft)	**3RK1902-4HB50-5AA0**
• 10 m (32.81 ft)	**3RK1902-4HC01-5AA0**
M12 connector For screw mounting, 5-pole screw-type connection max. 0.75 mm^2, A-coded, max. 4 A, UL, plug connector	
• Straight	**3RK1902-4BA00-5AA0**
• Angled	**3RK1902-4DA00-5AA0**

Connecting cables pre-assembled at one end and connector sets to connect to the line supply

Selection and ordering data

Description	Article No.
Connecting cable pre-assembled at one end Power supply cable, open at one end, for HAN Q4/2, angled, 4 × 4 mm^2	
• 1.5 m (4.92 ft) long	**3RK1911-0DB13**
• 5 m (16.41 ft) long	**3RK1911-0DB33**
Connector set for the power supply HAN Q4/2	
• 2.5 mm^2	**3RK1911-2BE50**
• 4 mm^2	**3RK1911-2BE10**
• 6 mm^2	**3RK1911-2BE30**

Accessories

Motor cables pre-assembled at one end and connector sets to connect the inverter to the motor

Selection and ordering data

Motor cables pre-assembled at one end For motors with brake and temperature sensor with HAN Q8 connector, shielded	Article No. (HTG: supplied by Harting) (ZKT: supplied by KnorrTec)		
Cross-section	4 × 1.5 mm² 2 × (2 × 0.75 mm²)	4 × 2.5 mm² 2 × (2 × 0.75 mm²)	4 × 4 mm² 2 × 1 mm² + 2 × 1.5 mm²
• 1.5 m (4.92 ft) long	**HTG: 61 88 201 0288**	**HTG: 61 88 201 0291**	**HTG: 61 88 201 0303**
	ZKT: 70020501000150	**ZKT: 70009601000150**	**ZKT: 70017001000150**
• 3 m (9.84 ft) long	**HTG: 61 88 201 0289**	**HTG: 61 88 201 0292**	**HTG: 61 88 201 0304**
	ZKT: 70020501000300	**ZKT: 70009601000300**	**ZKT: 70017001000300**
• 5 m (16.41 ft) long	**HTG: 61 88 201 0290**	**HTG: 61 88 201 0293**	**HTG: 61 88 201 0305**
	ZKT: 70020501000500	**ZKT: 70009601000500**	**ZKT: 70017001000500**
• 10 m (32.81 ft) long	**HTG: 61 88 201 0299**	**HTG: 61 88 201 0301**	**HTG: 61 88 201 0306**
	ZKT: 70020501001000	**ZKT: 70009601001000**	**ZKT: 70017001001000**
Connector set for motor cable HAN Q8, shielded			
	HTG: 61 83 401 0131	**HTG: 61 83 401 0132**	**HTG: 61 83 401 0133**
	ZKT: 10032001	**ZKT: 10032011**	**ZKT: 10032021**

Power bus distribution 400 V in IP65 degree of protection

Selection and ordering data

Description	Ordering (see Solution Partner)
Power T clamp connector for 2.5 ... 6 mm² With attached 7-pole connector, socket insert, grommet housing, UL Seals for various cable cross-sections must be ordered separately	Ordered from and supplied by Harting
T clamp connector Completely pre-assembled	Ordered from and supplied by KnorrTec
T distributor box, IDC connection power cable Pre-assembled, UL, uncut power cable, 2.5 ... 6 mm² Push-in connection: 1.5 ... 6 mm² Seals for various cable cross-sections must be ordered separately	Ordered from and supplied by Weidmüller
Y distributor For direct connection of 400 V supply line, HAN Q4/2, conductor cross-section 1.5 ... 4 mm²	Ordered from and supplied by Harting

Additional information

An overview of further accessories (e.g. connectors and cables) can be found under the following link:
www.siemens.com/distributeddrives-supplementaryproducts

For further information about the connecting cables and plug-in connectors mentioned above, please refer to Catalog IK PI.

Further selected accessories are available from Siemens Solution Partners. Please go to the "Solution Partner Finder" and select technology "Distributed Field Installation System".
www.siemens.com/automation/partnerfinder

Overview

A Spare Parts Kit can be ordered which comprises small parts such as replacement seals, caps and screws.

Selection and ordering data

Description	Article No.
Spare Parts Kit for SINAMICS G110D Comprising replacement seals, caps and screws	**6SL3500-0TK01-0AA0**

Overview

The fans are designed for extra long service life. Replacement fans can be ordered for special applications.

Selection and ordering data

Rated power		SINAMICS G110D		**Replacement fan** (pre-mounted unit with cover, fan and screws)
kW	hp	Type 6SL3511-...	Frame size	Article No.
380 ... 500 V 3 AC				
4	5	. PE24-0AM0	FSB	**6SL3500-0TF01-0AA0**
5.5	7.5	. PE25-5AM0	FSC	
7.5	10	. PE27-5AM0		

Notes

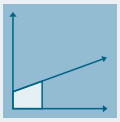
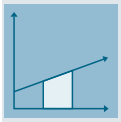
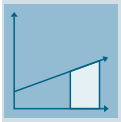
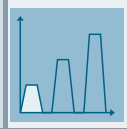
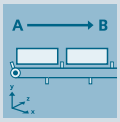
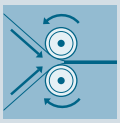
SINAMICS G120D distributed inverters
0.75 kW to 7.5 kW (1 hp to 10 hp)

SINAMICS G120D distributed inverters

0.75 kW to 7.5 kW (1 hp to 10 hp)

Introduction

Application

Use	Requirements for torque accuracy/speed accuracy/position accuracy/coordination of axes/functionality					
	Continuous motion			Non-continuous motion		
	Basic	Medium	High	Basic	Medium	High
						
Pumping, ventilating, compressing	Centrifugal pumps Radial / axial fans Compressors	Centrifugal pumps Radial / axial fans Compressors	Eccentric screw pumps	Hydraulic pumps Metering pumps	Hydraulic pumps Metering pumps	Descaling pumps Hydraulic pumps
	V20 G110 G120C G120P	G120P G130/G150 G180 [1]	S120	G120	S110	S120
Moving	Conveyor belts Roller conveyors Chain conveyors	Conveyor belts Roller conveyors Chain conveyors Lifting/lowering devices Elevators Escalators/moving walkways Indoor cranes Marine drives Cable railways	Elevators Container cranes Mining hoists Excavators for open-cast mining Test bays	Acceleration conveyors Storage and retrieval machines	Acceleration conveyors Storage and retrieval machines Cross cutters Reel changers	Storage and retrieval machines Robotics Pick & place Rotary index tables Cross cutters Roll feeds Engagers/ disengagers
	V20 G110 G110D G110M G120C	G120 **G120D** G130/G150 G180 [1]	S120 S150 DCM	G120 **G120D**	S110 DCM	S120 DCM
Processing	Mills Mixers Kneaders Crushers Agitators Centrifuges	Mills Mixers Kneaders Crushers Agitators Centrifuges Extruders Rotary furnaces	Extruders Winders/unwinders Lead/follower drives Calenders Main press drives Printing machines	Tubular bagging machines Single-axis motion control such as • Position profile • Path profile	Tubular bagging machines Single-axis motion control such as • Position profile • Path profile	Servo presses Rolling mill drives Multi-axis motion control such as • Multi-axis positioning • Cams • Interpolations
	V20 G120C	G120 G130/G150 G180 [1]	S120 S150 DCM	G120	S110	S120 DCM
Machining	Main drives for • Turning • Milling • Drilling	Main drives for • Drilling • Sawing	Main drives for • Turning • Milling • Drilling • Gear cutting • Grinding	Axis drives for • Turning • Milling • Drilling	Axis drives for • Drilling • Sawing	Axis drives for • Turning • Milling • Drilling • Lasering • Gear cutting • Grinding • Nibbling and punching
	S110	S110 S120	S120	S110	S110 S120	S120

SINAMICS G120D is ideally suited for demanding conveyor system applications in the industrial environment for which a distributed drive with communications capability is required. This applies in particular to the automotive sector, e.g. for assembly lines.

SINAMICS G120D is also suitable for many additional high-performance applications, e.g. in the airport sector, the food and beverage industry (without surfactants) and in distribution logistics (e.g. electric monorail systems).

Specific examples and descriptions of applications can be found on the Internet at www.siemens.com/sinamics-applications

More information

You may also be interested in these drives:

- Simple applications with AS-Interface in degree of protection IP65 ⇒ SINAMICS G110D
- Simple applications in degree of protection IP65, integrated in motor ⇒ SINAMICS G110M
- More performance for the control cabinet in IP20 degree of protection ⇒ SINAMICS G120, SINAMICS G120C
- With positioning function in the control cabinet in IP20 degree of protection ⇒ SINAMICS S110

[1] Industry-specific inverters.

Overview

The SINAMICS G120D distributed inverters are the solution for demanding drive tasks especially in the field of conveyor systems. SINAMICS G120D inverters continuously control the speed of three-phase asynchronous (induction) motors and fulfill all the requirements of conveyor system applications from simple frequency control through to demanding vector control and positioning requirements. With its intelligent modular design with IP65 degree of protection, it can be seamlessly integrated into the plant or system and supports a high plant availability and low stocks of spare parts. The innovative power unit concept capable of energy recovery helps to save energy. The patented implementation concept of the integrated safety functions is unique worldwide and has been extended further, without the use of external components. This drive can be optimally integrated into the Siemens TIA world of automation via PROFIBUS or PROFINET / EtherNet/IP.

With different device versions (frame sizes FSA to FSC) in a power range from 0.75 kW to 7.5 kW, it is suitable for a wide variety of drive solutions.

Example: SINAMICS G120D, frame size FSA, comprising PM250D Power Module and fail-safe CU250D-2 PN-F Control Unit

Reasons for using distributed drive systems

- Modular drive solutions – therefore standardized mechatronic elements that can be individually tested
- A control cabinet is not required, resulting in a smaller space requirement and lower cooling requirements
- Long cables between the inverter and motor can be avoided (which means lower power losses, reduced noise emission and lower costs for shielded cables and additional filters)
- Distributed configurations offer considerable benefits for conveyor systems with their extensive coverage (e.g. in the automotive and logistics sectors)

Siemens family of distributed drives

Siemens offers an innovative portfolio of frequency inverters to optimally implement distributed drive solutions. The strengths of the individual members of the drive family permit simple adaptation to the widest range of application demands:

- Identical connection systems
- Identical mounting dimensions for SINAMICS G110D and SINAMICS G120D
- Standard commissioning and configuration tool

Products from the family of distributed drives:

- SINAMICS G110D inverters
- SINAMICS G110M inverters
- SINAMICS G120D inverters
- SIMATIC ET200pro FC-2 frequency inverters (available soon)
- SIRIUS M200D motor starters

Modularity

SINAMICS G120D is a modular inverter system with IP65 degree of protection comprising various function units. The main units are

- Control Unit (CU)
- Power Module (PM)

The Control Unit controls and monitors the Power Module and the connected motor using several different closed-loop control types that can be selected. The digital inputs, analog inputs and digital outputs on the device support the simple wiring of sensors and actuators directly at the drive. The input signals can either be directly linked within the Control Unit and initiate local responses independently or they can be transferred to the central control via PROFIBUS or PROFINET / EtherNet/IP for further processing within the context of the overall plant.

The Power Module supplies the motor in a power range from 0.75 kW to 7.5 kW (1 hp to 10 hp). The Power Module is controlled by a microprocessor in the Control Unit. State-of-the-art IGBT technology with pulse-width-modulation is used for highly reliable and flexible motor operation. Comprehensive protection functions provide a high degree of protection for the Power Module and the motor. The unusually low profile mechanical design is optimized so that the device can be directly used in the plant or system. The Power Module also has the same drilling dimensions for all power ratings (standard footprint). Further, the dimensions are identical to those of SINAMICS G110D. This significantly simplifies the mechanical design, installation and retrofit of a system.

The latest technical documentation (catalogs, dimension drawings, certificates, manuals and operating instructions) is available in the Internet at the following address:

www.siemens.com/sinamics-g120d/documentation

and offline on the DVD-ROM CA 01 in the Drive Technology Configurator (DT Configurator).
In addition, the DT Configurator can be used on the Internet without requiring any installation. The DT Configurator can be found in the Siemens Industry Mall at the following address:

www.siemens.com/dt-configurator

Overview

Safety Integrated

The SINAMICS G120D distributed inverters include versions for safety-oriented applications. All Power Modules are already designed for Safety Integrated. In conjunction with a fail-safe Control Unit, the drive can be turned into a Safety Integrated Drive.

The safety function "Safe Torque Off" (STO) (certified according to IEC 61508 SIL 2, EN ISO 13849-1 PL d and Category 3) is already integrated into the standard versions of the CU240D-2 series (CU240D-2 DP and CU240D-2 PN). It can be activated either over PROFIsafe or over the safety input.

With the fail-safe variants of the CU240D-2 series (CU240D-2 DP-F xx and CU240D-2 PN-F xx) and with the entire CU250D-2 series, the fail-safe SINAMICS G120D inverter provides five safety functions which are certified according to IEC 61508 SIL 2, EN ISO 13849-1 PL d and Category 3:

- Safe Torque Off (STO)
  to protect against active movement of the drive
- Safe Stop 1 (SS1)
  for continuous monitoring of a safe braking ramp
- Safely Limited Speed (SLS)
  for protection against dangerous movements on exceeding a speed limit
- Safe direction (SDI)
  This function ensures that the drive can only rotate in the selected direction.
- Safe speed monitoring (SSM)
  This function signals if a drive is operating below a specific speed/feed velocity.

These functions can be activated by means of PROFIsafe or via the safety inputs. A safety output is provided in addition.

All safety functions can be implemented without having to use a motor encoder; the implementation costs are minimal. Existing systems in particular can be simply updated with safety technology without the need to change the motor or mechanical system.

The Safe Torque Off (STO) function can be used without restriction for all applications. The SS1, SLS, SSM and SDI functions are only permissible for applications where the load can never accelerate when the inverter is switched off. They are therefore not permitted for applications involving pull-through loads such as hoisting gear and unwinders.

Additional information is provided in chapter Highlights, section Safety Integrated.

Efficient Infeed Technology

The innovative Efficient Infeed Technology is employed in PM250D Power Modules. This technology allows the energy produced by motors operating in generator mode connected to standard inverters to be fed back into the supply system. At the same time, considerable savings can be achieved in terms of energy consumption and operating costs.

Additional information is provided in chapter Highlights, section Efficient Infeed Technology.

STARTER commissioning tool

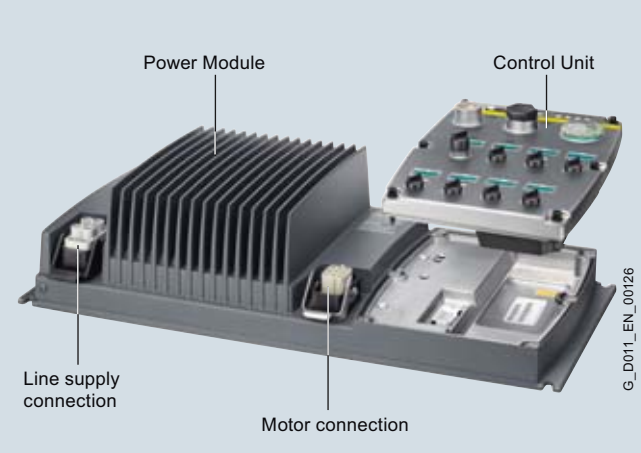
The STARTER commissioning tool (V4.3 and higher) supports the commissioning and maintenance of SINAMICS G120D inverters. The operator guidance combined with comprehensive, user-friendly functions for the relevant drive solution allow you to commission the device quickly and easily.

Benefits

- Mechanical design, installation and retrofit of systems are significantly simplified as a result of the compact and space-saving design with an extremely low profile and with the same drilling dimensions for all power ratings; further, the dimensions are identical to those of the SINAMICS G110D distributed inverter
- Wide power range from 0.75 kW to 7.5 kW (1 hp to 10 hp)
- The safety functions make it easier to integrate drives into safety-oriented machines or plants
- The innovative circuit design (bidirectional input rectifier with "pared-down" DC link) allows the kinetic energy of a load to be fed back into the line supply system. This feedback capability provides enormous potential for energy saving because generated energy no longer has to be converted into heat in a braking resistor. Braking resistors and reactors are not necessary - this is a particular advantage in terms of the project engineering outlay, space requirement and installation costs for the high IP65 degree of protection
- Easy commissioning and maintenance due to a mini USB parameterization interface and screen-based parameterization software and wizards
- The same, standardized plug-in connections for the bus, power and I/O connections (ISO 23570) for the complete range of power ratings of SINAMICS G110D, SINAMICS G110M and SINAMICS G120D
- Integrated positioning functionality supports process-related implementation of positioning tasks with a high dynamic response. Positioning can be implemented with an incremental and/or absolute encoder (SSI)
- Increased degree of ruggedness and longer service life as the electronic modules are coated
- Flexibility due to modularity for a future-oriented distributed drive concept with a high IP65 degree of protection
  - Module replacement under voltage (hot swapping)
  - The modules can be easily replaced, which makes the system extremely service friendly
- Simple, standard implementation of completely distributed plant and system concepts by using products in a scalable fashion:
  - SIRIUS M200D (motor starter)
  - SIMATIC ET200pro FC-2 (inverter for distributed IOs, available soon)
  - SINAMICS G110D (inverter for basic, conveyor-related applications)
  - SINAMICS G110M (inverter for conveyor-related applications)
  - SINAMICS G120D (inverter for demanding, conveyor-related applications)
- The same connectors are used as for the SIRIUS M200D motor starter
- Communications-capable via PROFINET / EtherNet/IP or PROFIBUS with PROFIdrive profile 4.1:
  PROFINET features:
  - Neighbor recognition (LLDP)
  - Ring topology possible (MRP (Media redundancy protocol), MRPD (media redundancy with planned duplication)
  - Isochronous real-time communication (IRT)
  - PROFIenergy
  - PROFIsafe
  - Diagnostics, interrupts
  - Shared Device
  - Attenuation meter (for FO variant)
- Integrated fiber-optic interfaces (with CU240D-2 PN-F FO and CU250D-2 PN-F FO) for use in environments with harsh EMC conditions. These help to maintain stable communication and allow preventive maintenance of the connected PROFINET communication cable by means of an integrated attenuation meter.
- Simple connection, engineering, data management as well as control of the inverter in sophisticated plants and systems as a result of the consequential integration in TIA (Totally Integrated Automation)
- High degree of operator friendliness by using the Intelligent Operator Panel (IOP) to parameterize, diagnose, control (open-loop) and copy drive parameters
- The ability to connect up to 6 sensors and up to 2 actuators to the Control Unit directly ensures that almost all the information relevant to the drive can be managed directly. Fail-safe Control Units can process signals from up to three fail-safe sensors and one fail-safe actuator. The CU240D-2 Control Units are also equipped with two analog inputs. Local preprocessing of the signals relieves the fieldbus of the task and ensures a faster and more reproducible response time
- Integrated EMC filter class A (acc. to EN 55011)
- Integrated brake control, supported brake voltage 180 V DC (at line voltage of 400 V AC – otherwise $U_{line} \times 0.45$ = brake voltage)
- Integrated motor protection using a thermal motor model and evaluation of PTC, KTY or bimetal temperature sensors
- Software parameters for simple adaptation to 50 Hz or 60 Hz motors (IEC or NEMA motors)
- Easy replacement of devices and time-saving copying of parameters to optional memory card
- Engineering and commissioning with standard engineering tools such as SIZER for Siemens Drives (V2.9 and higher), STARTER (V4.3 and higher) and Drive ES ensure fast engineering and easy commissioning – STARTER is integrated in STEP 7 with Drive ES Basic with all the advantages of central data storage and totally integrated communication
- Certified worldwide for compliance with CE, UL, cUL, C-Tick and Safety Integrated according to IEC 61508 SIL 2, EN ISO 13849-1 PL d and Category 3

Design

The SINAMICS G120D distributed inverters are modular inverters for standard drives. Each SINAMICS G120D comprises two operative units – a Power Module and a Control Unit.



PM250D Power Module with line supply and motor connections and CU240D-2 Control Unit

Power Modules

The following Power Modules are available for the SINAMICS G120D distributed inverters:

PM250D Power Modules

PM250D Power Modules (0.75 kW to 7.5 kW/1 hp to 10 hp) have an innovative circuit design which allows line-commutated energy recovery back into the line supply. This innovative circuit permits generated energy to be fed back into the supply system and therefore saves energy.

Control Units

A Control Unit performs closed-loop control functions for the inverter. In addition to the closed-loop control, it has additional functions that can be adapted to the particular application through parameterization.

The following Control Units are available for SINAMICS G120D distributed inverters:

CU240D-2 Control Units

Several Control Units are available in different versions:

- CU240D-2 DP → PROFIBUS
- CU240D-2 DP-F → PROFIBUS fail-safe
- CU240D-2 PN → PROFINET
- CU240D-2 PN-F → PROFINET fail-safe
- CU240D-2 PN-F PP → PROFINET fail-safe Push Pull
- CU240D-2 PN-F FO → PROFINET Fail-safe fiber optic

CU250D-2 Control Units

CU250D-2 Control Units can be used to implement applications with positioning requirements in the drive. Several Control Units are available in different versions:

- CU250D-2 DP-F → PROFIBUS fail-safe
- CU250D-2 PN-F → PROFINET fail-safe
- CU250D-2 PN-F PP → PROFINET fail-safe Push Pull
- CU250D-2 PN-F FO → PROFINET Fail-safe fiber optic

Supplementary system components

Intelligent Operator Panel IOP Handheld

The IOP supports both entry-level personnel and drive experts. Thanks to the large plain text display, the menu-based operation and the application wizards, it is easy to commission, diagnose and locally control standard drives.

Memory card

The parameter settings for an inverter can be stored on the SINAMICS SD card. When service is required, e.g. after the inverter has been replaced and the data have been downloaded from the memory card the drive system is immediately ready for use again. The associated slot is located on the rear of the Control Unit.

Mini USB interface cable for communication with a PC

For controlling and commissioning an inverter directly from a PC if the appropriate software (STARTER commissioning tool V4.3 and higher or SINAMICS Startdrive) has been installed.

Connecting cable for the Control Units

Flexible plug-in cables to transfer data between the Industrial Ethernet stations or PROFIBUS stations, as well as to supply power to the Control Unit.

Connecting cable for the Power Modules

Connector sets to connect to the line supply and the outgoing motor feeder are available as accessories as well as pre-assembled motor cables for connection to the motor.

Spare Parts Kit

A Spare Parts Kit is available which comprises small parts such as seals, caps, PROFIBUS address windows and screws.

Replacement fan

A replacement fan is available, which comprises a pre-mounted unit with cover, fan and screws.

Configuration

The following electronic configuring aids and engineering tools are available for the SINAMICS G120D distributed inverters:

Drive Technology Configurator (DT Configurator) within CA 01

The interactive catalog CA 01 – the offline Industry mall of Siemens on DVD-ROM – contains over 100,000 products with approximately 5 million possible drive system product variants. The Drive Technology Configurator (DT Configurator) has been developed to facilitate selection of the correct motor and/or inverter from the wide spectrum of available drives. It is integrated as a selection tool in catalog CA 01.

Online DT Configurator

In addition, the DT Configurator can be used on the Internet without requiring any installation. The DT Configurator can be found in the Siemens Industry Mall at the following address:
www.siemens.com/dt-configurator

SIZER for Siemens Drives engineering tool

The PC-based SIZER for Siemens Drives engineering tool makes it easy to engineer the SINAMICS and MICROMASTER 4 drive families. It provides support when selecting the hardware and firmware components necessary to implement a drive task. SIZER for Siemens Drives provides support for engineering an entire drive system, from basic individual drives to complex multi-axis applications.

You can find further information about the SIZER for Siemens Drives engineering tool in the section Engineering Tools.

The SIZER for Siemens Drives engineering tool is available free on the Internet at
www.siemens.com/sizer

STARTER commissioning tool

The STARTER commissioning tool allows menu-prompted commissioning, optimization and diagnostics. Apart from the SINAMICS drives, STARTER is also suitable for MICROMASTER 4 devices.

The new CU240D-2 PN-F FO and CU250D-2 PN-F FO Control Units can be commissioned with STARTER V4.4 and higher.

You can find further information about the STARTER commissioning tool in the section Engineering Tools.

Additional information about the STARTER commissioning tool is also available on the Internet at
www.siemens.com/starter

SINAMICS Startdrive commissioning tool

SINAMICS Startdrive is a tool for configuring, commissioning, and diagnosing the SINAMICS family of drives and is integrated into the TIA Portal. SINAMICS Startdrive can be used to implement drive tasks with the SINAMICS G120, SINAMICS G120C, SINAMICS G110M, SINAMICS G120D and SINAMICS G120P inverter series. The commissioning tool has been optimized in terms of its user friendliness and systematic use of the TIA Portal benefits of a common working environment for PLC, HMI and drives.

You can find further information about the SINAMICS Startdrive commissioning tool in the section Engineering Tools.

The SINAMICS Startdrive commissioning tool is available free on the Internet at
www.siemens.com/startdrive

Drive ES engineering system

Drive ES is the engineering system that can be used to integrate the communication, configuration and data management functions of Siemens drive technology into the SIMATIC automation world easily, efficiently and cost-effectively. The STEP 7 Manager user interface provides the ideal basis for this. A variety of software packages are available for SINAMICS – Drive ES Basic, Drive ES SIMATIC and Drive ES PCS.

You can find further information about the Drive ES engineering system in the section Engineering Tools.

Additional information about the Drive ES engineering system is also available on the Internet at
www.siemens.com/drive-es

Technical specifications

Unless explicitly specified otherwise, the following technical specifications are valid for all the following SINAMICS G120D distributed inverter components listed here.

SINAMICS G120D	
Mechanical specifications	
Vibratory load	
• Transport acc. to EN 60721-3-2 [1]	Class 1M2
• Operation acc. to EN 60721-3-3	Class 3M2
Shock load	
• Transport acc. to EN 60721-3-2 [1]	Class 1M2
• Operation acc. to EN 60721-3-3	Class 3M2
Ambient conditions	
Degree of protection	IP65/UL Type 3
Protection class According to EN 61800-5-1	Class III (PELV)
Touch protection According to EN 61800-5-1	Class I (with protective conductor system)
Permissible ambient and coolant temperature (air) during operation for Power Modules	-10 ... +40 °C (14 ... 104 °F) without derating >40 ... 55 °C (104 ... 131 °F), see derating characteristics
Permissible ambient and coolant temperature (air) during operation for Control Units	-10 ... +55 °C (14 ... 131 °F) with derating Limit values are determined by the Control Unit used (>40 ... 55 °C (104 ... 131 °F) see derating characteristics) up to 2000 m above sea level
Humidity, max.	95 % at 40 °C (104 °F)
Ambient temperature	
• Storage [1] acc. to EN 60068-2-1	-40 ... +70 °C (-40 ... +158 °F)
• Transport [1] acc. to EN 60068-2-1	-40 ... +70 °C (-40 ... +158 °F)
• Operation acc. to EN 60068-2-2	-10 ... +40 °C (14 ... 104 °F) without derating
Environmental class/harmful chemical substances	
• Operation acc. to EN 60721-3-3	Class 3C2
Degree of pollution acc. to EN 61800-5-1	2
Certification for fail-safe versions	
• According to IEC 61508	SIL 2
• According to EN ISO 13849-1	PL d and Category 3
Standards	
Compliance with standards	UL 508C (UL list number E121068), cUL, CE, C-Tick
CE marking, according to	Low-Voltage Directive 2006/95/EC
EMC Directive [2]	
• Frame sizes FSA to FSC with integrated line filter class A	Category C2 [3] according to EN 61800-3 Note: The EMC product standard EN 61800-3 does not apply directly to a frequency inverter but to a PDS (Power Drive System), which comprises the complete circuitry, motor and cables in addition to the inverter. The frequency inverters on their own do not generally require identification according to the EMC Directive.

[1] In product packaging.

[2] For further general information, see also chapter SINAMICS G120, section Technical specifications, Compliance with standards.

[3] With shielded motor cable up to 15 m (49 ft).

Overview

The Control Unit performs closed-loop control functions for the inverter. In addition to the closed-loop control, it has additional functions that can be adapted to the particular application through parameterization. The CU240D-2 Control Units supersede the CU240D Control Units, whereby both versions can be operated with PM250D Power Modules.

CU250D-2 Control Units can be used to implement applications with positioning requirements in the drive. This expansion opens up their use in lifting, swiveling, traversing or rotating applications. The positioning functionality is comparable to that of SINAMICS S110 servo drives.
Two points must be noted in this context:

- Vector control (VC) and sensorless vector control (SLVC) are possible (but not servo control)
- Positioning using one encoder (HTL/SSI) or using two encoders simultaneously (HTL and SSI)

Control Units are available in different versions:

- CU240D-2 DP
- CU240D-2 DP-F
- CU240D-2 PN
- CU240D-2 PN-F
- CU240D-2 PN-F PP (Push Pull)
- CU240D-2 PN-F FO (fiber optic)
- CU250D-2 DP-F
- CU250D-2 PN-F
- CU250D-2 PN-F PP (Push Pull)
- CU250D-2 PN-F FO (fiber optic)

The Push Pull version comprises an alternative connection method for the 24 V DC supply voltage and the PN communication.

CU240D-2 DP Control Unit

CU250D-2 DP-F Control Unit

CU240D-2 PN Control Unit

CU250D-2 PN-F Control Unit

Overview

CU250D-2 PN-F PP and CU250D-2 PN-F FO Control Units

Safety Integrated functions

The safety function "Safe Torque Off" (STO) (certified according to IEC 61508 SIL 2, EN ISO 13849-1 PL d and Category 3) is already integrated into the standard versions of the CU240D-2 series (CU240D-2 DP and CU240D-2 PN). It can be activated either over PROFIsafe or over the safety input.

With the fail-safe variants of the CU240D-2 series (CU240D-2 DP-F xx and CU240D-2 PN-F xx) and with the entire CU250D-2 series, the fail-safe SINAMICS G120D inverter provides five safety functions which are certified according to IEC 61508 SIL 2, EN ISO 13849-1 PL d and Category 3:

- Safe Torque Off (STO)
  to protect against active movement of the drive
- Safe Stop 1 (SS1)
  for continuous monitoring of a safe braking ramp
- Safely Limited Speed (SLS)
  for protection against dangerous movements on exceeding a speed limit
- Safe direction (SDI)
  This function ensures that the drive can only rotate in the selected direction.
- Safe speed monitoring (SSM)
  This function signals if a drive is operating below a specific speed/feed velocity.

These functions can be activated by means of PROFIsafe or via the safety inputs. A safety output is provided in addition.

All safety functions can be implemented without having to use a motor encoder; the implementation costs are minimal. Existing systems in particular can be simply updated with safety technology without the need to change the motor or mechanical system.

The Safe Torque Off (STO) function can be used without restriction for all applications. The SS1, SLS, SSM and SDI functions are only permissible for applications where the load can never accelerate when the inverter is switched off. They are therefore not permitted for applications involving pull-through loads such as hoisting gear and unwinders.

Additional information is provided in chapter Highlights, section Safety Integrated.

Selection and ordering data

Communication	Digital inputs (number which can be parameterized as fail-safe given below)	Analog inputs	Digital outputs (number which can be parameterized as fail-safe given below)	Encoder interfaces HTL/SSI	Safety Integrated functions	Designation		**Control Unit** Article No.
CU240D-2 series – standard								
PROFIBUS DP	6 (1)	2	2	1/–	STO	CU240D-2 DP		**6SL3544-0FB20-1PA0**
PROFINET, EtherNet/IP	6 (1)	2	2	1/–	STO	CU240D-2 PN		**6SL3544-0FB20-1FA0**
CU240D-2 series – fail-safe for Safety Integrated								
PROFIBUS DP	6 (3)	2	2 (1)	1/–	STO, SLS, SS1, SSM, SDI	CU240D-2 DP-F		**6SL3544-0FB21-1PA0**
PROFINET, EtherNet/IP	6 (3)	2	2 (1)	1/–	STO, SLS, SS1, SSM, SDI	CU240D-2 PN-F		**6SL3544-0FB21-1FA0**
						CU240D-2 PN-F PP		**6SL3544-0FB21-1FB0**
						CU240D-2 PN-F FO	NEW	**6SL3544-0FB21-1FC0**
CU250D-2 series – basic positioner (EPos) and fail-safe for Safety Integrated								
PROFIBUS DP	6 (3)	–	2 (1)	1/1	STO, SLS, SS1, SSM, SDI	CU250D-2 DP-F		**6SL3546-0FB21-1PA0**
PROFINET, EtherNet/IP	6 (3)	–	2 (1)	1/1	STO, SLS, SS1, SSM, SDI	CU250D-2 PN-F		**6SL3546-0FB21-1FA0**
						CU250D-2 PN-F PP		**6SL3546-0FB21-1FB0**
						CU250D-2 PN-F FO	NEW	**6SL3546-0FB21-1FC0**

Note:

An external 24 V DC power supply is required in order to operate the Control Unit. For information about suitable connecting cables, refer to section "Supplementary system components", connecting cables/plug-in connectors for supplying 24 V DC to the Control Unit.

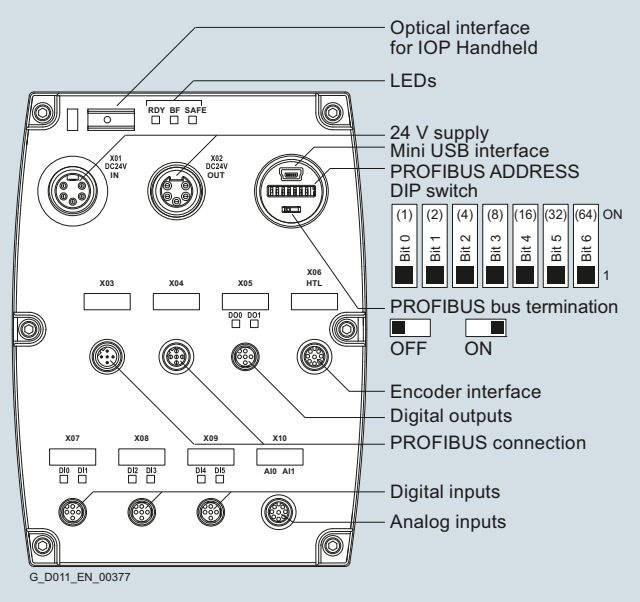
Selection and ordering data

Optional firmware memory cards

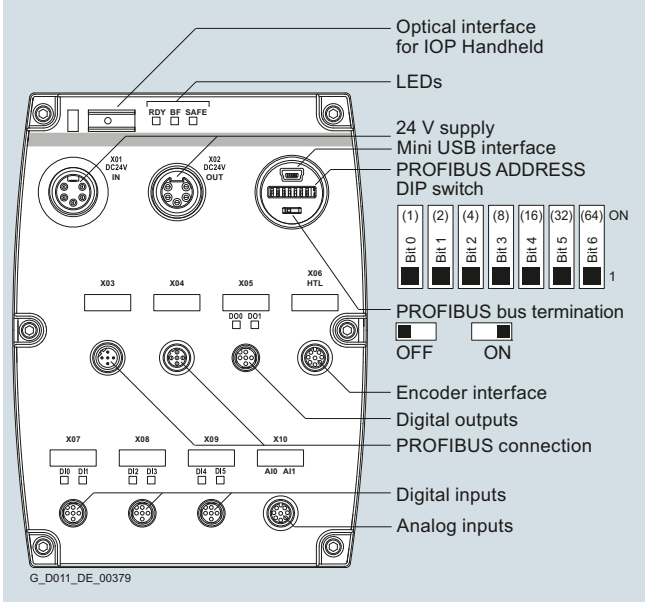
Designation		Article No.
SINAMICS SD card **512 MB + firmware V4.5** (Multicard V4.5)	NEW	**6SL3054-7EF00-2BA0**
SINAMICS SD card **512 MB + firmware V4.6** (Multicard V4.6)	NEW	**6SL3054-7EG00-2BA0**
SINAMICS SD card **512 MB + firmware V4.7** (Multicard V4.7)	NEW	**6SL3054-7EH00-2BA0**

For more information about firmware V4.5:
http://support.automation.siemens.com/WW/view/en/72841234
For more information about firmware V4.6:
http://support.automation.siemens.com/WW/view/en/67385235
For more information about firmware V4.7:
http://support.automation.siemens.com/WW/view/en/92554110

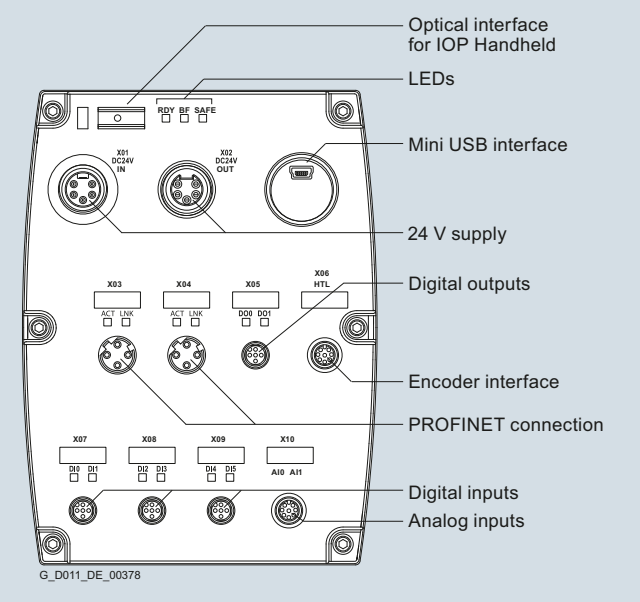
Design



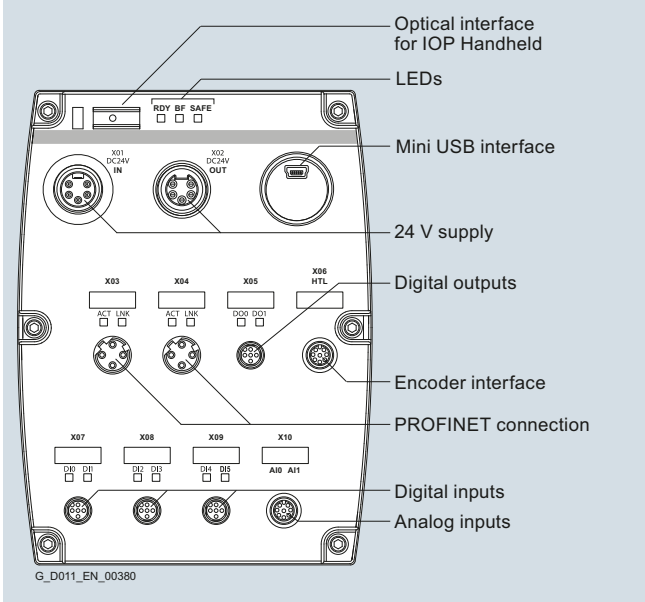
CU240D-2 DP Control Unit



CU240D-2 DP-F Control Unit

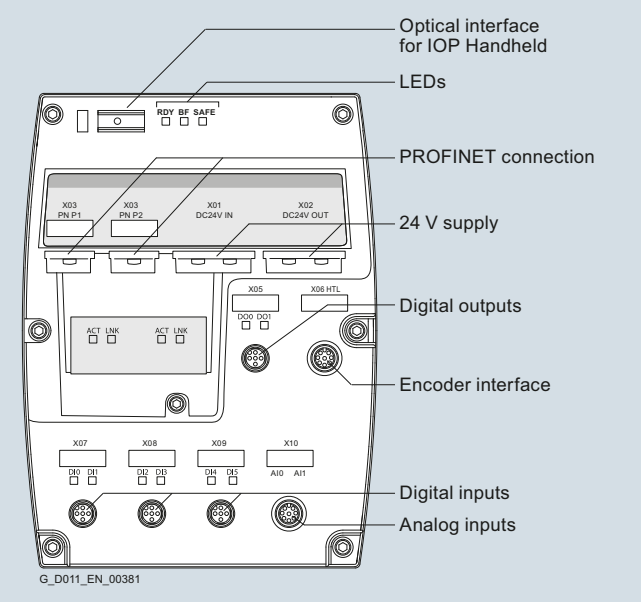


CU240D-2 PN Control Unit

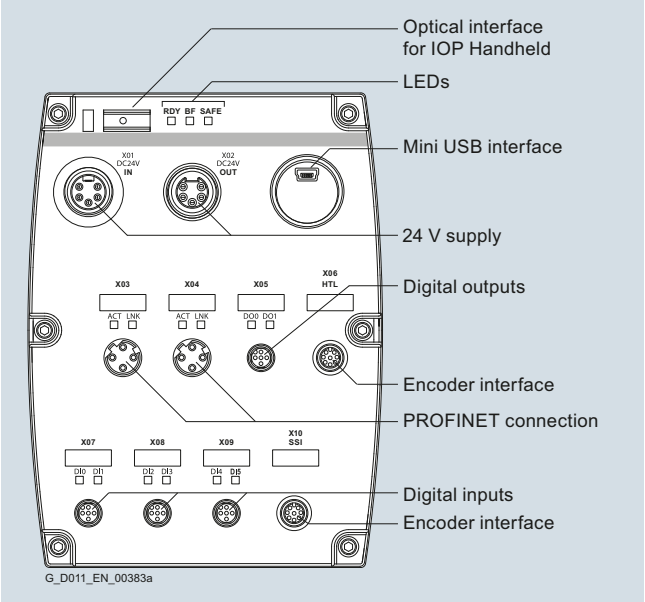


CU240D-2 PN-F Control Unit

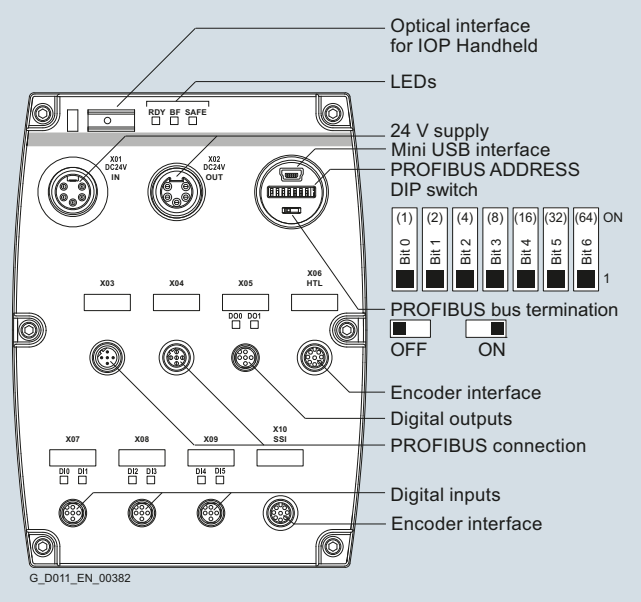
Design



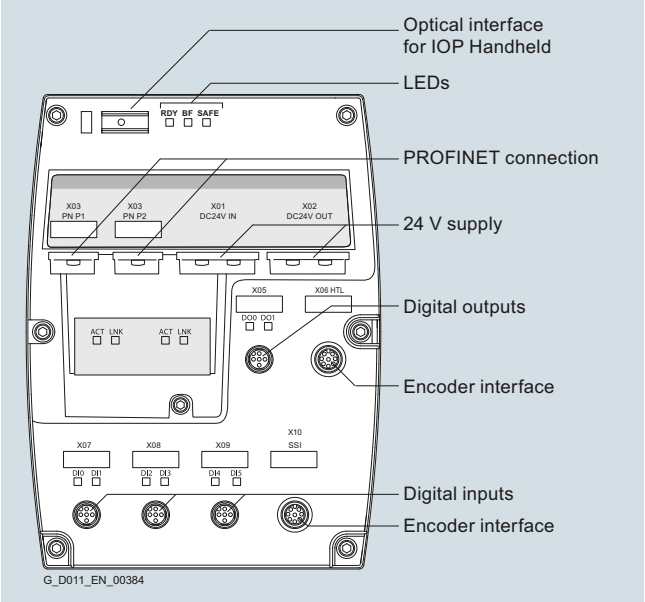
CU240D-2 PN-F PP and CU240D-2 PN-F FO Control Units



CU250D-2 PN-F Control Unit



CU250D-2 DP-F Control Unit



CU250D-2 PN-F PP and CU250D-2 PN-F FO Control Units

Control Unit, view from the rear, memory card slot at the top and PM-IF interface at bottom center

Function

Basic positioner (EPos)

Overview

- Absolute and relative positioning
- Linear and rotary axis
- Motor encoder or direct measuring system
- 4 referencing modes
- 16 traversing blocks
- Direct setpoint input (MDI)
- Jogging
- Backlash compensation
- Following error monitoring
- Cam signals

The positioning functions are only available in the CU250D-2 Control Unit and are functionally identical to the positioning functionality of SINAMICS S110. 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. Furthermore, they are characterized by their comprehensive monitoring functions.

Many applications can be carried out without external position controllers.

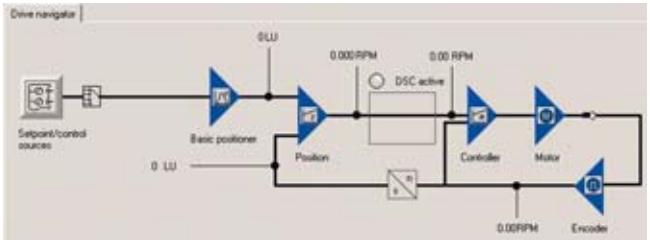
The EPos basic positioner is available as an additional function module that can be activated, and is used for the absolute/ relative positioning of linear and rotary axes (modulo) with both rotary and linear motor encoders (indirect measuring system).

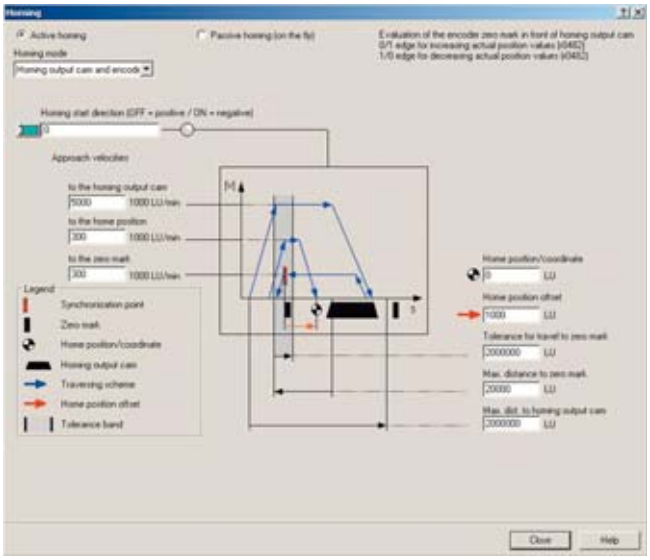
User-friendly configuring and commissioning including control panel (operation using PC) and diagnostics with the STARTER commissioning tool V4.3 and higher.

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 frames are available which, when selected, automatically establish the internal "connection" to the basic positioner.





8

Function

Functionality of the EPos basic positioner

Lower-level closed-loop position control with the following essential components

- Position actual value sensing (including the lower-level measuring input evaluation and reference mark search)
- Position controller (including limits, adaptation and pre-control calculation)
- Position control cycle 8 ms (speed control cycle 2 ms)
- Monitoring functions (standstill, positioning and dynamic following error monitoring, cam signals)

Mechanical system

- Backlash compensation

Limitations

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

Referencing or adjustment

- Setting reference point (with stationary axis)
- Search for reference (separate mode including reversing cam functionality, automatic reversal of direction, referencing to "output cam and encoder zero mark" or only "encoder zero mark" or "external zero mark (BERO)")
- Flying referencing (seamless subordinate referencing is possible during "normal" traversing with the aid of 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 (16 traversing blocks)

- Positioning by means of traversing blocks stored in the device, including continuation conditions and specific jobs for previously homed axis
- Traversing block editor using STARTER
- A traversing block contains the following information:
  - Job number and job (e.g. positioning, waiting, GOTO block jump, setting of binary outputs, travel to fixed endstop)
  - 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 measuring inputs")
  - Job parameters (e.g. wait time, block step conditions)

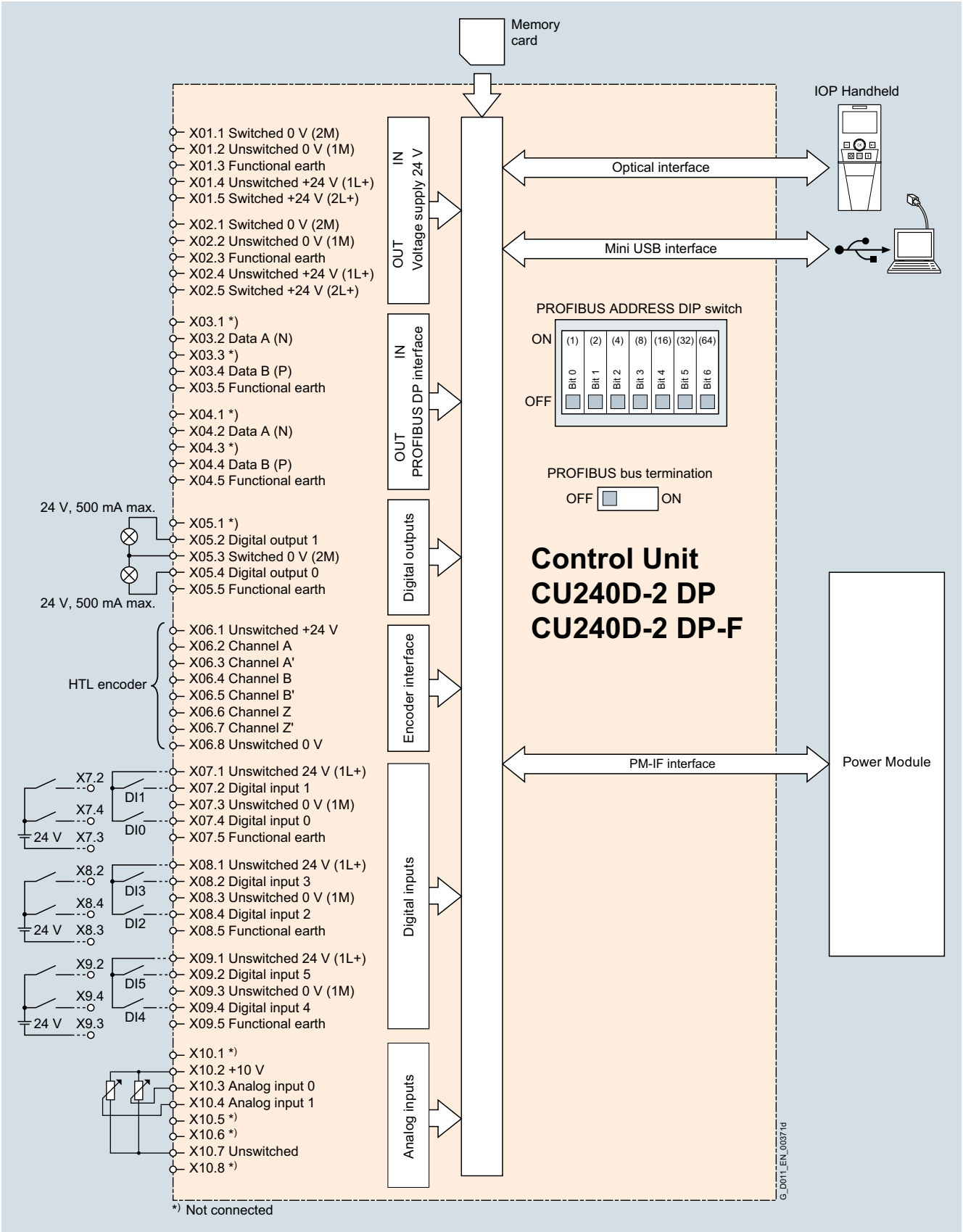
Direct setpoint specification mode (MDI)

- 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 for on-the-fly changes between the setup and positioning modes.
- The direct setpoint input mode (MDI) can also be used in the relative positioning or setup mode if the axis is not referenced. This means that on-the-fly synchronization and re-referencing can be carried out using "flying referencing".

Jog mode

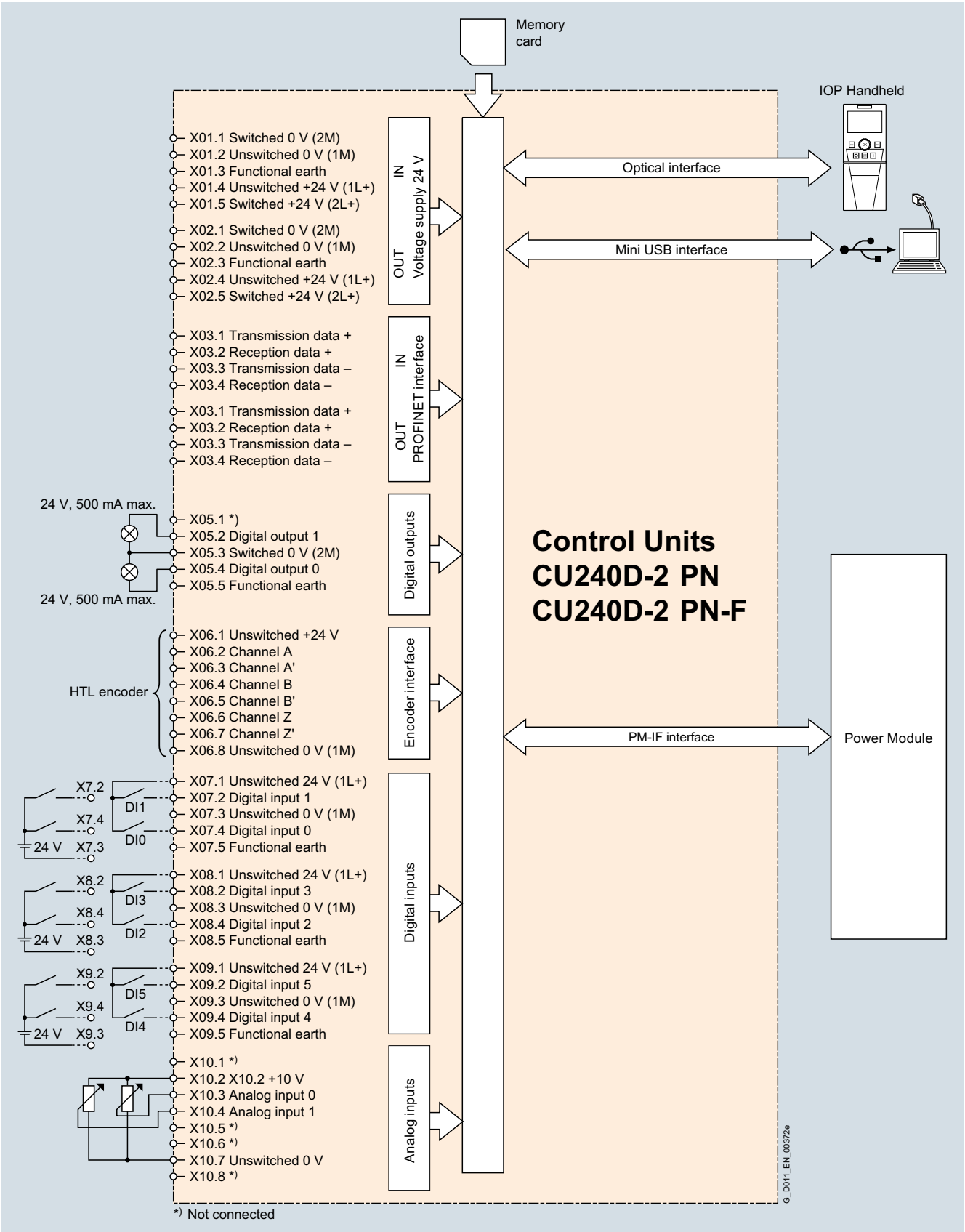
- Closed-loop position controlled traversing of the axis with "endless position controlled" or "jog incremental" modes (traverse through a "step width"), which can be toggled between

Integration



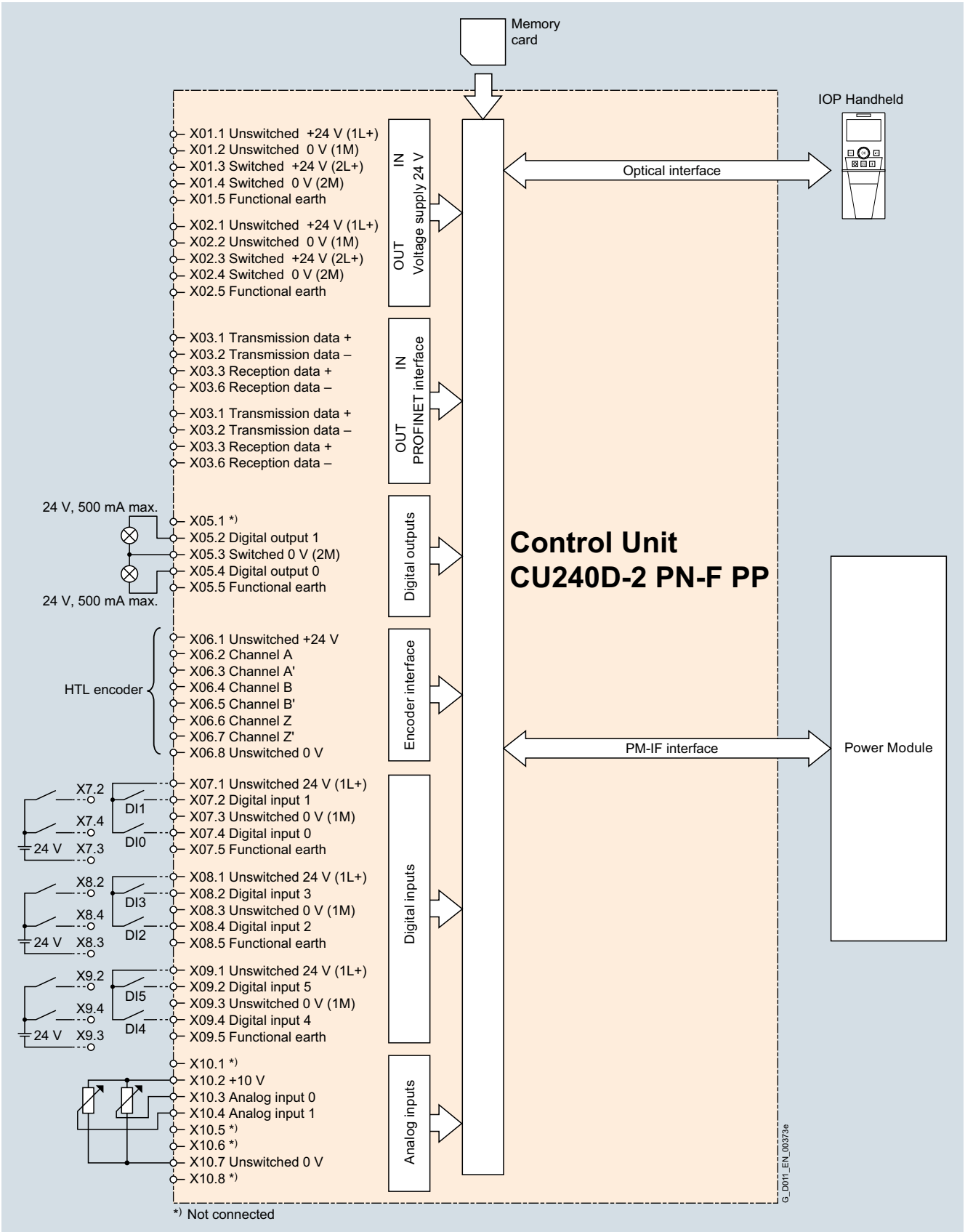
Connection example for CU240D-2 DP and CU240D-2 DP-F Control Units

Integration



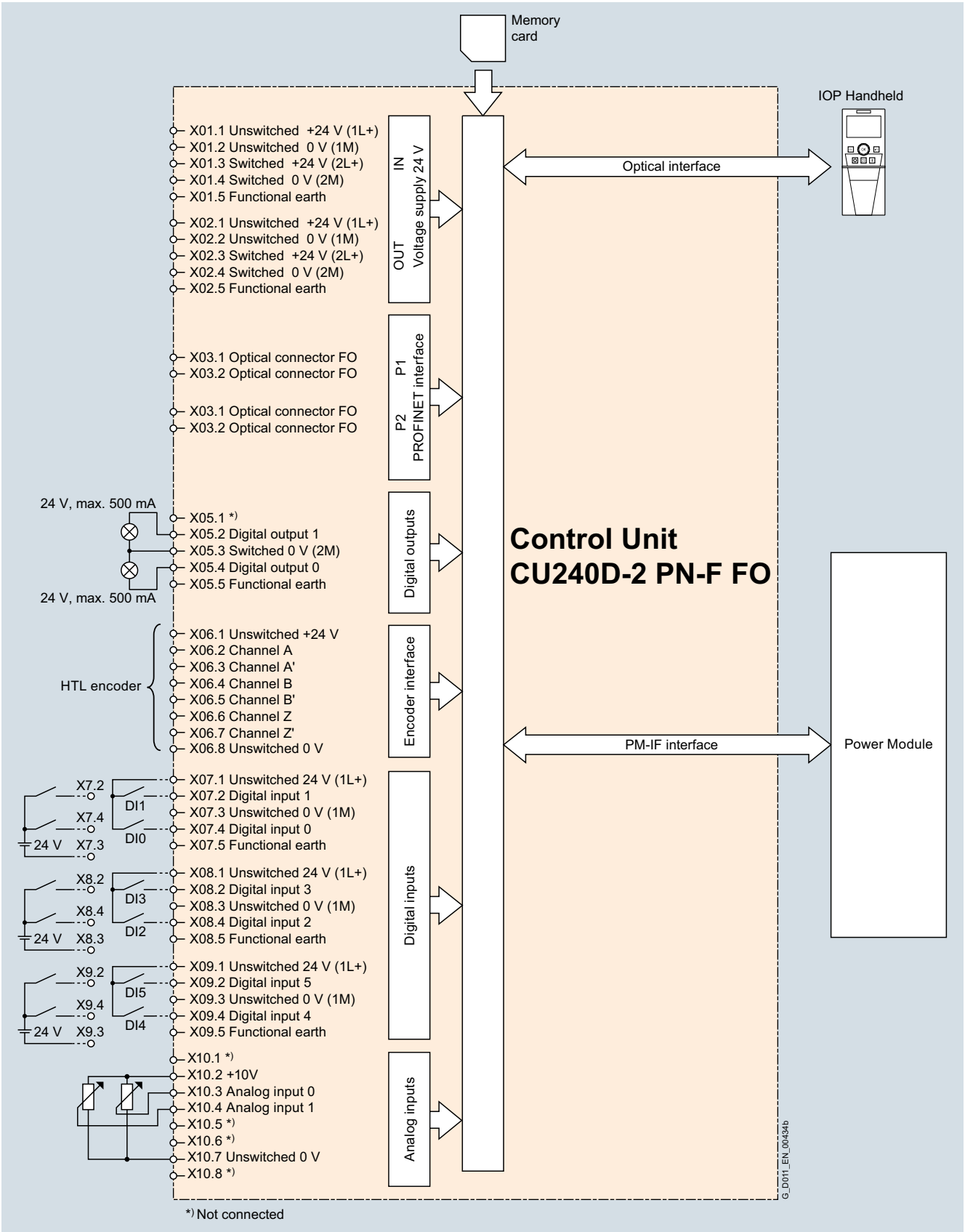
Connection example for CU240D-2 PN and CU240D-2 PN-F Control Units

Integration



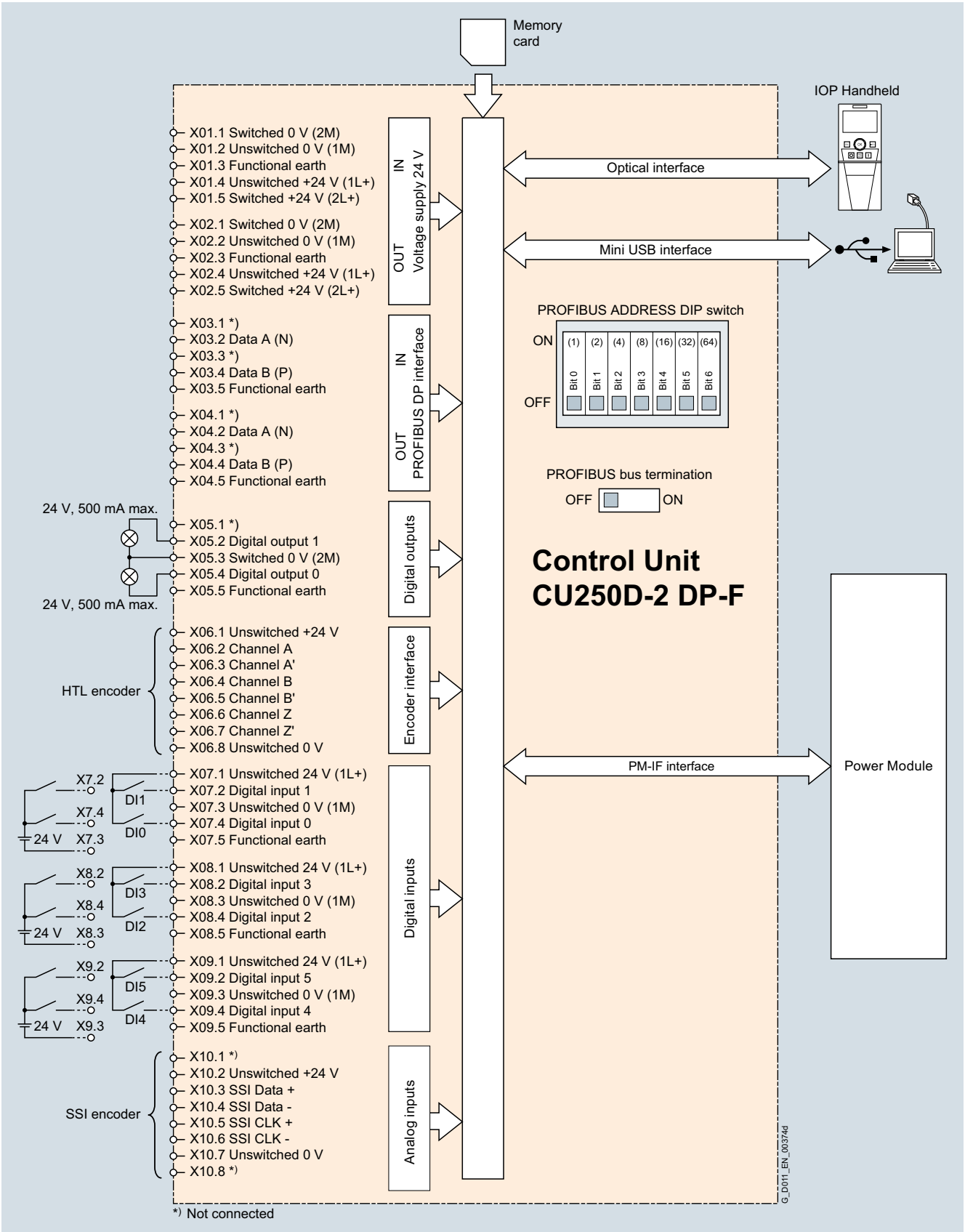
Connection example for CU240D-2 PN-F PP Control Unit

Integration



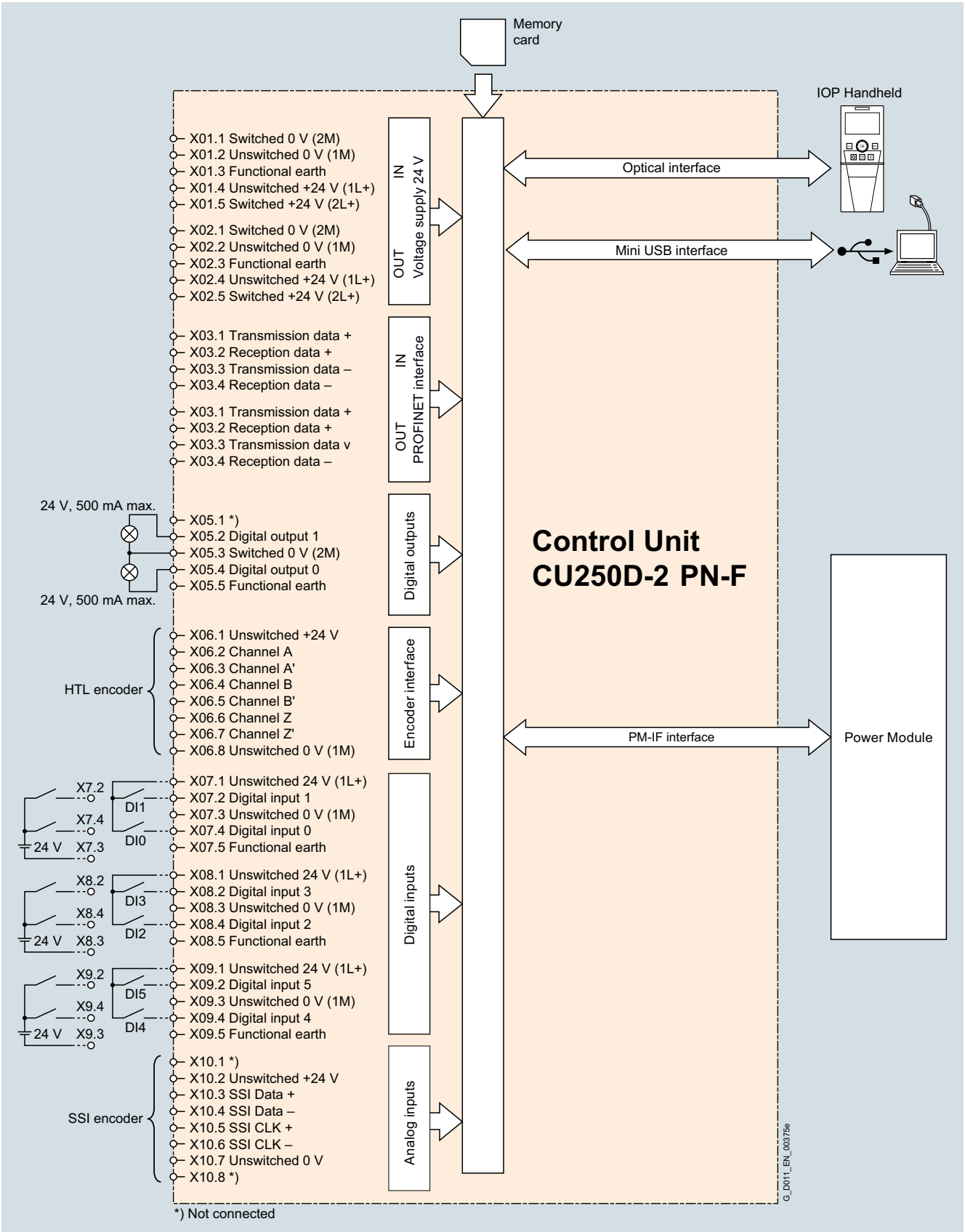
Connection diagram CU240D-2 PN-F FO Control Unit

Integration



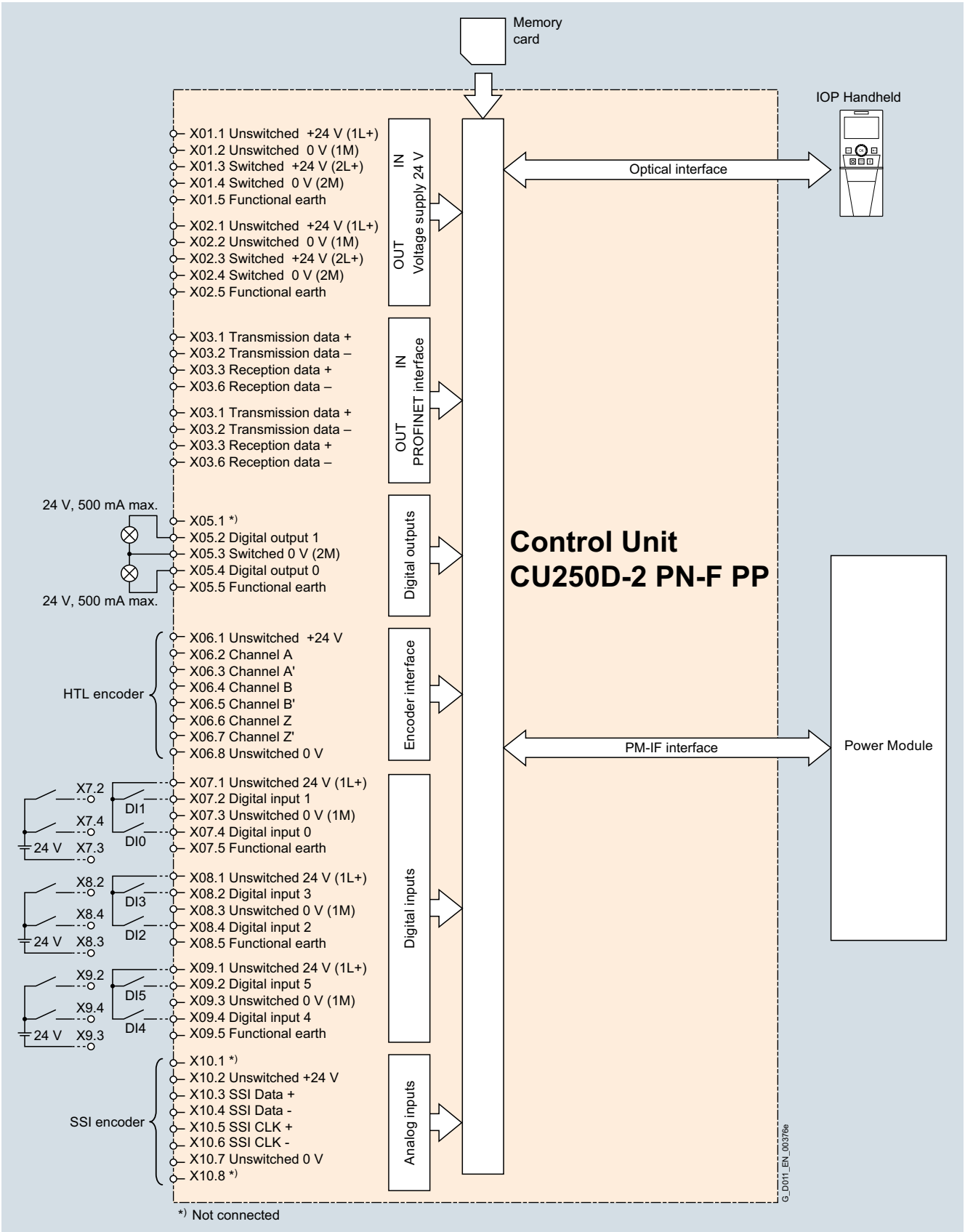
Connection example for CU250D-2 DP-F Control Unit

Integration



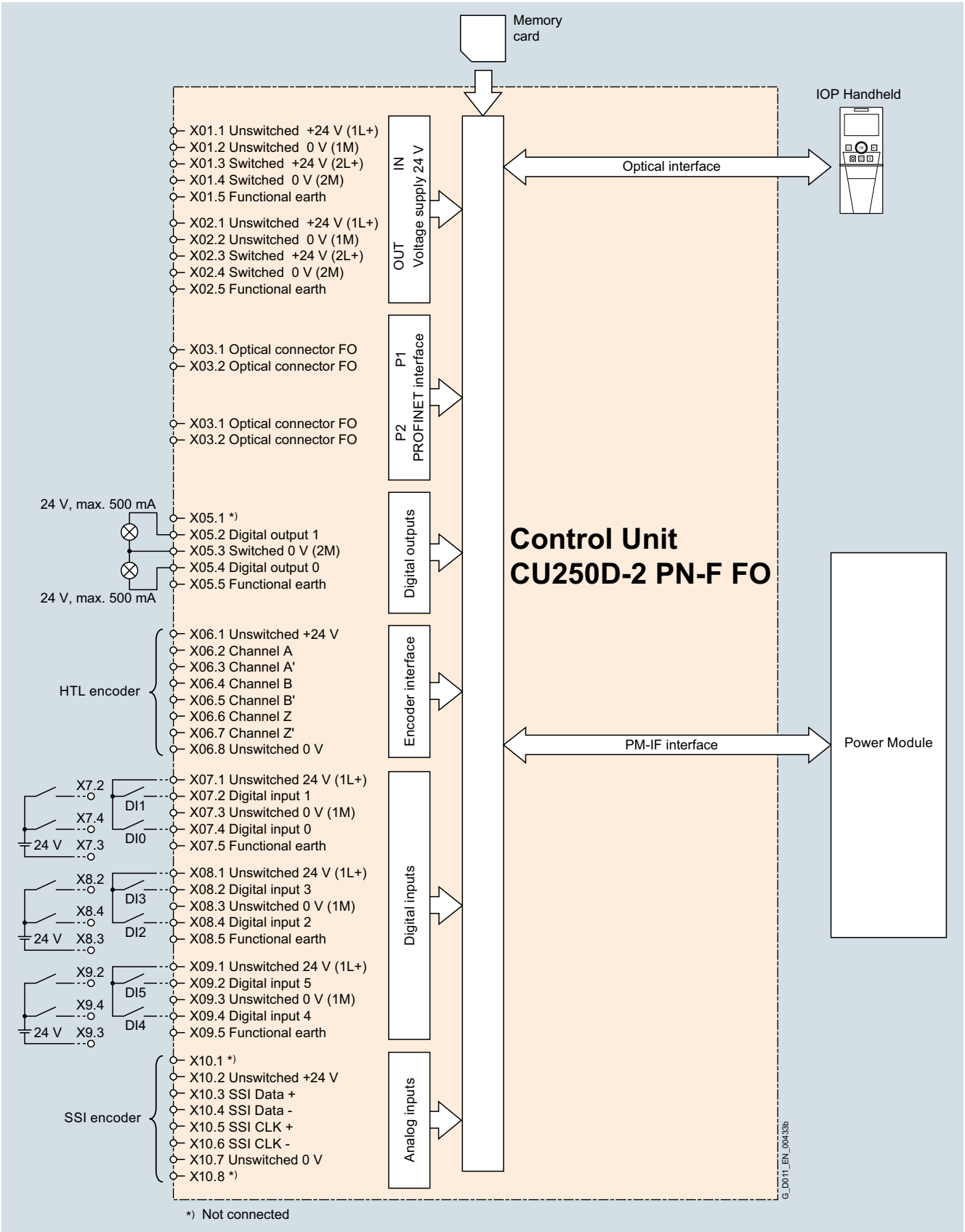
Connection example for CU250D-2 PN-F Control Unit

Integration



Connection example for CU250D-2 PN-F PP Control Unit

Integration



Connection diagram CU250D-2 PN-F FO Control Unit

Technical specifications

Control Unit	**CU240D-2 DP** 6SL3544- 0FB20-1PA0	**CU240D-2 PN** 6SL3544- 0FB20-1FA0	**CU240D-2 DP-F** 6SL3544- 0FB21-1PA0	**CU240D-2 PN-F** 6SL3544- 0FB21-1FA0 **CU240D-2 PN-F PP** 6SL3544- 0FB21-1FB0 **CU240D-2 PN-F FO** 6SL3544- 0FB21-1FC0	**CU250D-2 DP-F** 6SL3546- 0FB21-1PA0	**CU250D-2 PN-F** 6SL3546- 0FB21-1FA0 **CU250D-2 PN-F PP** 6SL3546- 0FB21-1FB0 **CU250D-2 PN-F FO** 6SL3546- 0FB21-1FC0
Electrical specifications						
Operating voltage	External 24 V DC necessary	External 24 V DC necessary	External 24 V DC necessary	External 24 V DC necessary	External 24 V DC necessary	External 24 V DC necessary
Current consumption [1] (from the 24 V DC supply)						
• With Power Module frame sizes FSA and FSB	300 mA	400 mA	300 mA	400 mA (FO variant: 520 mA)	300 mA	400 mA (FO variant: 520 mA)
• With Power Module frame size FSC	450 mA	550 mA	450 mA	550 mA (FO variant: 670 mA)	450 mA	550 mA (FO variant: 670 mA)
Interfaces						
Digital inputs (non-isolated)	6	6	6	6	6	6
• Optionally parameterizable as safe inputs	1	1	3	3	3	3
Analog inputs (0 ... 10 V)	2	2	2	2	–	–
Digital outputs (0.5 A, fed through switched 24 V DC, isolated)	2	2	2	2	2	2
• Optionally parameterizable as safe digital output	–	–	1	1	1	1
Bus interface						
• Fieldbus protocols	PROFIBUS DP	PROFINET EtherNet/IP	PROFIBUS DP	PROFINET EtherNet/IP	PROFIBUS DP	PROFINET EtherNet/IP
• Profile	PROFIdrive PROFIsafe	PROFIdrive PROFIsafe PROFIenergy	PROFIdrive PROFIsafe	PROFIdrive PROFIsafe PROFIenergy	PROFIdrive PROFIsafe	PROFIdrive PROFIsafe PROFIenergy
HTL encoder interface (incremental interface, bipolar up to 2048 pulses, max. 150 mA)	1	1	1	1	1	1
SSI encoder interface (absolute encoder, singleturn and multiturn 4096 pulses, 24 V, max. 250 mA)	–	–	–	–	1	1
PTC/KTY interface (connection via Power Module)	✓	✓	✓	✓	✓	✓
• Motor temperature sensor	1 input, sensors that can be connected: PTC, KTY or bimetal	1 input, sensors that can be connected: PTC, KTY or bimetal	1 input, sensors that can be connected: PTC, KTY or bimetal	1 input, sensors that can be connected: PTC, KTY or bimetal	1 input, sensors that can be connected: PTC, KTY or bimetal	1 input, sensors that can be connected: PTC, KTY or bimetal
Control of a mechanical motor brake (connection via Power Module)	✓	✓	✓	✓	✓	✓
Slot for SINAMICS memory card (SD card)	✓	✓	✓	✓	✓	✓
Commissioning interface (mini USB)	✓	✓	✓	✓ Not with PP and FO variants	✓	✓ Not with PP and FO variants

[1] The current consumption of connected encoders (HTL ≤ 100 mA or SSI ≤ 250 mA), sensors (total, max. 300 mA) as well as the current drawn from the digital outputs (total, max. 500 mA) must be added, where applicable.

Technical specifications

Control Unit	**CU240D-2 DP** 6SL3544- 0FB20-1PA0	**CU240D-2 PN** 6SL3544- 0FB20-1FA0	**CU240D-2 DP-F** 6SL3544- 0FB21-1PA0	**CU240D-2 PN-F** 6SL3544- 0FB21-1FA0 **CU240D-2 PN-F PP** 6SL3544- 0FB21-1FB0 **CU240D-2 PN-F FO** 6SL3544- 0FB21-1FC0	**CU250D-2 DP-F** 6SL3546- 0FB21-1PA0	**CU250D-2 PN-F** 6SL3546- 0FB21-1FA0 **CU250D-2 PN-F PP** 6SL3546- 0FB21-1FB0 **CU250D-2 PN-F FO** 6SL3546- 0FB21-1FC0
Safety functions						
Integrated safety functions acc. to IEC 61508 SIL 2, EN ISO 13849-1 PL d and Category 3	• Safe Torque Off (STO)	• Safe Torque Off (STO)	• Safe Torque Off (STO) • Safe Stop 1 (SS1) • Safely Limited Speed (SLS) • Safe Direction (SDI) • Safe Speed Monitor (SSM)	• Safe Torque Off (STO) • Safe Stop 1 (SS1) • Safely Limited Speed (SLS) • Safe Direction (SDI) • Safe Speed Monitor (SSM)	• Safe Torque Off (STO) • Safe Stop 1 (SS1) • Safely Limited Speed (SLS) • Safe Direction (SDI) • Safe Speed Monitor (SSM)	• Safe Torque Off (STO) • Safe Stop 1 (SS1) • Safely Limited Speed (SLS) • Safe Direction (SDI) • Safe Speed Monitor (SSM)
Open-loop/closed-loop control techniques						
V/f linear/quadratic/ parameterizable	✓	✓	✓	✓	✓	✓
V/f with flux current control (FCC)	✓	✓	✓	✓	✓	✓
Vector control, sensorless	✓	✓	✓	✓	✓	✓
Vector control, with sensor	✓	✓	✓	✓	✓	✓
Torque control, sensorless	✓	✓	✓	✓	–	–
Torque control, with sensor	✓	✓	✓	✓	–	–
Software functions						
Basic positioner (EPos)	–	–	–	–	✓	✓
Fixed frequencies	16, parameterizable	16, parameterizable	16, parameterizable	16, parameterizable	16, parameterizable	16, parameterizable
Signal interconnection with BICO technology	✓	✓	✓	✓	✓	✓
Automatic restart after line supply failure or operational fault	✓	✓	✓	✓	✓	✓
Slip compensation	✓	✓	✓	✓	✓	✓
Free function blocks (FFB) for logical and arithmetic operations	✓	✓	✓	✓	–	–
Ramp smoothing	✓	✓	✓	✓	✓	✓
4 selectable drive data sets	✓	✓	✓	✓	✓	✓
4 selectable command data sets (CDS) (manual/auto)	✓	✓	✓	✓	✓	✓
Flying restart	✓	✓	✓	✓	–	–
JOG	✓	✓	✓	✓	–	–
Cyclic recording of ramp-up and ramp-down	✓	✓	✓	✓	✓	✓
Technology controller (PID)	✓	✓	✓	✓	–	–
Thermal motor protection	✓	✓	✓	✓	✓	✓

Technical specifications

Control Unit	**CU240D-2 DP** 6SL3544-0FB20-1PA0	**CU240D-2 PN** 6SL3544-0FB20-1FA0	**CU240D-2 DP-F** 6SL3544-0FB21-1PA0	**CU240D-2 PN-F** 6SL3544-0FB21-1FA0 **CU240D-2 PN-F PP** 6SL3544-0FB21-1FB0 **CU240D-2 PN-F FO** 6SL3544-0FB21-1FC0	**CU250D-2 DP-F** 6SL3546-0FB21-1PA0	**CU250D-2 PN-F** 6SL3546-0FB21-1FA0 **CU250D-2 PN-F PP** 6SL3546-0FB21-1FB0 **CU250D-2 PN-F FO** 6SL3546-0FB21-1FC0
Software functions (continued)						
Thermal inverter protection	✓	✓	✓	✓	✓	✓
Setpoint input	✓	✓	✓	✓	✓	✓
Motor identification	✓	✓	✓	✓	✓	✓
Motor holding brake	✓	✓	✓	✓	✓	✓
Mechanical specifications and ambient conditions						
Operating temperature	-10 ... +55 °C (14 ... 131 °F)	-10 ... +50 °C (14 ... 122 °F)	0 ... 55 °C (32 ... 131 °F)	0 ... 50 °C (32 ... 122 °F) (FO variant: 0 ... 45 °C (32 ... 113 °F))	0 ... 55 °C (32 ... 131 °F)	0 ... 50 °C (32 ... 122 °F) (FO variant: 0 ... 45 °C (32 ... 113 °F))
Storage temperature	-40 ... +70 °C (-40 ... +158 °F)	-40 ... +70 °C (-40 ... +158 °F)	-40 ... +70 °C (-40 ... +158 °F)	-40 ... +70 °C (-40 ... +158 °F)	-40 ... +70 °C (-40 ... +158 °F)	-40 ... +70 °C (-40 ... +158 °F)
Relative humidity	<95 % RH, condensation not permissible	<95 % RH, condensation not permissible	<95 % RH, condensation not permissible	<95 % RH, condensation not permissible	<95 % RH, condensation not permissible	<95 % RH, condensation not permissible
Dimensions						
• Width	153 mm (6.02 in)	153 mm (6.02 in)	153 mm (6.02 in)	153 mm (6.02 in)	153 mm (6.02 in)	153 mm (6.02 in)
• Height	208 mm (8.19 in)	208 mm (8.19 in)	208 mm (8.19 in)	208 mm (8.19 in)	208 mm (8.19 in)	208 mm (8.19 in)
• Depth	55 mm (2.17 in)	55 mm (2.17 in)	55 mm (2.17 in)	55 mm (2.17 in) (PP variant: 118 mm (4.65 in))	55 mm (2.17 in)	55 mm (2.17 in) (PP variant: 118 mm (4.65 in))
Weight, approx.	0.8 kg (1.76 lb)	0.8 kg (1.76 lb)	0.8 kg (1.76 lb)	0.8 kg (1.76 lb) (PP and FO variants: 1.3 kg (2.87 lb))	0.8 kg (1.76 lb)	0.8 kg (1.76 lb) (PP and FO variants: 1.3 kg (2.87 lb))

Overview

Example of PM250D Power Module, frame size FSA

The regenerative feedback capability of the PM250D Power Module in generating mode (electronic braking) means that energy is returned to the supply system and not wasted in a braking resistor. This saves space, time-consuming dimensioning of the braking resistor as well as its wiring. Generated heat is also reduced. Additional information is provided in chapter Highlights, section Efficient Infeed Technology.

An innovative circuit design reduces the line harmonics. A line reactor is not required. This saves space and costs for engineering and procurement.

The PM250D Power Module is also designed for safety-oriented applications. In conjunction with a fail-safe Control Unit, the drive can be transformed into a Safety Integrated Drive (see Control Units).

The PM250D Power Modules with integrated line filter class A are suitable for connection to TN and TT supply systems.

Selection and ordering data

Rated power [1]		Rated output current [2]	Input current	Frame size	**PM250D Power Module with integrated line filter class A** Article No.
kW	hp	A	A		
380 ... 500 V 3 AC					
0.75	1	2.2	2.1	FSA	**6SL3525-0PE17-5AA1**
1.5	1.5 [3]	4.1	3.8	FSA	**6SL3525-0PE21-5AA1**
3	4	7.7	7.2	FSB	**6SL3525-0PE23-0AA1**
4	5	10.2	9.5	FSC	**6SL3525-0PE24-0AA1**
5.5	7.5	13.2	12.2	FSC	**6SL3525-0PE25-5AA1**
7.5	10	19	17.7	FSC	**6SL3525-0PE27-5AA1**

[1] Rated power based on the rated output current I_{rated}. The rated output current I_{rated} is based on the duty cycle for high overload (HO).

[2] The rated output current I_{rated} is based on the duty cycle for high overload (HO). These current values are valid for 400 V and are specified on the rating plate of the Power Module.

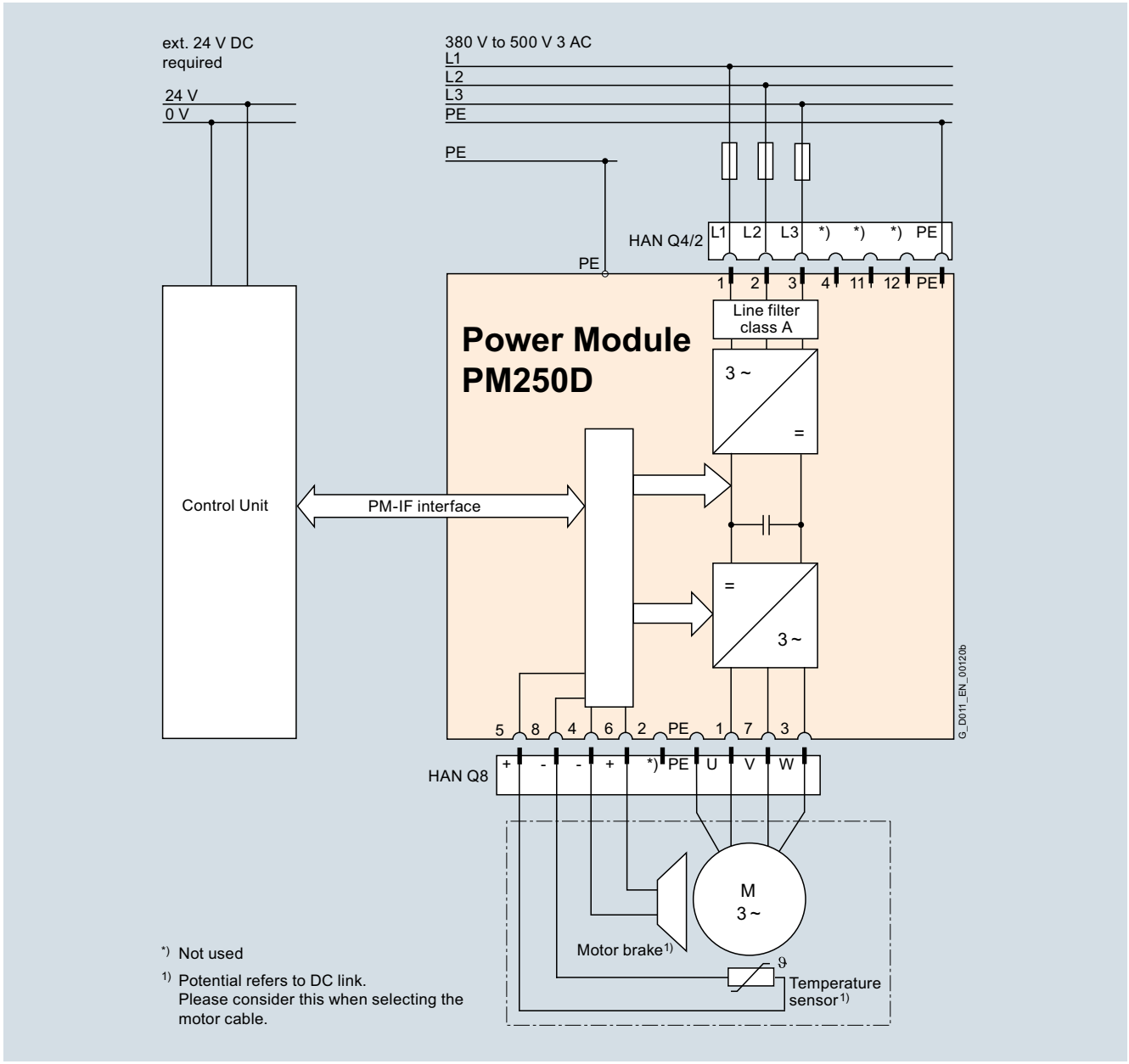
[3] It is not possible to make any assignment to a particular standard.

Integration

PM250D Power Modules communicate with the Control Unit via the PM-IF interface.

PM250D Power Modules have the following interfaces as standard:

- PM-IF interface to connect the PM250D Power Module to the Control Unit.
- Motor connection via a HAN Q8 (connector) including control of the motor brake and temperature sensor
- Line supply connection via HAN Q4/2 (socket)



Connection diagram for PM250D Power Module with integrated line filter class A

Technical specifications

General technical specifications

	PM250D Power Modules					
System operating voltage	380 ... 500 V 3 AC ±10 %					
Grid requirement **Short-circuit power R_{SC}**	>100					
Input frequency	47 ... 63 Hz					
Output frequency						
• Control mode V/f	0 ... 650 Hz (due to legal requirements, the maximum output frequency is restricted to 550 Hz with firmware V4.7 and higher)					
• Control type Vector	0 ... 200 Hz					
Pulse frequency	4 kHz (standard), for higher pulse frequencies up to 16 kHz, see derating data					
Power factor λ	0.95					
Inverter efficiency η	95 ... 97 %					
Output voltage, max. as % of input voltage	87 %					
Overload capability						
• High overload (HO)	Maximum duty cycle of a total cycle time of 300 s: • 2 × rated output current I_{rated} (i.e. 200 % overload) for 3 s and • 1.5 × rated output current I_{rated} (i.e. 150 % overload) for 57 s and • 0.87 × rated output current I_{rated} for the remaining 240 s					
Electromagnetic compatibility	Integrated line filter class A according to EN 55011					
Possible braking methods	Energy recovery in regenerative mode (max. with rated power possible); Integrated brake control supplies the DC supply voltage for the brake					
	Line input voltage	380 V AC	400 V AC	440 V AC	480 V AC	500 V AC
	Resulting brake voltage	171 V DC	180 V DC	198 V DC	216 V DC	225 V DC
	Disconnection on the DC permits "fast" braking (max. output current 1 A)					
Operating temperature	-10 ... +55 °C (14 ... 131 °F) (operating temperature ranges of the Control Units must be taken into account)					
Storage temperature	-40 ... +70 °C (-40 ... +158 °F)					
Permissible mounting position	Horizontal wall mounting and mounting in the horizontal position					
Relative humidity	<95 % RH, condensation not permissible					
Cooling	FSA and FSB: Convection FSC: Air cooling as required using the integrated fan					
Installation altitude	Up to 1000 m (3281 ft) above sea level without derating, > 1000 m (3281 ft) see derating characteristics					
Short Circuit Current Rating (SCCR) [1]	40 kA					
Protection functions	• Undervoltage • Phase failure detection • Overvoltage • Overload • Ground fault • Short-circuit • Stall protection • Motor blocking protection • Motor overtemperature • Inverter overtemperature • Parameter locking					
Compliance with standards	UL 508C (UL list number E121068), cUL, CE, C-Tick					
CE marking, according to	Low-Voltage Directive 2006/95/EC					

[1] Applies to industrial control panel installations to NEC article 409 or UL 508A.

Technical specifications

Line voltage 380 ... 500 V 3 AC		**PM250D Power Modules**		
		6SL3525-0PE17-5AA1	6SL3525-0PE21-5AA1	6SL3525-0PE23-0AA1
Rated output current I_{rated} [1]	A	2.2	4.1	7.7
Maximum output current I_{max}	A	4.4	8.2	15.4
Rated power	kW	0.75	1.5	3
Rated pulse frequency	kHz	4	4	4
Efficiency η		>0.95	>0.95	>0.95
Power loss [2] at rated output current	kW	0.046	0.068	0.125
Cooling air requirement	m^3/s (ft^3/s)	0.004 (0.14)	0.005 (0.18)	0.009 (0.32)
Sound pressure level L_{pA} (1 m)	dB	–	–	–
Rated input current [3]	A	2.1	3.8	7.2
Line supply connection U1/L1, V1/L2, W1/L3, PE		HAN Q4/2 (connector)	HAN Q4/2 (connector)	HAN Q4/2 (connector)
• Conductor cross-section	mm^2	1.5 ... 6	1.5 ... 6	2.5 ... 6
PE connection (external connection)		On housing with M5 screw	On housing with M5 screw	On housing with M5 screw
• Conductor cross-section (recommended)	mm^2	10 ... 16	10 ... 16	10 ... 16
Motor connection U2, V2, W2, PE, motor brake, temperature sensor		HAN Q8 (socket)	HAN Q8 (socket)	HAN Q8 (socket)
• Conductor cross-section	mm^2	1 ... 4	1 ... 4	2.5 ... 4
Motor cable length, max. Shielded	m (ft)	15 (49)	15 (49)	15 (49)
Degree of protection		IP65/UL Type 3	IP65/UL Type 3	IP65/UL Type 3
Dimensions				
• Width	mm (in)	445 (17.52)	445 (17.52)	445 (17.52)
• Height	mm (in)	210 (8.27)	210 (8.27)	210 (8.27)
• Depth	mm (in)	110 (4.33)	110 (4.33)	180 (7.09)
Frame size		FSA	FSA	FSB
Weight, approx.	kg (lb)	5.7 (12.6)	5.7 (12.6)	8 (17.6)

[1] The rated output current I_{rated} is based on the duty cycle for high overload (HO).

[2] Typical values. Additional information can be found on the Internet at http://support.automation.siemens.com/WW/view/en/94059311

[3] The input current depends on the motor load and line impedance. The input currents apply for load at rated power for a line impedance corresponding to u_K = 1 %.

Technical specifications

Line voltage 380 ... 500 V 3 AC		PM250D Power Modules		
		6SL3525-0PE24-0AA1	6SL3525-0PE25-5AA1	6SL3525-0PE27-5AA1
Rated output current I_{rated} [1]	A	10.2	13.2	19
Maximum output current I_{max}	A	20.4	26.4	38
Rated power	kW	4	5.5	7.5
Rated pulse frequency	kHz	4	4	4
Efficiency η		>0.95	>0.95	>0.95
Power loss [2] at rated output current	kW	0.167	0.218	0.291
Cooling air requirement	m^3/s (ft^3/s)	0.012 (0.42)	0.018 (0.64)	0.025 (0.88)
Sound pressure level L_{pA} (1 m)	dB	74.5	74.5	74.5
Rated input current [3]	A	9.5	12.2	17.7
Line supply connection U1/L1, V1/L2, W1/L3, PE		HAN Q4/2 (connector)	HAN Q4/2 (connector)	HAN Q4/2 (connector)
• Conductor cross-section	mm^2	2.5 ... 6	4 ... 6	4 ... 6
PE connection (external connection)		On housing with M5 screw	On housing with M5 screw	On housing with M5 screw
• Conductor cross-section (recommended)	mm^2	10 ... 16	10 ... 16	10 ... 16
Motor connection U2, V2, W2, PE, motor brake, temperature sensor		HAN Q8 (socket)	HAN Q8 (socket)	HAN Q8 (socket)
• Conductor cross-section	mm^2	2.5 ... 4	4	4
Motor cable length, max. Shielded	m (ft)	15 (49)	15 (49)	15 (49)
Degree of protection		IP65/UL Type 3	IP65/UL Type 3	IP65/UL Type 3
Dimensions				
• Width	mm (in)	445 (17.52)	445 (17.52)	445 (17.52)
• Height	mm (in)	210 (8.27)	210 (8.27)	210 (8.27)
• Depth	mm (in)	220 (8.66)	220 (8.66)	220 (8.66)
Frame size		FSC	FSC	FSC
Weight, approx.	kg (lb)	8.5 (18.7)	8.5 (18.7)	8.5 (18.7)

[1] The rated output current I_{rated} is based on the duty cycle for high overload (HO).

[2] Typical values. Additional information can be found on the Internet at http://support.automation.siemens.com/WW/view/en/94059311

[3] The input current depends on the motor load and line impedance. The input currents apply for load at rated power for a line impedance corresponding to u_K = 1 %.

Characteristic curves

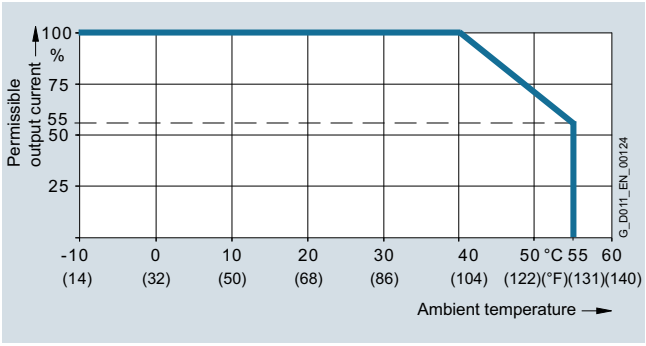
Derating data

Pulse frequency

Rated power at 400 V 3 AC		**Rated output current in A** for a pulse frequency of						
kW	hp	4 kHz	6 kHz	8 kHz	10 kHz	12 kHz	14 kHz	16 kHz
0.75	1	2.2	1.9	1.5	1.3	1.1	1	0.9
1.5	1.5 [1]	4.1	3.5	2.9	2.5	2.1	1.8	1.6
3	4	7.7	6.5	5.4	4.6	3.9	3.5	3.1
4	5	10.2	8.7	7.1	6.1	5.1	4.6	4.1
5.5	7.5	13.2	11.2	9.2	7.9	6.6	5.9	5.3
7.5	10	19	16.2	13.3	11.4	9.5	8.6	7.6

1)

Ambient temperature

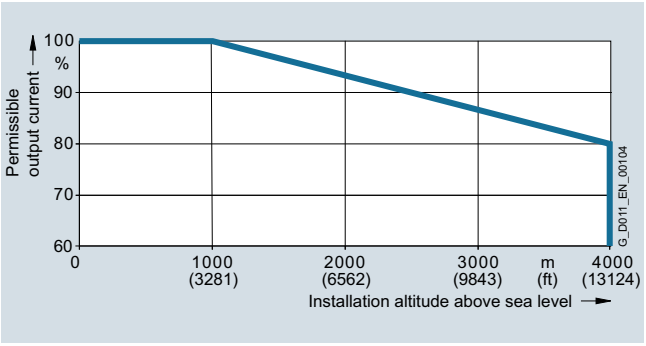


Permissible output current as a function of ambient temperature for PM250D Power Modules, frame sizes FSA to FSC

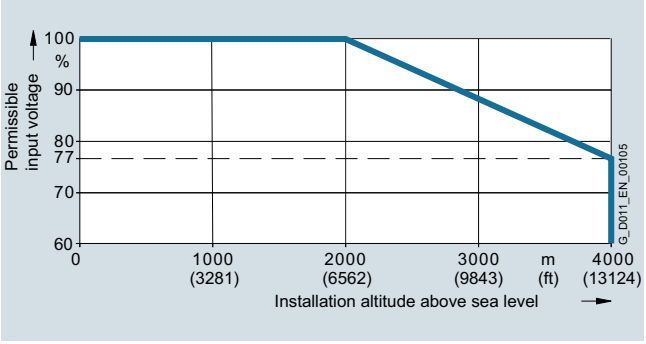
Note:

The operating temperature ranges of the Control Units should be taken into account. The temperature ranges are specified in the technical specifications under Control Units.

Installation altitude



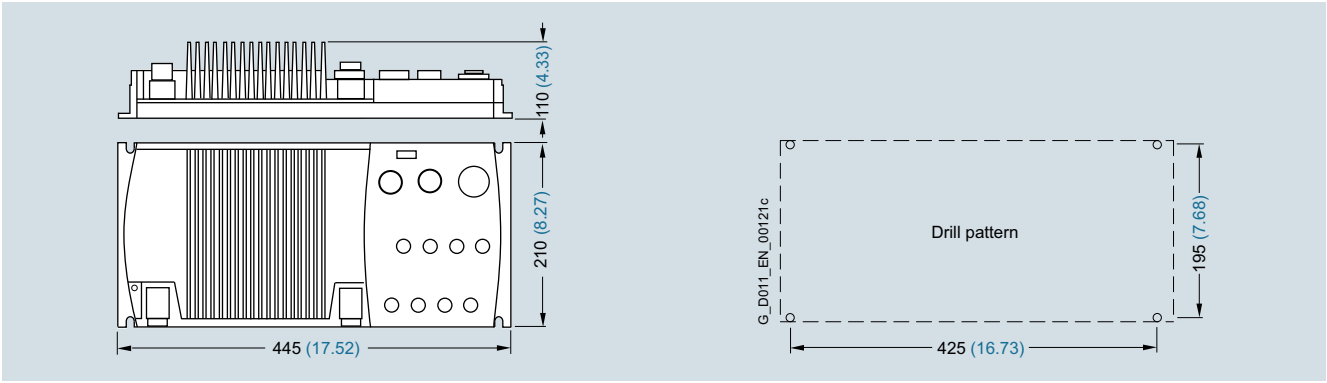
Permissible output current as a function of installation altitude for PM250D Power Modules, frame sizes FSA to FSC



Permissible input voltage as a function of installation altitude for PM250D Power Modules, frame sizes FSA to FSC

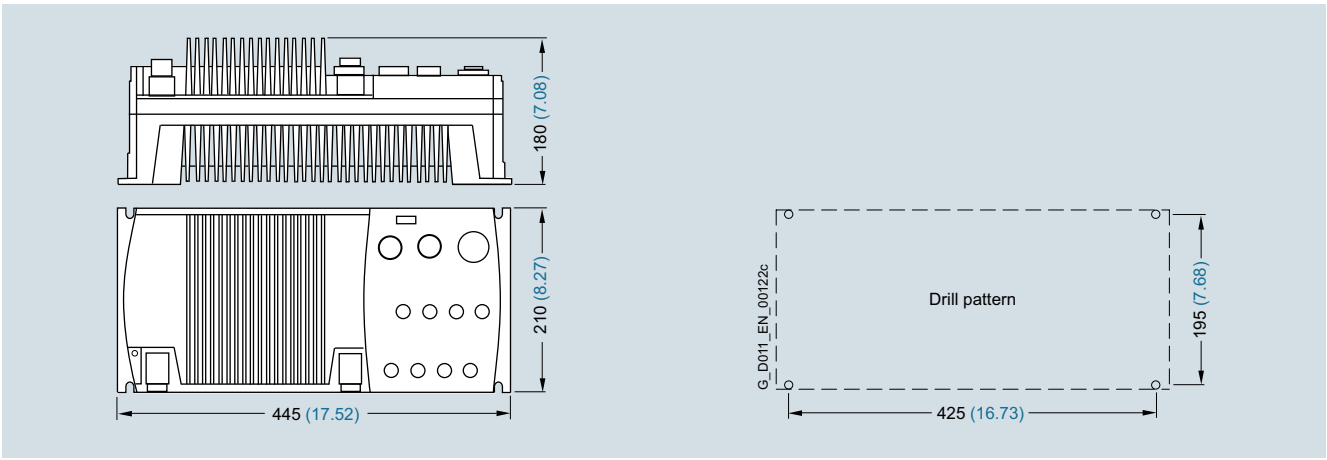
[1] It is not possible to make any assignment to a particular standard.

Dimensional drawings



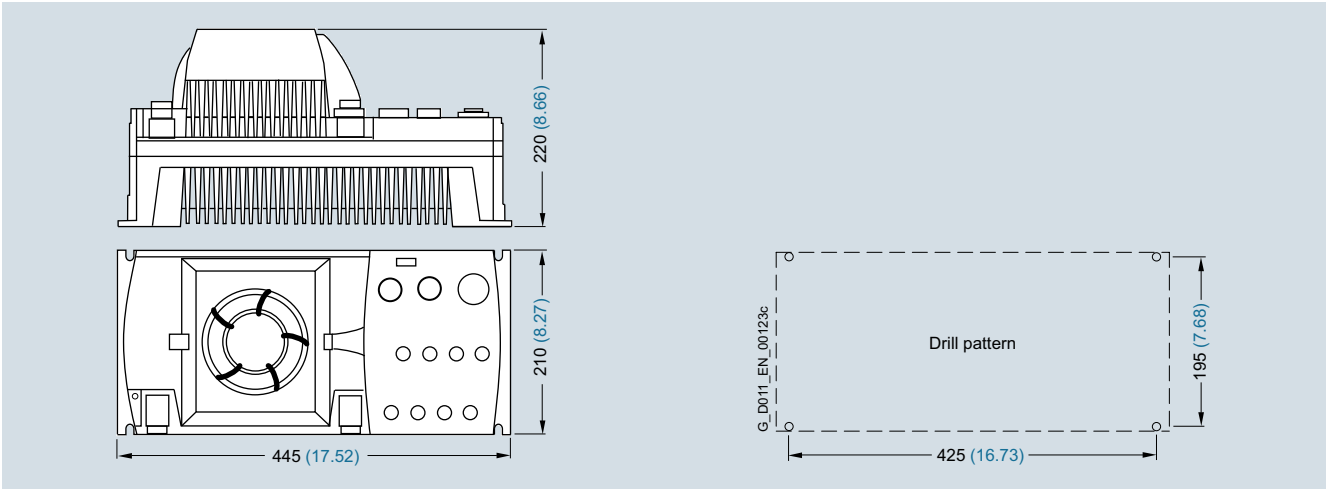
PM250D Power Module, frame size FSA, with integrated line filter class A and plugged-in Control Unit

With a CU2x0D-2 PN-F PP/FO Control Unit, the height increases to 128.3 mm (5.05 inches).



PM250D Power Module, frame size FSB, with integrated line filter class A and plugged-in Control Unit

With a CU2x0D-2 PN-F PP/FO Control Unit, the height increases to 198.3 mm (7.81 inches).



PM250D Power Module, frame size FSC, with integrated line filter class A and plugged-in Control Unit

Mounted with M5 or M6 screwed joints with a maximum washer diameter of 12 mm (0.47 inches).

3 mm (0.12 inches) allen screw for the Control Unit.

Ventilation clearance required (for wall mounting) at top and bottom: 150 mm (5.9 inches).

All dimensions in mm (values in brackets are in inches).

Selection and ordering data

The following table lists recommendations for additional line-side components, such as fuses and circuit breakers.

Note for use in compliance with IEC standards:

3NA3 type fuses and 3RV type circuit breakers are recommended for European countries. The values in the table take into account the overload capability of the inverter.

Note for use in compliance with UL regulations:

Fuses for use in North America must be UL-certified, Class J fuses with a rated voltage of 600 V AC.

Short Circuit Current Rating (SCCR)
according to UL

Applies to industrial control panel installations according to NEC Article 409 or UL 508A

- PM250D: 40 kA

Additional information about the listed fuses and circuit breakers can be found in Catalogs LV 10, IC 10 and IC 10 AO.

Individual protection

Rated power		SINAMICS G120D PM250D Power Modules		**IEC-compliant**			**UL/cUL-compliant**	
				Fuse		**Circuit breaker**	**Fuse type** Rated voltage 600 V AC	
				Current				Current
kW	hp	Type 6SL3525-...	Frame size	A	Article No.	Article No.	Class	A
380 ... 500 V 3 AC								
0.75	1	0PE17-5AA1	FSA	10	**3NA3803**	**3RV2011-1JA10**	J	10
1.5	1.5 [1]	0PE21-5AA1	FSA	10	**3NA3803**	**3RV2011-1JA10**	J	10
3	4	0PE23-0AA1	FSB	16	**3NA3805**	**3RV2011-4AA10**	J	16
4	5	0PE24-0AA1	FSC	20	**3NA3807**	**3RV2021-4BA10**	J	20
5.5	7.5	0PE25-5AA1	FSC	20	**3NA3807**	**3RV2021-4BA10**	J	20
7.5	10	0PE27-5AA1	FSC	32	**3NA3812**	**3RV2021-4PA10**	J	32

Group protection (installation on power bus)

For installations with several inverters, the inverters are normally supplied from a 400 V power bus. Further information can be found in the operating instructions on the Internet at www.siemens.com/sinamics-g120d/documentation

Information about UL/cUL-compliant group protection for applications in North America can be found on the Internet at http://support.automation.siemens.com/WW/view/en/35935349/130000

[1] It is not possible to make any assignment to a particular standard.

Accessories

For SINAMICS G120D distributed frequency inverters, the following supplementary system components are always required or are available depending on the intended application.

Designation	Order	See page
Intelligent Operator Panel IOP Handheld	Application-dependent	8/35
• RS232 connecting cable [1]	Application-dependent	8/35
Memory cards	Application-dependent	8/36
PC inverter connection kit -2 (mini USB interface cable for communication with a PC)	Application-dependent	8/36
STARTER commissioning tool	Application-dependent	8/36
Connecting cables for the Control Unit		
• PROFINET connecting cables	Application-dependent	8/37
• PROFIBUS connecting cables	Application-dependent	8/37
• Connecting cables/plug-in connectors for supplying 24 V DC to the Control Unit	**Always required**	8/37
• Connecting cables and connectors for digital inputs and outputs	Application-dependent	8/38
• Connecting cables and connectors for encoders and analog inputs	Application-dependent	8/38
Connecting cables for Power Modules		
• Connecting cables pre-assembled at one end and connector sets to connect to the line supply	**Always required**	8/38
• Motor cables pre-assembled at one end and connector sets to connect the Power Module to the motor	**Always required**	8/38
• Power bus distribution 400 V in IP65 degree of protection	Application-dependent	8/39

[1] For use in combination with SINAMICS G110D, SINAMICS G120D and SINAMICS G110M, the RS232 connecting cable with optical interface is required (Article No.: 3RK1922-2BP00). The cable must be ordered separately.

Accessories

Intelligent Operator Panel IOP Handheld

IOP Handheld for mobile use

The IOP Handheld is a very user-friendly and powerful operator panel for commissioning and diagnostics as well as local operator control and monitoring of SINAMICS G110D, SINAMICS G120D and SINAMICS G110M distributed inverters.

The IOP supports both entry-level personnel and drive experts. Thanks to the large plain text display, the menu-based operation and the application wizards, it is easy to commission standard drives. A drive can be essentially commissioned without having to use a printed parameter list – as the parameters are displayed in plain text, and explanatory help texts and the parameter filtering function are provided.

Application wizards interactively guide you when commissioning important applications such as conveyor technology, pumps, fans and compressors.

There is a basic commissioning wizard for general commissioning.

The drives are easily controlled manually using directly assigned buttons and the navigation wheel. The IOP Handheld has a dedicated switchover button to switch over from automatic to manual mode.

The inverter can be diagnosed in a user-friendly fashion using the plain text display of faults and alarms. Help texts can be obtained by pressing the INFO button.

Up to 2 process values can be displayed graphically or numerically on the status screen/status display.

Process values can also be displayed in technological units.

The IOP Handheld supports standard commissioning of identical drives. For this purpose, a parameter list can be copied from an inverter into the IOP Handheld and, downloaded into other drive units of the same type as required.

The IOP supports the following languages [1]: German, English, French, Italian, Spanish, Portuguese, Dutch, Swedish, Russian, Czech, Polish, Turkish, Finnish.

In addition to the IOP, the IOP Handheld includes a housing with the rechargeable batteries, charging unit and RS232 connecting cable. The charging unit is supplied with connector adapters for Europe, the US and UK. When the batteries are fully charged, the operating time is up to 8 hours.

To connect the IOP Handheld to SINAMICS G110D, SINAMICS G120D or SINAMICS G110M, the RS232 connecting cable with optical interface is required in addition.

Updating the IOP Handheld

The IOP Handheld can be updated and expanded using the integrated USB interface.

Data to support future drive systems can be transferred from the PC to the IOP Handheld via drag & drop. Further, the USB interface allows user languages and wizards that will become available in the future to be subsequently downloaded and the firmware to be updated for the IOP Handheld [1].

The IOP is supplied with power via the USB interface during an update.

Selection and ordering data

Description	Article No.
IOP Handheld For use with SINAMICS G120, SINAMICS G120C, SINAMICS G120P, SINAMICS G110D, SINAMICS G120D, SINAMICS G110M and SINAMICS S110 Included in the scope of delivery: • IOP • Handheld housing • Rechargeable batteries (4 × AA) • Charging unit (international) • RS232 connecting cable (length 3 m/9.84 ft long, for use with SINAMICS G120, SINAMICS G120C, SINAMICS G120P and SINAMICS S110) • USB cable (1 m/3.28 ft long)	**6SL3255-0AA00-4HA0**
RS232 connecting cable With optical interface to connect the SINAMICS G110D, SINAMICS G120D or SINAMICS G110M inverters (2.5 m/8.2 ft long)	**3RK1922-2BP00**

[1] Additional information is available at http://support.automation.siemens.com/WW/view/en/67273266

Accessories

Memory cards

SINAMICS memory card (SD card)

The parameter settings for an inverter can be stored on the SINAMICS SD card. When service is required, e.g. after the inverter has been replaced and the data have been downloaded from the memory card the drive system is immediately ready for use again.

- Parameter settings can be written from the memory card to the inverter or saved from the inverter to the memory card.
- Up to 100 parameter sets can be stored.
- The memory card supports standard commissioning without the use of the Intelligent Operator Panel IOP Handheld or the STARTER and SINAMICS Startdrive commissioning tools.
- If firmware is stored on the memory card, a firmware upgrade/downgrade operation can be performed from the card during power-up when a Control Unit is installed [1)]

Note:

The memory card is not required for operation and does not have to remain inserted.

Selection and ordering data

Description		Article No.
SINAMICS SD card 512 MB		**6SL3054-4AG00-2AA0**
Optional firmware memory cards		
SINAMICS SD card 512 MB + firmware V4.5 (Multicard V4.5)	NEW	**6SL3054-7EF00-2BA0**
SINAMICS SD card 512 MB + firmware V4.6 (Multicard V4.6)	NEW	**6SL3054-7EG00-2BA0**
SINAMICS SD card 512 MB + firmware V4.7 (Multicard V4.7)	NEW	**6SL3054-7EH00-2BA0**

For more information about firmware V4.5:

http://support.automation.siemens.com/WW/view/en/72841234

For more information about firmware V4.6:

http://support.automation.siemens.com/WW/view/en/67385235

For more information about firmware V4.7:

http://support.automation.siemens.com/WW/view/en/92554110

PC inverter connection kit 2 (mini USB interface cable for communication with a PC)

For controlling and commissioning an inverter directly from a PC via a point-to-point connection if the appropriate software (STARTER commissioning tool [2)], V4.3 and higher, or SINAMICS Startdrive) has been installed.

Selection and ordering data

Description	Article No.
PC inverter connection kit -2 USB cable (3 m/9.84 ft long) for • SINAMICS G120C • SINAMICS G120 Control Units • SINAMICS G110M Control Units • SINAMICS G120D Control Units - CU230P-2 - CU240B-2 - CU240E-2 - CU250S-2 • SINAMICS G110M Control Units - CU240M • SINAMICS G120D Control Units - CU240D-2 - CU250D-2	**6SL3255-0AA00-2CA0**

STARTER commissioning tool

The STARTER commissioning tool (V4.3 and higher) supports the commissioning and maintenance of SINAMICS G120D inverters. The operator guidance combined with comprehensive, user-friendly functions for the relevant drive solution allow you to commission the device quickly and easily.

Selection and ordering data

Description	Article No.
STARTER commissioning tool [2)] On DVD-ROM	**6SL3072-0AA00-0AG0**

[1)] Additional information about upgrading/downgrading firmware can be found on the Internet at
http://support.automation.siemens.com/WW/view/en/67364620

[2)] The STARTER commissioning tool is also available on the internet at
http://support.automation.siemens.com/WW/view/en/10804985/133100

Accessories

An overview of all available accessories (e.g. connectors and cables) can be found under the following link:
www.siemens.com/distributeddrives-supplementaryproducts

Connecting cables for the Control Unit

PROFINET connecting cables

Flexible plug-in cables and plug-in connectors that can be assembled in the field for transmission of data (up to 100 Mbit/s) between Industrial Ethernet stations with IP65 degree of protection.

Selection and ordering data

Description	Article No.
IE connecting cable M12-180/M12-180 Pre-assembled IE FC TP trailing cable GP 2 x 2 PROFINET type C with two 4-pole M12 plugs (4-pole, D-coded), IP65/IP67 degree of protection, UL, plug/plug connector (IN/OUT) Length:	
• 0.3 m (0.98 ft)	**6XV1870-8AE30**
• 0.5 m (1.64 ft)	**6XV1870-8AE50**
• 1 m (3.28 ft)	**6XV1870-8AH10**
• 1.5 m (4.92 ft)	**6XV1870-8AH15**
• 2 m (6.56 ft)	**6XV1870-8AH20**
• 3 m (9.84 ft)	**6XV1870-8AH30**
• 5 m (16.41 ft)	**6XV1870-8AH50**
• 10 m (32.81 ft)	**6XV1870-8AN10**
• 15 m (49.22 ft)	**6XV1870-8AN15**
IE M12 Plug PRO For assembly in the field, M12 plug-in connector (D-coded), metal enclosure, UL, fast connection method, plug connector	
• 1 unit	**6GK1901-0DB20-6AA0**
• 8 units	**6GK1901-0DB20-6AA8**
• 1 unit (angled)	**3RK1902-2DA00**
RJ45 PLUG PRO connector For on-site assembly for CU240D-2 PN-F PP or CU250D-2 PN-F PP Control Unit, UL 1 package = 1 unit	
• 1 unit	**6GK1901-1BB10-6AA0**
SIMATIC NET POF/PCF cables (fiber optic) for CU240D-2 PN-F FO and CU250D-2 PN-F FO Coded cables for assembly in the field (sold by the meter)	
• POF standard cable GP 980/1000 NEW Minimum order quantity: 20 m (65.62 ft)	**6XV1874-2A**
• POF trailing cable 980/1000 NEW Minimum order quantity: 20 m (65.62 ft)	**6XV1874-2B**
• PCF standard cable GP 200/230 NEW With UL approval Minimum order quantity: 20 m (65.62 ft)	**6XV1861-2D**
• PCF trailing cable 200/230 NEW With UL approval Minimum order quantity: 20 m (65.62 ft)	**6XV1861-2C**
Connectors for fiber-optic cables POF/PCF plug-in connectors for assembly in the field	
• IE SC RJ POF PLUG PRO (1 unit) NEW	**6GK1900-0MB00-6AA0**
• IE SC RJ PCF PLUG PRO (1 unit) NEW	**6GK1900-0NB00-6AA0**

PROFIBUS connecting cables

Flexible plug-in cables/connectors for transmission of data (up to 12 Mbit/s) from PROFIBUS stations.

Selection and ordering data

Description	Article No.
PROFIBUS M12 plug-in cable Pre-assembled with two 5-pole M12 plug/socket connectors, UL Length:	
• 0.3 m (0.98 ft)	**6XV1830-3DE30**
• 0.5 m (1.64 ft)	**6XV1830-3DE50**
• 1 m (3.28 ft)	**6XV1830-3DH10**
• 1.5 m (4.92 ft)	**6XV1830-3DH15**
• 2 m (6.56 ft)	**6XV1830-3DH20**
• 3 m (9.84 ft)	**6XV1830-3DH30**
• 5 m (16.41 ft)	**6XV1830-3DH50**
• 10 m (32.81 ft)	**6XV1830-3DN10**
• 15 m (49.22 ft)	**6XV1830-3DN15**
PROFIBUS M12 connector 5-pole, B-coded, metal enclosure, 1 package = 5 units	
• Pin insert	**6GK1905-0EA00**
• Female contact insert	**6GK1905-0EB00**

Connecting cables/plug-in connectors for supplying 24 V DC to the Control Unit

Selection and ordering data

Description	Article No.
7/8" plug-in cable For power supply, pre-assembled with two 5-pole 7/8" plug/socket connectors, UL 5 × 1.5 mm^2 Length:	
• 0.3 m (0.98 ft)	**6XV1822-5BE30**
• 0.5 m (1.64 ft)	**6XV1822-5BE50**
• 1 m (3.28 ft)	**6XV1822-5BH10**
• 1.5 m (4.92 ft)	**6XV1822-5BH15**
• 2 m (6.56 ft)	**6XV1822-5BH20**
• 3 m (9.84 ft)	**6XV1822-5BH30**
• 5 m (16.41 ft)	**6XV1822-5BH50**
• 10 m (32.81 ft)	**6XV1822-5BN10**
• 15 m (49.22 ft)	**6XV1822-5BN15**
7/8" plug-in connector 5-pole, B-coded, plastic enclosure, 1 package = 5 units	
• Pin insert (OUT)	**6GK1905-0FA00**
• Female contact insert (IN)	**6GK1905-0FB00**
POWER PLUG PRO plug-in connector For the CU2x0D-2 PN-F PP/FO 5-pole push-pull power connector for on-site assembly 1 package = 1 unit	
• 1 unit	**6GK1907-0AB10-6AA0**

Accessories

Connecting cables and connectors for digital inputs and outputs

Selection and ordering data

Description	Article No.
M12 plug-in cable With PUR sheath, to connect digital sensors and actuators, pre-assembled at one end, angled, plug connector, 5-pole, 5 × 0.34 mm², UL Length:	
• 1.5 m (4.92 ft)	**3RK1902-4HB15-5AA0**
• 5 m (16.41 ft)	**3RK1902-4HB50-5AA0**
• 10 m (32.81 ft)	**3RK1902-4HC01-5AA0**
M12 connector For screw mounting, 5-pole screw-type connection max. 0.75 mm², A-coded, max. 4 A, UL, plug connector	
• Straight	**3RK1902-4BA00-5AA0**
• Angled	**3RK1902-4DA00-5AA0**

Connecting cables and connectors for encoders and analog inputs

Selection and ordering data

Description	Ordering (see Solution Partner)
M12 cable connector 8-pole plug connector	
• Straight cable outlet	Ordered from and supplied by KnorrTec
• Angled cable outlet	Ordered from and supplied by KnorrTec
M12 plug-in cable Pre-assembled at one end, straight, plug connector, 8-pole, 4 × 2 × AWG24, shielded, PUR gray, suitable for trailing cables, for HTL and SSI encoders Length:	
• 1.5 m (4.92 ft)	Ordered from and supplied by KnorrTec
• 5 m (16.41 ft)	Ordered from and supplied by KnorrTec
• 10 m (32.81 ft)	Ordered from and supplied by KnorrTec
M12 plug-in cable Pre-assembled at both ends, 8-pole M12 male connector to 12-pole M23 socket, 4 × 2 × AWG24, shielded, PUR gray, suitable for trailing cables	Ordered from and supplied by KnorrTec
• HTL plug-in cable	
• SSI plug-in cable Length:	
• 1.5 m (4.92 ft)	Ordered from and supplied by KnorrTec
• 5 m (16.41 ft)	Ordered from and supplied by KnorrTec
• 10 m (32.81 ft)	Ordered from and supplied by KnorrTec
T distribution piece To connect two analog inputs 8-pole M12 male connector to 2 × 4-pole M12 socket, angled	Ordered from and supplied by KnorrTec

Connecting cables for Power Modules

Connecting cables pre-assembled at one end and connector sets to connect to the line supply

Selection and ordering data

Description	Article No.
Connecting cable pre-assembled at one end Power supply cable, open at one end, for HAN Q4/2, angled, 4 × 4 mm²	
• 1.5 m (4.92 ft) long	**3RK1911-0DB13**
• 5 m (16.41 ft) long	**3RK1911-0DB33**
Connector set for the power supply HAN Q4/2	
• 2.5 mm²	**3RK1911-2BE50**
• 4 mm²	**3RK1911-2BE10**
• 6 mm²	**3RK1911-2BE30**

Accessories

Motor cables pre-assembled at one end and connector sets to connect the Power Module to the motor

Selection and ordering data

Motor cables pre-assembled at one end For motors with brake and temperature sensor with HAN Q8 connector, shielded	Article No. (HTG: supplied by Harting) (ZKT: supplied by KnorrTec)		
Cross-section	4 × 1.5 mm² 2 × (2 × 0.75 mm²)	4 × 2.5 mm² 2 × (2 × 0.75 mm²)	4 × 4 mm² 2 × 1 mm² + 2 × 1.5 mm²
• 1.5 m (4.92 ft)	**HTG: 61 88 201 0288** **ZKT: 70020501000150**	**HTG: 61 88 201 0291** **ZKT: 70009601000150**	**HTG: 61 88 201 0303** **ZKT: 70017001000150**
• 3 m (9.84 ft)	**HTG: 61 88 201 0289** **ZKT: 70020501000300**	**HTG: 61 88 201 0292** **ZKT: 70009601000300**	**HTG: 61 88 201 0304** **ZKT: 70017001000300**
• 5 m (16.41 ft)	**HTG: 61 88 201 0290** **ZKT: 70020501000500**	**HTG: 61 88 201 0293** **ZKT: 70009601000500**	**HTG: 61 88 201 0305** **ZKT: 70017001000500**
• 10 m (32.81 ft)	**HTG: 61 88 201 0299** **ZKT: 70020501001000**	**HTG: 61 88 201 0301** **ZKT: 70009601001000**	**HTG: 61 88 201 0306** **ZKT: 70017001001000**
Connector set for motor cable HAN Q8, shielded			
	HTG: 61 83 401 0131 **ZKT: 10032001**	**HTG: 61 83 401 0132** **ZKT: 10032011**	**HTG: 61 83 401 0133** **ZKT: 10032021**

Power bus distribution 400 V in IP65 degree of protection

Selection and ordering data

Description	Ordering (see Solution Partner)
Power T clamp connector for 2.5 ... 6 mm² With attached 7-pole connector, female contact insert, grommet housing, UL Seals for various cable cross-sections must be ordered separately	Ordered from and supplied by Harting
T clamp connector Completely pre-assembled	Ordered from and supplied by KnorrTec
T distributor box, **IDC connection power cable** Pre-assembled, UL, uncut power cable, 2.5 ... 6 mm² Push-in connection: 1.5 ... 6 mm² Seals for various cable cross-sections must be ordered separately	Ordered from and supplied by Weidmüller
Y distributor For direct connection of 400 V supply line, HAN Q4/2, conductor cross-section 1.5 ... 4 mm²	Ordered from and supplied by Harting

Additional information

An overview of further accessories (e.g. connectors and cables) can be found under the following link:
www.siemens.com/distributeddrives-supplementaryproducts

For further information about the connecting cables and plug-in connectors mentioned above, please refer to Catalog IK PI.

Further selected accessories are available from Siemens Solution Partners. Please go to the "Solution Partner Finder" and select technology "Distributed Field Installation System".
www.siemens.com/automation/partnerfinder

8

Spare parts > Spare Parts Kit

Overview

A Spare Parts Kit can be ordered, comprising small parts such as replacement seals, caps, PROFIBUS address windows and screws.

Selection and ordering data

Description	Article No.
Spare Parts Kit for SINAMICS G120D Comprising replacement seals, caps, PROFIBUS address windows and screws	**6SL3500-0SK01-0AA0**
Replacement caps for CU2x0D-2 PN-F PP/FO	
• 24 V push-pull PLUG PRO caps 1 package = 5 units	**6ES7194-4JA50-0AA0**
• RJ45 PLUG PRO caps 1 package = 5 units	**6ES7194-4JD50-0AA0**

Spare parts > Replacement fans

Overview

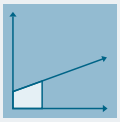
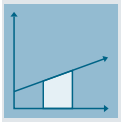
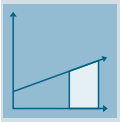
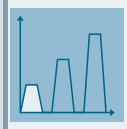
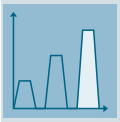
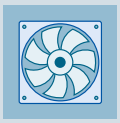
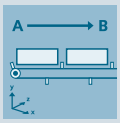
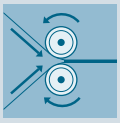
The Power Module fans are designed for extra long service life. Replacement fans can be ordered for special applications.

Selection and ordering data

Rated power		SINAMICS G120D PM250D Power Module		**Replacement fan** (pre-mounted unit with cover, fan and screws)
kW	hp	Type 6SL3525-...	Frame size	Article No.
4	5	0PE24-0AA1	FSC	**6SL3500-0SF01-0AA0**
5.5	7.5	0PE25-5AA1		
7.5	10	0PE27-5AA1		

SINAMICS S110 servo drives
0.12 kW to 90 kW (0.16 hp to 125 hp)

Application

Use	Requirements for torque accuracy/speed accuracy/position accuracy/coordination of axes/functionality					
	Continuous motion			Non-continuous motion		
	Basic	Medium	High	Basic	Medium	High
						
Pumping, ventilating, compressing	Centrifugal pumps Radial / axial fans Compressors	Centrifugal pumps Radial / axial fans Compressors	Eccentric screw pumps	Hydraulic pumps Metering pumps	Hydraulic pumps Metering pumps	Descaling pumps Hydraulic pumps
	V20 G110 G120C G120P	G120P G130/G150 G180 [1]	S120	G120	**S110**	S120
Moving 	Conveyor belts Roller conveyors Chain conveyors	Conveyor belts Roller conveyors Chain conveyors Lifting/lowering devices Elevators Escalators/moving walkways Indoor cranes Marine drives Cable railways	Elevators Container cranes Mining hoists Excavators for open-cast mining Test bays	Acceleration conveyors Storage and retrieval machines	Acceleration conveyors Storage and retrieval machines Cross cutters Reel changers	Storage and retrieval machines Robotics Pick & place Rotary indexing tables Cross cutters Roll feeds Engagers/ disengagers
	V20 G110 G110D G110M G120C	G120 G120D G130/G150 G180 [1]	S120 S150 DCM	G120 G120D	**S110** DCM	S120 DCM
Processing 	Mills Mixers Kneaders Crushers Agitators Centrifuges	Mills Mixers Kneaders Crushers Agitators Centrifuges Extruders Rotary furnaces	Extruders Winders/unwinders Lead/follower drives Calenders Main press drives Printing machines	Tubular bagging machines Single-axis motion control such as • Position profile • Path profile	Tubular bagging machines Single-axis motion control such as • Position profile • Path profile	Servo presses Rolling mill drives Multi-axis motion control such as • Multi-axis positioning • Cams • Interpolations
	V20 G120C	G120 G130/G150 G180 [1]	S120 S150 DCM	G120	**S110**	S120 DCM
Machining 	Main drives for • Turning • Milling • Drilling	Main drives for • Drilling • Sawing	Main drives for • Turning • Milling • Drilling • Gear cutting • Grinding	Axis drives for • Turning • Milling • Drilling	Axis drives for • Drilling • Sawing	Axis drives for • Turning • Milling • Drilling • Lasering • Gear cutting • Grinding • Nibbling and punching
	S110	**S110** S120	S120	**S110**	**S110** S120	S120

Many applications in mechanical engineering and plant construction require machine axes to be positioned quickly and precisely by the simplest possible method. It is often simply a case of moving a machine axis from position X to position Y reliably and with the required level of performance. The SINAMICS S110 drive inverter is ideally suited to this type of application. It is specially designed to position single axes accurately and effectively.

Specific application examples and descriptions can be found on the Internet at
www.siemens.com/sinamics-applications

More information

You may also be interested in these drives:

- Higher performance, more functionality ⇒ SINAMICS S120
- I/O extension using additional modules ⇒ SINAMICS S120
- Operation of linear and torque motors ⇒ SINAMICS S120
- Reduced functionality for basic applications with standard asynchronous motors ⇒ SINAMICS G120

[1] Industry-specific inverters.

Overview

SINAMICS S110 – the basic positioning drive for single-axis applications

SINAMICS S110: PM340 Power Module in blocksize format with CU305 Control Unit and BOP20

SINAMICS S110 can be used in numerous applications. Typical examples are:

- Handling equipment
- Feed and withdrawal devices
- Stacking units
- Automatic assembly machines
- Laboratory automation
- Metalworking
- Woodworking, glass and ceramic industries
- Printing machines
- Plastics processing machines

The SINAMICS S110 servo drive is designed for connection to both synchronous servomotors and asynchronous (induction) motors. It supports all the most popular types of encoder.

A variety of fieldbus interfaces is provided for linking the unit to a higher-level control system. Alternatively, it can be controlled via ±10 V and a pulse direction interface.

The so-called basic positioner (EPos) is an integral component of SINAMICS S110. It provides a simple method of solving positioning tasks.

Flexible in application

SINAMICS S110 is a flexible, versatile system.

Synchronous servomotors and asynchronous (induction) motors with outputs up to 90 kW can be used to implement rotary or linear axes. DRIVE-CLiQ motors can be connected simply by means of the integrated DRIVE-CLiQ interface. This means that the electronic rating plate of the motor is easy to read out, reducing the engineering time and cost involved in commissioning the drive.

Furthermore, the SINAMICS S110 features an integrated encoder interface for optional use. It is capable of evaluating HTL/TTL and SSI encoders.

In addition to pure point-to-point positioning, SINAMICS S110 naturally also offers on-the-fly changeover from continuous operation to positioning mode in order, for example, to precisely position objects transported randomly on a conveyor belt. Even simple traversing profiles with different motion cycles and wait times can be executed automatically by SINAMICS S110.

The CU305 Control Unit of the SINAMICS S110 is equipped with an integrated communication interface for linking the inverter to an automation system. A PROFINET, PROFIBUS or CANopen interface can be ordered. Standardized protocols for linking to a higher-level control are supported – the PROFIdrive profile for positioning mode and the PROFIsafe profile for safety-related communication.

The inverter is thus perfectly coordinated with the SIMATIC S7 automation system. The devices are linked by means of PROFIBUS and the SIMATIC S7 uses standard function blocks to communicate with the drive. In addition, the STARTER commissioning tool can be seamlessly integrated into STEP 7, the SIMATIC's programming software.

BICO technology

Every drive contains a 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.

Free function blocks

The drive can be adapted easily and precisely to a wide range of customized requirements using the "free function blocks" integrated in the CU305 Control Unit. The available range of blocks includes simple logic blocks such as AND/OR elements, as well as more complex devices such as smoothing elements or limit-value monitors. All blocks can be flexibly interconnected using BICO (Binector-Connector) technology, ensuring that signals are processed quickly and close to the drive which helps reduce the load on the higher-level control.

Diagnostics optimally supported by trace function

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

Overview

Safety Integrated

The integrated safety functions of SINAMICS S110 provide highly effective application-oriented protection for personnel and machinery (terms as defined in IEC 61800-5-2).

The following Safety Integrated Basic Functions are included as standard:

- Safe Torque Off (STO)
- Safe Brake Control (SBC)
- Safe Stop 1 (SS1)

The following Safety Integrated Extended Functions are optionally available:

- Safe Stop 2 (SS2)
- Safe Operating Stop (SOS)
- Safely Limited Speed (SLS)
- Safe Speed Monitor (SSM)
- Safe Direction (SDI)

The Safety Integrated functions are fully integrated into the drive system. They can be activated via fail-safe digital inputs on the CU305 Control Unit or via PROFINET or 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.

Additional information is provided in chapter Highlights, section Safety Integrated.

Accessories

Memory cards

The memory card can be used as an option for SINAMICS S110. The relevant slot is located underneath the CU305 Control Unit. The complete functionality of SINAMICS S110 can be saved on the memory card: the parameter settings and the firmware. When service is required, e.g. after the inverter has been replaced and the data has been downloaded from the memory card, the drive system is immediately ready for use once more.

A SINAMICS Micro Memory Card (MMC) is essential, if the optional Safety Integrated Extended Functions are used. The necessary license is saved on the MMC.

Intelligent Operator Panel (IOP)

The IOP supports both entry-level personnel and drive experts. Thanks to the large plain text display, menu-based operation and application wizards, it is easy to commission, diagnose and locally control standard drives.

The IOP can be connected to the RS232 interface of the CU305 Control Unit using the appropriate connecting cable. Mounting the IOP directly on the CU305 Control Unit is not possible.

Varnished modules

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

- Blocksize format units
- Control Units
- Sensor Modules

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

Function

SINAMICS S110 – Summary of the most important functions	
Control method	Servo control
• Asynchronous (induction) motor	Torque control with encoder Speed control with and without encoder Position control with encoder
• Synchronous motor	Torque control with encoder Speed control with encoder Position control with encoder
Control function	*V/f* characteristic
• Asynchronous (induction) motor	Basic linear
• Synchronous motor	–
Basic positioner (EPos)	Absolute and relative positioning Linear and rotary axes Motor encoder or direct measuring system 4 referencing modes 16 traversing blocks Direct setpoint input (MDI) Jog mode Backlash compensation Following error monitoring Cam signals Position tracking for extended position range ....
Safety Integrated	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) Safe Direction (SDI)
Protection functions	Undervoltage DC link voltage Overvoltage DC link voltage Overcurrent power unit Overcurrent motor Overload power unit (I^2t) Short circuit Ground fault Overtemperature motor Overtemperature power unit
Functions for simplified commissioning	Electronic rating plate for motors with DRIVE-CLiQ Motor data identification Pole position identification Automatic controller optimization with STARTER
Free function blocks	Logic and arithmetic blocks
Data sets	2 command data sets 2 drive data sets 2 motor data sets 1 encoder data set
Further software functions	BICO interconnection Technology controller (PID) Extended setpoint channel Automatic restart Armature short-circuit brake DC brake Brake control V_{dc_min}control (kinetic buffering) V_{dc_max}control Travel to fixed stop Vertical axis Variable signaling functions Central measuring probe evaluation Pulse direction interface Efficiency optimization for asynchronous (induction) motors Runtime (operating hours counter)

Function

Basic positioner (EPos)

SINAMICS S110 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. Furthermore, they are characterized by their comprehensive monitoring functions.

Many applications can be carried out without external position controllers.

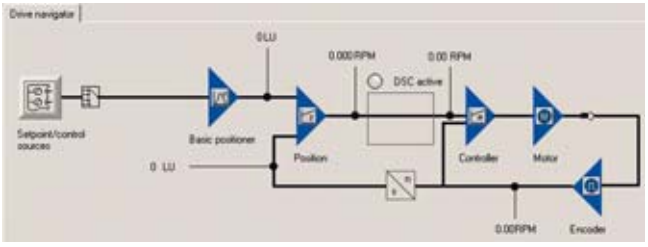
The EPos basic positioner is available as a function module that can be activated in the drive,, and is used for the absolute/ relative positioning of linear and rotary axes (modulo) with both rotary and linear motor encoders (indirect measuring system).

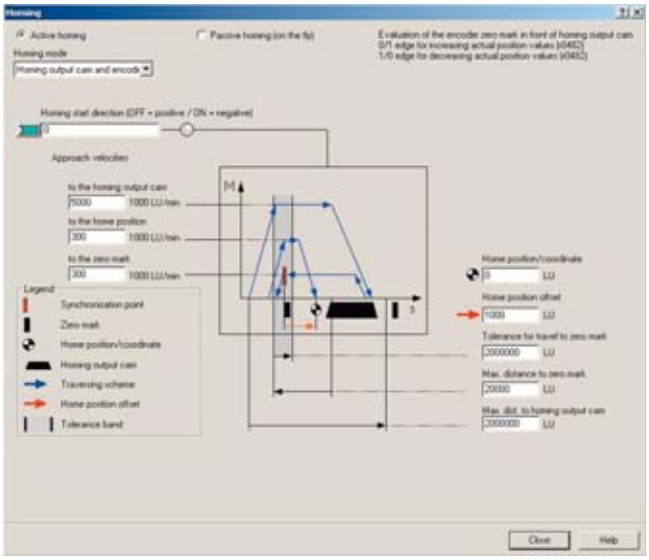
User-friendly configuring and commissioning including control panel (operation using PC) and diagnostics with the STARTER commissioning tool.

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 frames 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, 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)

Referencing and alignment

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

Traversing blocks mode (16 traversing blocks)

- Positioning using traversing blocks stored in the drive unit, including block change enable conditions and specific tasks for a previously referenced axis
- 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 for on-the-fly changes between the setup and positioning modes
- The direct setpoint input operating mode (MDI) can also be used in the relative positioning or setup mode if the axis is not referenced. This means that on-the-fly synchronization and re-referencing can be carried out using "flying referencing".

Jog mode

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

Configuration

The following electronic configuring aids and engineering tools are available for the SINAMICS S110 servo drives:

Drive Technology Configurator (DT Configurator) within the CA 01

The interactive catalog CA 01 – the offline Industry mall of Siemens on DVD-ROM contains over 100,000 products with approximately 5 million possible drive system product variants. The Drive Technology Configurator (DT Configurator) has been developed to facilitate selection of the correct motor and/or inverter from the wide spectrum of drives. It is integrated as a selection tool in Catalog CA 01.

Online DT Configurator

In addition, the DT Configurator can be used in the Internet without requiring any installation. The DT Configurator can be found in the Siemens Industry Mall at the following address:
www.siemens.com/dt-configurator

SIZER for Siemens Drives engineering tool

The SIZER for Siemens Drives engineering tool makes it easy to engineer the SINAMICS and MICROMASTER 4 drive families. It provides support when selecting the hardware and firmware components necessary to implement a drive task. SIZER for Siemens Drives is designed to support configuring of the entire drive system.

Additional information on the SIZER for Siemens Drives engineering tool is provided in the chapter Engineering tools.

The SIZER for Siemens Drives engineering tool is available free on the Internet at
www.siemens.com/sizer

STARTER commissioning tool

The STARTER commissioning tool allows menu-prompted commissioning, optimization and diagnostics. Apart from the SINAMICS drives, STARTER is also suitable for MICROMASTER 4 devices.

Additional information on the STARTER commissioning tool is provided in the chapter Engineering tools.

Additional information about the STARTER commissioning tool is available on the Internet at
www.siemens.com/starter

Drive ES engineering system

Drive ES is the engineering system that can be used to integrate the communication, configuration and data management functions of Siemens drive technology into the SIMATIC automation world easily, efficiently and cost-effectively. The STEP 7 Manager user interface provides the ideal basis for this. A variety of software packages are available for SINAMICS – Drive ES Basic, Drive ES SIMATIC and Drive ES PCS.

You can find further information on the Drive ES engineering system in the section Engineering Tools.

Additional information about the Drive ES engineering system is available on the Internet at
www.siemens.com/drive-es

Technical specifications

Unless specified otherwise, the following technical specifications are valid for all the following components of the SINAMICS S110 drive system.

Electronics power supply	24 V DC -15 %/+20 %
Vibratory load	
• Transport [1] acc. to EN 60721-3-2	
- Control Units and Power Modules	Class 2M3
• 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	
- Control Units and Power Modules	Class 2M3
• Operation Test values acc. to EN 60068-2-27	Test Ea
- Power Modules frame sizes FSA and FSB	147 m/s^2 (15 × *g*)/11 ms
- Power Modules frame sizes FSC to FSF	- 49 m/s^2 (5 × *g*)/30 ms
Ambient conditions	
• Protection class according to EN 61800-5-1	Class I (with protective conductor system) and Class III (PELV)
• Touch protection	DIN VDE 0106 Part 100 and BGV A 3 when used properly
• Type of cooling	Internal ventilator, power units with increased air cooling by built-in fans
Permissible ambient/coolant temperature (air) during operation	
• Power Modules	0 ... 40 °C (32 ... 104 °F) without derating, > 40 ... 55 °C (>104 ... 131 °F), see derating characteristics
• 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 acc. 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 pollution According to EN 61800-5-1	2

[1] In transport packaging.

Technical specifications

European standards	
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, original components of the SINAMICS system and the original Siemens accessories as described in Catalog D 31 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 non-original components are used, for example, even in the case of a repair, approvals such as UL, EN and Safety Integrated may become invalid. This may also result in the operating authorization for the machine in which the non-Siemens components are installed becoming invalid.

All of the approvals, certificates, declarations of conformity, 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. In other cases, the vendor of these products is responsible for arranging that new certificates are issued.

Note:

The products described in Catalog D 31 may cause high-frequency disturbances in a residential environment and necessitate the implementation of interference-suppression measures.

Overview

CU305 PN Control Unit

The CU305 Control Unit for the communication and open-loop/closed-loop control functions of a SINAMICS S110 is combined with the PM340 Power Module to create a powerful single drive.

Design

The CU305 Control Unit features the following connections and interfaces as standard:

- Fieldbus interface
  - CU305 PN: 1 PROFINET interface with 2 ports (RJ45 sockets) with PROFIdrive V4 profile
  - CU305 DP: 1 PROFIBUS interface with PROFIdrive V4 profile
  - CU305 CAN: 1 CANopen interface with DS301 V4.0, DSP402 V2.0, DR303-3 V1.0 profile
- 1 DRIVE-CLiQ socket, used solely to connect a DRIVE-CLiQ motor or a Sensor Module
- 1 onboard encoder evaluation for evaluating the following encoder signals
  - Incremental encoder TTL/HTL
  - SSI encoder without incremental signals
- 1 PE/protective conductor connection
- 1 connection for the electronics power supply via the 24 V DC power supply connector
- 1 temperature sensor input (KTY84-130 or PTC)
- 3 parameterizable, fail-safe digital inputs (floating), or alternatively 6 parameterizable digital inputs (floating)
- 5 parameterizable digital inputs (floating)
- 1 parameterizable, fail-safe digital output (floating), or alternatively 1 digital output (floating)
- 4 parameterizable bidirectional digital inputs/outputs
- 1 analog input ± 10 V, resolution 12 bit + sign
- 1 serial RS232 interface
- 1 slot for the memory card on which the firmware, parameters and licenses can be stored
- 1 PM-IF interface for communication with PM340 Power Modules in blocksize format
- 2 test sockets and one reference ground for commissioning support
- 1 interface to the BOP20 Basic Operator Panel

Integration

The CU305 Control Unit controls the PM340 Power Module via the PM-IF interface.

A BOP20 Basic Operator Panel can also be snapped directly onto the CU305 for diagnostic purposes. For comprehensive diagnostics and commissioning functions, an Intelligent Operator Panel (IOP) can be connected to the RS232 interface.

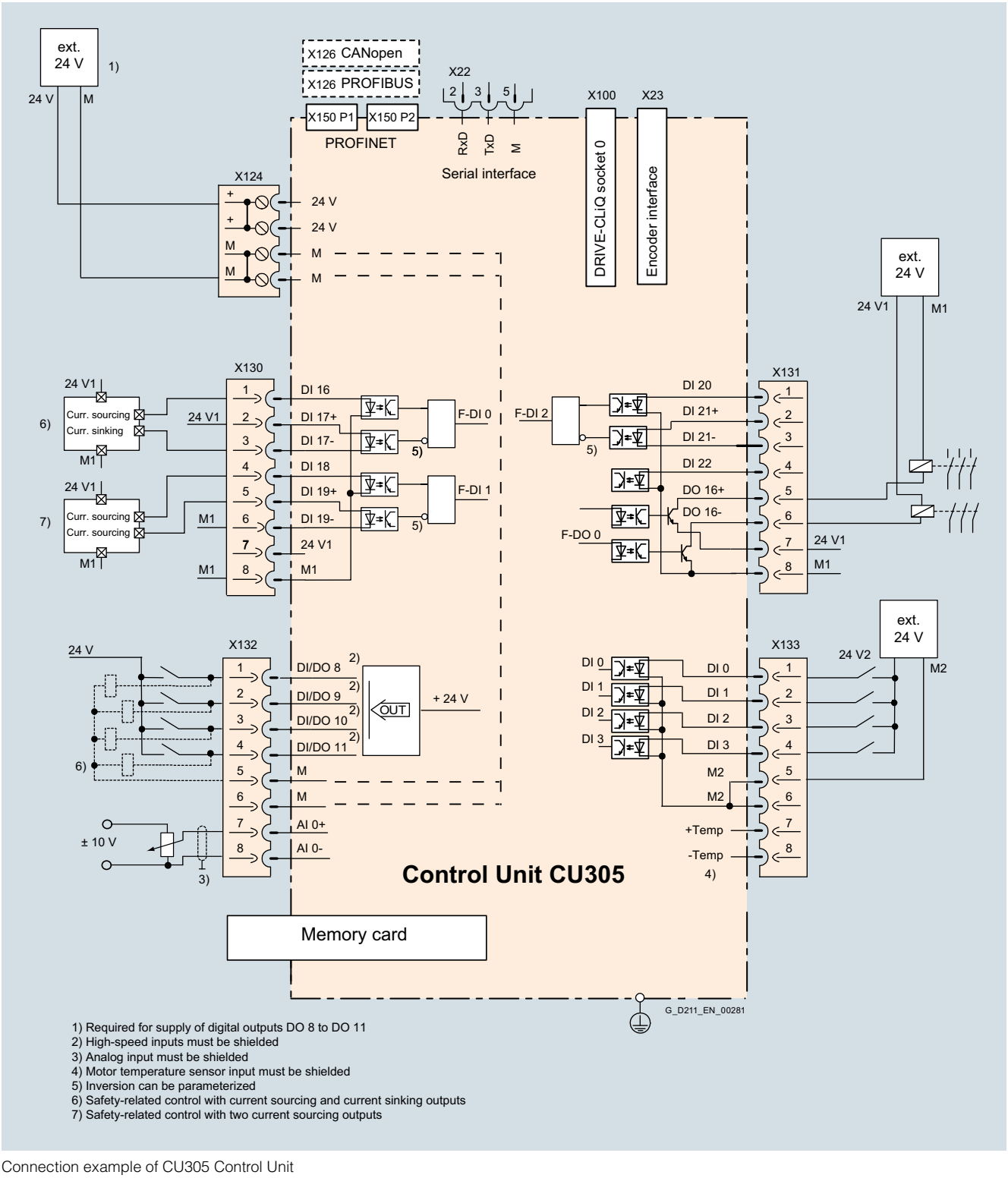
DRIVE-CLiQ motors can be connected to the integrated DRIVE-CLiQ socket as well as Sensor Modules (SMC) to permit the operation of motors without a DRIVE-CLiQ interface.

The status of the CU305 is indicated via multi-color LEDs.

The CU305 can be operated optionally with a memory card. The firmware and project data are stored on the plug-in card underneath, so that the CU305 can be replaced without the support of software tools. This memory card can also be used to perform standard commissioning on multiple drives of identical type. The card is available as an empty memory card or containing the latest drive firmware version. The card also contains the safety license for the Extended Safety Functions. To use these Extended Safety Functions, a memory card containing the safety license must be permanently inserted.

The CU305 and other connected components are commissioned and diagnosed with the STARTER commissioning tool.

Integration



1) Required for supply of digital outputs DO 8 to DO 11
2) High-speed inputs must be shielded
3) Analog input must be shielded
4) Motor temperature sensor input must be shielded
5) Inversion can be parameterized
6) Safety-related control with current sourcing and current sinking outputs
7) Safety-related control with two current sourcing outputs

Connection example of CU305 Control Unit

Selection and ordering data

Description	Article No.
CU305 PN Control Unit Without memory card	**6SL3040-0JA01-0AA0**
CU305 DP Control Unit Without memory card	**6SL3040-0JA00-0AA0**
CU305 CAN Control Unit Without memory card	**6SL3040-0JA02-0AA0**

Description	Article No.
Accessories	
Memory card for CU305 PN / CU305 DP / CU305 CAN Control Units 64 MB	
• Empty	**6SL3054-4AG00-0AA0**
• With firmware version V4.1	**6SL3054-4EB00-0AA0**
• With firmware version V4.3	**6SL3054-4ED00-0AA0**
• With firmware version V4.4	**6SL3054-4EE00-0AA0**
• With firmware version V4.4 and safety license (Extended Functions)	**6SL3054-4EE00-0AA0-Z F01**
Safety license (Extended Functions) [1]	**6SL3074-0AA10-0AA0**
STARTER commissioning tool [2] on DVD-ROM	**6SL3072-0AA00-0AG0**

Technical specifications

CU305 PN / CU305 DP / CU305 CAN Control Units PROFINET: 6SL3040-0JA01-0AA0 PROFIBUS: 6SL3040-0JA00-0AA0 CANopen: 6SL3040-0JA02-0AA0	
Power requirement At 24 V DC, max. without taking account of digital outputs and DRIVE-CLiQ supply	0.8 A for CU305 incl. 350 mA for HTL encoder + 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 3 floating fail-safe inputs 5 floating 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, typ.	6 mA
• Delay time of digital inputs [3], approx.	
- L → H	15 µs
- H → L	55 µs
• Delay time of high-speed digital inputs [3], approx. (high-speed digital inputs can be used for position detection)	
- L → H	5 µs
- H → L	5 µs
• Conductor cross-section, max.	1.5 mm^2
Digital outputs (continuously short-circuit-proof)	1 fail-safe digital output 4 bidirectional non-floating digital inputs/digital outputs
• Voltage	24 V DC
• Load current per digital output [4], max.	100 mA
• Delay time [3], approx.	150 µs
• Conductor cross-section, max.	1.5 mm^2

CU305 PN / CU305 DP / CU305 CAN Control Units PROFINET: 6SL3040-0JA01-0AA0 PROFIBUS: 6SL3040-0JA00-0AA0 CANopen: 6SL3040-0JA02-0AA0	
Analog input	-10 ... +10 V resolution 12 bits + sign
• Internal resistance	15 kΩ
Encoder evaluation	• Incremental encoder TTL/HTL • SSI encoder without incremental signals
• Encoder supply	24 V DC/0.35 A or 5 V DC/0.35 A
• Encoder frequency, max.	500 kHz
• SSI baud rate	100 ... 250 kBaud depending on cable length
• Resolution absolute position SSI	30 bit
• Cable length, max.	
- TTL encoder	100 m (328 ft) (only bipolar signals permitted) [5]
- HTL encoder	100 m (328 ft) for unipolar signals 300 m (984 ft) for bipolar signals [5]
- 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) (for CU305 PN: 195 mm/7.68 in)
• Depth	55 mm (2.17 in) (for CU305 PN: 71 mm/2.80 in).
Weight, approx.	0.95 kg (2.09 lb)
Approvals	cULus

[1] Extended function for an existing memory card. The memory card is not included with the scope of supply. By specifying the Z option **F01** it is possible to order the safety license together with a memory card.

[2] The STARTER commissioning tool is also available on the Internet at http://support.automation.siemens.com/WW/view/en/10804985/133100

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

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

[5] Signal cables twisted in pairs and shielded.

Overview

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 supply connection
- PM-IF interface for connection of the PM340 and CU305 Control Unit. The PM340 Power Module also supplies power to the CU305 Control Unit 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 for controlling a holding brake
- 2 PE/protective conductor connections

PM340 Power Modules without integrated line filter can be connected to grounded TN/TT and non-grounded IT systems. PM340 Power Modules with integrated line filter are suitable only for connection to TN systems with grounded star point.

The integrated braking unit (braking chopper) is rated with the capability to continuously utilize the external braking resistor. The temperature of the external braking resistor must be monitored to provide protection against thermal overloading.

9

Integration

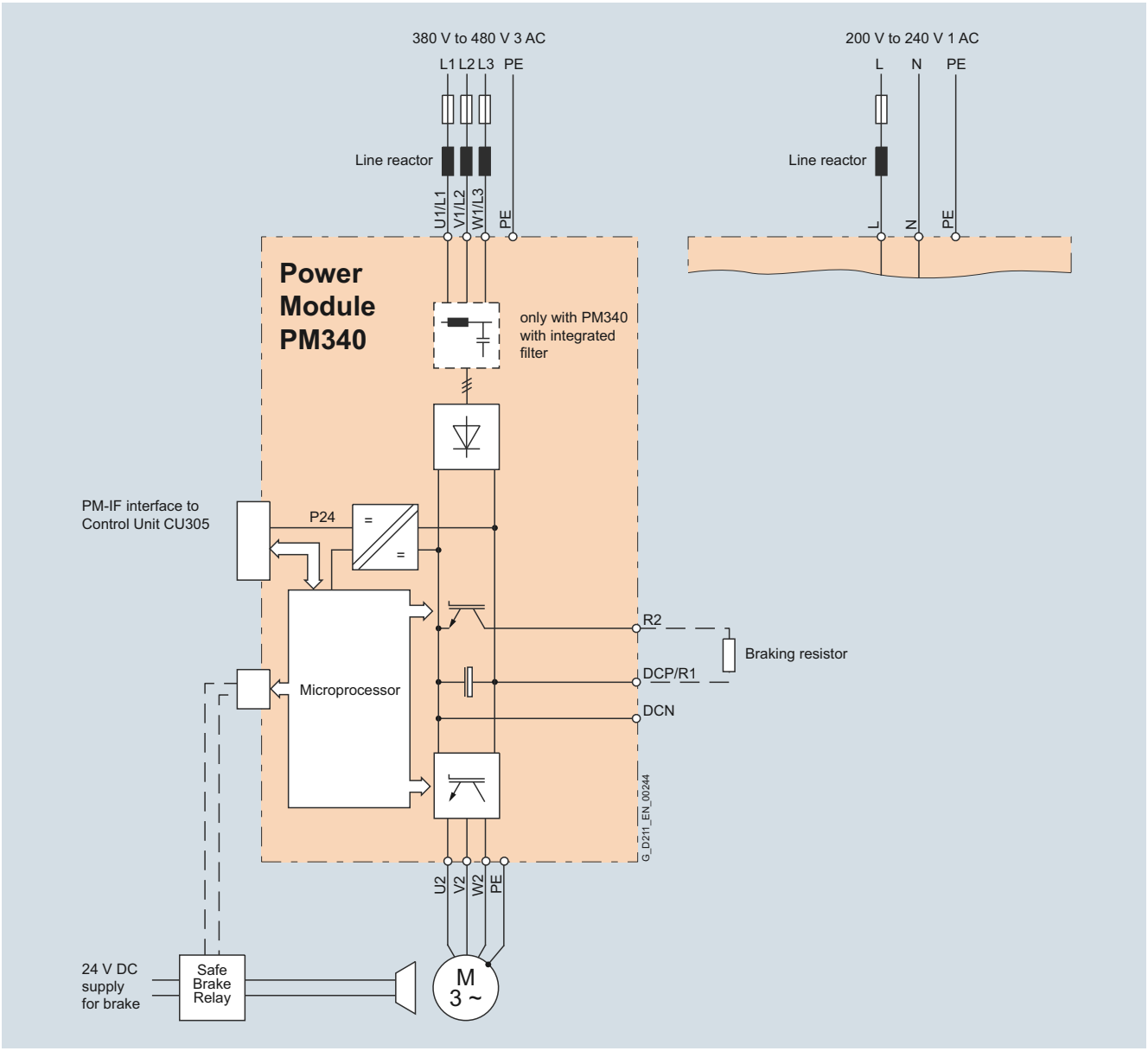
PM340 Power Modules communicate with the CU305 Control Unit via the PM-IF interface.

PM340 Power Module with CU305 DP Control Unit and BOP20 Basic Operator Panel

Note:

Operation of SINAMICS S110 in conjunction with PM240-2 Power Modules will become possible with a service pack planned for firmware V4.4.

Integration



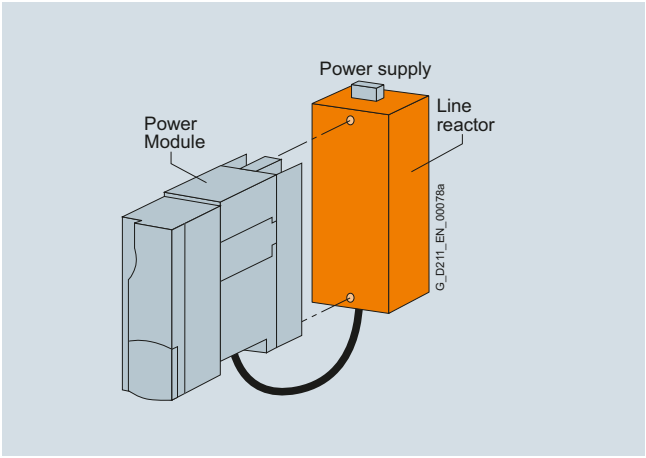
Connection example: PM340 Power Module

Integration

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.

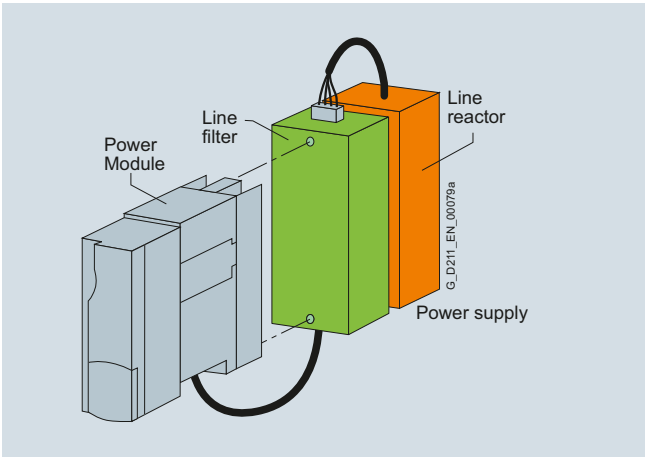
	FSA	FSB	FSC	FSD	FSE	FSF
Line filter	✓	–	–	–	–	–
Line reactor	✓	✓	✓	✓	✓	O
Braking resistor	✓	✓	O	O	O	O
Motor reactor	✓	✓	✓	O	O	O

✓ = Suitable as base type
O = Not suitable as base type
– = Not available (use a PM340 Power Module with integrated line filter)



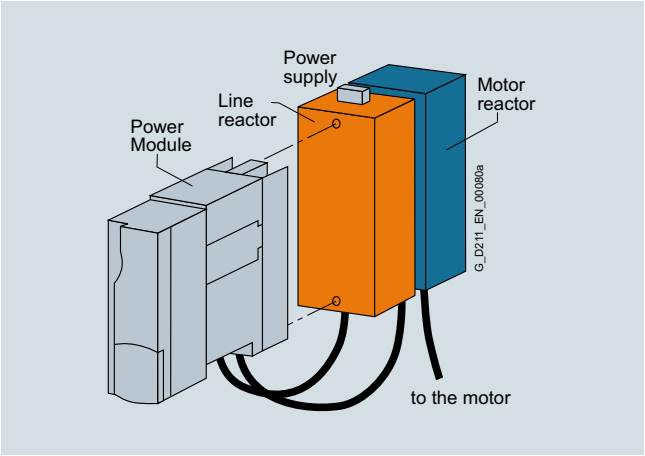
Basic layout of a PM340 Power Module with line reactor as base component

The line side reactors are equipped with terminals on the line side and with a pre-assembled cable on the PM340 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.



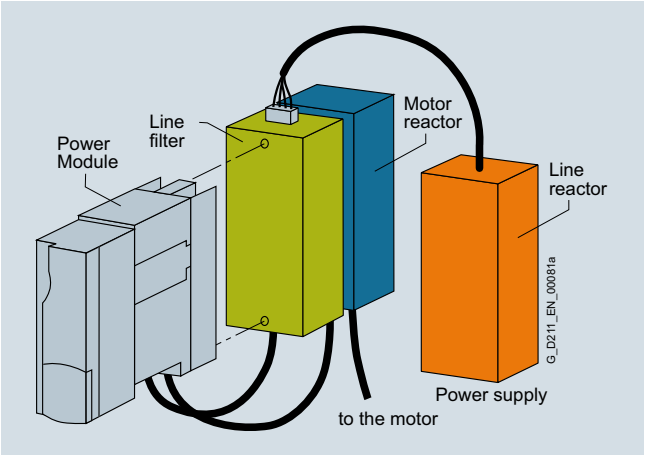
PM340 Power Module in frame size FSA with line reactor and line filter

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 supply connection is at the bottom.



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

PM340 Power Modules of frame size FSB and higher are available with integrated line filters, alleviating the need for an external line filter.

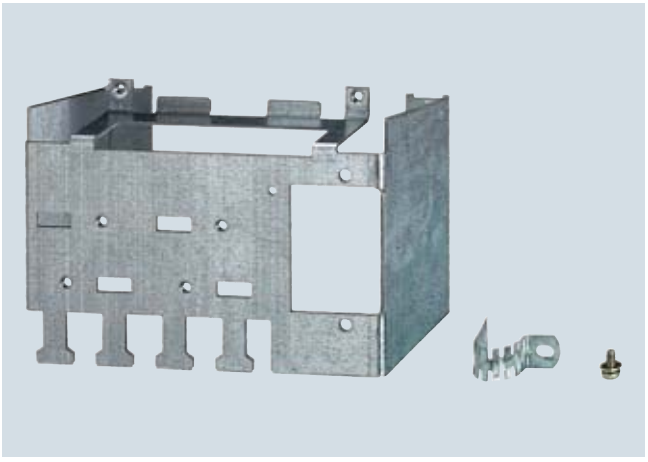


For configurations involving more than two base-type system components, e.g. line reactor + motor reactor + braking resistor, individual components must be mounted to the side of the PM340 Power Module. In this instance, the line and motor reactors must be installed behind the PM340 Power Module and the braking resistor to the side.

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)		Article No.	Article No.
Line voltage 200 ... 240 V 1 AC				
0.9	0.12 (0.16)	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 (1.0)	FSA	**6SL3210-1SE12-2UA0**	–
3.1	1.1 (1.5)	FSA	**6SL3210-1SE13-1UA0**	–
4.1	1.5 (2.0)	FSA	**6SL3210-1SE14-1UA0**	–
5.9	2.2 (3.0)	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 Power Module, frame size FSB

Description	Article No.
Shield connection kit For PM340 Power Modules	
• 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**

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 V ... 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 acc. 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 ... 330 Hz[1)]
Electronics power supply	24 V DC -15 %/+20 %
Radio interference suppression	
• Standard	No radio interference suppression
• With line filter	Category C2 acc. to EN 61800-3
Type of cooling	Forced air cooling by means of built-in fan
A ambient or coolant temperature (air) in operation for line-side components, 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	cULus
Safety Integrated	Safety Integrity Level 2 (SIL 2) according to IEC 61508, Performance Level d (PL d) and Category 3 according to EN ISO 13849-1 Additional information is provided in chapter Highlights, section Safety Integrated.

1) Note the correlation between max. output frequency, pulse frequency and current derating.

Technical specifications

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	3.4
• For S6 duty (40 %) I_{S6}	A	1.4	3.3	5.5
• Maximum current I_{max}	A	2	4.6	7.8
Type rating [1] Based on I_{rated}	kW (hp)	0.12 (0.16)	0.37 (0.5)	0.75 (0.75)
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 (0.2)	0.005 (0.2)	0.005 (0.2)
Sound pressure level L_{pA} (1 m)	dB	<45	<45	<45
24 V DC power supply for Control Unit	A	1	1	1
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 supply connection L, N		Screw-type terminals	Screw-type terminals	Screw-type terminals
• Conductor cross-section	mm^2	1 ... 2.5	1 ... 2.5	1 ... 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 ... 2.5	1 ... 2.5	1 ... 2.5
Motor connection U2, V2, W2		Screw-type terminals	Screw-type terminals	Screw-type terminals
• Conductor cross-section	mm^2	1 ... 2.5	1 ... 2.5	1 ... 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 CU305 PN	mm (in)	216 (8.50)	216 (8.50)	216 (8.50)
- PM340 with CU305 DP/CAN	mm (in)	200 (7.87)	200 (7.87)	200 (7.87)
Frame size		FSA	FSA	FSA
Weight, approx.	kg (lb)	1.2 (2.65)	1.3 (2.87)	1.3 (2.87)

1) Rated power of a typical standard asynchronous (induction) motor at 230 V 3 AC.

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 (shielded) for PM340 Power Modules with integrated line filter to maintain the limit values of EN 61800-3 Category C2.

Technical specifications

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	2.5	3.5	4.5
• Maximum current 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 (1.0)	1.1 (1.5)	1.5 (2.0)
• Based on I_H	kW (hp)	0.37 (0.5)	0.55 (0.5)	0.75 (0.75)	1.1 (1)	1.5 (2.0)
Rated pulse frequency	kHz	4	4	4	4	4
Power loss	kW	0.1	0.1	0.1	0.11	0.11
Cooling air requirement	m^3/s (ft^3/s)	0.005 (0.2)	0.005 (0.2)	0.005 (0.2)	0.005 (0.2)	0.005 (0.2)
Sound pressure level L_{pA} (1 m)	dB	<45	<45	<45	<45	<45
24 V DC power supply for Control Unit	A	1	1	1	1	1
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 supply 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 ... 2.5	1 ... 2.5	1 ... 2.5	1 ... 2.5	1 ... 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 ... 2.5	1 ... 2.5	1 ... 2.5	1 ... 2.5	1 ... 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 ... 2.5	1 ... 2.5	1 ... 2.5	1 ... 2.5	1 ... 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 CU305 PN	mm (in)	216 (8.50)	216 (8.50)	216 (8.50)	216 (8.50)	216 (8.50)
- PM340 with CU305 DP/CAN	mm (in)	200 (7.87)	200 (7.87)	200 (7.87)	200 (7.87)	200 (7.87)
Frame size		FSA	FSA	FSA	FSA	FSA
Weight, approx.	kg (lb)	1.2 (2.65)	1.2 (2.65)	1.2 (2.65)	1.2 (2.65)	1.2 (2.65)

[1] Rated power of a typical asynchronous (induction) motor at 400 V 3 AC.

[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

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
• Maximum current I_{max}	A	11.8	15.4	20.4	26.4	38	52
Type rating [1]							
• Based on I_{rated}	kW (hp)	2.2 (3.0)	3 (5)	4 (5)	7.5 (10)	11 (15)	15 (20)
• Based on I_H	kW (hp)	2.2 (3.0)	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	0.3	0.4
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 Control Unit	A	1	1	1	1	1	1
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 supply 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 ... 6	1 ... 6	1 ... 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 ... 6	1 ... 6	1 ... 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 ... 6	1 ... 6	1 ... 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 CU305 PN	mm (in)	236 (9.29)	236 (9.29)	236 (9.29)	256 (10.08)	256 (10.08)	256 (10.08)
- PM340 with CU305 DP/CAN	mm (in)	220 (8.66)	220 (8.66)	220 (8.66)	240 (9.45)	240 (9.45)	240 (9.45)
Frame size		FSB	FSB	FSB	FSC	FSC	FSC
Weight, approx.	kg (lb)	4 (9)	4 (9)	4 (9)	6.5 (14.3)	6.5 (14.3)	6.5 (14.3)

1) Rated power of a typical asynchronous (induction) motor at 400 V 3 AC.

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

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
• Maximum current 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 Control Unit	A	1	1	1	1	1
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 supply 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 ... 50	10 ... 50	10 ... 50	10 ... 50	10 ... 50
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 CU305 PN	mm (in)	274.5 (10.81)	274.5 (10.81)	274.5 (10.81)	274.5 (10.81)	274.5 (10.81)
- PM340 with CU305 DP/CAN	mm (in)	258.5 (10.18)	258.5 (10.18)	258.5 (10.18)	258.5 (10.18)	258.5 (10.18)
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) Rated power of a typical asynchronous (induction) motor at 400 V 3 AC.

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

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
• Maximum current 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 Control Unit	A	1	1	1
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 supply 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 CU305 PN	mm (in)	386.5 (15.22)	386.5 (15.22)	386.5 (15.22)
- PM340 with CU305 DP/CAN	mm (in)	370.5 (14.59)	370.5 (14.59)	370.5 (14.59)
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)

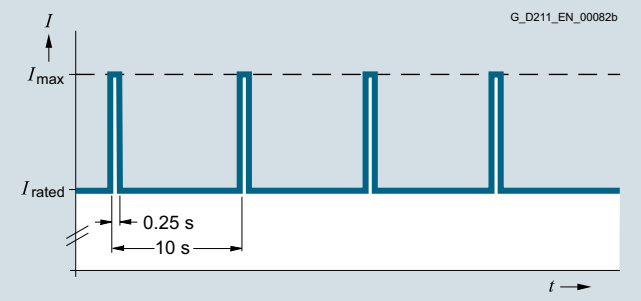
1) Rated power of a typical asynchronous (induction) motor at 400 V 3 AC.

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%.

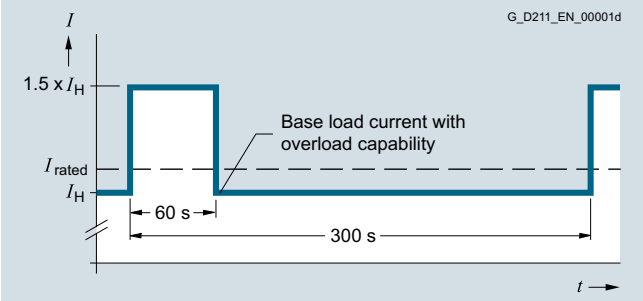
3) Max. motor cable length 25 m (82 ft) (shielded) for PM340 Power Modules with integrated line filter to maintain the limit values of EN 61800-3 Category C2.

Characteristic curves

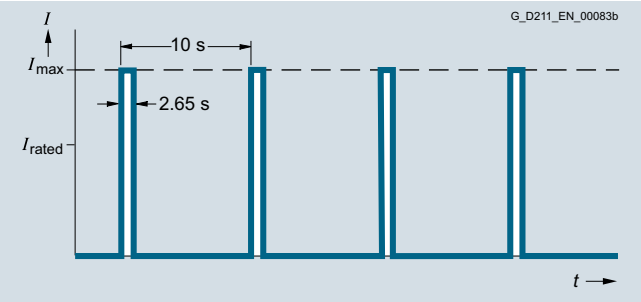
Overload capability



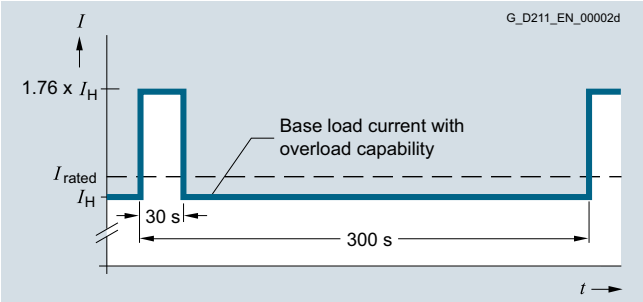
Duty cycle with initial load



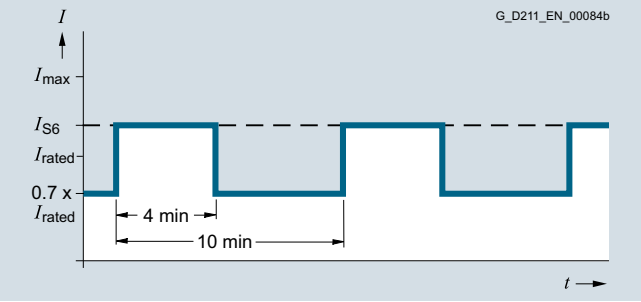
Duty cycle with 60 s overload with a duty cycle duration of 300 s



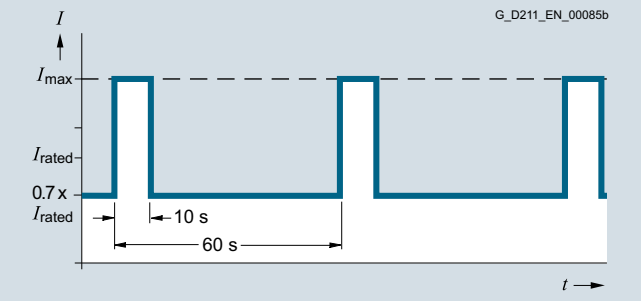
Duty cycle without initial load



Duty cycle with 30 s overload with a duty cycle duration of 300 s



S6 duty cycle with initial load with a duty cycle duration of 600 s

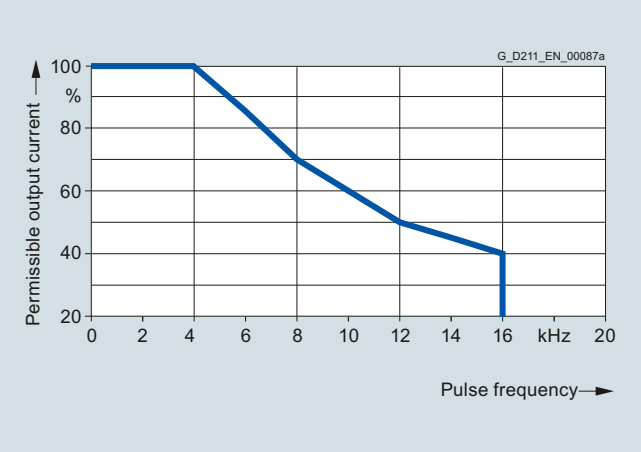


S6 duty cycle with initial load with a duty cycle duration of 60 s

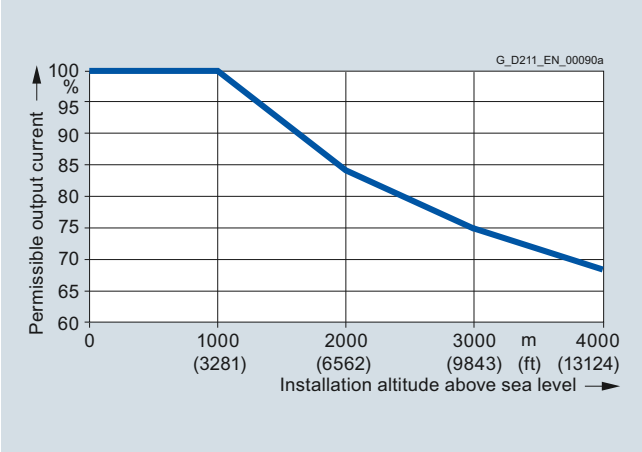
Characteristic curves

Derating characteristics

- Frame sizes FSA to FSE

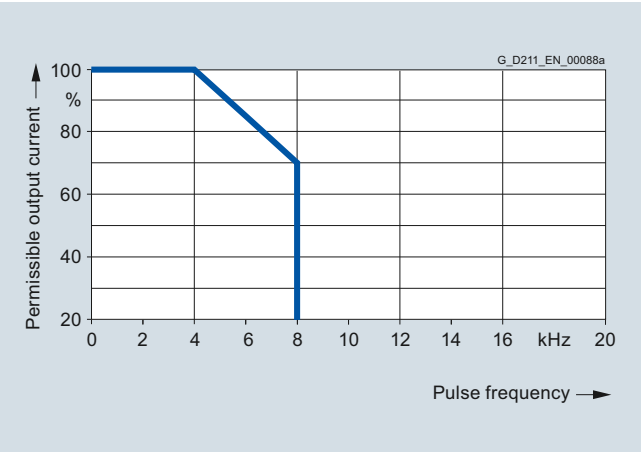


Output current as a function of pulse frequency

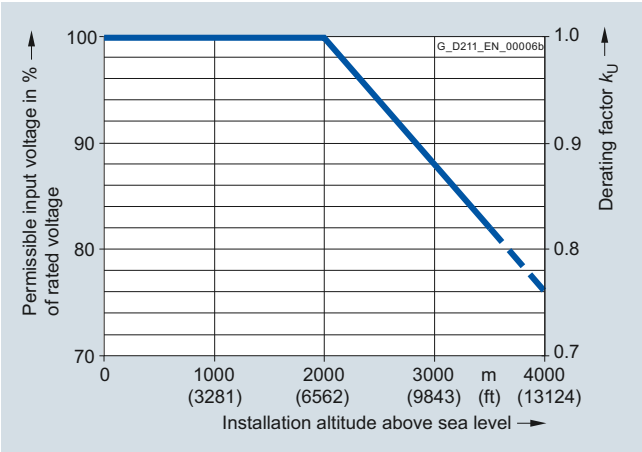


Output current as a function of installation altitude

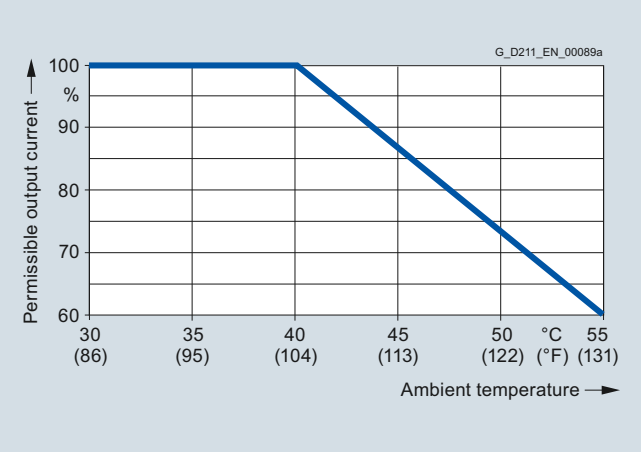
- Frame sizes FSF



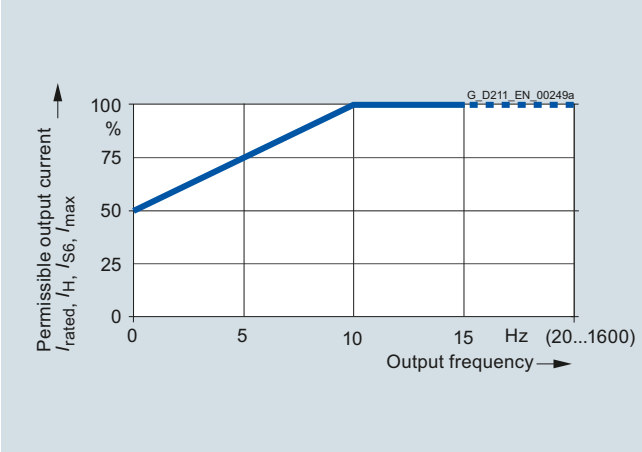
Output current as a function of pulse frequency



Voltage derating as a function of installation altitude



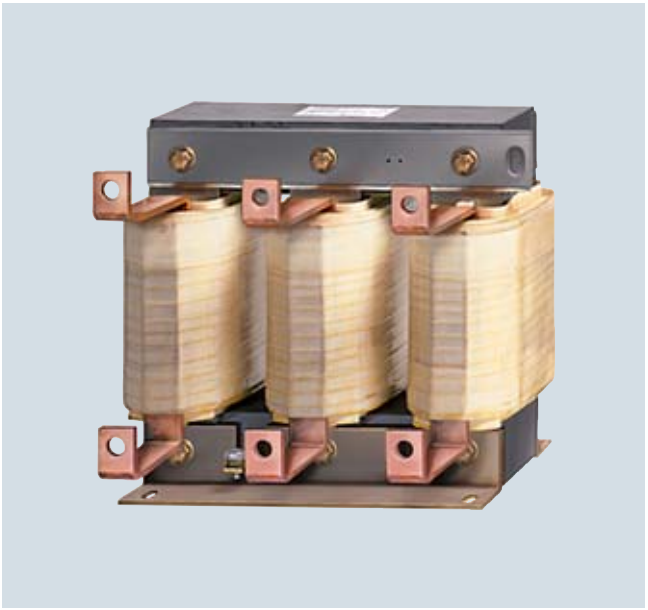
Output current as a function of ambient temperature



Output current as a function of output frequency

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 addition, the line reactors limit the current spikes at the inverter input, e.g. for commutation notches. It is recommended to use the line reactors in combination with unfiltered PM340 Power Modules and line voltages with a high harmonic content (industrial networks).

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 supply connection through terminals.

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

Selection and ordering data

Rated output current	Type rating	Suitable for Power Module in blocksize format		**Line reactor**
A	kW (hp)	Type	Frame size	Article No.
Line voltage 200 ... 240 V 1 AC				
0.9	0.12 (0.16)	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 (1.0)	6SL3210-1SE12-2UA0	FSA	**6SE6400-3CC00-4AD3**
3.1	1.1 (1.5)	6SL3210-1SE13-1UA0		
4.1	1.5 (2.0)	6SL3210-1SE14-1UA0	FSA	**6SE6400-3CC00-6AD3**
5.9	2.2 (3.0)	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**

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 supply 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 supply 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

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	95	151	186
Power loss at 50/60 Hz	W	37/44	90/115	90/115	170/215	280/360	280/360
Line supply 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.

Overview

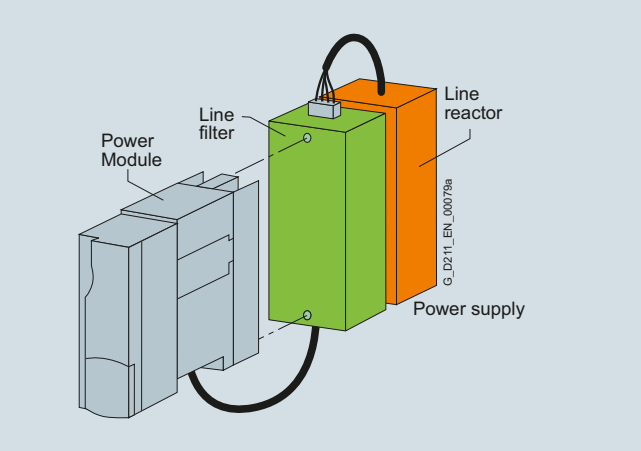
In plants with strict EMC requirements, the line filter for frame size FSA restricts the conducted interference emanating from the PM340 Power Module to the limit values of Category C2 as defined in EN 61800-3. The line filter is suited only for direct connection to TN (grounded) systems.

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.



Selection and ordering data

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

Technical specifications

Line voltage 380 ... 480 V 3 AC	**Line filter** 6SE6400-2FA00-6AD0
Rated current	6 A
Power loss	<5 W
Line supply 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 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).

Additional information about the listed line contactors, switch disconnectors, circuit breakers and fuses can be found in Catalogs LV 10, IC 10 and IC 10 AO.

Rated output current	Type rating	Power Module in blocksize format	**Line contactor**	**Circuit breaker IEC 60947**
A	kW (hp)	Type 6SL3210-...	Type	Article No.
Line voltage 200 ... 240 V 1 AC				
0.9	0.12 (0.16)	1SB11-0...	**5TT57...**	**5SJ4206-7HG41**
2.3	0.37 (0.5)	1SB12-3...	**5TT57...**	**5SJ4210-7HG41**
3.9	0.75 (0.75)	1SB14-0...	**5TT57...**	**5SJ4216-7HG41**

Rated output current	Type rating	Power Module in blocksize format	**Line contactor**	**Circuit breaker IEC 60947**	**Main switch**
A	kW (hp)	Type 6SL3210-...	Type	Article No.	Article No.
Line voltage 380 ... 480 V 3 AC					
1.3	0.37 (0.5)	1SE11-3UA0	**3RT1015-...**	**3RV2011-1DA10**	**3LD2003-1TP51**
1.7	0.55 (0.75)	1SE11-7UA0	**3RT1015-...**	**3RV2011-1DA10**	**3LD2003-1TP51**
2.2	0.75 (1.0)	1SE12-2UA0	**3RT1015-...**	**3RV2011-1FA10**	**3LD2003-1TP51**
3.1	1.1 (1.5)	1SE13-1UA0	**3RT1015-...**	**3RV2011-1GA10**	**3LD2003-1TP51**
4.1	1.5 (2.0)	1SE14-1UA0	**3RT1015-...**	**3RV2011-1HA10**	**3LD2003-1TP51**
5.9	2.2 (3.0)	1SE16-0...	**3RT1015-...**	**3RV2011-1KA10**	**3LD2003-1TP51**
7.7	3 (5)	1SE17-7...	**3RT1015-...**	**3RV2021-4AA10**	**3LD2003-1TP51**
10	4 (5)	1SE21-0...	**3RT1016-...**	**3RV2021-4BA10**	**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**	**3LD2704-0TK51**
75	37 (50)	1SE27-5...	**3RT1045-...**	**3VL1712-1DD33-....** *)	**3LD2704-0TK51**
90	45 (60)	1SE31-0...	**3RT1046-...**	**3VL1716-1DD33-....** *)	**3LD2804-0TK51**
110	55 (75)	1SE31-1...	**3RT1054-...**	**3VL3720-1DC36-....** *)	**3KA5330-1GE01**
145	75 (100)	1SE31-5...	**3RT1056-...**	**3VL3720-1DC36-....** *)	**3KA5530-1GE01**
178	90 (125)	1SE31-8...	**3RT1064-...**	**3VL4725-1DC36-....** *)	**3KA5530-1GE01**

*) See Catalog LV 10 for Article No. supplements.

Selection and ordering data

Rated output current A	Type rating kW (hp)	Power Module in blocksize format Type 6SL3210-...	**Fuse switch disconnector** Article No.	**Switch disconnector with fuse holders** Article No.	**Fuse** [1] Article No.
Line voltage 380 ... 480 V 3 AC					
1.3	0.37 (0.5)	1SE11-3UA0	**3NP1123-1CA20**	**3KL5030-1GB01**	**3NA3804**
1.7	0.55 (0.75)	1SE11-7UA0	**3NP1123-1CA20**	**3KL5030-1GB01**	**3NA3804**
2.2	0.75 (1.0)	1SE12-2UA0	**3NP1123-1CA20**	**3KL5030-1GB01**	**3NA3801**
3.1	1.1 (1.5)	1SE13-1UA0	**3NP1123-1CA20**	**3KL5030-1GB01**	**3NA3803**
4.1	1.5 (2.0)	1SE14-1UA0	**3NP1123-1CA20**	**3KL5030-1GB01**	**3NA3803**
5.9	2.2 (3.0)	1SE16-0...	**3NP1123-1CA20**	**3KL5030-1GB01**	**3NA3803**
7.7	3 (5)	1SE17-7...	**3NP1123-1CA20**	**3KL5030-1GB01**	**3NA3805**
10	4 (5)	1SE21-0...	**3NP1123-1CA20**	**3KL5030-1GB01**	**3NA3805**
18	7.5 (10)	1SE21-8...	**3NP1123-1CA20**	**3KL5030-1GB01**	**3NA3810**
25	11 (15)	1SE22-5...	**3NP1123-1CA20**	**3KL5030-1GB01**	**3NA3814**
32	15 (20)	1SE23-2...	**3NP1123-1CA20**	**3KL5030-1GB01**	**3NA3817**
38	18.5 (25)	1SE23-8...	**3NP1123-1CA20**	**3KL5030-1GB01**	**3NA3820**
45	22 (30)	1SE24-5...	**3NP1123-1CA20**	**3KL5030-1GB01**	**3NA3822**
60	30 (40)	1SE26-0...	**3NP1123-1CA20**	**3KL5230-1GB01**	**3NA3824**
75	37 (50)	1SE27-5...	**3NP1123-1CA20**	**3KL5230-1GB01**	**3NA3830**
90	45 (60)	1SE31-0...	**3NP1133-1CA20**	**3KL5230-1GB01**	**3NA3832**
110	55 (75)	1SE31-1...	**3NP1133-1CA20**	**3KL5330-1GB01**	**3NA3836**
145	75 (100)	1SE31-5...	**3NP1143-1DA10**	**3KL5530-1GB01**	**3NA3140**
178	90 (125)	1SE31-8...	**3NP1143-1DA10**	**3KL5530-1GB01**	**3NA3144**

[1] Can also be protected by semiconductor protection or device protection fuses of type 3NE, and the switch disconnector appropriate for the fuse.

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 size 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 lead the resulting heat loss away from the Power Modules. The level of air conditioning required is therefore reduced.

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** Article 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**

Technical specifications

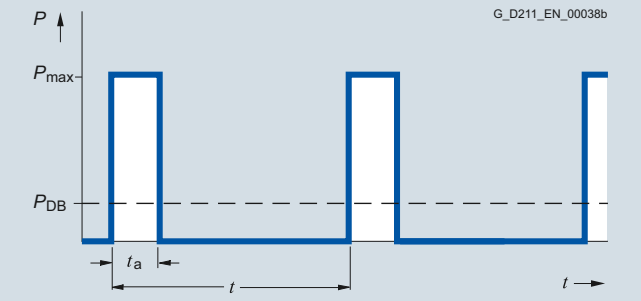
DC link voltage 240 ... 360 V DC	**Braking resistor** 6SE6400-4BC05-0AA0
Resistance	180 Ω
Rated power P_{DB} (Continuous braking power)	0.05 kW
Peak power P_{max}	1 kW
Degree of protection [1]	IP20
Power connections	3 × 1.5 mm² (shielded)
• Length	0.5 m (1.64 ft)
Thermostatic switch (NC contact)	
• Switching 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 kg
Approvals, according to	cURus
Suitable for Power Module in blocksize format	Frame size FSA

[1] With correctly connected load connection cable.

Technical specifications

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
Resistance	Ω	390	160	56	27	15	8.2
Rated power P_{DB} (Continuous braking power)	kW	0.1	0.2	0.65	1.2	2.2	4
Peak power 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

Characteristic curves



Load diagram for braking resistors in blocksize format

t_a = 12 s

t = 240 s

[1] With correctly connected load connection cable.

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.

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	Article No.
Line voltage 380 ... 480 V 3 AC				
1.3	0.37 (0.5)	6SL3210-1SE11-3UA0	FSA	**6SE6400-3TC00-4AD2**
1.7	0.55 (0.75)	6SL3210-1SE11-7UA0		
2.2	0.75 (1.0)	6SL3210-1SE12-2UA0		
3.1	1.1 (1.5)	6SL3210-1SE13-1UA0		
4.1	1.5 (2.0)	6SL3210-1SE14-1UA0		
5.9	2.2 (3.0)	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**

Technical specifications

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

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

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

Overview

BOP20 Basic Operator Panel

The BOP20 Basic Operator Panel can be snapped onto any CU305 Control Unit and may be used to acknowledge faults, set parameters and read diagnostic information (e.g. alarm and fault messages).

Design

The BOP20 has a backlit two-line display area and 6 keys.

The integrated plug connector on the back of the BOP20 provides its power and establishes communication with the Control Unit.

Integration

CU305 Control Unit with attached BOP20 Basic Operator Panel

Selection and ordering data

Description	Article No.
BOP20 Basic Operator Panel	**6SL3055-0AA00-4BA0**

9

Overview

The Intelligent Operator Panel IOP is a very user-friendly and powerful operator panel for SINAMICS S110.

The IOP supports both entry-level personnel and drive experts. Thanks to the large plain text display, the menu-based operation and the application wizards, it is easy to commission the drive. A drive can be essentially commissioned without having to use a printed parameter list – as the parameters are displayed in plain text, and explanatory help texts and a parameter filtering function are provided.

The drives are easily controlled manually using directly assigned buttons and the navigation wheel. The IOP has a dedicated switchover button to switch from automatic to manual mode.

The inverter can be diagnosed in a user-friendly fashion using the plain text display of faults and alarms. Help texts can be obtained by pressing the INFO button.

Up to 2 process values can be displayed graphically or numerically at the same time. Process values can also be displayed in technological units.

The IOP supports standard commissioning of identical drives. For this purpose, a parameter list can be copied from a inverter into the IOP and downloaded into other drive units of the same type as required.

The IOP supports the following languages [1]: German, English, French, Italian, Spanish, Portuguese, Dutch, Swedish, Russian, Czech, Polish, Turkish, Finnish.

Note:

The IOP cannot be directly snapped onto the CU305 Control Unit. An adapter cable is required for operation.

Note:

The IOP cannot be used for commissioning SINAMICS S120.

Updating the IOP

The IOP can be updated and expanded using the integrated USB interface.

Data to support future drive systems can be transferred from the PC to the IOP. Further, the USB interface allows user languages and wizards that will become available in the future to be subsequently downloaded and the firmware to be updated for the IOP [1].

The IOP is supplied with power via the USB interface during an update.

Benefits

- Simple commissioning of standard applications using wizards, it is not necessary to know the parameter structure
- Diagnostics using plain text display; can be used locally on-site without documentation
- Direct manual operation of the drive; you can toggle between automatic and manual modes
- Status display with freely selectable units; display of real physical values
- Intuitive navigation using a wheel - just like in everyday applications
- Graphic display e.g. for status values such as pressure or flowrate in bar charts
- Commissioning without documentation using the integrated help function
- Standard commissioning using the clone function (parameter set data is saved for fast replacement)
- User-defined parameter list with a reduced number of self-selected parameters (to generate your own commissioning screens)
- The IOP supports the following languages [1]: German, English, French, Italian, Spanish, Portuguese, Dutch, Swedish, Russian, Czech, Polish, Turkish, Finnish.
- Simple update of languages, wizards and firmware via USB [1]

Selection and ordering data

Description	Article No.
Intelligent Operator Panel IOP	**6SL3255-0AA00-4JA1**
IOP Handheld For use with SINAMICS G120, SINAMICS G120C, SINAMICS G120P, SINAMICS G110D, SINAMICS G120D, SINAMICS G110M and SINAMICS S110 Included in the scope of delivery: • IOP • Handheld housing • Rechargeable batteries (4 × AA) • Charging unit (international) • RS232 connecting cable (length 3 m, used in combination with SINAMICS G120, SINAMICS G120C, SINAMICS G120P and SINAMICS S110 [2]) • USB cable (1 m/3.28 ft long)	**6SL3255-0AA00-4HA0**
Accessories	
Door mounting kit IP54 degree of protection for mounting an operator panel in control cabinet doors with sheet steel thicknesses of 1 ... 3 mm (0.04 ...0.12 in) IP54 degree of protection for IOP IP55 degree of protection for BOP-2 Included in the scope of delivery: • Seal • Mounting material • Connecting cable (5 m/16.4 ft long)	**6SL3256-0AP00-0JA0**

[1] You can find more information at http://support.automation.siemens.com/WW/view/en/67273266

[2] For use in combination with SINAMICS G110D, SINAMICS G120D and SINAMICS G110M, the RS232 connecting cable with optical interface is required (Article No.: 3RK1922-2BP00). The cable must be ordered separately.

Overview

With the Safe Brake Relay function, the brake is controlled in accordance with IEC 61508 SIL 2 and EN ISO 13849-1 PL d and Category 3.

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 delivery of a Safe Brake Relay includes the following:

- 2 cable harnesses for connecting to the CTRL socket of the 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

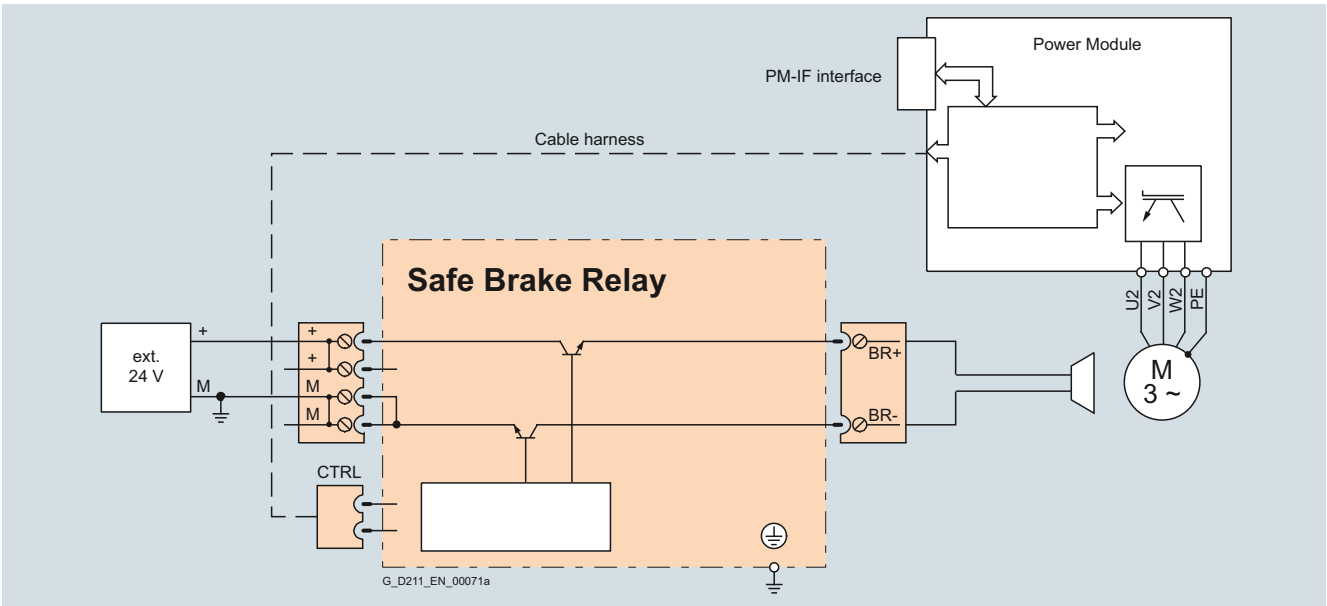
Selection and ordering data

Description	Article No.
Safe Brake Relay Including cable harness for connection to Power Module	**6SL3252-0BB01-0AA0**

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
• At 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)

Integration

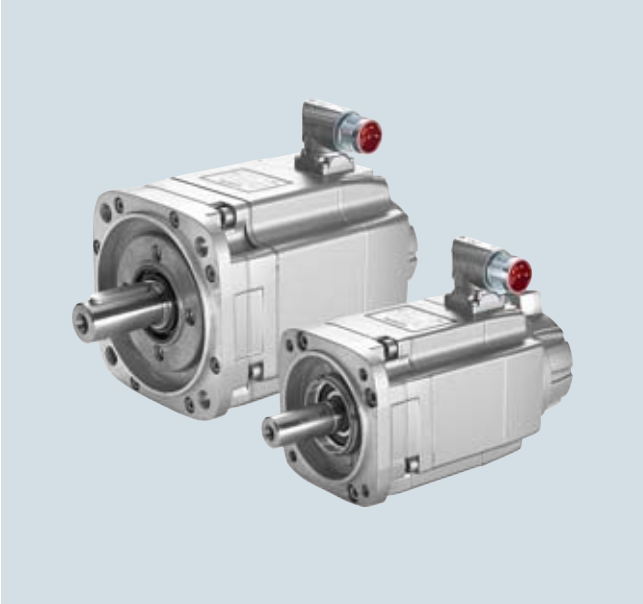


Connection example of Safe Brake Relay

The 24 V DC solenoid of the motor brake is directly connected to the Safe Brake Relay. External overvoltage limiters are not required.

Overview

Motors with DRIVE-CLiQ interface



DRIVE-CLiQ is the preferred method for connecting the encoder systems to SINAMICS S110.

Motors with DRIVE-CLiQ interface are available for this purpose, e.g.

- SIMOTICS M-1PH8, SIMOTICS S-1FT7 and SIMOTICS S-1FK7 synchronous motors
- SIMOTICS M-1PH8 asynchronous (induction) motors

Motors with a DRIVE-CLiQ interface can be directly connected to the CU305 Control Unit 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. resolvers or absolute encoders, different encoder cables with varying permissible lengths are now no longer a concern. Instead, just one cable type, MOTION-CONNECT DRIVE-CLiQ, can be used for all encoders.

Motors with a DRIVE-CLiQ interface simplify SINAMICS S110 commissioning and diagnostics, as the motor and encoder type are identified automatically and programmed error-free in the drive.

Motors without DRIVE-CLiQ interface

The cables for motor 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 in degree of protection IP67.

Only one encoder system can be connected to each Sensor Module.

Overview

The SMC10 Sensor Module Cabinet-Mounted is required to evaluate the encoders 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 resolvers
- 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/protective 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 onto a TH 35 standard mounting rail according to 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.

Selection and ordering data

Description	Article No.
SMC10 Sensor Module Cabinet-Mounted Without DRIVE-CLiQ cable	**6SL3055-0AA00-5AA3**

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

More information

Risk of encoder failures by encoder signal disturbances

Frictional (static) electricity can occur if the belt and belt pulley materials are unfavorably matched. This static electricity can discharge over the motor shaft and encoder and cause spurious encoder signals. A belt made of anti-static material (conductive polyurethane compound) can be used to mitigate this risk.

Overview

The SMC20 Sensor Module Cabinet-Mounted is required to evaluate the encoders 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 2.1
- 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/protective 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 onto a TH 35 standard mounting rail acc. to 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.

Selection and ordering data

Description	Article No.
SMC20 Sensor Module Cabinet-Mounted Without DRIVE-CLiQ cable	**6SL3055-0AA00-5BA3**

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, max.	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

More information

Risk of encoder failures by encoder signal disturbances

Frictional (static) electricity can occur if the belt and belt pulley materials are unfavorably matched. This static electricity can discharge over the motor shaft and encoder and cause spurious encoder signals. A belt made of anti-static material (conductive polyurethane compound) can be used to mitigate this risk.

Overview

The SMC30 Sensor Module Cabinet-Mounted is required to evaluate the encoders 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 terminals
- 1 connection for the electronics power supply via the 24 V DC power supply connector
- 1 PE/protective conductor 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 standard mounting rail acc. 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 if the A+/A- and B+/B- signals 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.

Selection and ordering data

Description	Article No.
SMC30 Sensor Module Cabinet-Mounted Without DRIVE-CLiQ cable	**6SL3055-0AA00-5CA2**

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 ... 1000 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

More information

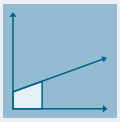
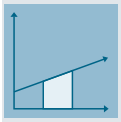
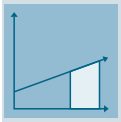
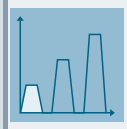
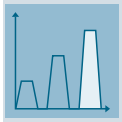
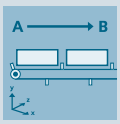
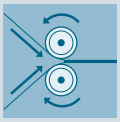
Risk of encoder failures by encoder signal disturbances

Frictional (static) electricity can occur if the belt and belt pulley materials are unfavorably matched. This static electricity can discharge over the motor shaft and encoder and cause spurious encoder signals. A belt made of anti-static material (conductive polyurethane compound) can be used to mitigate this risk.

[1] Signal cables twisted in pairs and shielded.

SINAMICS S120 drive system
0.12 kW to 250 kW (0.16 hp to 400 hp)

Application

Use	Requirements for torque accuracy/speed accuracy/position accuracy/coordination of axes/functionality					
	Continuous motion			Non-continuous motion		
	Basic	Medium	High	Basic	Medium	High
						
Pumping, ventilating, compressing	Centrifugal pumps Radial / axial fans Compressors	Centrifugal pumps Radial / axial fans Compressors	Eccentric screw pumps	Hydraulic pumps Metering pumps	Hydraulic pumps Metering pumps	Descaling pumps Hydraulic pumps
	V20 G110 G120C G120P	G120P G130/G150 G180 [1]	**S120**	G120	S110	**S120**
Moving 	Conveyor belts Roller conveyors Chain conveyors	Conveyor belts Roller conveyors Chain conveyors Lifting/lowering devices Elevators Escalators/moving walkways Indoor cranes Marine drives Cable railways	Elevators Container cranes Mining hoists Excavators for open-cast mining Test bays	Acceleration conveyors Storage and retrieval machines	Acceleration conveyors Storage and retrieval machines Cross cutters Reel changers	Storage and retrieval machines Robotics Pick & place Rotary indexing tables Cross cutters Roll feeds Engagers/ disengagers
	V20 G110 G110D G110M G120C	G120 G120D G130/G150 G180 [1]	**S120** S150 DCM	G120 G120D	S110 DCM	**S120** DCM
Processing 	Mills Mixers Kneaders Crushers Agitators Centrifuges	Mills Mixers Kneaders Crushers Agitators Centrifuges Extruders Rotary furnaces	Extruders Winders and unwinders Lead/follower drives Calenders Main press drives Printing machines	Tubular bagging machines Single-axis motion control such as • Position profile • Path profile	Tubular bagging machines Single-axis motion control such as • Position profile • Path profile	Servo presses Rolling mill drives Multi-axis motion control such as • Multi-axis positioning • Cams • Interpolations
	V20 G120C	G120 G130/G150 G180 [1]	**S120** S150 DCM	G120	S110	**S120** DCM
Machining 	Main drives for • Turning • Milling • Drilling	Main drives for • Drilling • Sawing	Main drives for • Turning • Milling • Drilling • Gear cutting • Grinding	Axis drives for • Turning • Milling • Drilling	Axis drives for • Drilling • Sawing	Axis drives for • Turning • Milling • Drilling • Lasering • Gear cutting • Grinding • Nibbling and punching
	S110	S110 **S120**	**S120**	S110	S110 **S120**	**S120**

As part of the SINAMICS drive family, the SINAMICS S120 drive is a modular system for high-performance applications in machine and plant engineering. SINAMICS S120 offers high-performance single-axis and multi-axis (common DC bus) drives for a very broad range of industrial applications. Thanks to 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 speedy implementation of customized drive solutions.

Specific application examples and descriptions can be found on the Internet at
www.siemens.com/sinamics-applications

More information

You may also be interested in these drives:

- SINAMICS multi-axis system with energy compensation and regenerative feedback ⇒ SINAMICS S120 (Catalog PM 21)
- Power range up to 1400 kW ⇒ SINAMICS S120 (Catalog PM 21)
- Reduced functionality for applications with synchronous motors ⇒ SINAMICS S110
- With a positioning function for distributed drive solutions in IP65 degree of protection ⇒ SINAMICS G120D

[1] Industry-specific inverters.

Overview

Thanks to its modular design, the SINAMICS S120 drive system can be perfectly adapted to a wide range of different drive tasks utilizing induction, servo, linear, and torque motors. The SINAMICS S120 modular components are computed on the Control Unit. Power units (Power Modules, Line Modules and Motor Modules) ensure an optimum conversion of energy between the supply system and motor. SINAMICS S120 inverters are available in blocksize, booksize, booksize compact and chassis formats or as distributed inverters (SINAMICS S120M). SINAMICS S120 offers optimum solutions for simple, single-axis drives as well as for complex multi-axis drives.

SINAMICS S120 inverters can be used for many different applications.
Typical application examples are:

- Turning, milling and grinding machines
- Packaging machines
- Machines for producing food and beverages
- Printing and paper machines
- Textile machines
- Plastics processing machines
- Presses and punches
- Machines used in the wood, glass, and ceramics industries
- Assembly and testing equipment
- Handling equipment
- Rolling mill drives
- Vehicle and gearbox test stands
- Hoisting gear, cranes
- Plants and processing lines
- Test bays
- Renewable energy

SINAMICS S120 single-axis drives (AC/AC)

SINAMICS S120, PM240-2 FSC, CU310-2 PN

The simplest version of a SINAMICS S120 is a single-axis drive. It consists of a CU310-2 Control Unit and a Power Module. A mains rectifier, a voltage-source DC link and an inverter for supplying the motor are integrated in the Power Module.

SINAMICS S120 Power Modules are 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 for SINAMICS S120 are available in the following formats and power ranges:

Format	Rated current (type rating)
PM240-2 blocksize	1.7 ... 32 A (0.55 ... 15 kW)
PM340 blocksize	38 ... 178 A (18.5 ... 90 kW)
Chassis	210 ... 490 A (110 ... 250 kW)

SINAMICS S120 single-axis drives essentially offer the following additional functions compared to SINAMICS S110:

- Higher power up to 250 kW (400 hp)
- Operation of linear and torque motors
- Motor and machine encoders can be evaluated simultaneously
- Flexible technology functionality with Drive Control Chart (DCC)
- Higher dynamic response for current, speed and position control loop
- Vector control for highly precise torque control of asynchronous (induction) motors
- More digital I/Os via external terminal modules
- Integrated web server (firmware version V4.6 and higher)

You can find more information on SINAMICS S120 in Catalog PM 21.

Selection and ordering data

The following devices are identical to those of the SINAMICS G120 standard inverter:

- PM240-2 Power Module in blocksize format
- Line-side components for PM240-2
- DC link components for PM240-2
- Load-side components for PM240-2

PM240-2 Power Modules (0.55 kW to 15 kW) are supported by SINAMICS S120 with firmware version V4.7 and higher.

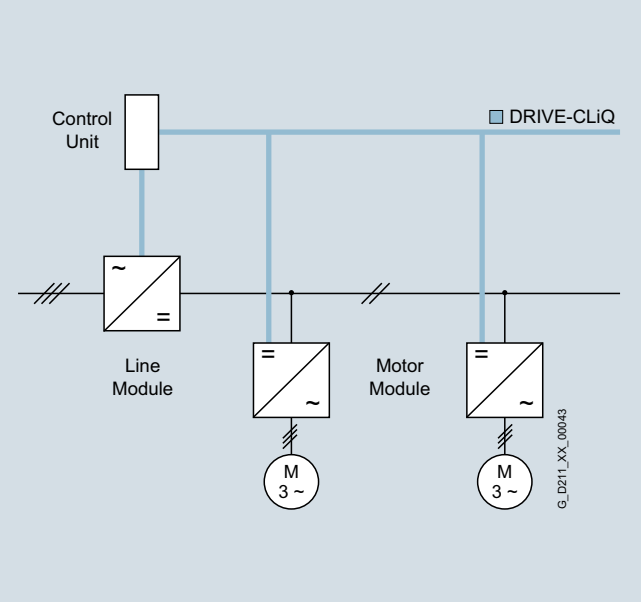
The following devices are identical to those of the SINAMICS S110 servo drive:

- PM340 Power Modules in blocksize format
- Line-side components (e.g. line reactors and line filters)
- DC link components (braking resistors)
- Load-side components (motor reactors)
- Supplementary system components (e.g. operator panels)
- Encoder system connection (Sensor Modules)

Overview

SINAMICS S120 multi-axis drives

Drive line-up comprising SINAMICS S120 in booksize format with CU320-2 DP, Line Module and three Motor Modules



Block diagram with CU320-2 Control Unit, Line Module and two Motor Modules

SINAMICS S120M, SH 63

A multi-axis drive consists of a Line Module, several Motor Modules and a Control Unit. The Line Module generates a DC voltage from the line voltage and supplies the Motor Modules with energy via the DC link. In the Motor Modules, the DC link voltage is converted by an inverter into an AC voltage for feeding the motor. On the shared Control Unit, both the line infeed/ regenerative feedback and the closed-loop control of the motors are computed. The connection between the Control Unit and the power units is made very simply using the digital system interface DRIVE-CLiQ.

SINAMICS S120 multi-axis drives are available with the cooling methods internal air cooling and external air cooling and in the following formats:

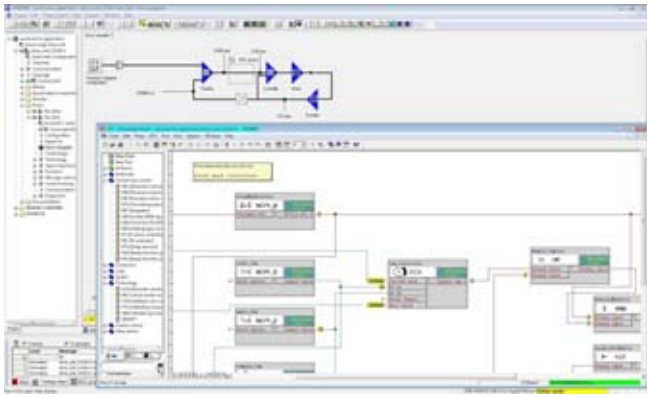
Format	Rated power or rated current (type rating) or static torque
Line Modules	
Booksize compact	16 kW
Booksize	5 ... 120 kW
Chassis	132 ... 1400 kW
Motor Modules	
Booksize compact	1.7 ... 18 A (0.9 ... 9.7 kW)
Booksize	3 ... 200 A (1.6 ... 107 kW)
Chassis	210 ... 1405 A (110 ... 1200 kW)
Distributed	
SINAMICS S120M distributed servo drive	1 ... 7.1 Nm

The SINAMICS S120 multi-axis drives are often used together with a higher-level controller for motion control (SIMOTION, SINUMERIK). For this reason, the following catalogs contain a detailed description of SINAMICS S120 multi-axis drives together with the perfectly matched servo, torque and linear motors including the associated cables and connections and the higher-level controllers for motion control:

- Catalog PM 21
  SIMOTION, SINAMICS S120 and SIMOTICS Equipment for Production Machines
- Catalog NC 62
  SINUMERIK 840D sl Type 1B Equipment for Machine Tools

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. SINAMICS DCC is the first stage of the Advanced Technology Function and is installed as an add-on to the STARTER commissioning tool.



For users, DCC opens up a new dimension regarding the adaptability of the systems mentioned to the specific functions of their machines. DCC does not limit the number of functions that can be used. The number of functions is limited only by the performance capability of the Control Unit.

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 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.

Two types of DCB library are available, i.e. DCB Standard and DCB Extension. The DCB Standard library supplied with SINAMICS DCC contains 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.

In addition to the standard library, the DCB Extension library is also available with SINAMICS DCC, firmware version V4.6 and higher. This contains an extended range of blocks and can be used as an additional, independent library in the DCC Editor.

DCB Extension provides new motion control blocks in the motion control library GMC.

Using these blocks, it is possible to implement the following positioning and synchronous operation functions with DCC in the SINAMICS S120 drive system:

- Positioning
- 1:1 synchronous operation
- Gearing
- Gearing and positioning
- Camming

These applications are available to download from the Internet on the Siemens Application Support pages at www.siemens.com/sinamics-applications

With the blocks provided by DCB Extension, it is also possible to commission the programming of user-specific blocks.

Drive Control Chart for SINAMICS S120 therefore provides a convenient basis for resolving drive-level open-loop and closed-loop control tasks directly in the inverter. 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 chapter Engineering tools, STARTER commissioning tool.

Selection and ordering data

DCC comprises the graphical configuring tool (DCC Editor) and the DCB standard library. DCC is installed in coordination with the STARTER commissioning tool.

The necessary engineering license for each PC (floating) for DCC is acquired at the same time the order is placed. No runtime license is required for the DCB standard library included in the scope of supply.

Existing licenses for DCC V2.1 and V2.2 SP1 are also valid for DCC V2.3.
An upgrade variant for the engineering license is available for DCC V2.0.

Description	Article No.
SINAMICS DCC V2.3 for STARTER V4.4 Graphical configuring with Drive Control Chart DCC Editor + DCB standard library for use on SINAMICS S120	
• Single engineering license, with data carrier	**6AU1810-1HA23-0XA0**
• Upgrade engineering license, with data carrier	**6AU1810-1HA23-0XE0**

The blocks of the DCB Extension library are also configured with the graphical configuring tool (DCC Editor). Use of these blocks requires a runtime license.

Description	Article No.
SINAMICS DCB Extension License Runtime license for license upgrading with firmware version V4.6 and higher (can also be ordered in conjunction with the CompactFlash card, see CompactFlash card for CU310-2)	**6SL3077-0AA00-0AB0**

CU310-2 Control Unit for single-axis drives

Overview

CU310-2 PN and CU310-2 DP Control Units

The CU310-2 Control Unit that is designed for the communication and open-loop/closed-loop control functions of a SINAMICS S120 (AC/AC) is combined with the PM340 Power Module to create a powerful single-axis drive. PROFINET (PN) and PROFIBUS (DP) variants are available for fieldbus communication.

Design

The CU310-2 Control Unit features the following connections and interfaces as standard:

- Fieldbus interface
  - CU310-2 PN: 1 PROFINET interface with 2 ports (RJ45 sockets) with PROFIdrive V4 profile
  - CU310-2 DP: 1 PROFIBUS interface with PROFIdrive V4 profile
- 1 DRIVE-CLiQ socket for communication with the DRIVE-CLiQ motor or other DRIVE-CLiQ devices (e.g. Sensor Modules or Terminal Modules)
- 1 encoder evaluation for evaluating the following encoder signals
  - Incremental encoder TTL/HTL
  - SSI encoder without incremental signals
- 1 PE/protective conductor connection
- 1 connection for the electronics power supply via the 24 V DC power supply connector
- 1 temperature sensor input (KTY84-130 or PTC)
- 3 parameterizable, fail-safe (can be used with firmware version 4.5 and higher) digital inputs (isolated) or alternatively 6 parameterizable digital inputs (isolated).
  The fail-safe digital inputs can be routed, i.e. they can be routed via PROFIsafe to a higher-level controller.
- 5 parameterizable digital inputs (floating)
- 1 parameterizable, fail-safe (can be used with firmware version 4.5 and higher) digital output (isolated) or alternatively 1 digital output (isolated) [1)]
- 8 parameterizable bidirectional digital inputs/outputs (non-floating) [1)]
- 1 analog input, either ±10 V (resolution 12 bit + sign) or ±20 mA (11 bit + sign)
- 1 Ethernet interface (socket RJ45) for commissioning and diagnostics
- 1 slot for the CompactFlash card on which firmware and parameters are stored
- 1 PM-IF interface for communication with the Power Modules in blocksize format
- 3 test sockets and one reference ground for commissioning support
- 1 interface to the BOP20 Basic Operator Panel

The status of the CU310-2 Control Unit is indicated via multi-color LEDs.

A BOP20 Basic Operator Panel can also be snapped directly onto the CU310-2 Control Unit for diagnostic purposes, for example.

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 CU310-2 Control Unit controls Power Modules in blocksize format via the PM-IF interface. DRIVE-CLiQ motors as well as Sensor Modules (SMC) can be connected to the integrated DRIVE-CLiQ socket to permit the operation of motors without a DRIVE-CLiQ interface.

With the BOP20 Basic Operator Panel, parameters can be changed directly on the device. The BOP20 Basic Operator Panel can also be snapped onto the CU310-2 Control Unit during operation to perform troubleshooting procedures.

The CU310-2 Control Unit and other connected components are commissioned and diagnosed with the STARTER commissioning tool. The CU310-2 Control Unit requires a CompactFlash card with firmware version V4.4 or higher.

A CU310-2 PN Control Unit communicates with the higher-level control system using PROFINET IO and the PROFIdrive V4 profile.

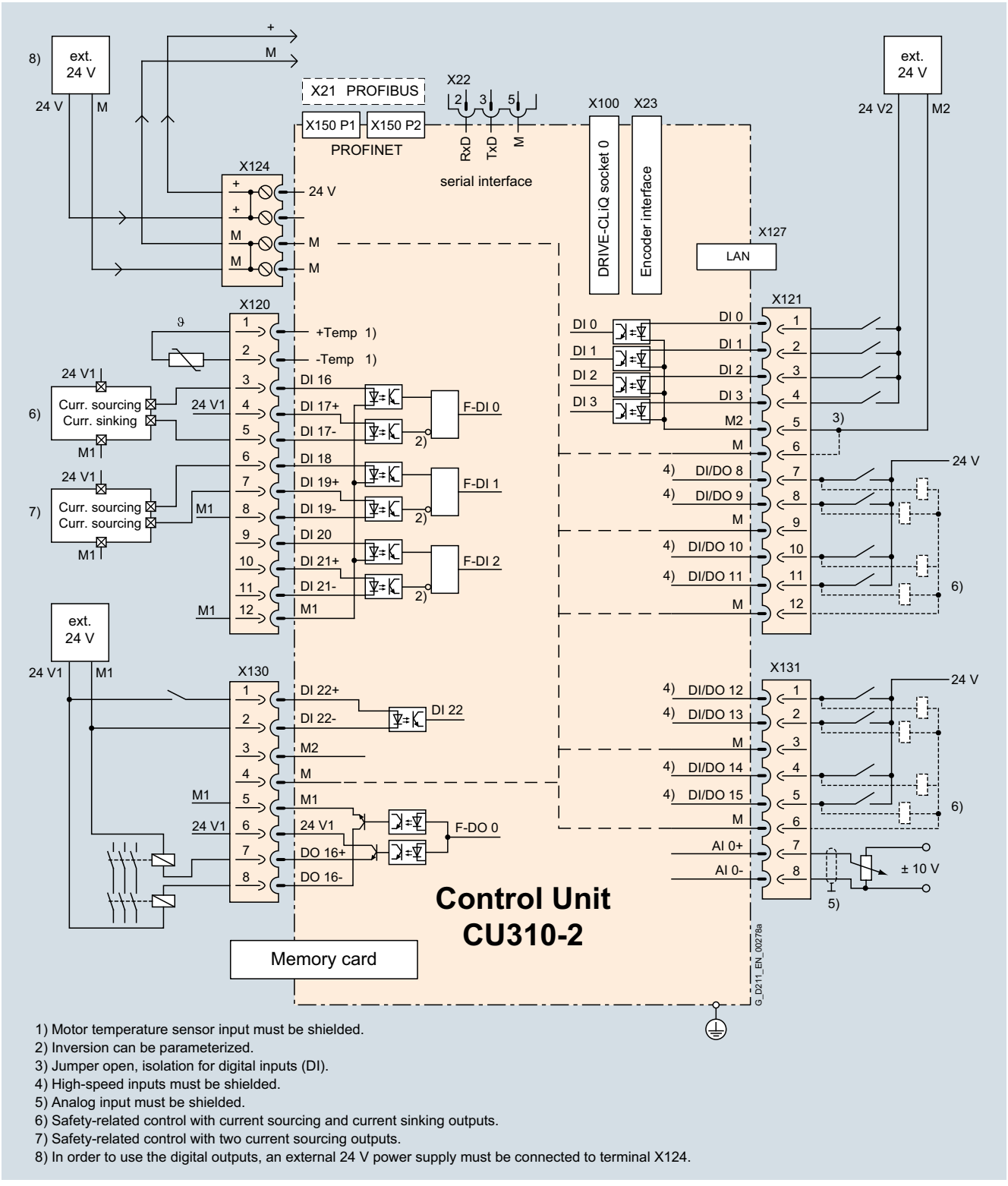
The SINAMICS S120 drive system with the CU310-2 PN Control Unit then assumes the function of a PROFINET IO device and can perform the following functions:

- 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 with the STARTER commissioning tool and for accessing the integrated web server
- Integrated 2-port switch with two RJ45 sockets based on the ERTEC ASIC. The optimum topology (line, star, tree) can therefore be configured without additional external switches.

A 24 V supply voltage must be connected to terminal X124 for the digital outputs to be used. A CompactFlash card with firmware V4.5 or higher is essential for the operation of the CU310-2 Control Unit.

[1)] In order to use the digital outputs, a 24 V supply voltage must be connected to terminal X124.

Integration



1) Motor temperature sensor input must be shielded.
2) Inversion can be parameterized.
3) Jumper open, isolation for digital inputs (DI).
4) High-speed inputs must be shielded.
5) Analog input must be shielded.
6) Safety-related control with current sourcing and current sinking outputs.
7) Safety-related control with two current sourcing outputs.
8) In order to use the digital outputs, an external 24 V power supply must be connected to terminal X124.

Connection example of the CU310-2 Control Unit

Selection and ordering data

Description	Article No.
CU310-2 PN Control Unit Without CompactFlash card	**6SL3040-1LA01-0AA0**
CU310-2 DP Control Unit Without CompactFlash card	**6SL3040-1LA00-0AA0**
Accessories	
STARTER commissioning tool [1] On DVD-ROM	**6SL3072-0AA00-0AG0**
Accessories for re-ordering	
SINAMICS/SINUMERIK/SIMOTION dust-proof blanking plugs (50 units) For DRIVE-CLiQ port	**6SL3066-4CA00-0AA0**

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

Technical specifications

PROFINET: PROFIBUS:	**CU310-2 Control Unit** 6SL3040-1LA01-0AA0 6SL3040-1LA00-0AA0
Power requirement, max. At 24 V DC, without taking account of digital outputs and DRIVE-CLiQ supply	0.35 A for CU310-2 + 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 5 floating digital inputs 8 bidirectional non-floating digital inputs/digital outputs 3 parameterizable, fail-safe digital inputs (isolated) or alternatively 6 parameterizable digital inputs (isolated) 5 bidirectional floating digital inputs/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 [2], approx.	
- L → H	50 µs
- H → L	100 µs
• Delay time of high-speed digital inputs [2], approx. (high-speed digital inputs can be used for position detection)	
- L → H	5 µs
- H → L	50 µs
• Conductor cross-section, max.	1.5 mm^2

PROFINET: PROFIBUS:	**CU310-2 Control Unit** 6SL3040-1LA01-0AA0 6SL3040-1LA00-0AA0
Digital outputs (continuously short-circuit-proof)	8 bidirectional non-floating digital outputs/digital inputs
• Voltage	24 V DC
• Load current per digital output [3], max.	500 mA
• Delay time [2], typ./max.	
• L → H	150 µs/400 µs
• H → L	75 µs/100 µs
• Conductor cross-section, max.	1.5 mm^2
Analog input	The analog input can be switched between current input and voltage input
• As voltage input	-10 ... +10 V; R_i > 100 kΩ Resolution: 12 bit + sign (with respect to the maximum range that can be resolved -11 ... +11 V)
• As current input	-20 ... +20 mA; R_i > 250 Ω Resolution: 11 bit + sign (based on -22 ... 22 mA) Max. range that can be resolved: -44 ... +44 mA
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) [4]
- HTL encoder	100 m (328 ft) for unipolar signals 300 m (984 ft) for bipolar signals [4]
- SSI encoder	100 m (328 ft)
Power loss	<20 W
PE connection	M5 screw
Dimensions	
• Width	73 mm (2.87 in)
• Height	191 mm (7.52 in)
• Depth	75 mm (2.95 in)
Weight, approx.	0.95 kg (2.09 lb)
Approvals, according to	cULus

[1] The STARTER commissioning tool is also available on the Internet at http://support.automation.siemens.com/WW/view/en/10804985/133100

[2] 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.

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

[4] Signal cables twisted in pairs and shielded.

Overview

The CompactFlash card contains the firmware and parameter settings. The CompactFlash card is plugged into the appropriate slot on the CU310-2 Control Unit.

Design

A CU310-2 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 (Safety Integrated Extended Functions and the DCB Extension in the current version). In addition to the Article No., order code **F01** must also be stated for Safety Integrated Extended Functions and order code **U01** for the DCB Extension.

The firmware option can also be enabled on-site, for example, if the Safety Integrated Extended functions should be enabled later. You will need the serial number of the CompactFlash card and the Article No. 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	Article No.
CompactFlash card for CU310-2 PN and CU310-2 DP Control Units With firmware version V4.7 including Certificate of License	**6SL3054-0EH00-1BA0**
• and with Safety license	**6SL3054-0EH00-1BA0-Z F01**
• and with DCB Extension license (firmware V4.6 and higher) (further information about DCB Extension and license upgrades can be found under Drive Control Chart (DCC))	**6SL3054-0EH00-1BA0-Z U01**
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 Article No. printed on the CompactFlash card:

Article No.:	6SL3054-0❑❑00-1BA0
Firmware version	↑
	4 E
Version	↑
	.4 E
	.5 F
	.6 G
	.7 H

Example:

A CompactFlash card with firmware version V4.7 and a safety license for a CU310-2 PN Control Unit are required:
Article No.: 6SL3054-0EH00-1BA0-Z
F01

Notes

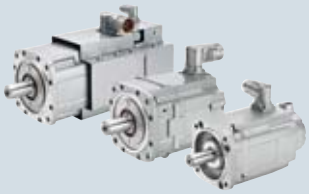
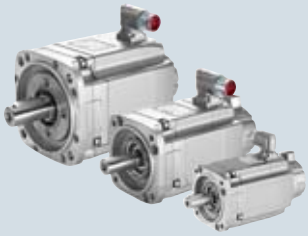
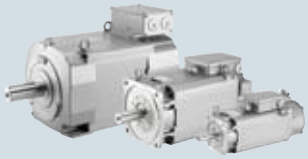
CAD CREATOR

Dimensional drawing and 2D/3D CAD generator

see Chapter 12 and

www.siemens.com/cadcreator

A complete overview and further information about all types of SIMOTICS motors can be found in section "SIMOTICS motors" in Chapter 1 "System overview". Below is a summary of selected products from the SIMOTICS range:

SIMOTICS motor type	Features	Degree of protection	Cooling method
SIMOTICS S-1FK7 servomotors 	Compact Permanent-magnet synchronous servomotor	IP64 (optionally IP65)	Natural cooling
	High Dynamic Permanent-magnet synchronous servomotor	IP64 (optionally IP65)	Natural cooling
	High Inertia Permanent-magnet synchronous servomotor Increased rotor moment of inertia	IP64 (optionally IP65)	Natural cooling
	Compact for Power Modules 230 V 1 AC Permanent-magnet synchronous servomotor	IP64 (optionally IP65)	Natural cooling
	High Dynamic for Power Modules 230 V 1 AC Permanent-magnet synchronous servomotor		
SIMOTICS S-1FT7 servomotors 	Compact Permanent-magnet synchronous servomotor	IP64 (optionally IP65, IP67)	Natural cooling
			Forced ventilation
			Water cooling
	High Dynamic Permanent-magnet synchronous servomotor Very low rotor moment of inertia	IP64 (optionally IP65, IP67)	Forced ventilation
			Water cooling
SIMOTICS M-1PH8 main motors [1] • Asynchronous variant 	Three-phase squirrel-cage motor without housing High power density with small motor dimensions	IP55	Forced ventilation
		IP23	Forced ventilation
		IP55/IP65	Water cooling
• Synchronous variant 	Permanent-magnet synchronous servomotor Excellent performance features Extremely high power density with small motor dimensions	IP65	Forced ventilation
		IP55/IP65	Water cooling

[1] SIMOTICS M-1PH8 asynchronous (induction) main motors can be combined with SINAMICS G120 Power Modules on request.

[2] Information in round brackets refers to data for shaft height 355 at 85 dB, for selection and ordering data see Catalog CR 1.

Shaft height SH	Rated power P_{rated} for S1 duty kW (hp)	Rated torque M_{rated} Nm (lb_f-ft)	Catalog
20/28/36/48/63/80/100	0.05 (0.07) ... 8.2 (11.0)	0.08 ... 37 (0.06 ... 27.3)	**Preferred types on page 11/6 et seqq., combination for SINAMICS S110 on page 11/8 et seqq. and Catalog PM 21 Chapter 4**
36/48/63/80	0.6 (0.8) ... 3.8 (5.1)	0.9 ... 18 (0.7 ... 13.3)	
48/63/80/100	0.9 (1.21) ... 7.7 (10.3)	1.5 ... 37 (1.1 ... 27.3)	
20/28/36/48	0.05 (0.07) ... 0.8 (1.07)	0.08 ... 2.6 (0.06 ... 1.9)	
36/48	0.4 (0.54) ... 0.9 (1.21)	1.2 ... 3 (0.9 ... 2.2)	
36/48/63/80/100	0.88 (1.18) ... 10.5 (14.1)	1.4 ... 61 (1.0 ... 45)	**Catalog PM 21 Chapter 4**
80/100	5 (6.71) ... 19.8 (26.6)	21 ... 73 (15.5 ... 53.8)	
63/80/100	3.1 (4.16) ... 34.2 (45.9)	9.2 ... 125 (6.8 ... 92.2)	
63/80	3.8 (5.1) ... 10.8 (14.5)	11 ... 33 (8.1 ... 24.3)	
63/80	5.7 (7.64) ... 21.7 (29.1)	16.5 ... 51 (12.2 ... 37.6)	
80/100/132/160/180/225/280/355	2.8 (3.75) ... 590 (730) [2] (791) (979)	13 ... 5900 (9.6 ... 4352) (13 ... 6860) [2] (9.6 ... 5060)	**Combination for SINAMICS S110 on page 11/12 et seqq. and Catalog PM 21 Chapter 5**
180/225/100/280/355	24.5 (32.9) ... 1230 (1340) [2] (1649) (1797)	317 ... 11640 (234 ... 8586) (317 ... 12435) [2] (234 ... 9172)	
80/100/132/160/180/225/280	3.5 (4.69) ... 22 (29.5)	20 ... 2610 (14.8 ... 1925)	
132/160/180/225	15.7 (21) ... 196 (263)	94 ... 1091 (69.3 ... 805)	**Catalog PM 21 Chapter 5**
132/160/180/225	15 (20.12) ... 310 (416)	107 ... 1650 (78.9 ... 1217)	

Information and download center

Digital versions of the catalogs are available on the Internet at: www.siemens.de/industry/infocenter
Please note the information in section "Downloading catalogs" on the page headed "Online services" in the chapter Services and Documentation of this catalog.

A complete overview and further information about all types of SIMOTICS motors can be found in section "SIMOTICS motors" in Chapter 1 "System overview". Below is a summary of selected products from the SIMOTICS range:

SIMOTICS motor type	Features	Degree of protection	Cooling method
SIMOTICS GP 1LE1 and SIMOTICS SD 1LE1 low-voltage motors 	SIMOTICS GP for general-purpose applications – Motors with aluminum housing	IP55	Natural cooling/ forced ventilation
	SIMOTICS SD for severe-duty applications – Motors with cast-iron housing	IP55	Natural cooling

SIMOGEAR geared motor type	Features	Degree of protection	Gear unit designation
SIMOGEAR 2KJ geared motors 	Helical geared motors	IP55	Z19 … Z149 (2-stage)
			D19 … D149 (3-stage)
	Parallel shaft geared motors	IP55	FZ29 … FZ149 (2-stage)
			FD29 … FD149 (3-stage)
	Bevel geared motors	IP55	B19 … B49 (2-stage)
			K39 … K129 (3-stage)
	Helical worm geared motors	IP55	C29 … C89 (2-stage)

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[1] With 4-pole motor for a 50 Hz line frequency.

Shaft height SH	Rated power P_{rated} for S1 duty kW (hp)	Rated torque M_{rated} Nm (lb_f-ft)	Catalog
80/90/100/112/132/160	0.37 (0.5) … 22 (29.5)	2.5 ... 148 (1.8 ... 109)	**Catalog D 81.1**
100/112/132/160/180/200/225/250/280/315	0.75 (1.01) … 200 (268)	9.8 ... 1703 (7.2 ... 1256)	

Frame size	Maximum output torque T_{2N} Nm (lb_f-ft)	Transmission ratio *i*	Maximum motor output [1] kW (hp)	Catalog
19/29/39/49/59/69/79/89/109/129/149	100 (134) … 8000 (10728)	3.4 ... 57	55 (73.8)	**Catalog MD 50.1**
19/29/39/49/59/69/79/89/109/129/149	100 (134) … 8000 (10728)	36 ... 328	55 (73.8)	
29/39/49/69/79/89/109/129/149	150 (201) … 8000 (10728)	4 ... 48	55 (73.8)	
29/39/49/69/79/89/109/129/149	150 (201) … 8000 (10728)	58 ... 377	55 (73.8)	
19/29/39/49	30 (40.2) … 450 (603)	3.6 ... 59	9.2 (12.3)	
39/49/69/79/89/109/129/149	150 (201) … 8000 (10728)	5.7 ... 237	55 (73.8)	
29/39/49/69/89	61 (81.8) … 1450 (1944)	6.5 ... 363	9.2 (12.3)	

Information and download center

Digital versions of the catalogs are available on the Internet at:
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SIMOTICS S-1FK7 Compact servomotors

Overview

We offer a shorter delivery time for very popular types from the SIMOTICS S-1FK7 Compact motor series. The shorter delivery period is available for the following motor types in shaft heights 28 to 100.

The shorter delivery period applies ex works following successful order clarification, particularly in the case of large-quantity orders.

Selection and ordering data

Rated speed	Shaft height	Rated power	Static torque	Rated torque	Rated current	**SIMOTICS S-1FK7 Compact synchronous motors** **Natural cooling**	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	**Preferred type**	p	J	m
rpm		kW (hp)	Nm (lb_f-ft)	Nm (lb_f-ft)	A	Article No.		10^{-4} kgm^2 (10^{-3} lb_f-in-s^2)	kg (lb)
SIMOTICS S-1FK7 Compact synchronous motors for DC link voltage 720 V DC, degree of protection IP64									
6000	28	0.38 (0.51)	0.85 (0.63)	0.6 (0.44)	1.4	**1FK7022-5AK71-1V ■3**	3	0.28 (0.25)	1.8 (4.0)

Encoder systems for motors with DRIVE-CLiQ interface:	AM15DQ encoder – multi-turn absolute encoder		**V**
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**

Rated speed	Shaft height	Rated power	Static torque	Rated torque	Rated current	**SIMOTICS S-1FK7 Compact synchronous motors** **Natural cooling**	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	**Preferred type**	p	J	m
rpm		kW (hp)	Nm (lb_f-ft)	Nm (lb_f-ft)	A	Article No.		10^{-4} kgm^2 (10^{-3} lb_f-in-s^2)	kg (lb)
SIMOTICS S-1FK7 Compact synchronous motors for DC link voltage 720 V DC, degree of protection IP64									
6000	36	0.5 (0.67)	1.15 (0.85)	0.8 (0.59)	1.3	**1FK7032-2AK71-1 ■ ■0**	3	0.65 (0.58)	2.7 (5.95)
3000	48	0.8 (1.07)	3 (2.21)	2.6 (1.92)	2	**1FK7042-2AF71-1 ■ ■0**	4	2.9 (2.57)	4.6 (10.1)
	63	1.5 (2.01)	6 (4.43)	4.7 (3.47)	3.7	**1FK7060-2AF71-1 ■ ■0**	4	7.7 (6.82)	7.1 (15.7)
		2.3 (3.08)	11 (8.11)	7.3 (5.4)	5.6	**1FK7063-2AF71-1 ■ ■0**	4	14.7 (13.0)	11.1 (24.5)
2000	80	2.6 (3.49)	16 (11.8)	12.5 (9.22)	6.3	**1FK7083-2AC71-1 ■ ■0**	4	26 (23.0)	15.6 (34.4)
	100	4.3 (5.77)	27 (19.9)	20.5 (15.1)	9.7	**1FK7101-2AC71-1 ■ ■0**	4	79 (69.9)	23 (50.7)

Encoder systems for motors with DRIVE-CLiQ interface:	AS20DQI encoder – absolute encoder, single-turn	**Q**
	AM20DQI encoder – absolute encoder, multi-turn	**R**
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**

Further information and selection options for SIMOTICS S-1FK7 servomotors can be found in Chapter 4 of Catalog PM 21.

Motor type (repeated)	Efficiency [1]	Static current	Calculated power $P_{calc} = M_0 \times n_{rated}/9550$	**SINAMICS S110/SINAMICS S120 Blocksize format**		**Pre-assembled power cable with complete shield** Motor and brake connection via SPEED-CONNECT power connector		
				Rated output current [2]	**PM340 Power Module Air cooling**			
	η	I_0 at M_0 ΔT=100 K	P_{calc} at M_0 ΔT=100 K	I_{rated}		Power connector	Cable cross-section [3]	
	%	A	kW (hp)	A	Article No.	Size	mm²	Article No.
				Line voltage 380 ... 480 V 3 AC				
1FK7022-5AK71...	86	1.8	0.5 (0.67)	2.2	**6SL3210-1SE12-2UA0**	1	4 × 1.5	**6FX■002-5■G10-....**

Line filter:
Without **U**

Power cable:
MOTION-CONNECT 800 PLUS **8**
MOTION-CONNECT 500 **5**

Without brake cores **C**
With brake cores **D**

Length code ....

You can find further versions and components in SINAMICS S110 servo drives in Chapter 9.

Information about the cables can be found in Connection system MOTION-CONNECT in Catalog PM 21.

Motor type (repeated)	Efficiency [1]	Static current	Calculated power $P_{calc} = M_0 \times n_{rated}/9550$	**SINAMICS S110/SINAMICS S120 Blocksize format**		**Pre-assembled power cable with complete shield** Motor and brake connection via SPEED-CONNECT power connector		
				Rated output current [2]	**PM340 Power Module Air cooling**			
	η	I_0 at M_0 ΔT=100 K	P_{calc} at M_0 ΔT=100 K	I_{rated}		Power connector	Cable cross-section [3]	
	%	A	kW (hp)	A	Article No.	Size	mm²	Article No.
				Line voltage 380 ... 480 V 3 AC				
1FK7032-2AK71...	88	1.7	0.7 (0.94)	1.7	**6SL3210-1SE11-7UA0**	1	4 × 1.5	**6FX■002-5■G10-**
1FK7042-2AF71...	89	2.2	0.9 (1.21)	2.2	**6SL3210-1SE12-2UA0**	1	4 × 1.5	**6FX■002-5■G10-**
1FK7060-2AF71...	90	4.45	1.9 (2.55)	5.9	**6SL3210-1SE16-0■A0**	1	4 × 1.5	**6FX■002-5■G10-**
1FK7063-2AF71...	91	8	3.5 (4.69)	10.2	**6SL3210-1SE21-0■A0**	1	4 × 1.5	**6FX■002-5■G10-**
1FK7083-2AC71...	93	7.5	3.4 (4.56)	7.7	**6SL3210-1SE17-7■A0**	1	4 × 1.5	**6FX■002-5■G10-**
1FK7101-2AC71...	93	12.3	5.7 (7.64)	18	**6SL3210-1SE21-8■A0**	1.5	4 × 1.5	**6FX■002-5■G22-**

Line filter:
Without **U**
Integrated **A**

Power cable:
MOTION-CONNECT 800 PLUS **8**
MOTION-CONNECT 500 **5**

Without brake cores **C**
With brake cores **D**

Length code ....

You can find further versions and components in SINAMICS S110 servo drives in Chapter 9.

Information about the cables can be found in Connection system MOTION-CONNECT in Catalog PM 21.

[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). Cable cross-section for brake connection 2 × 1.5 mm².

SIMOTICS S-1FK7 Compact servomotors

Selection and ordering data

Rated speed	Shaft height	Rated power	Static torque	Rated torque	Rated current	**SIMOTICS S-1FK7 Compact synchronous motors Natural cooling**	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	Article No.		10^{-4} kgm^2 (10^{-3} lb_f-in-s^2)	kg (lb)
SIMOTICS S-1FK7 Compact synchronous motors for DC link voltage 720 V DC									
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**	3	0.28 (0.25)	1.8 (4.0)
SIMOTICS S-1FK7 Compact synchronous motors for DC link voltage 270 ... 325 V DC									
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**	3	0.28 (0.25)	1.8 (4.0)

Encoder systems for motors without DRIVE-CLiQ interface:	IC2048S/R encoder	**A**
	AM512S/R encoder (only for 1FK702) AM16S/R encoder	**H** **J**
	Multi-pole resolver	**S**
	2-pole resolver	**T**
Encoder systems for motors with DRIVE-CLiQ interface:	IC22DQ encoder (only for 1FK702)	**D**
	AM20DQ encoder (only for 1FK702) AM15DQ encoder (only for 1FK702)	**L** **V**
	R15DQ resolver (only for 1FK702)	**U**
	R14DQ resolver (only for 1FK702)	**P**

Shaft extension:	**Shaft and flange accuracy:**	**Holding brake:**	
Plain shaft	Tolerance N	Without	**G**
Plain shaft	Tolerance N	With	**H**

Further information and selection options for SIMOTICS S-1FK7 servomotors can be found in Chapter 4 of Catalog PM 21.

Motor type (repeated)	Effi-ciency [1]	Static current	Calculated power $P_{calc} = M_0 \times n_{rated}/9550$	**SINAMICS S110 blocksize format** Rated output current [2]	**PM340 Power Module Air cooling**	**Pre-assembled power cable with complete shield** Motor and brake connection via SPEED-CONNECT power connector		
						Power connector	Cable cross-section [3]	
	η	I_0 at M_0 ΔT=100 K	P_{calc} at M_0 ΔT=100 K	I_{rated}				
	%	A	kW (hp)	A	Article No.	Size	mm^2	Article No.
				Line voltage 380 ... 480 V 3 AC				
1FK7011-5AK71...	62	1.5	0.1 (0.13)	1.7	**6SL3210-1SE11-7UA0**	0.5	4 × 1.5	**6FX■002-5DN30-....**
1FK7015-5AK71...	68	1.5	0.2 (0.27)	1.7	**6SL3210-1SE11-7UA0**	0.5	4 × 1.5	**6FX■002-5DN30-....**
1FK7022-5AK71...	86	1.8	0.5 (0.67)	2.2	**6SL3210-1SE12-2UA0**	1	4 × 1.5	**6FX■002-5■G10-....**
				Line voltage 200 ... 240 V 1 AC				
1FK7011-5AK21...	62	0.85	0.1 (0.13)	0.9	**6SL3210-1SB11-0■A0**	0.5	4 × 1.5	**6FX■002-5DN30-....**
1FK7015-5AK21...	68	0.85	0.2 (0.27)	0.9	**6SL3210-1SB11-0■A0**	0.5	4 × 1.5	**6FX■002-5DN30-....**
1FK7022-5AK21...	85	1.8	0.5 (0.67)	2.3	**6SL3210-1SB12-3■A0**	1	4 × 1.5	**6FX■002-5■G10-....**

Line filter:
Without **U**
Integrated **A**

You can find further versions and components in SINAMICS S110 servo drives in Chapter 9.

Power cable:
MOTION-CONNECT 800PLUS **8**
MOTION-CONNECT 500 **5**

Without brake cores **C**
With brake cores **D**

Length code **....**

Information about the cables can be found in Connection system MOTION-CONNECT in Catalog PM 21.

[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). Cable cross-section for brake connection 2 × 1.5 mm^2.

SIMOTICS S-1FK7 Compact servomotors

Selection and ordering data

Rated speed	Shaft height	Rated power	Static torque	Rated torque	Rated current	**SIMOTICS S-1FK7 Compact synchronous motors Natural cooling**	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	Article No.		10^{-4} kgm^2 (10^{-3} lb_f-in-s^2)	kg (lb)
SIMOTICS S-1FK7 Compact synchronous motors for DC link voltage 720 V DC									
2000	48	0.6 (0.80)	3 (2.21)	2.8 (2.07)	1.55	**1FK7042-2AC71-1■ ■0**	4	2.9 (2.57)	4.6 (10.1)
	63	1.1 (1.5)	6 (4.43)	5.3 (3.91)	2.95	**1FK7060-2AC71-1■ ■0**	4	7.7 (6.82)	7.1 (15.7)
		1.5 (2.0)	8.5 (6.27)	7 (5.16)	2.65	**1FK7062-2AC71-1■ ■0**	4	11.2 (9.91)	9.1 (20.1)
		1.9 (2.55)	11 (8.11)	8.9 (6.56)	4.4	**1FK7063-2AC71-1■ ■0**	4	14.7 (13.0)	11.1 (24.5)
	80	2.1 (2.82)	12 (8.85)	10 (7.38)	4.4	**1FK7081-2AC71-1■ ■0**	4	20 (17.7)	12.9 (28.4)
		2.6 (3.49)	16 (11.8)	12.5 (9.22)	6.3	**1FK7083-2AC71-1■ ■0**	4	26 (23.0)	15.6 (34.4)
		3.1 (4.16)	20 (14.7)	15 (11.1)	6.7	**1FK7084-2AC71-1■ ■0**	4	32.5 (28.8)	18.3 (40.4)
	100	3 (4.02)	18 (13.3)	14.5 (10.7)	7.1	**1FK7100-2AC71-1■ ■0**	4	54 (47.8)	17.6 (38.8)
		4.3 (5.77)	27 (19.9)	20.5 (15.1)	9.7	**1FK7101-2AC71-1■ ■0**	4	79 (69.9)	23 (50.7)
		5.2 (6.97)	36 (26.6)	25 (18.4)	11	**1FK7103-2AC71-1■ ■0**	4	104 (92.1)	28.5 (62.8)
		7.7 (10.33)	48 (35.4)	37 (27.3)	16	**1FK7105-2AC71-1■ ■0**	4	154 (136)	39 (86.0)
3000	48	0.8 (1.07)	3 (2.21)	2.6 (1.92)	2	**1FK7042-2AF71-1■ ■0**	4	2.9 (2.57)	4.6 (10.1)
	63	1.5 (2.01)	6 (4.43)	4.7 (3.47)	3.7	**1FK7060-2AF71-1■ ■0**	4	7.7 (6.82)	7.1 (15.7)
		1.9 (2.55)	8.5 (6.27)	6 (4.43)	4	**1FK7062-2AF71-1■ ■0**	4	11.2 (9.91)	9.1 (20.1)
		2.3 (3.08)	11 (8.11)	7.3 (5.38)	5.6	**1FK7063-2AF71-1■ ■0**	4	14.7 (13.0)	11.1 (24.5)
	80	2.1 (2.82)	8 (5.90)	6.8 (5.02)	4.4	**1FK7080-2AF71-1■ ■0**	4	14.2 (12.6)	10.3 (22.7)
		2.7 (3.62)	12 (8.85)	8.7 (6.42)	6.8	**1FK7081-2AF71-1■ ■0**	4	20 (17.7)	12.9 (28.4)
		3.3 (4.43)	16 (11.8)	10.5 (7.74)	7.2	**1FK7083-2AF71-1■ ■0**	4	26 (23.0)	15.6 (34.4)
		3.1 (4.16)	20 (14.7)	10 (7.38)	6.5	**1FK7084-2AF71-1■ ■0**	4	32.5 (28.8)	18.3 (40.4)
	100	3.8 (5.10)	18 (13.3)	12 (8.85)	8	**1FK7100-2AF71-1■ ■0**	4	54 (47.8)	17.6 (38.8)
		4.9 (6.57)	27 (19.9)	15.5 (11.4)	11.6	**1FK7101-2AF71-1■ ■0**	4	79 (69.9)	23 (50.7)
		4.4 (5.90)	36 (26.6)	14 (10.3)	11.5	**1FK7103-2AF71-1■ ■0**	4	104 (92.1)	28.5 (62.8)
		8.2 (11.0)	48 (35.4)	26 (19.2)	18	**1FK7105-2AF71-1■ ■0**	4	154 (136)	39 (86.0)
4500	63	1.7 (2.28)	6 (4.43)	3.7 (2.73)	4.3	**1FK7060-2AH71-1■ ■0**	4	7.7 (6.82)	7.1 (15.7)
		1.4 (1.88)	8.5 (6.27)	3 (2.21)	3.3	**1FK7062-2AH71-1■ ■0**	4	11.2 (9.91)	9.1 (20.1)
		1.4 (1.88)	11 (8.11)	3 (2.21)	3.8	**1FK7063-2AH71-1■ ■0**	4	14.7 (13.0)	11.1 (24.5)
	80	2.1 (2.82)	8 (5.90)	4.5 (3.32)	4.8	**1FK7080-2AH71-1■ ■0**	4	14.2 (12.6)	10.3 (22.7)
		1.8 (2.41)	12 (8.85)	3.8 (2.80)	4.9	**1FK7081-2AH71-1■ ■0**	4	20 (17.7)	12.9 (28.4)
		1.4 (1.88)	16 (11.8)	3 (2.21)	3.6	**1FK7083-2AH71-1■ ■0**	4	26 (23.0)	15.6 (34.4)
6000	36	0.5 (0.67)	1.15 (0.85)	0.8 (0.59)	1.3	**1FK7032-2AK71-1■ ■0**	3	0.65 (0.58)	2.7 (5.95)
		0.6 (0.80)	1.6 (1.18)	1 (0.74)	1.3	**1FK7034-2AK71-1■ ■0**	3	0.9 (0.80)	3.5 (7.72)
	48	0.7 (0.94)	1.6 (1.18)	1.1 (0.81)	1.85	**1FK7040-2AK71-1■ ■0**	4	1.6 (1.42)	3.2 (7.06)
		0.9 (1.21)	3 (2.21)	1.5 (1.11)	2.5	**1FK7042-2AK71-1■ ■0**	4	2.9 (2.57)	4.6 (10.1)
SIMOTICS S-1FK7 Compact synchronous motors for DC link voltage 270 ... 325 V DC									
3000	36	0.3 (0.40)	1.15 (0.85)	1 (0.74)	1.6	**1FK7032-2AF21-1■ ■0**	3	0.65 (0.58)	2.7 (5.95)
		0.5 (0.67)	1.6 (1.18)	1.45 (1.07)	1.8	**1FK7034-2AF21-1■ ■0**	3	0.9 (0.80)	3.5 (7.72)
	48	0.8 (1.07)	3 (2.21)	2.6 (1.92)	3.5	**1FK7042-2AF21-1■ ■0**	4	2.9 (2.57)	4.6 (10.1)

Encoder systems for motors without DRIVE-CLiQ interface:	IC2048S/R encoder AM2048S/R encoder Multi-pole resolver 2-pole resolver	**A** **E** **S** **T**
Encoder systems for motors with DRIVE-CLiQ interface:	AS20DQI encoder AM20DQI encoder R15DQ resolver R14DQ resolver	**Q** **R** **U** **P**

Shaft extension:	**Shaft and flange accuracy:**	**Holding brake:**	
Plain shaft	Tolerance N	Without	**G**
Plain shaft	Tolerance N	With	**H**

Further information and selection options for SIMOTICS S-1FK7 servomotors can be found in Chapter 4 of Catalog PM 21.

Motor type (repeated)	Effi-ciency [1]	Static current	Calculated power $P_{calc} = M_0 \times n_{rated}/9550$	SINAMICS S110 blocksize format Rated output current [2] PM340 Power Module Air cooling		Pre-assembled power cable with complete shield Motor and brake connection via SPEED-CONNECT power connector Power connector	Cable cross-section [3]	
	η	I_0 at M_0 ΔT=100 K	P_{calc} at M_0 ΔT=100 K	I_{rated}				
	%	A	kW (hp)	A	Article No.	Size	mm^2	Article No.
				Line voltage 380 ... 480 V 3 AC				
1FK7042-2AC71...	88	1.6	0.6 (0.80)	1.7	**6SL3210-1SE11-7UA0**	1	4 × 1.5	**6FX■002-5■G10-....**
1FK7060-2AC71...	90	3.15	1.3 (1.74)	4.1	**6SL3210-1SE14-1UA0**	1	4 × 1.5	**6FX■002-5■G10-....**
1FK7062-2AC71...	91	3	1.8 (2.41)	3.1	**6SL3210-1SE13-1UA0**	1	4 × 1.5	**6FX■002-5■G10-....**
1FK7063-2AC71...	91	5.3	2.3 (3.08)	5.9	**6SL3210-1SE16-0■A0**	1	4 × 1.5	**6FX■002-5■G10-....**
1FK7081-2AC71...	93	5	2.5 (3.35)	5.9	**6SL3210-1SE16-0■A0**	1	4 × 1.5	**6FX■002-5■G10-....**
1FK7083-2AC71...	93	7.5	3.4 (4.56)	7.7	**6SL3210-1SE17-7■A0**	1	4 × 1.5	**6FX■002-5■G10-....**
1FK7084-2AC71...	93	8.5	4.2 (5.63)	10.2	**6SL3210-1SE21-0■A0**	1	4 × 1.5	**6FX■002-5■G10-....**
1FK7100-2AC71...	92	8.4	3.8 (5.10)	10.2	**6SL3210-1SE21-0■A0**	1	4 × 1.5	**6FX■002-5■G10-....**
1FK7101-2AC71...	93	12.3	5.7 (7.64)	18	**6SL3210-1SE21-8■A0**	1.5	4 × 1.5	**6FX■002-5■G22-....**
1FK7103-2AC71...	93	14.4	7.5 (10.1)	18	**6SL3210-1SE21-8■A0**	1.5	4 × 1.5	**6FX■002-5■G22-....**
1FK7105-2AC71...	93	20	10.1 (13.5)	25	**6SL3210-1SE22-5■A0**	1.5	4 × 2.5	**6FX■002-5■G32-....**
1FK7042-2AF71...	89	2.2	0.9 (1.21)	2.2	**6SL3210-1SE12-2UA0**	1	4 × 1.5	**6FX■002-5■G10-....**
1FK7060-2AF71...	90	4.45	1.9 (2.55)	5.9	**6SL3210-1SE16-0■A0**	1	4 × 1.5	**6FX■002-5■G10-....**
1FK7062-2AF71...	91	5.3	2.7 (3.62)	5.9	**6SL3210-1SE16-0■A0**	1	4 × 1.5	**6FX■002-5■G10-....**
1FK7063-2AF71...	91	8	3.5 (4.69)	10.2	**6SL3210-1SE21-0■A0**	1	4 × 1.5	**6FX■002-5■G10-....**
1FK7080-2AF71...	92	4.9	2.5 (3.35)	5.9	**6SL3210-1SE16-0■A0**	1	4 × 1.5	**6FX■002-5■G10-....**
1FK7081-2AF71...	93	8.7	3.8 (5.10)	10.2	**6SL3210-1SE21-0■A0**	1	4 × 1.5	**6FX■002-5■G10-....**
1FK7083-2AF71...	93	10.1	5 (6.71)	10.2	**6SL3210-1SE21-0■A0**	1	4 × 1.5	**6FX■002-5■G10-....**
1FK7084-2AF71...	93	12.1	6.3 (8.45)	18	**6SL3210-1SE21-8■A0**	1	4 × 1.5	**6FX■002-5■G10-....**
1FK7100-2AF71...	92	11.1	5.7 (7.64)	18	**6SL3210-1SE21-8■A0**	1	4 × 1.5	**6FX■002-5■G10-....**
1FK7101-2AF71...	93	18.8	8.5 (11.4)	25	**6SL3210-1SE22-5■A0**	1.5	4 × 2.5	**6FX■002-5■G32-....**
1FK7103-2AF71...	93	26	11.3 (15.1)	32	**6SL3210-1SE23-2■A0**	1.5	4 × 4	**6FX■002-5■G42-....**
1FK7105-2AF71...	94	31	15.1 (20.2)	32	**6SL3210-1SE23-2■A0**	1.5	4 × 6	**6FX■002-5■G52-....**
1FK7060-2AH71...	90	6.3	2.8 (3.75)	7.7	**6SL3210-1SE17-7■A0**	1	4 × 1.5	**6FX■002-5■G10-....**
1FK7062-2AH71...	91	8	4 (5.36)	10.2	**6SL3210-1SE21-0■A0**	1	4 × 1.5	**6FX■002-5■G10-....**
1FK7063-2AH71...	90	12	5.2 (6.97)	18	**6SL3210-1SE21-8■A0**	1	4 × 1.5	**6FX■002-5■G10-....**
1FK7080-2AH71...	92	7.4	3.8 (5.10)	7.7	**6SL3210-1SE17-7■A0**	1	4 × 1.5	**6FX■002-5■G10-....**
1FK7081-2AH71...	93	13.1	5.7 (7.64)	18	**6SL3210-1SE21-8■A0**	1	4 × 1.5	**6FX■002-5■G10-....**
1FK7083-2AH71...	93	15	7.5 (10.1)	18	**6SL3210-1SE21-8■A0**	1	4 × 1.5	**6FX■002-5■G10-....**
1FK7032-2AK71...	88	1.7	0.7 (0.94)	1.7	**6SL3210-1SE11-7UA0**	1	4 × 1.5	**6FX■002-5■G10-....**
1FK7034-2AK71...	88	1.9	1 (1.34)	2.2	**6SL3210-1SE12-2UA0**	1	4 × 1.5	**6FX■002-5■G10-....**
1FK7040-2AK71...	88	2.35	1 (1.34)	3.1	**6SL3210-1SE13-1UA0**	1	4 × 1.5	**6FX■002-5■G10-....**
1FK7042-2AK71...	89	4.4	1.9 (2.55)	5.9	**6SL3210-1SE16-0■A0**	1	4 × 1.5	**6FX■002-5■G10-....**
				Line voltage 200 ... 240 V 1 AC				
1FK7032-2AF21...	85	1.7	0.4 (0.54)	2.3	**6SL3210-1SB12-3■A0**	1	4 × 1.5	**6FX■002-5■G10-....**
1FK7034-2AF21...	85	1.9	0.5 (0.67)	2.3	**6SL3210-1SB12-3■A0**	1	4 × 1.5	**6FX■002-5■G10-....**
1FK7042-2AF21...	89	3.95	0.9 (1.21)	3.9	**6SL3210-1SB14-0■A0**	1	4 × 1.5	**6FX■002-5■G10-....**

Line filter:	
Without	**U**
Integrated	**A**

You can find further versions and components in SINAMICS S110 servo drives in Chapter 9.

Power cable:	
MOTION-CONNECT 800PLUS	**8**
MOTION-CONNECT 500	**5**
Without brake cores	**C**
With brake cores	**D**
Length code	**....**

Information about the cables can be found in Connection system MOTION-CONNECT in Catalog PM 21.

[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). Cable cross-section for brake connection 2 × 1.5 mm^2.

SIMOTICS M-1PH8 asynchronous (induction) 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]	**SIMOTICS M-1PH8 asynchronous motors Forced ventilation NDE→ DE**
n_{rated}	SH	P_{rated}	T_{rated}	I_{rated}	U_{rated}	f_{rated}	n_2	n_{max}	
rpm		kW (hp)	Nm (lb_f-ft)	A	V	Hz	rpm	rpm	Article No.
Line voltage 400 V 3 AC									
400	160	9.5	227 (167)	30	260	14.3	2150	6500	**1PH8163-1■B1■-■■■1**
		13 (17.43)	310 (229)	36	300	14.1	1750	6500	**1PH8165-1■B1■-■■■1**
1000	100	3.7 (4.96)	35 (25.8)	10	333	35.8	2550	9000	**1PH8103-1■D1■-■■■1**
		6.3 (8.45)	60 (44.3)	17.5	307	35.5	4300	9000	**1PH8107-1■D1■-■■■1**
	132	12 (16.1)	115 (84.8)	30	319	35	3000	8000	**1PH8133-1■D1■-■■■1**
		17 (22.8)	162 (119)	43	307	34.8	4300	8000	**1PH8137-1■D1■-■■■1**
	160	22 (29.5)	210 (155)	55	300	34.2	2800	6500	**1PH8163-1■D1■-■■■1**
		28 (37.55)	267 (197)	71	292	34.2	4600	6500	**1PH8165-1■D1■-■■■1**
1500	80	2.8 (3.75)	18 (13.3)	7.5	346	53.3	4700	10000	**1PH8083-1■F1■-■■■1**
		3.7 (4.96)	24 (17.7)	10	336	53.2	5200	10000	**1PH8087-1■F1■-■■■1**
	100	3.7 (4.96)	24 (17.7)	12.5	265	52.4	5000	9000	**1PH8101-1■F1■-■■■1**
		5.5 (7.38)	35 (25.8)	13.5	368	52.4	4200	9000	**1PH8103-1■F1■-■■■1**
		7.0 (9.39)	45 (33.2)	17.5	348	51.9	5250	9000	**1PH8105-1■F1■-■■■1**
		9.0 (12.1)	57 (42)	23.5	330	52.2	4500	9000	**1PH8107-1■F1■-■■■1**
	132	11 (14.75)	70 (51.6)	24	360	51.4	4800	8000	**1PH8131-1■F1■-■■■1**
		15 (20.12)	96 (70.8)	34	342	51.3	5500	8000	**1PH8133-1■F1■-■■■1**
		18.5	118 (87)	43	330	51.3	6150	8000	**1PH8135-1■F1■-■■■1**
		22 (29.5)	140 (103)	56	308	51.3	4300	8000	**1PH8137-1■F1■-■■■1**
	160	30 (40.23)	191 (141)	71	319	50.8	3500	6500	**1PH8163-1■F1■-■■■1**
		37 (49.62)	236 (174)	78	350	50.8	2800	6500	**1PH8165-1■F1■-■■■1**
Line voltage 480 V 3 AC									
600	160	14.5 (19.4)	231 (170)	30	370	21	2150	6500	**1PH8163-1■B1■-■■■1**
		19 (25.5)	302 (223)	35	420	20.8	1800	6500	**1PH8165-1■B1■-■■■1**
1350	100	4.7 (6.30)	33 (24.3)	9.7	423	47.3	3500	9000	**1PH8103-1■D1■-■■■1**
		8.0 (10.7)	57 (42.0)	17	400	47.1	5045	9000	**1PH8107-1■D1■-■■■1**
	132	15 (20.1)	106 (78.2)	28	417	46.5	3500	8000	**1PH8133-1■D1■-■■■1**
		22 (29.5)	156 (115)	42	404	46.4	4000	8000	**1PH8137-1■D1■-■■■1**
	160	28 (37.6)	198 (146)	52	400	45.8	4000	6500	**1PH8163-1■D1■-■■■1**
		34 (45.6)	241 (178)	66	387	45.8	5600	6500	**1PH8165-1■D1■-■■■1**
2000	80	3.7 (4.96)	18 (13.3)	7.6	447	70	5550	10000	**1PH8083-1■F1■-■■■1**
		4.9 (6.57)	23 (17.0)	10	435	69.9	6100	10000	**1PH8087-1■F1■-■■■1**
	100	4.7 (6.30)	22 (16.2)	12.5	343	69	7500	9000	**1PH8101-1■F1■-■■■1**
		7 (9.39)	33 (24.3)	12.7	460	69.1	4100	9000	**1PH8103-1■F1■-■■■1**
		9 (12.1)	43 (31.7)	17	453	68.5	6180	9000	**1PH8105-1■F1■-■■■1**
		11 (14.8)	53 (39.1)	21.5	428	68.6	5500	9000	**1PH8107-1■F1■-■■■1**
	132	15 (20.1)	72 (53.1)	24	460	68.2	5300	8000	**1PH8131-1■F1■-■■■1**
		20 (26.8)	96 (70.8)	34	445	68	6200	8000	**1PH8133-1■F1■-■■■1**
		24 (32.2)	115 (84.8)	43	434	67.9	7100	8000	**1PH8135-1■F1■-■■■1**
		28 (37.6)	134 (98.8)	55	401	67.9	4000	8000	**1PH8137-1■F1■-■■■1**
	160	37 (49.6)	177 (131)	68	416	67.4	3550	6500	**1PH8163-1■F1■-■■■1**
		45 (60.4)	215 (159)	75	440	67.5	3300	6500	**1PH8165-1■F1■-■■■1**

For versions, see Article No. supplements on Page 11/16.

Further information and selection options for SIMOTICS M-1PH8 main motors can be found in Chapter 5 of Catalog PM 21.

SIMOTICS M-1PH8 asynchronous (induction) motors – Forced ventilation, IP55 degree of protection

Motor type (repeated)	Power factor	Magnetizing current	Efficiency	Moment of inertia	Weight, approx.	Terminal box	SINAMICS S110 blocksize format	
							Rated output current[3]	PM340 Power Module Air cooling
	cos φ	I_μ A	η	J kgm^2 (lb_f-in-s^2)	kg (lb)	Type	I_{rated} A	Article No.
							Line voltage 380 ... 480 V 3 AC	
1PH8163-1. B ...	0.91	8.1	0.823	0.2160 (1.912)	196 (432)	gk863	32	6SL3210-1SE23-2■A0
1PH8165-1. B ...	0.86	14.9	0.826	0.2320 (2.053)	230 (507)	gk863	38	6SL3210-1SE23-8■A0
1PH8103-1. D ...	0.82	4.6	0.814	0.0172 (0.152)	51 (112)	gk813	10.2	6SL3210-1SE21-0■A0
1PH8107-1. D ...	0.82	8.2	0.834	0.0289 (0.256)	73 (161)	gk813	18	6SL3210-1SE21-8■A0
1PH8133-1. D ...	0.88	10.1	0.871	0.0760 (0.673)	106 (234)	gk833	32	6SL3210-1SE23-2■A0
1PH8137-1. D ...	0.88	15.1	0.881	0.1090 (0.965)	141 (311)	gk833	45	6SL3210-1SE24-5■A0
1PH8163-1. D ...	0.89	17.3	0.909	0.2160 (1.912)	196 (432)	gk863	60	6SL3210-1SE26-0■A0
1PH8165-1. D ...	0.89	22.2	0.914	0.2320 (2.053)	230 (507)	gk863	75	6SL3210-1SE27-5■A0
1PH8083-1. F ...	0.80	3.8	0.809	0.0064 (0.057)	32 (70.6)	gk803	7.7	6SL3210-1SE17-7■A0
1PH8087-1. F ...	0.81	4.9	0.817	0.0089 (0.079)	39 (86.0)	gk803	10.2	6SL3210-1SE21-0■A0
1PH8101-1. F ...	0.80	6	0.835	0.0138 (0.122)	42 (92.6)	gk813	18	6SL3210-1SE21-8■A0
1PH8103-1. F ...	0.80	6.5	0.852	0.0172 (0.152)	51 (112)	gk813	18	6SL3210-1SE21-8■A0
1PH8105-1. F ...	0.79	8.8	0.867	0.0252 (0.223)	65 (143)	gk813	18	6SL3210-1SE21-8■A0
1PH8107-1. F ...	0.81	10.8	0.869	0.0289 (0.256)	73 (161)	gk813	25	6SL3210-1SE22-5■A0
1PH8131-1. F ...	0.84	10.4	0.899	0.0590 (0.522)	89 (196)	gk833	25	6SL3210-1SE22-5■A0
1PH8133-1. F ...	0.85	14.2	0.899	0.0760 (0.673)	106 (234)	gk833	38	6SL3210-1SE23-8■A0
1PH8135-1. F ...	0.85	18.1	0.898	0.0940 (0.832)	125 (276)	gk833	45	6SL3210-1SE24-5■A0
1PH8137-1. F ...	0.84	24.2	0.904	0.1090 (0.965)	141 (311)	gk833	60	6SL3210-1SE26-0■A0
1PH8163-1. F ...	0.87	25.6	0.923	0.2160 (1.912)	196 (432)	gk863	75	6SL3210-1SE27-5■A0
1PH8165-1. F ...	0.88	27	0.926	0.2320 (2.053)	230 (507)	gk863	90	6SL3210-1SE31-0■A0
							Line voltage 380 ... 480 V 3 AC	
1PH8163-1. B ...	0.90	8.1	0.851	0.2160 (1.912)	196 (432)	gk863	32	6SL3210-1SE23-2■A0
1PH8165-1. B ...	0.88	12	0.850	0.2320 (2.053)	230 (507)	gk863	38	6SL3210-1SE23-8■A0
1PH8103-1. D ...	0.82	4.4	0.848	0.0172 (0.152)	51 (112)	gk813	10.2	6SL3210-1SE21-0■A0
1PH8107-1. D ...	0.80	8.2	0.867	0.0289 (0.256)	73 (161)	gk813	18	6SL3210-1SE21-8■A0
1PH8133-1. D ...	0.86	10.7	0.904	0.0760 (0.673)	106 (234)	gk833	32	6SL3210-1SE23-2■A0
1PH8137-1. D ...	0.86	15.9	0.902	0.1090 (0.965)	141 (311)	gk833	45	6SL3210-1SE24-5■A0
1PH8163-1. D ...	0.88	17.7	0.924	0.2160 (1.912)	196 (432)	gk863	60	6SL3210-1SE26-0■A0
1PH8165-1. D ...	0.86	22.5	0.928	0.2320 (2.053)	230 (507)	gk863	75	6SL3210-1SE27-5■A0
1PH8083-1. F ...	0.79	3.7	0.850	0.0064 (0.057)	32 (70.6)	gk803	7.7	6SL3210-1SE17-7■A0
1PH8087-1. F ...	0.80	4.9	0.864	0.0089 (0.079)	39 (86.0)	gk803	10.2	6SL3210-1SE21-0■A0
1PH8101-1. F ...	0.79	6	0.871	0.0138 (0.122)	42 (92.6)	gk813	18	6SL3210-1SE21-8■A0
1PH8103-1. F ...	0.81	5.8	0.894	0.0172 (0.152)	51 (112)	gk813	18	6SL3210-1SE21-8■A0
1PH8105-1. F ...	0.78	8.7	0.911	0.0252 (0.223)	65 (143)	gk813	18	6SL3210-1SE21-8■A0
1PH8107-1. F ...	0.79	10.8	0.901	0.0289 (0.256)	73 (161)	gk813	25	6SL3210-1SE22-5■A0
1PH8131-1. F ...	0.86	9.2	0.931	0.0590 (0.522)	89 (196)	gk833	25	6SL3210-1SE22-5■A0
1PH8133-1. F ...	0.85	13.5	0.933	0.0760 (0.673)	106 (234)	gk833	38	6SL3210-1SE23-8■A0
1PH8135-1. F ...	0.84	18.1	0.929	0.0940 (0.832)	125 (276)	gk833	45	6SL3210-1SE24-5■A0
1PH8137-1. F ...	0.84	23.1	0.931	0.1090 (0.965)	141 (311)	gk833	60	6SL3210-1SE26-0■A0
1PH8163-1. F ...	0.86	24.6	0.932	0.2160 (1.912)	196 (432)	gk863	75	6SL3210-1SE27-5■A0
1PH8165-1. F ...	0.89	23.6	0.936	0.2320 (2.053)	230 (507)	gk863	90	6SL3210-1SE31-0■A0

Line filter:	
Without	**U**
Integrated	**A**

You can find further versions and components in SINAMICS S110 servo drives in Chapter 9.

[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 C).
[3] The rated pulse frequencies must be taken into account. The rated motor data is valid for 4 kHz.

SIMOTICS M-1PH8 asynchronous (induction) 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]	SIMOTICS M-1PH8 asynchronous motors Water cooling
n_{rated}	SH	P_{rated}	T_{rated}	I_{rated}	U_{rated}	f_{rated}	n_2	n_{max}	
rpm		kW (hp)	Nm (lbf-ft)	A	V	Hz	rpm	rpm	Article No.
Line voltage 400 V 3 AC									
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	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**
Line voltage 480 V 3 AC									
2000	80	4.6 (6.2)	22 (16.2)	8.7	457	71	4250	10000	**1PH8083-1■F2■-■■■1**
		6.1 (8.2)	29 (21.4)	13.7	402	70	6950	10000	**1PH8087-1■F2■-■■■1**
	100	6.6 (8.9)	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 (49.6)	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**

For versions, see Article No. supplements on page 11/16.

Further information and selection options for SIMOTICS M-1PH8 main motors can be found in Chapter 5 of Catalog PM 21.

SIMOTICS M-1PH8 asynchronous (induction) motors – Water cooling, IP65 degree of protection

Motor type (repeated)	Power factor	Magnetizing current	Efficiency	Moment of inertia	Weight, approx.	Terminal box	SINAMICS S110 blocksize format	
							Rated output current[3]	PM340 Power Module Air cooling
	cos φ	I_μ	η	J			I_{rated}	
		A		kgm^2 (lb$_f$-in-s^2)	kg (lb)	Type	A	Article No.
Line voltage 400 V 3 AC							**Line voltage 380 ... 480 V 3 AC**	
1PH8083-1.F2...	0.84	3.6	0.784	0.0064 (0.057)	36 (79.4)	gk803	10.2	**6SL3210-1SE21-0■A0**
1PH8087-1.F2...	0.78	7.2	0.814	0.0089 (0.079)	44 (97.0)	gk803	18	**6SL3210-1SE21-8■A0**
1PH8101-1.F2...	0.81	6	0.813	0.0138 (0.122)	51 (112)	gk823	18	**6SL3210-1SE21-8■A0**
1PH8103-1.F2...	0.82	8.6	0.827	0.0172 (0.152)	60 (132)	gk823	25	**6SL3210-1SE22-5■A0**
1PH8105-1.F2...	0.81	13.3	0.843	0.0252 (0.223)	74 (163)	gk823	32	**6SL3210-1SE23-2■A0**
1PH8107-1.F2...	0.83	17.8	0.829	0.0289 (0.256)	83 (183)	gk823	45	**6SL3210-1SE24-5■A0**
1PH8131-1.F2...	0.89	9.2	0.883	0.0590 (0.522)	105 (232)	gk843	32	**6SL3210-1SE23-2■A0**
1PH8133-1.F2...	0.86	14.2	0.897	0.0760 (0.673)	123 (271)	gk843	38	**6SL3210-1SE23-8■A0**
1PH8135-1.F2...	0.85	20.3	0.901	0.0940 (0.832)	141 (311)	gk843	60	**6SL3210-1SE26-0■A0**
1PH8137-1.F2...	0.86	25.3	0.900	0.1090 (0.965)	157 (346)	gk843	75	**6SL3210-1SE27-5■A0**
1PH8138-1.F2...	0.88	27.1	0.882	0.1090 (0.965)	157 (346)	gk843	75	**6SL3210-1SE27-5■A0**
1PH8163-1.F2...	0.88	27.4	0.916	0.2160 (1.912)	229 (505)	gk873	90	**6SL3210-1SE31-0■A0**
1PH8165-1.F2...	0.87	37.2	0.930	0.2320 (2.053)	264 (582)	gk873	110	**6SL3210-1SE31-1■A0**
1PH8166-1.F2...	0.88	36.7	0.936	0.2320 (2.053)	269 (593)	gk873	145	**6SL3210-1SE31-5■A0**
Line voltage 480 V 3 AC							**Line voltage 380 ... 480 V 3 AC**	
1PH8083-1.F2...	0.83	3.8	0.839	0.0064 (0.057)	36 (79.4)	gk803	10.2	**6SL3210-1SE21-0■A0**
1PH8087-1.F2...	0.79	6.8	0.868	0.0089 (0.079)	44 (97.0)	gk803	18	**6SL3210-1SE21-8■A0**
1PH8101-1.F2...	0.82	4.4	0.858	0.0138 (0.122)	51 (112)	gk823	18	**6SL3210-1SE21-8■A0**
1PH8103-1.F2...	0.82	8.5	0.869	0.0172 (0.152)	60 (132)	gk823	25	**6SL3210-1SE22-5■A0**
1PH8105-1.F2...	0.82	11.7	0.894	0.0252 (0.223)	74 (163)	gk823	32	**6SL3210-1SE23-2■A0**
1PH8107-1.F2...	0.81	19.1	0.873	0.0289 (0.256)	83 (183)	gk823	45	**6SL3210-1SE24-5■A0**
1PH8131-1.F2...	0.90	7.2	0.912	0.0590 (0.522)	105 (232)	gk843	32	**6SL3210-1SE23-2■A0**
1PH8133-1.F2...	0.86	14.4	0.938	0.0760 (0.673)	123 (271)	gk843	38	**6SL3210-1SE23-8■A0**
1PH8135-1.F2...	0.85	19.9	0.931	0.0940 (0.832)	141 (311)	gk843	60	**6SL3210-1SE26-0■A0**
1PH8137-1.F2...	0.86	25.4	0.928	0.1090 (0.965)	157 (346)	gk843	75	**6SL3210-1SE27-5■A0**
1PH8138-1.F2...	0.86	28.4	0.920	0.1090 (0.965)	157 (346)	gk843	75	**6SL3210-1SE27-5■A0**
1PH8163-1.F2...	0.88	26.9	0.925	0.2160 (1.912)	229 (505)	gk873	90	**6SL3210-1SE31-0■A0**
1PH8165-1.F2...	0.88	34	0.940	0.2320 (2.053)	264 (582)	gk873	110	**6SL3210-1SE31-1■A0**
1PH8166-1.F2...	0.89	32.8	0.941	0.2320 (2.053)	269 (593)	gk873	145	**6SL3210-1SE31-5■A0**

Line filter:	
Without	**U**
Integrated	**A**

You can find further versions and components in SINAMICS S110 servo drives in Chapter 9.

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 C).
3) The rated pulse frequencies must be taken into account. The rated motor data is valid for 4 kHz.

Article No. supplements for 1PH808/1PH810/1PH813/1PH816 motors

Data position of the Article 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**	■	**.**	■	■	**–**	■	■	■	**1**
Shaft height 100	**1**	**P**	**H**	**8**	**1**	**0**	**.**	**–**	**1**	■	**.**	■	■	**–**	■	■	■	**1**
Shaft height 132	**1**	**P**	**H**	**8**	**1**	**3**	**.**	**–**	**1**	■	**.**	■	■	**–**	■	■	■	**1**
Shaft height 160	**1**	**P**	**H**	**8**	**1**	**6**	**.**	**–**	**1**	■	**.**	■	■	**–**	■	■	■	**1**
Overall length[1]							**.**											
Asynchronous variant									**1**									
Encoder systems for motors without DRIVE-CLiQ interface																		
Without encoder										**A**								
Incremental encoder HTL 1024 S/R (encoder HTL1024S/R) [2]										**H**								
Incremental encoder HTL 2048 S/R (encoder HTL2048S/R) [3]										**J**								
Rated speeds at 400 V to 480 V 3 AC (winding design)																		
400 rpm/600 rpm											**B**							
1000 rpm/1350 rpm											**D**							
1500 rpm/2000 rpm											**F**							
Cooling / **Degree of protection**																		
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) [4]													**3**					
Shaft extension DE / **Balancing**																		
Plain shaft / –															**0**			
Fitted key / Half-key															**2**			
Bearing / **Vibration severity acc. to Siemens/EN 60034-14** [5] / **Shaft and flange accuracy**[5]																		
Standard / R/A / R																**B**		
Standard / S/A / R																**C**		
Cable connection (view of DE)																		
Terminal box / Cable entry / Signal connection																		
Top / Right / DE																	**A**	
Top / Left / DE																	**B**	
Top / NDE / Left																	**C**	
Version status																		**1**

Ordering example

Selection criteria	Design	Structure of the Article No.
1PH8 motor	Asynchronous variant, water cooling Shaft height 132 Version status 1	**1PH8131-1 . . 2.- . . . 1**
Encoder system	Incremental encoder HTL 1024 S/R (encoder HTL1024S/R)	**1PH8131-1H. 2. - . . . 1**
Rated operating point	1500 rpm, 15 kW (20.1 hp), 96 Nm (70.8 lb_f-ft)	**1PH8131-1HF2. - . . . 1**
Type of construction	IM B3 (IM V5, IM V6)	**1PH8131-1HF20- . . . 1**
Shaft extension DE	Plain shaft	**1PH8131-1HF20-0 . . 1**
Bearing version	Standard Vibration severity R/A Shaft and flange accuracy R	**1PH8131-1HF20-0B. 1**
Connection	Cable connection terminal box top Cable entry on the right, signal connection DE	**1PH8131-1HF20-0BA1**

Further information and selection options for SIMOTICS M-1PH8 main motors can be found in Chapter 5 of Catalog PM 21.

[1] Not selectable. Determined by the choice of rated power.
[2] Limited to n_{max} = 9000 rpm.
[3] Limited to n_{max} = 4600 rpm.
[4] Only possible with 1PH810 to 1PH816.
[5] For definition, see 1PH8 Configuration Manual.

Overview

Axial mounting of a SIMOTICS S-1FK7 motor on the linear unit with mounting kit and accessories

Parallel mounting of a SIMOTICS S-1FK7 motor on the linear unit with mounting kit and accessories

The electric cylinder comprises a CASM linear unit supplied by SKF and a SIMOTICS S-1FK7 motor.
The CASM linear unit converts the rotary motion of the SIMOTICS S-1FK7 motor into a highly dynamic linear movement and is a perfect substitute for pneumatic or hydraulic cylinders in many applications. By contrast with pneumatic and hydraulic cylinders, electric cylinders allow the driven machine to approach any position with extreme precision solely on the basis of setpoints transferred to an inverter from the SINAMICS S110 or SINAMICS S120 range.

Benefits

- Modular system with wide variety of options.
- Substitute for hydraulic and pneumatic cylinders in most applications.
- No compressed air/hydraulic fluid required – helps to cut costs (no need to supply compressed air or hydraulic fluid), reduces noise emissions significantly and lowers energy consumption in operation.
- Highly dynamic, precise positioning with high repeat accuracy.
- Mechanical conversion is simple because electric cylinders are essentially the same size as pneumatic cylinders. Furthermore, the relevant pneumatic cylinder accessories can also be used for electric cylinders.
- Adapters are used to attach the SIMOTICS S-1FK7 motors to the linear unit supplied by SKF, making it very easy for the customer to assemble the motor/linear unit combination.

Application

The electric cylinders (CASM linear unit supplied by SKF in conjunction with SIMOTICS S-1FK7 motors and SINAMICS S110/SINAMICS S120 inverters) are used for any application which requires a linear motion and/or a defined force. Their areas of application are the same as those for pneumatic and hydraulic cylinders.

They are used, for example, in production machines such as:

- Machines used in the wood, glass, and ceramics industries
- Metalworking and coating machines
- Printing machines
- Plastics processing machines
- Packaging machines

Examples of functions:

- Positioning of cutters
- Edge guidance/edge cutting
- Retainers
- Buffers/sorters/slide gates
- Nozzle holders

Notes:

- Technical advice must be sought for applications involving continuous short-stroke movements (less than three times screw pitch).
- The electric cylinder must be assembled (depending on the stroke length) in such a way as to minimize lateral forces.
- The electric cylinder is not self-locking – it might be necessary to provide a motor holding brake.

Design

Electric cylinders essentially comprise the CASM linear unit (with a lead screw or ball screw) housed in an extruded casing and a SIMOTICS S-1FK7 servomotor attached to the linear unit by means of an adapter kit.

The motor can be mounted on the linear unit in two different ways:

- Axial mounting – see first picture beneath Overview:
  Motor is attached using an axial adapter kit (containing all the necessary parts including the coupling)
- Parallel mounting – see second picture beneath Overview:
  Motor is attached using a parallel adapter kit (containing all the necessary parts including timing pulley and toothed belt).

Depending on the linear unit and SIMOTICS S-1FK7 motor used, higher forces can be obtained with the axial arrangement option than with the parallel arrangement driven by a toothed belt.

Design (continued)

The SIMOTICS S-1FK7 motor is normally attached to the linear unit by the user by means of the appropriate adapter kit, see SKF documentation (link). The adapter kit is included in the scope of supply of the linear unit.

A fully pre-assembled electric cylinder, comprising the CASM linear unit, the SIMOTICS S-1FK7 motor and the adapter, is also available on request. Please refer to the technical specifications or follow the link below: www.skf.com/casm

Technical specifications

The technical specifications given below are intended to provide an initial overview only and refer to operation of the linear units with SIMOTICS S-1FK7 motors (see equipment combinations in the tables).

Comprehensive technical specifications can be found in the SKF documents accessible via the following link: www.skf.com/casm

CASM-32 linear unit

	Suitable motor type	CASM-32- LS	BS	BN
Screw type	–	Lead screw	Ball screw	Ball screw
Screw pitch [1]	–	1.5 mm/rev (0.06 in/rev)	3 mm/rev (0.12 in/rev)	10 mm/rev (0.39 in/rev)
Max. force F_{max}				
Parallel arrangement	1FK7015	300 N (67.4 lb_f)	700 N (157 lb_f)	450 N (101 lb_f)
Axial arrangement	1FK7015	300 N (67.4 lb_f)	700 N (157 lb_f)	450 N (101 lb_f)
	1FK7022	300 N (67.4 lb_f)	700 N (157 lb_f)	630 N (142 lb_f)
Max. average force F_m (average force over a completed motion cycle)				
Parallel arrangement	1FK7015	203 N (45.6 lb_f)	293 N (65.9 lb_f)	151 N (33.9 lb_f)
Axial arrangement	1FK7015	203 N (45.6 lb_f)	293 N (65.9 lb_f)	151 N (33.9 lb_f)
	1FK7022	300 N (67.4 lb_f)	672 N (151 lb_f)	357 N (80.3 lb_f)
Max. velocity		60 mm/s (2.36 in/s)	150 mm/s (5.91 in/s)	500 mm/s (19.7 in/s)
Stroke		50 … 400 mm (1.97 ... 15.7 in)		

Motors mounted on CASM-32 linear unit on request:
- Parallel adapter: 1FK7015-5AK71-1SH3
- Axial adapter: 1FK7022-5AK71-1UH3

CASM-40 linear unit

	Suitable motor type	CASM-40- LS	BS	BN
Screw type	–	Lead screw	Ball screw	Ball screw
Screw pitch [1]	–	2.5 mm/rev (0.1 in/rev)	5 mm/rev (0.2 in/rev)	12.7 mm/rev (0.5 in/rev)
Max. force F_{max}				
Parallel arrangement	1FK7022	600 N (135 lb_f)	2375 N (534 lb_f)	1163 N (261 lb_f)
Axial arrangement	1FK7022	600 N (135 lb_f)	2375 N (534 lb_f)	1318 N (296 lb_f)
	1FK7034	600 N (135 lb_f)	2375 N (534 lb_f)	1550 N (348 lb_f)
Max. average force F_m (average force over a completed motion cycle)				
Parallel arrangement	1FK7022	408 N (91.7 lb_f)	640 N (144 lb_f)	301 N (67.7 lb_f)
Axial arrangement	1FK7022	408 N (91.7 lb_f)	640 N (144 lb_f)	301 N (67.7 lb_f)
	1FK7034	600 N (135 lb_f)	1219 N (274 lb_f)	572 N (129 lb_f)
Max. velocity	–	70 mm/s (2.76 in/s)	300 mm/s (11.8 in/s)	825 mm/s (32.5 in/s)
Stroke	–	100 … 600 mm (3.94 ... 23.6 in)		

Motors mounted on CASM-40 linear unit on request:
- Parallel adapter: 1FK7022-5AK71-1UH3
- Axial adapter: 1FK7034-5AK71-1UH3

CASM-63 linear unit

	Suitable motor type	CASM-63- LS	BS	BN
Screw type	–	Lead screw	Ball screw	Ball screw
Screw pitch [1]	–	4 mm/rev (0.16 in/rev)	10 mm/rev (0.39 in/rev)	20 mm/rev (0.79 in/rev)
Max. force F_{max}				
Parallel arrangement	1FK7034	1000 N (225 lb_f)	2583 N (581 lb_f)	1339 N (301 lb_f)
Axial arrangement	1FK7034	1000 N (225 lb_f)	3052 N (686 lb_f)	1583 N (356 lb_f)
	1FK7044	1000 N (225 lb_f)	5400 N (1214 lb_f)	2800 N (629 lb_f)
Max. average force F_m (average force over a completed motion cycle)				
Parallel arrangement	1FK7034	527 N (118 lb_f)	708 N (159 lb_f)	367 N (82.5 lb_f)
Axial arrangement	1FK7034	527 N (118 lb_f)	708 N (159 lb_f)	367 N (82.5 lb_f)
	1FK7044	1000 N (225 lb_f)	1745 N (392 lb_f)	905 N (203 lb_f)
Max. velocity	–	70 mm/s (2.76 in/s)	530 mm/s (20.9 in/s)	1060 mm/s (41.7 in/s)
Stroke	–	100 … 800 mm (3.94 ... 31.5 in)		

Motors mounted on CASM-63 linear unit on request:
- Parallel adapter: 1FK7034-5AK71-1UH3
- Axial adapter: 1FK7044-7AH71-1UH3

[1] Distance traveled by screw per motor revolution.

More information

Full selection and ordering data can be viewed or downloaded from SKF's website at: www.skf.com/casm

The following example is provided to explain the ordering process.

Example of how to order an electric cylinder (SFK linear unit and SIMOTICS S-1FK7 motor)

Requirement:

- Average force F_m: 400 N (89.9 lb_f)
- Precalculated: F_{mL} = 380 N (85.4 lb_f)
- Max. velocity: 280 mm/s (11 in/s)
- Service life: 2000 km
- Stroke: 300 mm (11.8 in)
- Parallel arrangement of 1FK7022 motor and linear unit.
- The electric cylinder must be supported by a swivel flange.
- The customer will assemble the linear unit and the motor.

Solution:

- **Step 1:**
  Type CASM 40 BS is selected from the table of CASM-40 linear units:
  - F_m = 640 N (144 lb_f)
  - V_{max} = 300 mm/s (11.8 in/s)
  - Stroke = 100 to 600 mm (3.94 to 23.6 in)

All further steps are based on the information supplied about CASM electric cylinders on SKF's website.

- **Step 2:**
  Check the service life in the document "CASM 40 linear units".
  The service life ("lifetime") diagram shows that the service life with F_{mL} = 380 N (85.4 lb_f) is calculated to be 2000 km.
- **Step 3:**
  Work out the correct article number from the document "CASM 40 linear units".
  CASM 40 BS has been selected with:
- Stroke: 300 mm (11.8 in)
- Motor, adapter and attachment parts separate (assembly by customer)

The article number for the linear unit is thus:
CASM-40-**BS**-0300A**A**-000

- **Step 4:**
  Article number for the adapter, see "CASM–40 Siemens motors and adapters"

Article number for parallel adapter kit for CASM–40 and Siemens 1FK7022 motor:
ZBE–375541

- **Step 5:**
  Article number for swivel flange, see "CASM–40 Accessories": ZBE-375504-4

Overview

Linear motor complete axes LTS without bellows cover

The linear motor complete axes LTS/LTSE supplied by SKF are units comprising a slide top and a base which are supplied ready for installation and operation. A profile rail guide, the primary and secondary motor parts, a linear encoder including limit switches, limit position dampers and cable trailing device connection are fully integrated into the linear complete axis.

A variant of the SIMOTICS L-1FN3 linear motor series based on convection cooling is used. These axes are thus suitable for use in precise, highly dynamic short-stroke applications which require a high degree of repeat accuracy as well as for the implementation of dynamic linear motions for positioning workpieces and tools.

The linear motors are deployed in combination with SINAMICS S120 inverters.

Benefits

- Excellent dynamic response, positioning accuracy and control stability
- Outstanding synchronization characteristics coupled with high static and dynamic stability
- Incremental and absolute position measuring systems are available
- Modular system offering numerous options, lengths and widths
- Multiple slide tops (of different sizes if required) on a single base

Application

The linear motor complete axes LTS/LTSE are used whenever alternative options such as toothed belts and screws are too inaccurate, too slow or too inflexible in order to raise the throughput, the cycle time, the accuracy or the product variance of a machine or a testing facility. The low-wear design (minimum quantity lubrication required only on guides following assembly) also reduces maintenance requirements.

Typical applications for the LTS/LTSE are, for example:

- Workpiece transfer within assembly processes
- Laser machining – to achieve linear accuracies within a range of a few µm
- Measuring instruments – positioning/traversal of sensors, vision systems, probes
- Medical engineering – reliable, low-noise positioning in confined installation spaces
- Clamping systems (holding a part between two jaws (primary parts)
- Pick and place applications in (or at beginning or end of) production lines

Design

The linear motor complete axes LTS/LTSE consist of a stable aluminum base which supports a guide comprised of two profile rails, the secondary parts arranged between the rails, the linear measurement system and the inductive limit position sensors.

The 4 roller units (ball screw) belonging to the profile rail guide, the measuring probe of the linear encoder and the relevant primary part are all integrated into the slide top. The power and temperature sensor connectors are fitted to the casing of the slide top.

The scope of supply includes an adapter cable for the temperature sensor integrated in the primary part and (if required) for the measuring system to the encoder evaluation system (SME 120/125).

Convection-cooled linear motors from the tried-and-tested SIMOTICS L-1FN3 linear motor range developed by Siemens are used in the design. Each of the two series is available in three frame sizes and different lengths.

The LTS series is capable of higher operational accuracy (<20 µm). The LTSE series is more flexible in its basic design which means that it can be adapted more easily to meet individual customer requirements and also allows the use of other SIMOTICS L-1FN3 motor types.

Linear motor complete axes are supplied as standard with bellows cover.

Technical specifications

The technical specifications of the linear motor complete axes LTS and LTSE given below are intended to provide an initial overview only.

Comprehensive technical specifications can be found in the SKF documents accessible via the following link: www.skf.com/lts

Linear motor complete axis LTS

	Linear motor complete axis		
Type	**LTS 154**	**LTS 182**	**LTS 212**
Widths	154 mm (6.06 in)	182 mm (7.17 in)	212 mm (8.35 in)
Stroke range (without bellows)	77 … 1778 mm (3.03 ... 70 in)	77 … 1778 mm (3.03 ... 70 in)	77 … 1778 mm (3.03 ... 70 in)
Rated force F_{rated}	135 … 265 N (30.3 ... 59.6 lb_f)	240 … 725 N (53.9 ... 163 lb_f)	330 … 995 N (74.2 ... 224 lb_f)
Rated current I_{rated}	2.1 … 3.4 A	2.9 … 8.8 A	4.2 … 12.8 A
Max. velocity at rated force $v_{maxFrated}$	300 m/min (984 ft/min)	300 m/min (984 ft/min)	300 m/min (984 ft/min)
Maximum force F_{Max}	320 … 640 N (71.9 ... 144 lb_f)	680 … 2030 N (153 ... 456 lb_f)	1030 … 3100 N (232 ... 697 lb_f)
Maximum current I_{Max}	7.7 … 12.6 A	12.5 … 37.6 A	20.2 … 60.6 A
Max. velocity at maximum force $v_{maxFmax}$	144 ... 186 m/min (472 ... 610 ft/min)	150 m/min (492 ft/min)	162 m/min (532 ft/min)

Comments on linear motor complete axes LTS:

- Incremental, optical measuring system
- Bellows cover
- Up to three primary parts on a single secondary part
- For further options, see SKF
- Special versions available on request

Linear motor complete axis LTSE

	Linear motor complete axis		
Type	**LTSE 165**	**LTSE 210**	**LTSE 250**
Widths	165 mm (6.5 in)	210 mm (8.27 in)	250 mm (9.84 in)
Stroke range (without bellows)	80 … 1640 mm (3.15 ... 64.6 in)	80 … 3560 mm (3.15 ... 140 in)	60 … 3540 mm (2.36 ... 139 in)
Rated force F_{rated}	265 N (59.6 lb_f)	485 … 725 N (109 ... 163 lb_f)	665 … 995 N (149 ... 224 lb_f)
Rated current I_{rated}	3.4 A	5.9 … 8.8 A	8.5 … 12.8 A
Max. velocity at rated force $v_{maxFrated}$	300 m/min (984 ft/min)	300 m/min (984 ft/min)	300 m/min (984 ft/min)
Maximum force F_{Max}	640 N (144 lb_f)	1350 … 2030 N (303 ... 456 lb_f)	2060 … 3100 N (463 ... 696 lb_f)
Maximum current I_{Max}	12.6 A	25.1 … 37.6 A	40.4 … 60.6 A
Max. velocity at maximum force $v_{maxFmax}$	144 m/min (472 ft/min)	150 m/min (492 ft/min)	162 m/min (532 ft/min)

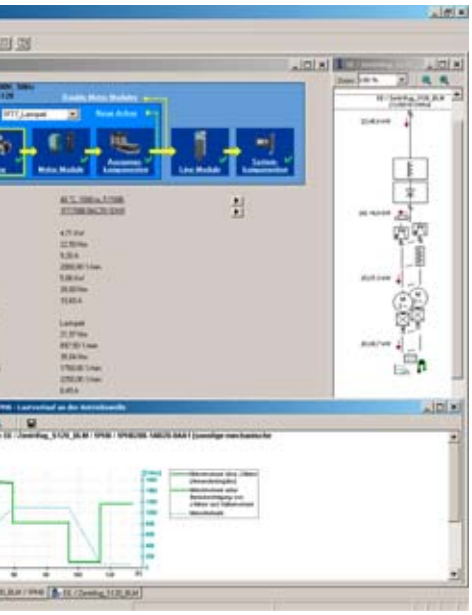
Comments on linear motor complete axes LTSE:

- Incremental/optical measuring system, inductive/absolute and inductive/incremental measuring systems are available
- Clamping elements can be integrated on request
- Limit position damping by shock absorbers or buffers
- Additional fans on request
- Multiple primary parts on a single secondary part
- Further options/special versions available on request

More information

Full selection and ordering data can be viewed or downloaded from SKF's website at: www.skf.com/lts

Notes



Security notes

Siemens provides products and solutions with industrial security functions that support the secure operation of plants, solutions, machines, devices, and/or networks. They are important components in a holistic industrial security concept.

The products and solutions from Siemens are continuously developed with this aspect in mind. Siemens highly recommends regularly checks for product updates.

For the secure operation of Siemens products and solutions it is necessary to take suitable preventive action (e.g. cell protection concept) and to integrate each component into a holistic, state-of-the-art industrial security concept. Any third-party products that may be in use must also be taken into account.

For more information about industrial security, visit
www.siemens.com/industrialsecurity

To stay informed about product updates as they occur, sign up for a product-specific newsletter.

For more information, visit
http://support.automation.siemens.com

SINAMICS SELECTOR app
Selection guide for frequency inverters, on the move

With the SINAMICS SELECTOR app Siemens has developed a practical tool for finding article numbers for your SINAMICS inverters in the output range from 0.12 kW to 400 kW quickly and easily. Whether for SINAMICS V20, SINAMICS G120C, SINAMICS G120P or SINAMICS G120: the app will provide you with the correct article numbers conveniently.

How does it work? Simply select your application, the frequency inverter you require, the rated power and device options as well as the necessary accessories.

Then you can save your selection and send it via email. Your preselection serves as a basis for an order specification.

You will find the free downloads for Android and for iPhone/iPad at the following link:
www.siemens.com/sinamics-selector

SinaSave energy efficiency tool

Overview

The SinaSave energy efficiency tool determines energy saving potentials and amortization times based on your individual conditions of use and therefore offers practical assistance in making decisions about investments in energy-efficient technologies.

From SinaSave Version 6.0 and higher, the drive systems to be compared and the relevant drive component parameters are displayed graphically. An additional expansion are the numerous comparison possibilities for different control types and comprehensive product combinations for drive solutions for pump and fan applications. In addition to SIMOTICS motors and SINAMICS inverters, the product portfolio comprises SIRIUS controls, offering a comprehensive range of comparison possibilities – according to your individual requirements.

SinaSave offers numerous comparison possibilities:

- Comparison of drive systems for pump and fan applications with
  - Reactor control (fixed speed; motor and switchgear)
  - Bypass control (fixed speed; motor and switchgear)
  - Speed control (variable speed; motor and inverter)
- Comparison and evaluation of products of different energy efficiency classes
- Comparison of Siemens drive systems with drive components from other manufacturers

Access to the SinaSave energy efficiency tool

SinaSave can be accessed without the need for registration or logging in:
www.automation.siemens.com/sinasave

More information

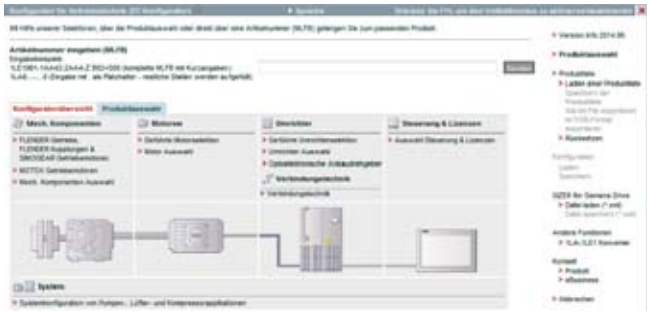
For more information about the amortization calculator for energy-efficient drive systems, visit
www.siemens.com/sinasave

More information about services for energy saving is available on the Internet at
www.siemens.com/energy-saving

Overview

The Drive Technology (DT) Configurator supports you when configuring the optimum drive technology products for your application – starting with gear units, motors, inverters as well as the associated options and components and ending with controllers, software licenses and connection systems. Whether with little or detailed knowledge of products: preselected product groups, targeted navigation through selection menus and direct product selection through entry of the article number support quick, efficient and convenient configuration.

In addition to all this, comprehensive documentation comprising technical data sheets, 2D/3D dimensional drawings, operating instructions, certificates, etc. can be selected in the DT Configurator. A direct order is possible by transferring a parts list to the shopping cart of the Industry Mall.



Drive Technology Configurator for efficient drive configuration with the following functions

- Fast, efficient configuration of drive products and associated components – gear units, motors, inverters, controllers, connection systems
- Configuration of drive systems for pumps, fans and compressor applications from 1 kW to 2.6 MW
- Displayable documentation for configured products and components, such as
  - Data sheets in up to 7 languages in PDF or RTF format
  - 2D/3D dimensional drawings in various formats
  - Terminal box drawing and terminal connection diagram
  - Operating instructions
  - Certificates
  - Start-up calculation for SIMOTICS motors
  - Macros EPLAN
- Support with retrofitting in conjunction with Spares On Web (www.siemens.com/sow)
- Ability to order products directly in the Siemens Industry Mall

Access to the Drive Technology Configurator

The Drive Technology Configurator can be called up without registration and without a login:
www.siemens.com/dt-configurator

Selection and ordering data

Description	Article No.
Interactive Catalog CA 01 on DVD-ROM including Drive Technology Configurator, English	**E86060-D4001-A510-D4-7600**

More information

Online access to Drive Technology Configurator

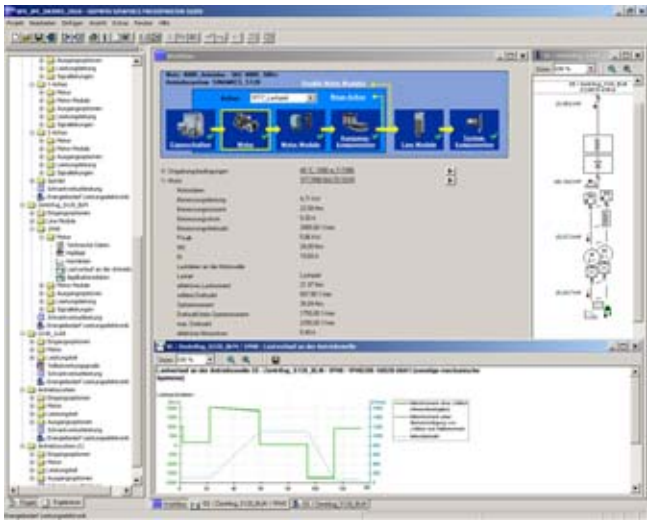
More information about the Drive Technology Configurator is available on the Internet at:
www.siemens.com/dtconfigurator

Offline access to the Drive Technology Configurator in the Interactive Catalog CA 01

In addition, the Drive Technology Configurator is also included in the Interactive Catalog CA 01 on DVD-ROM - the offline version of the Siemens Industry Mall.
The Interactive Catalog CA 01 can be ordered from the relevant Siemens sales office or via Internet:
www.siemens.com/automation/CA01

SIZER for Siemens Drives engineering tool

Overview



The following drives and controls can be engineered in a user-friendly way using the SIZER for Siemens Drives engineering tool:

- SIMOTICS low-voltage motors
- SINAMICS low-voltage and MICROMASTER 4 drive systems
- Motor starters
- SINUMERIK CNC control
- SIMOTION Motion Control System
- SIMATIC Technology

It provides support when selecting the technologies involved in the hardware and firmware components required for a drive task. SIZER for Siemens Drives supports the complete configuration of the drive system, from basic single drives to demanding multi-axis applications.

SIZER for Siemens Drives supports all of the configuring steps in one 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 for Siemens Drives 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 for Siemens Drives user interface is available in English, French, German 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 SAP)
- Technical specifications of the system
- Characteristic curves
- Comments on system reactions
- Mounting arrangement of drive and control components and dimension drawings of motors
- Energy requirements of the configured application

These results are displayed in a results tree and can be reused for documentation purposes.

Technological online help for support is available:

- Detailed technical specifications
- Information about the drive systems and their components
- Decision-making criteria for the selection of components
- Online help in English, French, German, Italian, Chinese and Japanese

System requirements

- PG or PC with Pentium III min. 800 MHz (recommended > 1 GHz)
- 512 MB RAM (1 GB RAM recommended)
- At least 4.1 GB of free hard disk space
- An additional 100 MB of free hard disk space on the Windows system drive
- Screen resolution 1024 × 768 pixels (1280 × 1024 pixels recommended)
- Operating system:
  - Windows 7 Professional (32/64 bit)
  - Windows 7 Enterprise (32/64 bit)
  - Windows 7 Ultimate (32/64 bit)
  - Windows 7 Home (32/64 bit)
  - Windows Vista Business
  - Windows XP Professional SP3 (32/64 bit)
  - Windows XP Home Edition SP3
- Microsoft Internet Explorer V5.5 SP2

Selection and ordering data

Description	Article No.
SIZER for Siemens Drives engineering tool on DVD-ROM English, French, German, Italian	**6SL3070-0AA00-0AG0**

More information

The SIZER for Siemens Drives engineering tool is available free on the Internet at:
www.siemens.com/sizer

Overview

CAD CREATOR – Dimensional 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, drafting engineers and project engineers.

Selection and ordering data

Description	Article No.
CAD CREATOR Dimensional drawing and 2D/3D CAD generator on DVD-ROM English, French, German, Italian, Spanish	**6SL3075-0AA00-0AG0**

More information

The CAD CREATOR is available on DVD-ROM and as an Internet application.

Additional information is available on the Internet at www.siemens.com/cadcreator

Benefits

- Provision of dimension drawings as 2D/3D CAD models in mm and inches
- Display of 2D/3D CAD models and dimension drawings on integrated viewers
- With the online version, 3D models and dimension drawings can also be displayed in the form of a downloadable PDF
- 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
- Multi-language operator interface in English, French, German, Italian and Spanish, and direct Help (English, German)
- 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 geared motors
  - 1PH8 synchronous/asynchronous motors
  - 1PH7/1PH4/1PL6/1PM4/1PM6 asynchronous motors
  - 2SP1 motor spindles
  - 1FN3, 1FN6 linear motors
- SINAMICS S110, SINAMICS S120
  - Control Units
  - Power Modules (Blocksize/Chassis/Combi)
  - 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
- SINUMERIK
  - CNC controls
  - Operator components for CNC controls
- SIMOTION
  - SIMOTION D
  - SIMOTION C

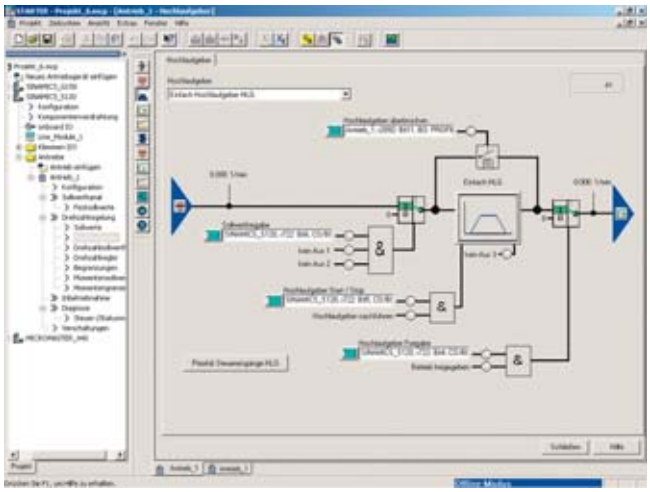
The CAD CREATOR offers a variety of options for configuring, but also different methods for searching for a product:

- According to Article No.
- According to technical description

After successful configuration of the product, the dimensional drawings and models are displayed with the integrated viewers and made available for export.

STARTER commissioning tool

Overview



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

- Commissioning
- Optimization
- Diagnostics

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

In addition to the SINAMICS drives, STARTER also supports MICROMASTER 4 devices.

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 required individual settings 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 and watch tables.

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

- Self-optimization of the controller settings (depending on drive unit)
- Trace
  (depending on the drive unit, this is not supported for
  - MICROMASTER 4
  - SINAMICS G110
  - SINAMICS G120 < Firmware V4.4
  - SINAMICS G110D
  - SINAMICS G120D < Firmware V4.5)

Diagnostics functions provide information about:

- Control/status words
- Parameter status
- Operating conditions
- 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-oriented dialog-based user guidance simplifies commissioning
- Self-optimization functions reduce manual effort for optimization.

Minimum system requirements

The following minimum requirements must be complied with:

- Hardware
  - PG or PC with Pentium III min. 1 GHz (recommended >1 GHz)
  - Work memory 1 GB (2 GB recommended)
  - Screen resolution 1024 x 768 pixels, 16-bit color depth
  - Free hard disk memory: min. 3 GB
- Software
  - Microsoft Internet Explorer V6.0 or higher
  - 32-bit operating systems:
    Microsoft Windows Server 2003 SP2
    Microsoft Windows XP Professional SP3
    Microsoft Windows 7 Professional incl. SP1
    Microsoft Windows 7 Ultimate incl. SP1
    Microsoft Windows 7 Enterprise incl. SP1 (standard installation)
  - 64-bit operating systems:
    Microsoft Windows 7 Professional SP1
    Microsoft Windows 7 Ultimate SP1
    Microsoft Windows 7 Enterprise SP1 (standard installation)
    Microsoft Windows Server 2008 R2

Selection and ordering data

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

Note:

In addition to the STARTER commissioning tool, Drive Control Chart (DCC) can be installed. This allows the device functionality in the SINAMICS S120 drive system to be expanded with technology functions as required.

For further information about DCC, see the section "SINAMICS S120 Drive System, Drive Control Chart (DCC)".

Accessories

Connection

Depending on the version of the Control Unit (CU), the Control Unit of the drive unit 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		**Recommended accessories** For communication between the drive unit and the programming device or PC Article No.
SINAMICS G110		
• RS232	**PC inverter connection kit** Scope of delivery: 9-pin SUB-D connector RS232 standard cable, 3 m	**6SL3255-0AA00-2AA1**
SINAMICS G120C		
• USB	**PC inverter connection kit 2** Mini USB interface cable for communication with a PC, 3 m	**6SL3255-0AA00-2CA0**
SINAMICS G120		
• USB	**PC inverter connection kit 2** Mini USB interface cable for communication with a PC, 3 m	**6SL3255-0AA00-2CA0**
• PROFIBUS	**SIMATIC DP plug-in cable** 12 Mbaud, for PG connector, pre-assembled with 2 × 9-pin sub D connector, 3 m	**6ES7901-4BD00-0XA0**
• PROFINET/ Ethernet	Standard CAT5 Ethernet cable or PROFINET cable	–
SINAMICS G110M		
• USB	**PC inverter connection kit 2** Mini USB interface cable for communication with a PC, 3 m	**6SL3255-0AA00-2CA0**
• PROFIBUS	Connection to the PROFIBUS system in the plant	See supplementary products [1]
• PROFINET/ Ethernet	Connection to the PROFINET system in the plant	See supplementary products [1]
SINAMICS G110D		
• Optical USB	**USB interface cable** for communication with a PC, 2.5 m	**6SL3555-0PA00-2AA0**
SINAMICS G120D		
• USB	**PC inverter connection kit 2** Mini USB interface cable for communication with a PC, 3 m	**6SL3255-0AA00-2CA0**
• PROFIBUS	Connection to the PROFIBUS system in the plant	See supplementary products [1]
• PROFINET/ Ethernet	Connection to the PROFINET system in the plant	See supplementary products [1]

Description		**Recommended accessories** For communication between the drive unit and the programming device or PC Article No.
SINAMICS S110		
• RS232	**SIMATIC S7 connecting cable** Null modem cable, 6 m	**6ES7901-1BF00-0XA0**
• PROFIBUS	**CP 5512 communications module** PCMCIA type 2 card + adapter with 9-pin sub D socket, for Windows 2000 / Windows XP Professional and PCMCIA 32	**6GK1551-2AA00**
	CP 5711 communications module USB adapter for connecting a PG or notebook to PROFIBUS or MPI USB cable (2 m) included in scope of delivery	**6GK1571-1AA00**
	SIMATIC DP plug-in cable 12 Mbaud, for PG connector, pre-assembled with 2 × 9-pin sub D connector, 3 m	**6ES7901-4BD00-0XA0**
• PROFINET/ Ethernet	Standard CAT5 Ethernet cable or PROFINET cable	–
SINAMICS S120		
• RS232	**SIMATIC S7 connecting cable** Null modem cable, 6 m	**6ES7901-1BF00-0XA0**
• PROFIBUS	**CP 5512 communications module** PCMCIA type 2 card + adapter with 9-pin sub D socket, for Windows 2000 / Windows XP Professional and PCMCIA 32	**6GK1551-2AA00**
	CP 5711 communications module USB adapter for connecting a PG or notebook to PROFIBUS or MPI USB cable (2 m (6.56 ft)) included in scope of supply	**6GK1571-1AA00**
	SIMATIC DP plug-in cable 12 Mbaud, for PG connector, pre-assembled with 2 × 9-pin sub D connector, 3 m	**6ES7901-4BD00-0XA0**
• PROFINET/ Ethernet	Standard CAT5 Ethernet cable or PROFINET cable	–

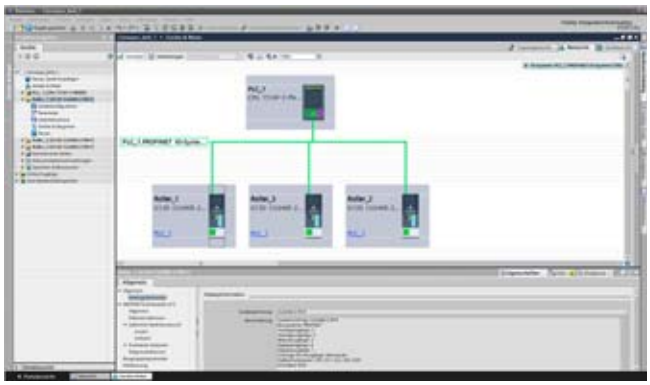
More information

Updates for the STARTER commissioning tool are also available on the Internet at
www.siemens.com/starter

[1] An overview of all the supplementary products that are available (e.g. cables and connectors) for the distributed drives family can be found at the following link:
www.siemens.com/distributeddrives-supplementaryproducts

SINAMICS Startdrive commissioning tool

Overview



SINAMICS Startdrive is a tool for configuring, commissioning, and diagnosing the SINAMICS family of drives and is integrated into the TIA Portal.

SINAMICS Startdrive can be used to implement drive applications involving the following inverters:

- SINAMICS G120
- SINAMICS G120C
- SINAMICS G120D
- SINAMICS G120P
- SINAMICS G110M

The SINAMICS Startdrive commissioning tool has been optimized with regard to user friendliness and consistent use of the TIA Portal benefits of a common working environment for PLC, HMI and drives.

Selection and ordering data

Description	Article No.
SINAMICS Startdrive commissioning tool on DVD-ROM incl. Single License and Certificate of License English, French, German, Italian, Spanish, Chinese (simplified)	**6SL3072-4DA02-0XG0**

Benefits

Efficient commissioning with easy parameter assignment and powerful tools:

- High degree of usability thanks to task-based navigation through the engineering workflow
  - Hardware configuration
  - Parameter assignment
  - Commissioning
  - Diagnostics
- Time-saving and guided step-by-step commissioning
- User-friendly graphic function view for all drive functions
- List of drive parameters structured according to functions
- Easy integration of SIMOTICS motors
- Integrated control panel for direct operation of the inverter from the TIA Portal
- Powerful realtime trace for commissioning and drive diagnostics
- Intuitive and efficient inverter diagnostics through automatic display of messages
- Context-sensitive online help, e.g. for drive messages
- Integrated detailed inverter diagnostic functions
  - Control/status words
  - Parameter status
  - Operating conditions
  - Communication states
- Simple configuration for drive-end Safety Integrated and the drive-internal basic positioning function (EPos)
- Graphic configuration of drive-internal free function blocks (FFB)
- Online work on the inverter
  - Without previous creation of an offline project
  - With new SINAMICS firmware (e.g. V4.7), without having to perform a tool update
  - Available online functions without project: Commissioning with wizard and control panel, full parameter access with graphic function view and structured parameter list with complete inverter diagnostics

Integration

Integration of SINAMICS drives with SIMATIC in the TIA Portal

The software packages based on the TIA Portal are harmonized with each other and offer important benefits. The TIA Portal enables simple integration of SINAMICS frequency inverters in your automation solution:

- Reduction of the familiarization overhead thanks to cross-tool uniformity of the operator inputs
- Device configuration and network connection of the inverters in the TIA Portal-wide configuration/network editor
- Device access to the inverters via the PLC across network boundaries (dataset routing)
- Automatic frame comparison between inverters and SIMATIC S7 PLC
- Reduction of standstill times through the integration of inverter messages in the SIMATIC S7 system diagnostics:
  - The drive messages are part of the SIMATIC S7 system diagnostics without previous configuration
  - The drive messages are therefore automatically available as plain text in the TIA Portal, the web server of the SIMATIC S7 PLC and the HMI
- Time saving due to simple and guided configuration of the inverters for operation with SIMATIC S7 Motion Control
- Short familiarization time for SIMATIC STEP 7 users due to common use of editors. Realtime trace and the drive control panel are identical to the editors in STEP 7
- Reuse of the drive configuration and parameterization is possible with the assistance of the TIA Portal library
- Standard TIA Portal functions for inverters, e.g. Undo, Redo
- Block library supplied for easy integration of SINAMICS inverters into the user programs of the SIMATIC S7-300, S7-400, S7-1200, S7-1500
- Shared project storage for all devices in the project

Supported frequency inverters

Integration of the SINAMICS drives into the TIA Portal is carried out in steps. The following frequency inverters can be configured in SINAMICS Startdrive

- SINAMICS G120
- SINAMICS G120C
- SINAMICS G120D
- SINAMICS G120P
- SINAMICS G110M

All of the available Control Units from SINAMICS Firmware V4.4 are supported for these devices (including PROFINET, PROFIBUS, Safety Integrated). All combinable Power Modules up to 400 kW can be configured.

Installation versions

SINAMICS Startdrive can be installed as an optional package to SIMATIC STEP 7 or as a stand-alone application (without SIMATIC STEP 7).

System requirements

Hardware

- PG or PC, Intel Core i5-3320M or higher, 3.3 GHz (or similar)
- 8 GB RAM
- Screen resolution 1920 × 1080 pixels
- 64-bit operating system

Software

SINAMICS Startdrive V13 is released for use with the following operating systems (64-bit, Windows 7, and also 32-bit):

- Microsoft Windows 7 Professional SP1
- Microsoft Windows 7 Enterprise SP1
- Microsoft Windows 7 Ultimate SP1
- Microsoft Windows 8.1 Professional
- Microsoft Windows 8.1 Enterprise
- Microsoft Server 2008 R2 StdE SP1 (only STEP 7 Professional)
- Microsoft Server 2012 R2 StdE

Compatibilities with other products

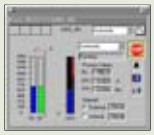
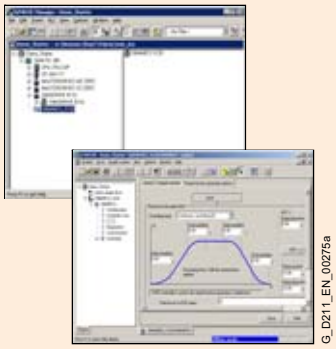
- SINAMICS Startdrive can be installed alongside STARTER
- SINAMICS Startdrive V13 operates together with STEP 7 Basic/Professional V13 and WinCC V13 in a framework
- SINAMICS Startdrive V13 can be installed on a computer alongside other versions of Startdrive V12, STEP 7 V12, V5.4 or V5.5, STEP 7 Micro/WIN, WinCC flexible (2008 and above) and WinCC (V7.0 SP2 and above)
- Supported virtualization platforms:
  - VMware Workstation 10
  - VMware Player 6.0
  - Microsoft Windows Server 2012 R2 Hyper-V
- SINAMICS Startdrive has been tested with the following virus scanners:
  - Symantec Endpoint Protection 12.1
  - Trend Micro Office Scan Corporate Edition 10.6
  - Kaspersky Anti-Virus 2014
  - Windows Defender (Windows version 8.1 and above)

More information

The SINAMICS Startdrive commissioning tool is available free on the Internet at
www.siemens.com/startdrive

Drive ES engineering software

Overview

SIMATIC Programs	Configuration / Commissioning
Drive ES PCS7 	Drive ES Basic 
Drive ES SIMATIC 	

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

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
- Drive ES SIMATIC
- Drive ES PCS7

The Drive ES (**D**rive **E**ngineering **S**oftware) engineering software fully integrates drives from Siemens into the world of Totally Integrated Automation.

Selection and ordering data

Description	Article No.
Drive ES Basic V5.5 SPx *)	
Configuration software for the integration of drives into TIA (Totally Integrated Automation)	
Precondition: STEP 7 from V5.3, SP3 and higher	
Supplied as: DVD Languages: Ger, Eng, Fr, It, Sp with electronic documentation	
• Floating license, 1 user	**6SW1700-5JA00-5AA0**
• Floating license (copy license), 60 users	**6SW1700-5JA00-5AA1**
• Upgrade from V5.x to V5.5 SPx *)	**6SW1700-5JA00-5AA4**
Drive ES SIMATIC V5.5 SPx *)	
Function block library for SIMATIC for the parameterization of communication with the drives	
Precondition: STEP 7 from V5.3, SP3 and higher	
Supplied as: CD-ROM Languages: Ger, Eng, Fr, It, Sp with electronic documentation	
• Single-user license incl. 1 runtime license	**6SW1700-5JC00-5AA0**
• Runtime license (without data carrier)	**6SW1700-5JC00-1AC0**
• Upgrade from V5.x to V5.5 SPx *)	**6SW1700-5JC00-5AA4**
Drive ES PCS7 V7.0 SPx *)	
Block library for PCS7 for the integration of drives	
Precondition: PCS7 from V7.0 and higher	
Supplied as: CD-ROM Languages: Ger, Eng, Fr, It, Sp with electronic documentation	
• Single-user license incl. 1 runtime license	**6SW1700-7JD00-0AA0**
• Runtime license (without data carrier)	**6SW1700-5JD00-1AC0**
• Update service for single-user license	**6SW1700-0JD00-0AB2**
Drive ES PCS7 V7.1 SPx *)	
Block library for PCS7 for the integration of drives	
Precondition: PCS7, V7.1 and higher	
Supplied as: CD-ROM Languages: Ger, Eng, Fr, It, Sp with electronic documentation	
• Single-user license incl. 1 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 *)	**6SW1700-7JD00-1AA4**
Drive ES PCS7 V8.0 SPx *)	
Function block library for PCS7 for the integration of drives in Classic Style (as predecessor)	
Precondition: PCS7 V8.0 and higher	
Supplied as: CD-ROM Languages: Ger, Eng, Fr, It, Sp with electronic documentation	
• Single-user license incl. 1 runtime license	**6SW1700-8JD00-0AA0**
• Runtime license (without data carrier)	**6SW1700-5JD00-1AC0**
• Update service for single-user license	**6SW1700-0JD00-0AB2**
• Upgrade from V6.x to V8.0 SPx *)	**6SW1700-8JD00-0AA4**
Drive ES PCS7 APL V8.0 SPx *)	
Function block library for PCS7 for the integration of drives in APL Style (Advanced Process Library)	
Precondition: PCS7 V8.0 and higher	
Supplied as: CD-ROM Languages: Ger, Eng, Fr, It, Sp with electronic documentation	
• Single-user license incl. 1 runtime license	**6SW1700-8JD01-0AA0**
• Runtime license (without data carrier)	**6SW1700-5JD00-1AC0**
• Update service for single-user license	**6SW1700-0JD01-0AB2**
• Upgrade of APL V8.0 to V8.0 SP1 or Drive ES PCS7 V6.x, V7.x, V8.x classic to Drive ES PCS7 APL V8.0 SPx *)	**6SW1700-8JD01-0AA4**

*) Orders are automatically supplied with the latest Service Pack (SP).

Design

Various software packages are available for selection:

- **Drive ES Basic**
- **Drive ES SIMATIC**
- **Drive ES PCS7** (APL Style or Classic Style)

Drive ES Basic

Drive ES Basic is for first-time users of the world of Totally Integrated Automation and the basic software for setting the parameters of all drives online and offline in this environment. Drive ES Basic enables both the automation system and the drives to be handled using the SIMATIC Manager software. Drive ES Basic is the starting point for common data archiving for complete projects and for extending the use of the SIMATIC routing and teleservice to drives. Drive ES Basic provides the engineering tools for the new motion control functions, slave-to-slave communication, equidistant mode and clock cycle synchronization with PROFIBUS DP and ensures that drives with PROFINET IO are simply integrated into the SIMATIC environment.

Note:

For SINAMICS and MICROMASTER 4 drives, this TIA functionality is also provided with the STARTER commissioning tool (V4.3.2 and above).

Drive ES SIMATIC

Drive ES SIMATIC is used for simple parameterization of STEP 7 communication and eliminates time-consuming programming. It requires STEP 7 to be installed. It includes a SIMATIC block library and therefore allows the PROFIBUS and/or PROFINET-IO interface to be simply and reliably programmed in the SIMATIC CPU for the drives.
There is no need for separate, time-consuming programming of the data exchange between the SIMATIC CPU and the drive.
For Drive ES users, it is as simple as this:
Copy – Adapt – Load – Ready.
Harmonized, proven function blocks are transferred from the library into your project.
Frequently used functions are fully programmed:

- Read out complete diagnostics buffer automatically from 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, i.e. update.

Detailed contents of the Drive ES SIMATIC package

- **"PROFIBUS DP" communications software** for SIMATIC S7-300 with CPUs with integrated DP interface (DRVDPS7, POSMO function block libraries), SIMATIC S7-400 with CPUs with integrated DP interface or with CP 443-5 (DRVDPS7, POSMO function block libraries) and SIMATIC S7-300 with CP 342-5 (DRVDPS7C function block library)
- **"USS protocol" communications software** for SIMATIC S7-300 with integral PtP interfaces or with CP 340/341 and SIMATIC S7-400 with CP 441 (DRVUSSS7 function block library)
- **STEP 7 slave object manager** for convenient configuration of drives and for non-cyclic PROFIBUS DP communication with the drives
- **STEP 7 device object manager** for easy 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 SIMATIC S7-300 with CPUs with integrated PN interface, SIMATIC S7-400 with CPUs with Integrated PN interface or with CP (DRVDPS7 function 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 (APL Style or Classic Style)

Drive ES PCS7 links the drives with a PROFIBUS DP interface into the SIMATIC PCS 7 process control system, and it requires that SIMATIC PCS 7, V6.1 or 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.

In Drive ES PCS7 version V8.0 and higher, two versions of the library are available: The APL (Advanced Process Library) variant and the previous version in the so-called Classic Style.

Contents of the Drive ES PCS7 package (APL Style or Classic Style) in detail

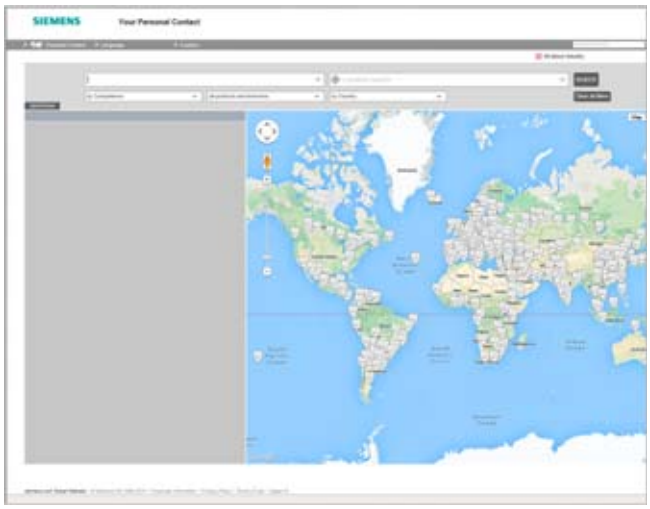
- **Function block library for SIMATIC PCS 7** Faceplates and control blocks for SIMOVERT MASTERDRIVES VC and MC, as well as MICROMASTER/MIDIMASTER of the third and fourth generation and SIMOREG DC-MASTER and SINAMICS
- **STEP 7 slave object manager** for convenient configuration of drives and for non-cyclic PROFIBUS DP communication with the drives
- **STEP 7 device object manager** for easy configuration of drives with PROFINET IO interfaces (V8.0 SP1 and higher)
- **SETUP program** for installing the software in the PCS 7 environment

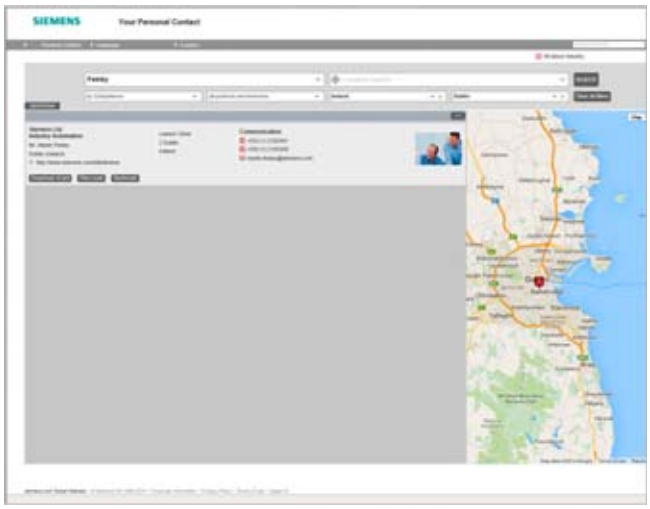
More information

Additional information is available on the Internet at www.siemens.com/drive-es

Notes

Services and documentation





At Siemens Industry we are resolutely pursuing the same goal: long-term improvement of your competitive ability.
We are committed to this goal. Thanks to our commitment, we continue to set new standards in automation and drive technology. In all industries – worldwide.

At your service locally, around the globe for consulting, sales, training, service, support, spare parts ... on the entire Industry Automation and Drive Technologies range.

Your personal contact can be found in our Contacts Database at:
www.siemens.com/automation/partner

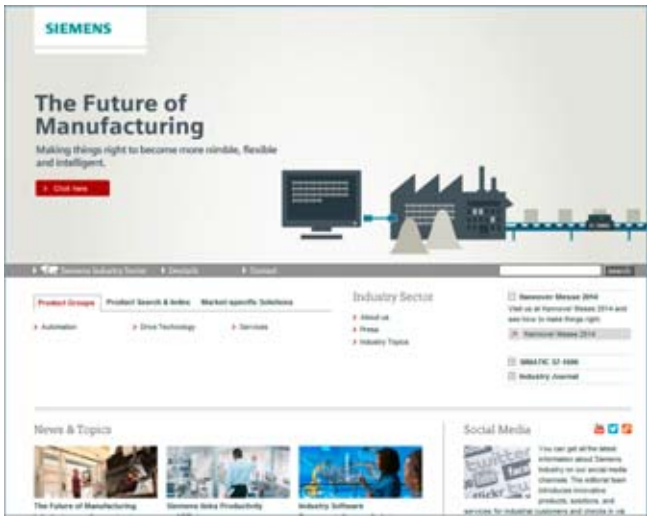
You start by selecting

- the required competence,
- products and branches,
- a country,
- a city

or by a

- location search or
- person search.

Siemens Industry Automation and Drive Technologies in the WWW



A detailed knowledge of the range of products and services available is essential when planning and configuring automation systems. It goes without saying that this information must always be fully up-to-date.

Siemens Industry Automation and Drive Technologies has therefore built up a comprehensive range of information in the World Wide Web, which offers quick and easy access to all data required.

Under the address

www.siemens.com/industry

you will find everything you need to know about products, systems and services.

Product Selection Using the Interactive Catalog CA 01

Detailed information together with convenient interactive functions:
The interactive catalog CA 01 covers more than 80 000 products and thus provides a full summary of the Siemens Industry Automation and Drive Technologies product base.

Here you will find everything that you need to solve tasks in the fields of automation, switchgear, installation and drives.
All information is linked into a user interface which is easy to work with and intuitive.

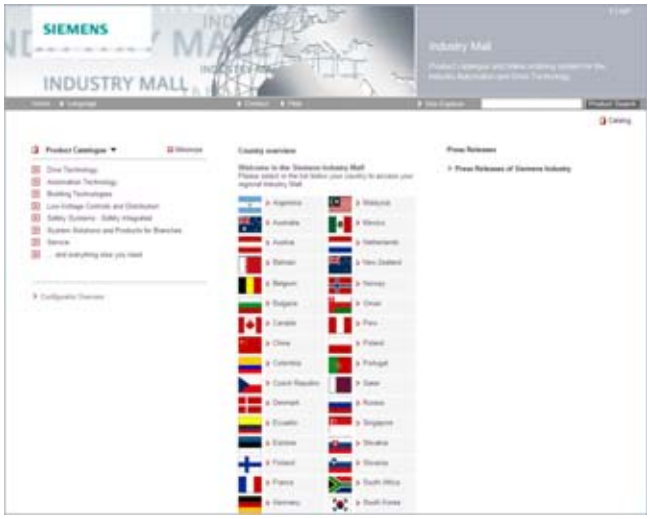
After selecting the product of your choice you can order at the press of a button, by fax or by online link.

Information on the interactive catalog CA 01 can be found in the Internet under

www.siemens.com/automation/ca01

or on DVD.

Easy Shopping with the Industry Mall



The Industry Mall is the electronic ordering platform of Siemens AG on the Internet. Here you have online access to a huge range of products presented in an informative and attractive way.

Data transfer via EDIFACT allows the whole procedure from selection through ordering to tracking and tracing of the order to be carried out. Availability checks, customer-specific discounts and preparation of quotes are also possible.

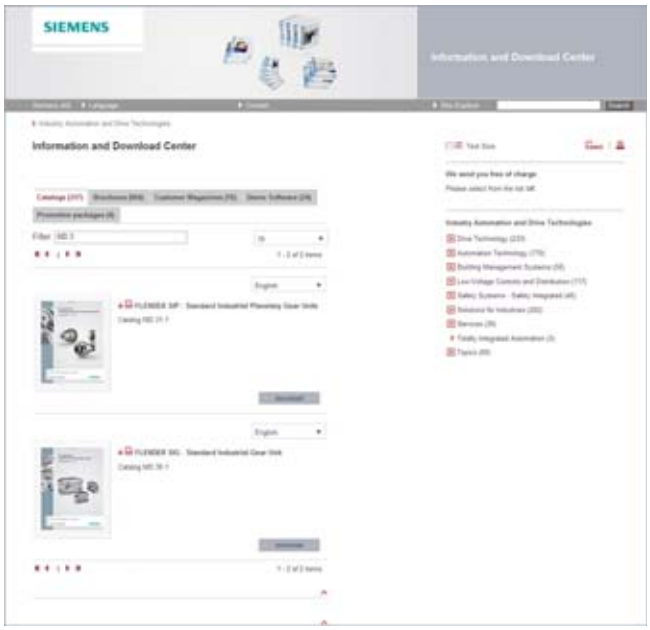
Numerous additional functions are available to support you.

For example, powerful search functions make it easy to select the required products. Configurators enable you to configure complex product and system components quickly and easily. CAx data types are also provided here.

Please visit the Industry Mall on the Internet under:

www.siemens.com/industrymall

Downloading Catalogs



In addition to numerous other useful documents, you can also find the catalogs listed on the back inside cover of this catalog in the Information and Download Center. Without having to register, you can download these catalogs in PDF format or increasingly as digital page-turning e-books.

The filter dialog box above the first catalog displayed makes it possible to carry out targeted searches. If you enter “MD 3” for example, you will find both the MD 30.1 and MD 31.1 catalogs. If you enter “ST 70” both the ST 70 catalog and the associated news or add-ons are displayed.

Visit us on the web at:

www.siemens.com/industry/infocenter

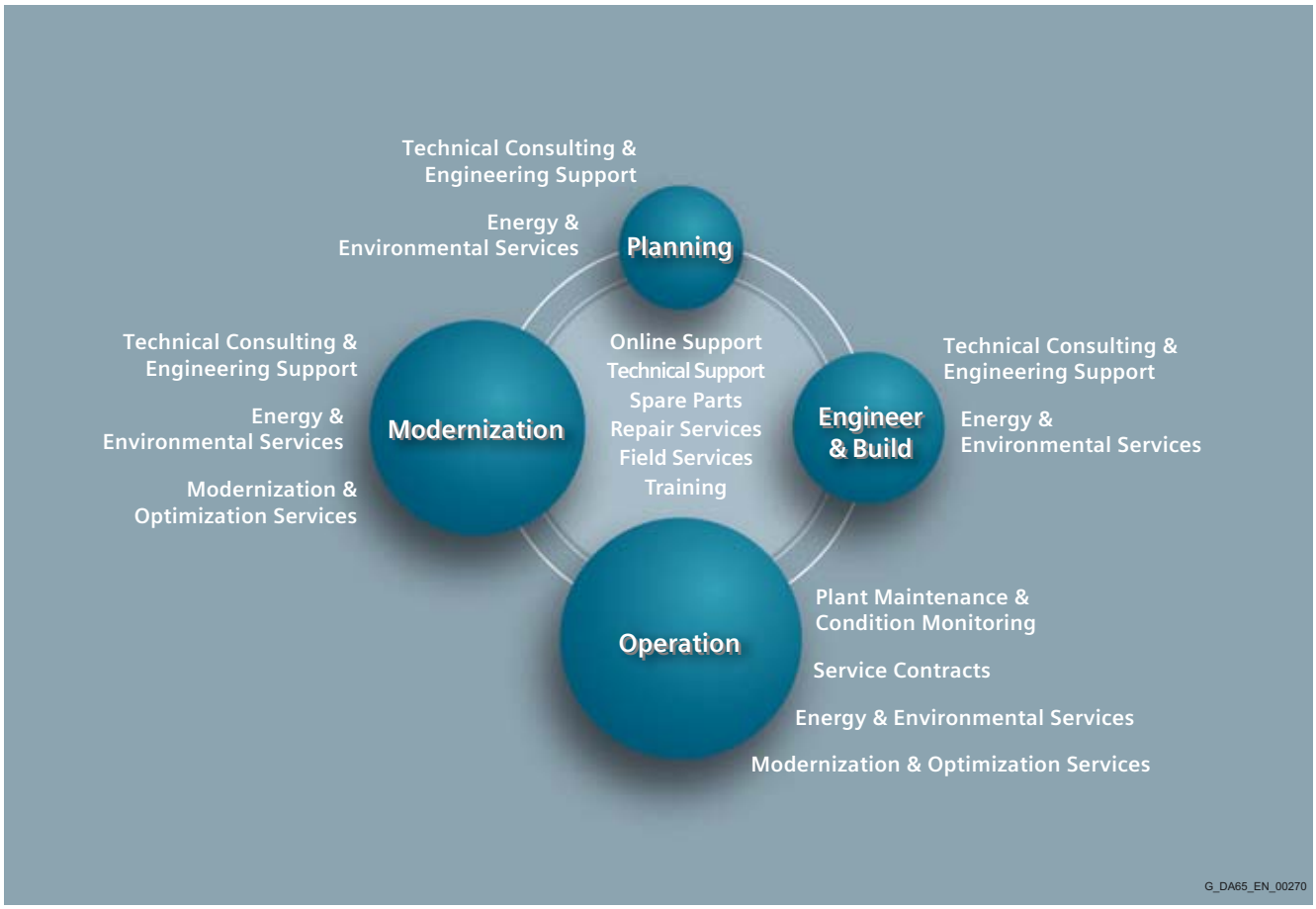
Your machines and plant can do more – with Industry Services.

Whether it is production or process industry - in view of rising cost pressure, growing energy costs, and increasingly stringent environmental regulations, services for industry are a crucial competitive factor in manufacturing as well as in process industries.

All over the world Siemens supports its customers with product, system, and application-related services throughout the entire life cycle of a plant. Right from the earliest stages of planning, engineering, and building, all the way to operation and modernization. These services enable customers to benefit from the Siemens experts' unique technological and product knowledge and industry expertise.

Thus downtimes are reduced and the utilization of resources is optimized. The bottom line: increased plant productivity, flexibility, and efficiency, plus reduced overall costs.

Discover all advantages of our service portfolio:
www.siemens.com/industry-services



Siemens supports its clients with technology based Services across a plants entire life cycle.

Industry Services for the entire life cycle

Online Support

Online support is a comprehensive information system for all questions relating to products, systems, and solutions that Siemens has developed for industry over time. With more than 300,000 documents, examples and tools, it offers users of automation and drive technology a way to quickly find up-to-date information. The 24-hour service enables direct, central access to detailed product information as well as numerous solution examples for programming, configuration and application.

The content, in six languages, is increasingly multimediabased – and now also available as a mobile app. Online support's "Technical Forum" offers users the opportunity to share information with each other. The "Support Request" option can be used to contact Siemens' technical support experts. The latest content, software updates, and news via newsletters and Twitter ensure that industry users are always up to date.

www.siemens.com/industry/onlinesupport

Online Support App

Using the Online Support app, you can access over 300,000 documents covering all Siemens industrial products - anywhere, any time. Regardless of whether you need help implementing your project, fault-finding, expanding your system or are planning a new machine.

You have access to FAQs, manuals, certificates, characteristics curves, application examples, product notices (e.g. announcements of new products) and information on successor products in the event that a product is discontinued.

Just scan the product code printed on the product directly using the camera of your mobile device to immediately see all technical information available on this product at a glance. The graphical CAx information (3D model, circuit diagrams or EPLAN macros) is also displayed. You can forward this information to your workplace using the e-mail function.

The search function retrieves product information and articles and supports you with a personalized suggestion list. You can find your favorite pages – articles you need frequently – under "mySupport". You also receive selected news on new functions, important articles or events in the News section.

Scan the QR code for information on our Online Support app.

The app is available free of charge from the Apple App Store (iOS) or from Google Play (Android).

www.siemens.com/industry/onlinesupportapp

Technical Support

The ability to quickly analyze system and error messages and take appropriate action are key factors in ensuring that plants run safely and efficiently. Questions can arise at any time and in any industry, whether it's an individual product or a complete automation solution. Siemens technical support offers individual technical assistance in matters related to functionality, how to operate, applications, and fault clearance in industrial products and systems – at any time and globally, over the phone, by e-mail, or via remote access. Experienced experts from Siemens answer incoming questions promptly. Depending on the requirements, they first consult specialists in the areas of development, on-site services, and sales. Technical support is also available for discontinued products that are no longer available. Using the support request number, any inquiry can be clearly identified and systematically tracked.

Spare Parts

Drive and automation systems must be available at all times. Even a single missing spare part can bring the entire plant to a standstill – and result in substantial financial losses for the operator. The spare parts services from Siemens protects against such losses – with the aid of quickly available, original spare parts that ensure smooth interaction with all other system components. Spare parts are kept on hand for up to ten years; defective parts can be returned. For many products and solutions, individual spare parts packages ensure a preventive stock of spare parts on-site. The spare parts services is available around the world and around the clock. Optimum supply chain logistics ensure that replacement components reach their destination as quickly as possible. Siemens' logistics experts take care of planning and management as well as procurement, transportation, customs handling, warehousing, and complete order management for spare parts.

Repair Services

Reliable electrical and electronic equipment is crucial for operating continuous processes. That is why it is essential that motors and converters always undergo highly specialized repair and maintenance. Siemens offers complete customer and repair services – on site and in repair centers – as well as technical emergency services worldwide. The repair services include all measures necessary to quickly restore the functionality of defective units. In addition, services such as spare parts logistics, spare parts storage and rapid manufacturing are available to plant operators in all verticals. With a global network of certified repair shops operated by Siemens as well as third parties, Siemens handles the maintenance and overhaul of motors, converters, and other devices as an authorized service partner.

Field Services

It's a top priority in all industries: the availability of plants and equipment. Siemens offers specialized maintenance services such as inspection and upkeep as well as rapid fault clearance in industrial plants – worldwide, continuously, and even with emergency services as needed. The services include startup as well as maintenance and fault clearance during operation. The startup service includes checking the installation, function tests, parameterization, integration tests for machines and plants, trial operation, final acceptance, and employee training. All services, including remote maintenance of drives, are also available as elements of customized service contracts.

Industry Services for the entire life cycle

Training

Increasingly, up-to-date knowledge is becoming a determining factor in success. One of the key resources of any company is well-trained staff that can make the right decision at the right moment and take full advantage of the potential. With SITRAIN – Training for Industry, Siemens offers comprehensive advanced training programs. The technical training courses convey expertise and practical knowledge directly from the manufacturer. SITRAIN covers Siemens' entire product and system portfolio in the field of automation and drives. Together with the customer, Siemens determines the company's individual training needs and then develops an advanced training program tailored to the desired requirements. Additional services guarantee that the knowledge of all Siemens partners and their employees is always up-to-date.

Technical Consulting & Engineering Support

The efficiency of plants and processes leads to sustainable economic success. Individual services from Siemens help save substantial time and money while also guaranteeing maximum safety. Technical consulting covers the selection of products and systems for efficient industrial plants. The services include planning, consulting, and conceptual design as well as product training, application support, and configuration verification – in all phases of a plant's lifecycle and in all questions related to product safety. Engineering support offers competent assistance throughout the entire project, from developing a precise structure for startup to product-specific preparation for implementation as well as support services in areas such as prototype development, testing and acceptance.

Energy & Environmental Services

Efficient energy use and resource conservation – these top sustainability concerns pay off – both for the environment and for companies. Siemens offers integrated solutions that unlock all technical and organizational potential for successful environmental management. Customized consulting services are aimed at sustainably lowering the cost of energy and environmental protection and thus increasing plant efficiency and availability. The experts provide support in the conceptual design and implementation of systematic solutions in energy and environmental management, enabling maximum energy efficiency and optimized water consumption throughout the entire company. Improved data transparency makes it possible to identify savings potential, reduce emissions, optimize production processes, and thereby noticeably cut costs.

Modernization & Optimization Services

High machine availability, expanded functionality and selective energy savings – in all industries, these are decisive factors for increasing productivity and lowering costs. Whether a company wants to modernize individual machines, optimize drive systems, or upgrade entire plants, Siemens' experts support the projects from planning to commissioning.

Expert consulting and project management with solution responsibility lead to security and make it possible to specifically identify savings potential in production. This secures investments over the long term and increases economic efficiency in operation.

Plant Maintenance & Condition Monitoring

Modern industrial plants are complex and highly automated. They must operate efficiently in order to ensure the company's competitive strength. In addition, the steadily increasing networking of machines and plants require consistent security concepts. Maintenance and status monitoring as well as the implementation of integrated security concepts by Siemens' experts support optimum plant use and avoid downtime. The services include maintenance management as well as consulting on maintenance concepts, including the complete handling and execution of the necessary measures. Complete solutions also cover remote services, including analysis, remote diagnosis, and remote monitoring. These are based on the Siemens Remote Services platform with certified IT security.

Service Contracts

Making maintenance costs calculable, reducing interfaces, speeding up response times, and unburdening the company's resources – the reduced downtimes that these measures achieve increase the productivity of a plant. Service contracts from Siemens make maintenance and repairs more cost-effective and efficient. The service packages include local and remote maintenance for a system or product group in automation and drive technology. Whether you need extended service periods, defined response times, or special maintenance intervals, the services are compiled individually and according to need. They can be adjusted flexibly at any time and used independently of each other. The expertise of Siemens' specialists and the capabilities of remote maintenance thus ensure reliable and fast maintenance processes throughout a plant's entire lifecycle.

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 240 application engineers in 16 countries.

Application centers

We currently have application centers in:

- Germany:
  Head Office in Erlangen and in 6 German regions, e.g. in Munich, Nuremberg, Stuttgart, Mannheim, Frankfurt, Chemnitz, Cologne, Bielefeld, Bremen, Hanover, Hamburg
- Brazil: Sao Paulo
- China: Beijing
- Denmark: Ballerup
- France: Paris
- Great Britain: Manchester
- India: Mumbai
- Italy: Bologna, Milan
- Japan: Tokyo, Osaka
- The Netherlands: The Hague
- Austria: Vienna
- Sweden: Göteborg
- Switzerland: Zurich
- South Korea: Seoul
- Turkey: Istanbul
- USA: Atlanta

These application centers have specialised intensely 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 already 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 the section "Industry Services".

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.

You can find additional information at:
www.siemens.com/motioncontrol/apc

Overview

Faster and more applicable know-how: Hands on training from the manufacturer

Siemens Industry Training provides you with comprehensive support in solving your tasks.

Training by the market leader in the industry 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 startup times, high-quality end products, faster troubleshooting and reduced downtimes. In other words, increased profits and lower costs.

Achieve more with Siemens Industry Training

- Shorter times for startup, maintenance and servicing
- Optimized production operations
- Reliable configuration and startup
- 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

Highlights Siemens Industry Training

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 on state-of-the-art methodically/didactically designed 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 Siemens Industry products 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.

The right mixture: Blended learning

"Blended learning" is a combination of various training media and sequences. For example, a local attendance course in a Training Center can be optimally supplemented by a teach-yourself program as preparation or follow-up. Additional effect: Reduced traveling costs and periods of absence.

More information

Contact

Visit our site on the Internet at:
www.siemens.com/sitrain

or let us advise you personally and request our current training catalog:

Siemens Industry Training Customer Support Germany:

Phone: +49 911 895-7575

Fax: +49 911 895-7576

E-Mail: info@sitrain.com

SINAMICS training courses

Overview

Training courses for SINAMICS drive system

This provides an overview of the training courses available for the SINAMICS drive system.

The courses are modularly 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 SINAMICS drive system and its place in the existing Siemens drives environment 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 German and English)	**Target group**						**Duration**	**Course code**
	Decision makers, sales personnel	Project managers, project assistants	Programmers	Commissioning engineers, configuring engineers	Service personnel	Maintenance personnel		
Basic courses								
Fundamentals of Drive Technology	✓	✓	–	✓	✓	✓	5 days	DR-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
SINAMICS S120 Maintenance	–	–	–	–	✓	✓	5 days	DR-SNS-IH
SINAMICS G120 Service and commissioning	✓	–	–	✓	✓	✓	2 days	DR-G120
MICROMASTER 4/ SINAMICS G110 Compact Course	–	✓	–	–	✓	✓	1 day	SD-WSMM4
Follow-up courses								
SINAMICS S120 Parameterization	–	–	✓	✓	✓	–	5 days	DR-S12-PA
SINAMICS S120 Chassis Unit Servicing	–	–	–	✓	✓	✓	2 days	DR-SNS-CHA
SINAMICS S120 Safety Integrated	–	✓	✓	✓	–	–	2 days	DR-SNS-SAF
SINAMICS S120 Control optimization	–	–	–	✓	✓	–	3 days	DR-S12-OPT

SINAMICS G110 training case

Overview

SINAMICS G110 training case

The SINAMICS G110 training case has been developed
- for customer presentations
- for training
- for laboratory tests

It contains the following components:
- SINAMICS G110 frequency inverter, 0.12 kW (0.16 hp)
- BOP operator panel
- SIMOTICS GP asynchronous motor

The SINAMICS G110 training case is supplied in the form of a stackable Tanos Systainer case of size 3.

Technical specifications

	SINAMICS G110 training case 6AG1064-1AA03-0AA0
Supply voltage	230 V 1 AC
Dimensions	
• Width	210 mm (8.27 in)
• Height	400 mm (15.75 in)
• Depth	300 mm (11.81 in)
Weight, approx.	12 kg (26.5 lb)

Selection and ordering data

Description	Article No.
Training case SINAMICS G110	**6AG1064-1AA03-0AA0**
Accessories	
Line adapter 110 V/230 V	**6AG1064-1AA02-0AA0**

SINAMICS G120C training case

Overview

SINAMICS G120C training case

The SINAMICS G120C training case is a convincing demonstration system thanks to its compact design. It is suitable for direct customer presentations as well as for tests in technical departments. It enables the functions of SINAMICS G120C to be demonstrated and tested quickly and easily.

It contains the following components:
- SINAMICS G120C frequency inverter, PROFINET / EtherNet/IP or PROFIBUS variants, 0.55 kW (0.75 hp)
- IOP and BOP-2 operator panels
- SIMOTICS GP asynchronous motor

The SINAMICS G120C training case is supplied in the form of a stackable Tanos Systainer case of size 4.

Technical specifications

	SINAMICS G120C training case 6AG1067-2AA00-0AA0 6AG1067-1AA25-0AA0
Supply voltage	230 V 1 AC
Dimensions	
• Width	315 mm (12.40 in)
• Height	400 mm (15.75 in)
• Depth	300 mm (11.81 in)
Weight, approx.	9 kg (19.9 lb)

Selection and ordering data

Description		Article No.
Training case SINAMICS G120C		
• PROFINET, EtherNet/IP variant	NEW	**6AG1067-2AA00-0AA0**
• PROFIBUS variant	NEW	**6AG1067-1AA25-0AA0**

Training case, single-axis drive, modular

Overview

Training case, single-axis drive, modular

The single-axis drive modular training case has been developed

- for customer presentations
- for training
- for laboratory tests

The basic version contains the following components:

- SINAMICS PM340 Power Module, 0.12 kW (0.16 hp)
- SINAMICS CU240E-2 PN-F Control Unit
- IOP operator panel
- SIMOTICS GP asynchronous motor with HTL encoder
- Simulator panel

The following expansions are possible:

- Second Power Module
- Various Control Units
- Servo module with load equipment and encoder system
- SIMATIC module

The single-axis drive modular training case is supplied in the form of a trolley case. It is available in the basic and compact basic variants. The basic compact variant cannot be expanded with the SIMATIC module.

Technical specifications

	Training case, single-axis drive, modular	
	Basic	**Compact basic**
	6AG1067-2AA00-0AA3	6AG1067-2AA00-0AB8
Supply voltage	230 V 1 AC	230 V 1 AC
Dimensions		
• Width	560 mm (22.05 in)	420 mm (22.05 in)
• Height	695 mm (27.36 in)	695 mm (27.36 in)
• Depth	325 mm (12.80 in)	325 mm (12.80 in)
Weight, approx.	28 kg (61.7 lb)	25 kg (55.1 lb)

Selection and ordering data

Description		Article No.
Training case, single-axis drive, modular		
• Basic	NEW	**6AG1067-2AA00-0AA3**
• Compact basic	NEW	**6AG1067-2AA00-0AB8**
Accessories		
Power Module	NEW	**6AG1067-2AA00-0AA5**
SINAMICS G Control Units		
• CU250S-2 PN	NEW	**6AG1067-2AA00-0AB7**
• CU240E-2 DP-F	NEW	**6AG1067-2AA00-0AA7**
• CU240E-2 PN-F	NEW	**6AG1067-2AA00-0AA8**
• CU230P-2 DP-F	NEW	**6AG1067-2AA00-0AB1**
• CU230P-2 CAN	NEW	**6AG1067-2AA00-0AB2**
SINAMICS S Control Units		
• CU310-2 DP	NEW	**6AG1067-2AA00-0AB3**
• CU310-2 PN	NEW	**6AG1067-2AA00-0AB4**
SIMOTION D Control Unit		
• D410-2	NEW	**6AG1067-2AA00-0AB5**
Servo module	NEW	**6AG1067-2AA00-0AA4**
SIMATIC module	NEW	**6AG1067-2AA00-0AA6**

Accessories

Power Module

The Power Module expands the single-axis drive modular training case with the functionality of a second inverter. The PM340 Power Module is already pre-wired on the supply side.

Control Units

The additional Control Units transform the single-axis drive modular training case into a universal training case for SINAMICS and SIMOTION drive technology. The I/O signals are wired to sub-D connectors.

SINAMICS G120 Control Units

CU250S-2 PN

CU240E-2 DP-F

CU240E-2 PN-F

CU230P-2 DP-F

CU230P-2 CAN

SINAMICS S120 Control Units

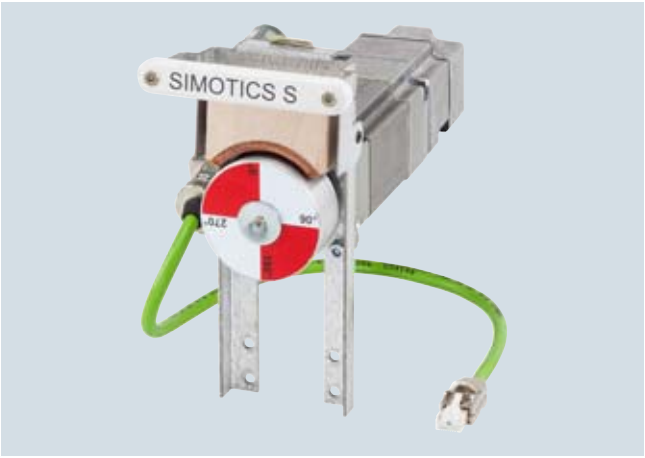
CU310-2 DP

CU310-2 PN

SIMOTION D Control Unit

D410-2

Servo module



The servo module expands the single-axis drive modular training case with servo functionality. The servo module comprises a SIMOTICS S-1FK7 servo motor with load equipment and a mounted mechanical system. The encoder cable is integrated into the servo module. The power cable is already included in the scope of supply of the SINAMICS modular training case.

SIMATIC module

The SIMATIC module expands the single-axis drive modular training case in the basic variant. The SIMATIC module supports integration of the single-axis drive modular training case in the basic variant into the SIMATIC and TIA world. The SIMATIC S7-300/S7-1200/S7-1500 automation systems can be integrated.

SINAMICS G120D training case

Overview

SINAMICS G120D training case

The SINAMICS G120D training case has been developed

- for customer presentations
- for training
- for laboratory tests

The SINAMICS G120D training case contains the following components:

- SINAMICS G120D distributed frequency inverter
  - PM250D Power Module
  - CU250D Control Unit
- SIMATIC S7-300 controller
- SIMATIC Touch Panel KTP600
- SIMOGEAR helical geared motor with HTL encoder

The SINAMICS G120D training case is supplied in the form of a trolley case.

Notes:

A 400 V 3-phase AC supply is required.
The inverter and motor plus encoder can be selected as required, on request.

Technical specifications

	SINAMICS G120D training case
	6AG1067-2AA00-0AA2
Supply voltage	400 V 3 AC
Protection	16 A
Dimensions	
• Width	720 mm (28.35 in)
• Height	380 mm (14.96 in)
• Depth	300 mm (11.81 in)
Weight, approx.	27 kg (59.5 lb)

Selection and ordering data

Description	Article No.
SINAMICS G120D training case NEW	**6AG1067-2AA00-0AA2**

Overview

SINAMICS S110 training case

The SINAMICS S110 training case is a convincing demonstration system for all situations thanks to its compact design. It vividly demonstrates easy and accurate positioning of an axis by means of the integrated basic positioner (EPos). The integrated touch panel allows for the specification of setpoint values via the PROFIBUS or CAN bus interface [1]. The travel adapter plug and replaceable side panels (German / English) included in the scope of supply enable the unit to be used worldwide.

It contains the following components:

- SINAMICS S110 servo drive
  - PM340 Power Module, 0.37 kW (0.5 hp)
  - CU305 DP Control Unit
- SIMATIC S7-300 controller
- SIMATIC Touch Panel TP177B, 4.3" TFT widescreen, color
- SIMOTICS S-1FK7 synchronous motor

The SINAMICS S110 training case is supplied preprogrammed in the form of a stackable Tanos Systainer case of size 4.

Technical specifications

	SINAMICS S110 training case 6AG1067-1AA18-0AA0
Supply voltage	230 V 1 AC
Dimensions	
• Width	360 mm (14.17 in)
• Height	280 mm (11.02 in)
• Depth	270 mm (10.63 in)
Weight, approx.	13 kg (28.67 lb)

Selection and ordering data

Description	Article No.
SINAMICS S110 training case with PROFIBUS NEW	**6AG1067-1AA18-0AA0**
SINAMICS S110 training case with CAN bus	On request

[1] Training case with CAN bus interface on request.

Applicable practical know-how

Comprehensive teaching support for educational institutions

Cooperates with Education

Automation

SIEMENS

Siemens Automation Cooperates with Education (SCE) offers a global system for sustained support of technical skills. SCE supports educational institutions in their teaching assignment in the industrial automation sector and offers added value in the form of partnerships, technical expertise, and know-how. As the technological leader, our comprehensive range of services can support you in the knowledge transfer for Industry 4.0.

Our services at a glance

- Training curriculums for your lessons
- Trainer packages for hands-on learning
- Courses convey up-to-date, specialist knowledge
- Support for your projects/textbooks
- Complete didactic solutions from our partners
- Personal contact for individual support

Training curriculums for your lessons

Use our profound industrial know-how for practice-oriented and individual design of your course. We offer you more than 100 didactically prepared training curriculums on the topics of automation and drives technology free of charge. These materials are perfectly matched to your curricula and syllabuses, and optimally suited for use with our trainer packages. This takes into account all aspects of a modern industrial solution: installation, configuration, programming, and commissioning. All documents, including projects, can be individually matched to your specific requirements.

Particular highlights:

- With the new SIMATIC PCS 7 curriculums and trainer packages, you can pass on basic, practice-oriented PCS 7 knowledge at universities within about 60 hours (= 1 semester), using plant simulation.
- The new TIA Portal training materials for SIMATIC S7-1200 are available in English, German, French, Italian, Spanish and Chinese for download.

www.siemens.com/sce/documents

Trainer packages for hands-on learning

Our SCE trainer packages offer a specific combination of original industrial components which are perfectly matched to your requirements and can be conveniently used in your course. These price reduced bundles available exclusively to schools include innovative and flexible hardware and software packages. SCE can currently offers more than 90 SCE trainer packages including related equipment. These cover both the factory and process automation sectors. You can use them to impart the complete course contents on industrial automation at a very low cost.

Trainer packages are available for:

- Introduction to automation technology with LOGO! logic module and SIMATIC S7-1200 compact controller
- PLC engineering with SIMATIC S7 hardware and STEP 7 software (S7-300, S7-1500 and TIA Portal)
- Operator control and monitoring with SIMATIC HMI
- Industrial networking over bus systems with SIMATIC NET (PROFINET, PROFIBUS, IO-Link)
- Sensor systems with VISION, RFID and SIWAREX
- Process automation with SIMATIC PCS 7
- Power Monitoring Devices SENTRON PAC 4200
- Motor Management SIMOCODE
- Networked drive and motion technologies with SINAMICS/ SIMOTION
- CNC programming with SinuTrain

Important ordering notes:

Only the following institutions are authorized to obtain trainer packages: vocational schools, Colleges and Universities, in-house vocational training departments, non commercial research institutions and non commercial training departments.

To purchase a trainer package, you require a specific end-use certificate, which you can obtain from your regional sales office.

www.siemens.com/sce/tp

Comprehensive teaching support for educational institutions

Courses convey up-to-date specialist knowledge

Profit from our excellent know-how as the leader in industrial technologies. We offer you specific courses for automation and drive technology worldwide. These support you in the practice-oriented transferring of product and system know-how, are in conformance with curriculums, and derived from the training fields. Compact technical courses especially for use at universities are also available.

Our range of courses comprises a wide variety of training modules based on the principle of Totally Integrated Automation (TIA). The focus is on the same subject areas as with the SCE trainer packages.

Every PLC and drive course is oriented on state-of-the-art technology. Your graduates can thus be prepared optimally for their future professional life.

In some countries we are offering classes based on our training curriculums. Please inquire with your SCE contact partner.

www.siemens.com/sce/contact

Support for your projects/textbooks

Automation and drive technology is characterized by continuous and rapid developments. Service and Support therefore play an important role.

We can provide you with consulting for selected projects and support from your personal SCE contact as well as our web based and regional Customer Support.

As a particular service, SCE supports technical authors with our know-how as well as with intensive technical consulting. Siemens library of special textbooks covering the industrial automation sector provides an additional resource for you and your students. These can be found at the SCE web site.

www.siemens.com/sce/contact
www.siemens.com/sce/books

Complete didactic solutions

Our partners for learning systems offer a wide range of training systems and solutions for use in your courses or laboratory.

These models have been designed based on our trainer packages and thus save you the time and cost of self-construction of individual components. The Partner systems provide you with simple and effective help in the fulfillment of your teaching assignment.

www.siemens.com/sce/partner

Contact for individual support

You can find your personal SCE contact on our Internet site. Your local SCE Promoter will answer all your questions concerning the complete SCE offering, and provide you with timely and competent information about innovations. When you encounter challenges, you can profit from our global team of excellence.

If a direct SCE contact is not listed for your country, please contact your local Siemens office.

www.siemens.com/sce/contact

SCE Support Finder for your Internet request

You are an educator and need support on the topic of industry automation? Send us your request:

www.siemens.com/sce/supportfinder

Scan the QR code for further information (SCE homepage)

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.

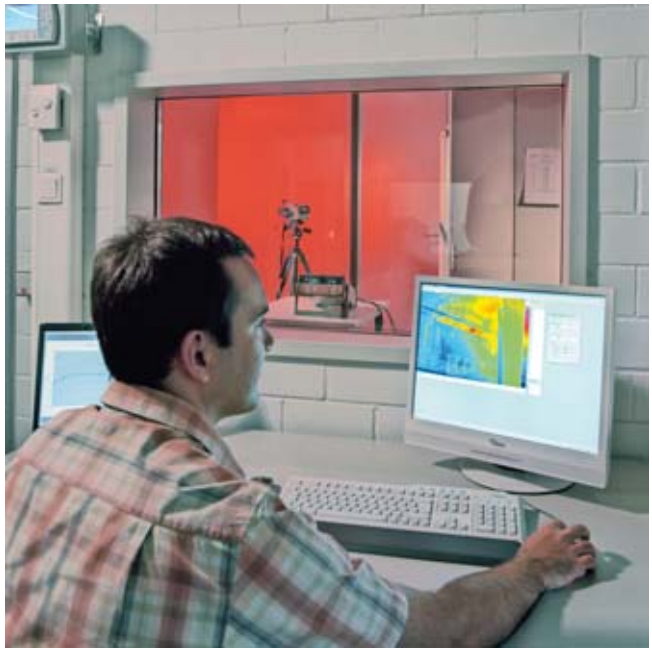
Our engineers configure for you in EPLAN P8 and other commonly used CAD systems, execute projects designed to cost and adapt your documents where necessary to UL or new systems.

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

Control cabinet engineering



Testing in the heat 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

Superior logistics

Everything from a single source offers you the following advantages:

- Cost savings for procurement, stockkeeping, financing
- Reduction in throughput times
- Justintime delivery

Overview

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.

Worldwide repair service

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

As part of its complete equipment program, 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.

Overview

RSC description of performance

In the context of the repair service contract (RSC), Siemens eliminates faults on components from Siemens Industry Sector, I IA&DT specified in the contract (with the exception of complete motor spindles) at the machine location on behalf of the machine tool/production machinery manufacturer and dealer.

RSC services

- Provision of service personnel
- On-site diagnostics
- Fault correction on site
- Proof of fault correction

Diagnostics refers to the components specified in the parts list of the final destination certificate. 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.

Troubleshooting 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 diagnostics and fault correction of 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.

Within the agreed contract period, faulty components which were not older than 12 months at the beginning of the repair service contract will be replaced free-of-charge.

The services are provided during the usual working hours in the country of installation. Waiting times not caused by Siemens – longer than an hour – will be invoiced separately. The service request must be made via the organization that signed the RSC.

Spare parts are provided from our central or regional spare parts warehouses using our worldwide spare parts logistics infrastructure. All of the essential spare parts are stocked in our central spare parts stores. Regional spare parts warehouses are adapted to include the components specified in the final destination certificate [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 certificate
- Data backup at the user`s site
- Parts lists for the individual components with article numbers and serial numbers.
- Access to machine/components

The manufacturer/dealer provides the final destination information in good time prior to commencement of the contract, and ensures that all machine data is backed up and available at the user`s site. Particular data for the final destination certificate are: Machine no., machine type, machining technology, control system, drive system, number of measuring circuits, data for OEM application, date of commissioning at end user's site, country of end user, if possible full address of end user and parts list of components used with article number and serial number.

The manufacturer/dealer must ensure that the work can be performed without delay and that problem-free access is provided to the components including any software security mechanisms (e.g. Lock-it!) for performing diagnosis/troubleshooting and that a contact is available who can be reached at any time for software-protected machines.

RSC certificate

As the RSC contract partner, the manufacturer or dealer is provided with a certificate with contract number (the contract number must be specified when requesting service) once the final destination certificate 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 Siemens for completion of the second commissioning procedure at the end customer site, and ends on expiry of the selected RSC period [5].

[1] Since the export of standard versions (components/systems) is subject to time-intensive approval procedures by authorities, and since this also applies to the delivery of components subject to approval in the context of services and spare part deliveries, it is recommended that **export versions should be used whenever 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 note in this regard the **Export control information**.

[2] For selected motors, we centrally stock components for fast delivery in Germany and in the USA. These motors can be manufactured and delivered within a few working days. You can obtain the current list from your Siemens contact.

[3] The delivery times known to you usually apply.

[4] Examples for service exclusions:
- Non-compliance with the "Siemens project engineering and user guidelines,
  e. g. incorrect installation or grounding or incorrect operating characteristics
- Function-critical fouling, e. g. oil, conductive substances, rust
- Mechanical damage
- External electrical influence, e. g. effects of overvoltage, compensation system without reactor or line harmonics
- Machine commissioning or optimization
- Intentional destruction

[5] For example, in the case of an RSC with 12 months contract period, maximum of 24 months from the transfer of risk (delivery of components).

Contract periods

The RSC is offered for the period of liability for defects (warranty period) that our customers (manufacturers/dealers) provide to their end customers. Different RSC periods permit various market requirements to be addressed. 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 fulfillment of performance, with the exception of further rights and claims, in line with the extended RSC period.

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.

Country list

A repair service is offered for the following countries:

Continent	Country/region
Country group 1	
America	Brazil, Mexico, USA
Asia	China, India, Japan, 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, Rumania, Slovakia, Spain, Sweden, Switzerland, Turkey
Country group 2	
Africa	South Africa
America	Argentina, Canada
Asia	Indonesia, Malaysia, Singapore
Australia	New Zealand
Europe	Estonia, Ireland, Latvia, Lithuania, Norway, Slovenia
Country group 3	
Africa	Egypt
America	Chile, Columbia, Ecuador, Peru, Venezuela
Asia	Bahrain, Hong Kong, Kuwait, Oman, Qatar, Saudi Arabia, United Arab Emirates (Dubai), Saudi Arabia, Vietnam
Europe	Belarus, Bosnia-Herzegovina, Bulgaria, Croatia, Greece, Malta, Russia, Serbia and Montenegro, Ukraine

Countries not listed, for customers with framework contracts only.

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
Countries not listed	Depending on country-specific conditions, only for customers with framework contracts 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 starts to travel to the site stated in the order, or until troubleshooting commences using teleservice. The specified response times apply to "technically clarified fault notifications" within the usual working hours of the region (e.g. Monday to Friday 8:00 to 17:00) excluding public holidays.

Data handling

To improve the service availability, Siemens Drive Technologies offers users the opportunity to register machines online and to save what is known as an identSNAPSHOT file. In addition to the component list and the software requirements of machines, this also includes information for machine manufacturers, and where relevant, dealers and end customers.

To simplify data handling, information about the final destination certificate can be saved using the XML function of identSNAPSHOT and transferred to Siemens using an online registration. This data can also be kept with the machine as data backup.

www.siemens.com/identsnapshot/register

Benefits

- Protection against unknown costs with a fixed price
- RSC can be synchronized with the machine warranty period
- Planning certainty and calculable costs
- Easier processing of servicing jobs
- High machine availability thanks to a fast response to machine faults (contract priority)
- Reduced downtime thanks to stored product, final destination and contract information
- RSC can be ordered for machine deliveries to numerous countries
- Worldwide service infrastructure with experienced service personnel

Repair service contract RSC

Selection and ordering data

Description	Article No.
Repair service contract RSC	
For Siemens I IA&DT components on production machines for countries in country groups 1 to 3	
• 12 month contract period [1]	**6FC8507-0RX12-■■■0**
• 24 month contract period [2]	**6FC8507-0RX24-■■■0**
Equipment value in €	↑
0.–	**0**
100000.–	**1**
200000.–	**2**
300000.–	**3**
400000.–	**4**
500000.–	**5**
600000.–	**6**
700000.–	**7**
800000.–	**8**
900000.–	**9**
	↑
0.–	**A**
10000.–	**B**
20000.–	**C**
30000.–	**D**
40000.–	**E**
50000.–	**F**
60000.–	**G**
70000.–	**H**
80000.–	**J**
90000.–	**K**
	↑
0.–	**A**
1000.–	**B**
2000.–	**C**
3000.–	**D**
4000.–	**E**
5000.–	**F**
6000.–	**G**
7000.–	**H**
8000.–	**J**
9000.–	**K**

Ordering example:
Validity period of the contract 12 months and equipment value €96000.–
6FC8507-0RX12-0KG0

[1] Max. 24 months from the transfer of risk (delivery of components).
[2] Max. 36 months from the transfer of risk (delivery of components).

Overview

Achieve the optimum machine quicker and more efficiently with Mechatronic Support

The Mechatronic Support service ensures that already at 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.

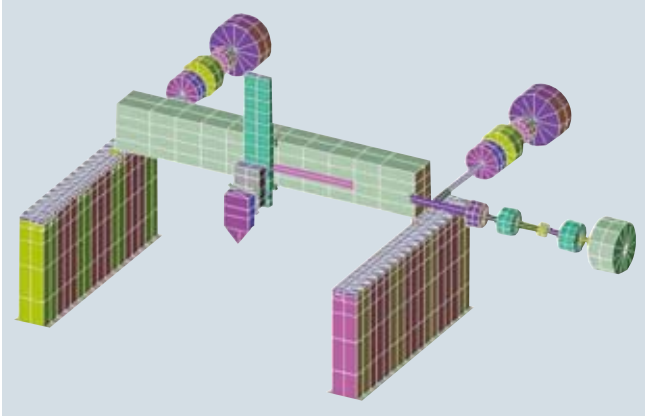
Virtual simulation – real construction

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	Type
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.

Contact information is available on the Internet at:

www.siemens.com/automation/partner

Overview

Spares on Web – Identification of spare parts on the Internet

Spares on Web is a web-based tool for identifying spare parts. After you have entered the Article No. and serial number, the spare parts available for the relevant unit are displayed.

www.siemens.com/sow

Overview

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 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.

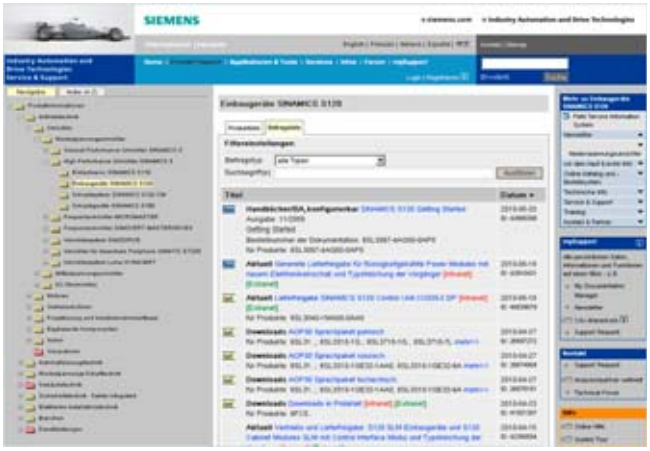
You must register for configuring and generating/managing (the existing login can be used, e.g.: Industry Mall
www.siemens.com/industrymall

Benefits

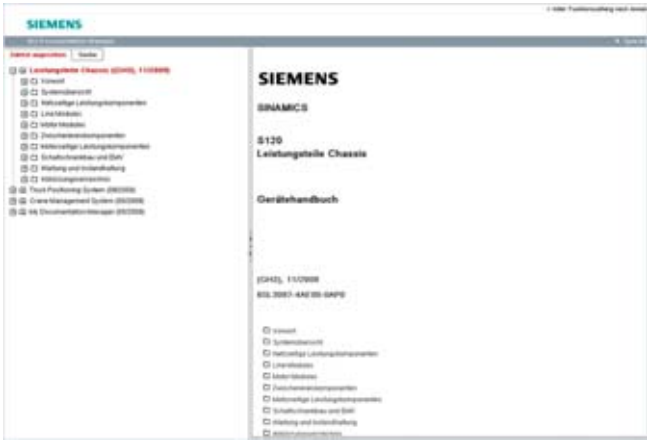
- Display
  View, print or download standard documents or personalized documents
- Configure
  Transfer standard documents or parts of them to personalized documents
- Generate/Manage
  Produce and manage personalized documents in the formats PDF, RTF or XML

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

You will find further information 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.

A comprehensive range of documentation is available which includes operating instructions and installation manuals, list manuals and a Getting Started guide.

Information is available in the following formats:

- Paper version, printed copy
- PDF file on the Internet at www.siemens.com/motioncontrol/docu
- Documentation (PDF) on the SINAMICS Manual Collection (DVD-ROM)

Information and documentation on SINAMICS G110, SINAMICS G110D, SINAMICS G110M, SINAMICS G120, SINAMICS G120C, SINAMICS G120D and SINAMICS G120P are available as:

- PDF file
- on the SINAMICS Manual Collection (DVD-ROM)
- Documents/documentation about configuration for downloading from http://support.automation.siemens.com/WW/view/en/36426537/133300

Application

Explanations of manuals:

- **Operating Instructions**
  contain all the information needed to install the device and make electrical connections, information about commissioning and a description of the inverter functions.
  Phases of use: Control cabinet construction, commissioning, operation, maintenance and servicing.
- **Hardware Installation Manual**
  contains all relevant information about the intended use of the components of a system (technical specifications, interfaces, dimensional drawings, characteristics, or possible applications), information about installation and electrical connections and information about maintenance and servicing.
  Phases of use: Control cabinet configuration/construction, maintenance and servicing.
- **Operating and Installation Instructions** (for inverter and accessories)
  contain all relevant information about the intended use of the components, such as technical specifications, interfaces, dimensional drawings, characteristics, or possible applications.
  Phases of use: Control cabinet configuration/construction.
- **Configuration Manual EMC Installation Guidelines**
  contain all relevant information about EMC-compliant design of control cabinets.
  Phases of use: Control cabinet configuration/construction**.**
- **Manual/Configuration Manual**
  containing all necessary information about the intended use of the components of a system, e.g. technical specifications, interfaces, dimensional drawings, characteristics, or 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/alarms for the product/system as well as their meanings and setting options. It contains parameter data and fault/alarm 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.

More information

Please send any queries or suggestions to docu.motioncontrol@siemens.com

General documentation

Selection and ordering data

Description	Article No.
Catalog D 31	
• German	**E86060-K5531-A101-A2**
• English [1]	**E86060-K5531-A101-A2-7600**
• Italian [1]	**E86060-K5531-A101-A2-7200**
• French [1]	**E86060-K5531-A101-A2-7700**
• Spanish [1]	**E86060-K5531-A101-A2-7800**
Catalog Add-On D 31 AO	
• German	**E86060-K5531-E101-A1**
• English [1]	**E86060-K5531-E101-A1-7600**
Catalog D 35	
• German	**E86060-K5535-A101-A1**
• English	**E86060-K5535-A101-A1-7600**
Catalog Add-On D 35 AO	
• German	**E86060-K5535-E101-A1**
• English	**E86060-K5535-E101-A1-7600**
Catalog D 81.1	
• German	**E86060-K5581-A111-A7**
• English [1]	**E86060-K5581-A111-A7-7600**
Catalog D 81.8	
• German	**E86060-K5581-A181-A2**
• English	**E86060-K5581-A181-A2-7600**
Catalog MD 10.1	
• German	**E86060-K5710-A111-A5**
• English	**E86060-K5710-A111-A4-7600**
Catalog MD 50.1	
• German	**E86060-K5250-A111-A3**
• English	**E86060-K5250-A111-A3-7600**
Catalog NC 62	
• German	**E86060-K4462-A101-A1**
• English	**E86060-K4462-A101-A1-7600**
• Italian	**E86060-K4462-A101-A1-7200**
• French	**E86060-K4462-A101-A1-7700**
• Spanish	**E86060-K4462-A101-A1-7800**
Catalog PM 21	
• German	**E86060-K4921-A101-A3**
• English	**E86060-K4921-A101-A3-7600**
• Italian	**E86060-K4921-A101-A3-7200**
• French	**E86060-K4921-A101-A3-7700**
Catalog ST 70	
• German	**E86060-K4670-A101-B4**
• English	**E86060-K4670-A101-B4-7600**
• Italian	**E86060-K4670-A101-B4-7200**
• French	**E86060-K4670-A101-B4-7700**
• Spanish	**E86060-K4670-A101-B4-7800**

Description	Article No.
Catalog ST 80/ST PC	
• German	**E86060-K4680-A101-C2**
• English	**E86060-K4680-A101-C2-7600**
• Italian [1]	**E86060-K4680-A101-C2-7200**
• French [1]	**E86060-K4680-A101-C2-7700**
• Spanish [1]	**E86060-K4680-A101-C2-7800**
Catalog IK PI	
• German	**E86060-K6710-A101-B8**
• English	**E86060-K6710-A101-B8-7600**
• Italian [1]	**E86060-K6710-A101-B8-7200**
• French [1]	**E86060-K6710-A101-B8-7700**
• Spanish [1]	**E86060-K6710-A101-B8-7800**
Catalog SI 10	
• German	**E86060-K7010-A101-A2**
• English	**E86060-K7010-A101-A2-7600**
PROFINET compact catalog	
• German	**E86060-K6710-B211-A6**
• English	**E86060-K6710-B201-A6-7600**
Decentralization with PROFIBUS DP/DPV1	**ISBN-13:978-3-89578-189-6**

Description	Article No.
User/Manufacturer Documentation	
SINAMICS Manual Collection On DVD-ROM with full text search over the complete DVD Network-enabled (storage of the PDFs on a central server) Languages: Chinese (simplified), English, French, German, Italian, Spanish	**6SL3097-4CA00-0YG2**
Manufacturer and service documentation	
EMC Installation Guidelines SINUMERIK, SIROTEC, SIMODRIVE, SIMOTION, SINAMICS S120	
• German	**6FC5297-0AD30-0AP3**
• English	**6FC5297-0AD30-0BP3**
• Italian	**6FC5297-0AD30-0CP3**
• French	**6FC5297-0AD30-0DP3**
• Spanish	**6FC5297-0AD30-0EP3**
• Chinese (simplified)	**6FC5297-0AD30-0RP3**

[1] Available soon.

SINAMICS S110 documentation

Selection and ordering data

Description	Article No.
Manufacturer and service documentation	
Manual SINAMICS S110	
• German	**6SL3097-4AC10-0AP2**
• English	**6SL3097-4AC10-0BP2**
• Italian	**6SL3097-4AC10-0CP2**
• French	**6SL3097-4AC10-0DP2**
• Spanish	**6SL3097-4AC10-0EP2**
List Manual SINAMICS S110	
• German	**6SL3097-4AP10-0AP3**
• English	**6SL3097-4AP10-0BP3**
• Italian	**6SL3097-4AP10-0CP3**
• French	**6SL3097-4AP10-0DP3**
• Spanish	**6SL3097-4AP10-0EP3**
• Chinese (simplified)	**6SL3097-4AP10-0RP3**

Description	Article No.
Manufacturer and service documentation	
Getting Started SINAMICS S110	
• German	**6SL3097-4AG10-0AP0**
• English	**6SL3097-4AG10-0BP0**
• Italian	**6SL3097-4AG10-0CP0**
• French	**6SL3097-4AG10-0DP0**
• Spanish	**6SL3097-4AG10-0EP0**
• Chinese (simplified)	**6SL3097-4AG10-0RP0**
Function Manual SINAMICS S110	
• German	**6SL3097-4AB10-0AP4**
• English	**6SL3097-4AB10-0BP4**
• Italian	**6SL3097-4AB10-0CP4**
• French	**6SL3097-4AB10-0DP4**
• Spanish	**6SL3097-4AB10-0EP4**
• Chinese (simplified)	**6SL3097-4AB10-0RP4**

SINAMICS S120 documentation

Selection and ordering data

Description	Article No.
Manufacturer and service documentation	
Manual SINAMICS S120 AC Drive	
• German	**6SL3097-4AL00-0AP3**
• English	**6SL3097-4AL00-0BP3**
• Italian	**6SL3097-4AL00-0CP3**
• French	**6SL3097-4AL00-0DP3**
• Spanish	**6SL3097-4AL00-0EP3**
• Chinese (simplified)	**6SL3097-4AL00-0RP3**
Commissioning Manual SINAMICS S120	
• German	**6SL3097-4AF00-0AP3**
• English	**6SL3097-4AF00-0BP3**
• Italian	**6SL3097-4AF00-0CP3**
• French	**6SL3097-4AF00-0DP3**
• Spanish	**6SL3097-4AF00-0EP3**
• Chinese (simplified)	**6SL3097-4AF00-0RP3**
List Manual SINAMICS S120/SINAMICS S150	
• German	**6SL3097-4AP00-0AP4**
• English	**6SL3097-4AP00-0BP4**
• Italian	**6SL3097-4AP00-0CP4**
• French	**6SL3097-4AP00-0DP4**
• Spanish	**6SL3097-4AP00-0EP4**
• Chinese (simplified)	**6SL3097-4AP00-0RP4**

Description	Article No.
Manufacturer and service documentation	
Getting Started SINAMICS S120	
• German	**6SL3097-4AG00-0AP2**
• English	**6SL3097-4AG00-0BP2**
• Italian	**6SL3097-4AG00-0CP2**
• French	**6SL3097-4AG00-0DP2**
• Spanish	**6SL3097-4AG00-0EP2**
• Chinese (simplified)	**6SL3097-4AG00-0RP2**
Function Manual SINAMICS S120 Drive Functions	
• German	**6SL3097-4AB00-0AP3**
• English	**6SL3097-4AB00-0BP3**
• Italian	**6SL3097-4AB00-0CP3**
• French	**6SL3097-4AB00-0DP3**
• Spanish	**6SL3097-4AB00-0EP3**
• Chinese (simplified)	**6SL3097-4AB00-0RP3**
Function Manual SINAMICS S120 Safety Integrated	
• German	**6SL3097-4AR00-0AP4**
• English	**6SL3097-4AR00-0BP4**
• Italian	**6SL3097-4AR00-0CP4**
• French	**6SL3097-4AR00-0DP4**
• Spanish	**6SL3097-4AR00-0EP4**
• Chinese (simplified)	**6SL3097-4AR00-0RP4**

Motor documentation

Selection and ordering data

Description	Article No.
Manufacturer and service documentation	
Configuration Manual 1FT7 Synchronous Motors	
• German	**6SN1197-0AD13-0AP4**
• English	**6SN1197-0AD13-0BP4**
• Italian	**6SN1197-0AD13-0CP4**
• French	**6SN1197-0AD13-0DP4**
• Spanish	**6SN1197-0AD13-0EP4**
• Chinese (simplified)	**6SN1197-0AD13-0RP4**
Configuration Manual 1FK7 Synchronous Motors	
• German	**6SN1197-0AD16-0AP4**
• English	**6SN1197-0AD16-0BP4**
• Italian	**6SN1197-0AD16-0CP4**
• French	**6SN1197-0AD16-0DP4**
• Spanish	**6SN1197-0AD16-0EP4**
• Chinese (simplified)	**6SN1197-0AD16-0RP4**
Configuration Manual SIMOTICS M-1PH8 Main Motor	
• German	**6SN1197-0AD74-0AP1**
• English	**6SN1197-0AD74-0BP1**
• Italian	**6SN1197-0AD74-0CP1**
• French	**6SN1197-0AD74-0DP1**
• Spanish	**6SN1197-0AD74-0EP1**
• Chinese (simplified)	**6SN1197-0AD74-0RP1**

Measuring systems documentation

Selection and ordering data

Description	Article No.
Manufacturer and service documentation	
User Manual SIMODRIVE sensor Absolute encoder with PROFIBUS DP	
• English/German	**6SN1197-0AB10-0YP4**

Appendix

Overview

Many products in this catalog are in compliance with UL/CSA and FM requirements and are labeled with the appropriate certification markings.

All 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 for new certificates to be issued.

UL: Underwriters Laboratories independent public testing institution in North America

Test symbol:

- **UL** for end products, tested by UL in accordance with UL standard
- **cUL** for end products, tested by UL in accordance with CSA standard
- **cULus** for end products, tested by UL in accordance with UL and CSA standards
- **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:

- SINUMERIK: Standard UL 508
- SINAMICS: Standard UL 508C
- SIMODRIVE: Standard UL 508C
- Motors: Standard UL 547

Product category/file No.:

- SINUMERIK: E164110
- SINAMICS: E192450
- SIMODRIVE: NMMS2/E192450
- Motors: E93429

TUV: TUV Rheinland of North America Inc. independent public testing institution in North America National recognized testing laboratory (NRTL)

Test symbol:

- **cTUVus** tested by TUV in accordance with UL and CSA standards

Test standards:

- SIMODRIVE: NRTL Listing according to standard UL 508C

Product category/file No.:

- SIMODRIVE: TUV.COM/4335304002

CSA: Canadian Standards Association independent public testing institution in Canada

Test symbol:

- **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

File No.:

- SINUMERIK FM ... : LR 102527

FMRC: Factory Mutual Research Corporation Independent public testing institution in North America

Test symbol:

- **FM** tested by FM in accordance with FM standard

Test standard:

- Standard FMRC 3600, FMRC 3611, FMRC 3810 Class I, Div.2, Group A, B, C, D

File No.:

- SINUMERIK FM... : 4Y1A7.AX
  5B0A2.AX
  2D7A2.AX
  3007320

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.

Information about extended rights of use for parameterization/configuration tools supplied as integral components of the scope of delivery can be found in the readme file supplied with the relevant product(s).

License types

Siemens Industry Automation & Drive Technologies offers various types of software license:

- Floating license
- Single license
- Rental license
- Rental floating license
- Trial license
- Demo license
- Demo floating license

Floating license

The software may be installed for internal use on any number of devices by the licensee. Only the concurrent user is licensed. The concurrent user is the person using the program. Use begins when the software is started.
A license is required for each concurrent user.

Single license

Unlike the floating license, a single license permits only one installation of the software per license.

The type of use licensed is specified in the ordering data and in the Certificate of License (CoL). Types of use include for example per instance, per axis, per channel, etc.

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 period of time (the operating hours do not have to be consecutive).
One license is required for each installation of the software.

Rental floating license

The rental floating license corresponds to the rental license, except that a license is not required for each installation of the software. Rather, one license is required per object (for example, user or device).

Trial license

A trial license supports "short-term use" of the software in a non-productive context, e.g. for testing and evaluation purposes. It can be transferred to another license.

Demo license

The demo license support the "sporadic use" of engineering software in a non-productive context, for example, use for testing and evaluation purposes. It can be transferred to another license. After the installation of the license key, the software can be operated for a specific period of time, whereby usage can be interrupted as often as required.

One license is required per installation of the software.

Demo floating license

The demo floating license corresponds to the demo license, except that a license is not required for each installation of the software. Rather, one license is required per object (for example, user or device).

Certificate of license (CoL)

The CoL is the licensee's proof that the use of the software has been licensed by Siemens. A CoL is required for every type of use and must be kept in a safe place.

Downgrading

The licensee is permitted to use the software or an earlier version/release of the software, provided that the licensee owns such a version/release and its use is technically feasible.

Delivery versions

Software is constantly being updated.
The following delivery versions

- PowerPack
- Upgrade

can be used to access updates.

Existing bug fixes are supplied with the ServicePack version.

PowerPack

PowerPacks can be used to upgrade to more powerful software. The licensee receives a new license agreement and CoL (Certificate of License) with the PowerPack. This CoL, together with the CoL for the original product, proves that the new software is licensed.
A separate PowerPack must be purchased for each original license of the software to be replaced.

Upgrade

An upgrade permits the use of a new version of the software on the condition that a license for a previous version of the product is already held.
The licensee receives a new license agreement and CoL with the upgrade. This CoL, together with the CoL for the previous product, proves that the new version is licensed.
A separate upgrade must be purchased for each original license of the software to be upgraded.

Software licenses

Overview

ServicePack

ServicePacks are used to debug existing products. ServicePacks may be duplicated for use as prescribed according to the number of existing original licenses.

License key

Siemens Industry Automation & Drive Technologies supplies software products with and without license keys.

The license key serves as an electronic license stamp and is also the "switch" for activating the software (floating license, rental license, etc.).

The complete installation of software products requiring license keys includes the program to be licensed (the software) and the license key (which represents the license).

Software Update Service (SUS)

As part of the SUS contract, all software updates for the respective product are made available to you free of charge for a period of one year from the invoice date. The contract will automatically be extended for one year if it is not canceled three months before it expires.

The possession of the current version of the respective software is a basic condition for entering into an SUS contract.

You can download explanations concerning license conditions from www.siemens.com/automation/salesmaterial-as/catalog/en/terms_of_trade_en.pdf

Appendix

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Explanation of the raw material/metal surcharges[1)]

Surcharge calculation

To compensate for variations in the price of the raw materials silver, copper, aluminum, lead, gold, dysprosium[2)] and/or neodym[2)], surcharges are calculated on a daily basis using the so-called metal factor for products containing these raw materials. A surcharge for the respective raw material is calculated as a supplement to the price of a product if the basic official price of the raw material in question is exceeded.

The surcharges are calculated in accordance with the following criteria:

- Basic official price of the raw material
  Basic official price from the day prior to receipt of the order or prior to release order (daily price) for[3)]
  - Silver (sales price, processed)
  - Gold (sales price, processed)

  and for[4)]
  - Copper (lower DEL notation + 1 %)
  - Aluminum (aluminum in cables)
  - Lead (lead in cables)
- Metal factor of the products
  Certain products are displayed with a metal factor. The metal factor determines the official price (for those raw materials concerned) as of which the metal surcharges are applied 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 percentage method of calculation refers to the list price or a possible discounted price (customer net price) (L = list price / N = customer net price).

The remaining digits indicate the method of calculation used for the respective raw material. If no surcharge is added for a raw material, 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)
7th digit	for dysprosium (Dy)[2)]
8th digit	for neodym (Nd)[2)]

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 difference is then multiplied by the raw material weight.

The basic official price can be found in the table below using the number (1 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 50 €, 0.5 %
Copper Basis 150 €, Step 50 €, 0.1 %
No surcharge for aluminum
No surcharge for lead
No surcharge for gold
No surcharge for dysprosium
No surcharge for neodym

N – A 6 – – – –

Basis for % surcharge: Customer net price
No surcharge for silver
Copper Basis 150 €, Step 50 €, 0.1 %
Aluminum acc. to weight, basic offic. price 225 €
No surcharge for lead
No surcharge for gold
No surcharge for dysprosium
No surcharge for neodym

– – 3 – – – – –

No basis necessary
No surcharge for silver
Copper acc. to weight, basic official price 150 €
No surcharge for aluminum
No surcharge for lead
No surcharge for gold
No surcharge for dysprosium
No surcharge for neodym

1) Refer to the separate explanation on the next page regarding the raw materials dysprosium and neodym (= rare earths).
2) For a different method of calculation, refer to the separate explanation for these raw materials on the next page.
3) Source: Umicore, Hanau (www.metalsmanagement.umicore.com).
4) Source: German Trade Association for Cables and Conductors (www.kabelverband.org).

Explanation of the raw material/metal surcharges for dysprosium and neodym (rare earths)

Surcharge calculation

To compensate for variations in the price of the raw materials silver[1)], copper[1)], aluminum[1)], lead[1)], gold[1)], dysprosium and/or neodym, surcharges are calculated on a daily basis using the so-called metal factor for products containing these raw materials. The surcharge for dysprosium and neodym is calculated as a supplement to the price of a product if the basic official price of the raw material in question is exceeded.

The surcharge is calculated in accordance with the following criteria:

- Basic official price of the raw material[2)]
  Three-month basic average price (see below) in the period before the quarter in which the order was received or the release order took place (= average official price) for
  - dysprosium (Dy metal, 99 % min. FOB China; USD/kg)
  - neodym (Nd metal, 99 % min. FOB China; USD/kg)
- Metal factor of the products
  Certain products are displayed with a metal factor. The metal factor indicates (for those raw materials concerned) the basic official price as of which the surcharges for dysprosium and neodym are calculated using the weight method. An exact explanation of the metal factor is given below.

Three-month average price

The prices of rare earths vary according to the foreign currency, and there is no freely accessible stock exchange listing. This makes it more difficult for all parties involved to monitor changes in price. In order to avoid continuous adjustment of the surcharges, but to still ensure fair, transparent pricing, an average price is calculated over a three-month period using the average monthly foreign exchange rate from USD to EUR (source: European Central Bank). Since not all facts are immediately available at the start of each month, a one-month buffer is allowed before the new average price applies.

Examples of calculation of the average official price:

Period for calculation of the average price:	Period during which the order/release order is effected and the average price applies:
Sep 2012 - Nov 2012	Q1 in 2013 (Jan - Mar)
Dec 2012 - Feb 2013	Q2 in 2013 (Apr - Jun)
Mar 2013 - May 2013	Q3 in 2013 (Jul - Sep)
Jun 2013 - Aug 2013	Q4 in 2013 (Oct - Dec)

Structure of the metal factor

The metal factor consists of several digits; the first digit is not relevant to the calculation of dysprosium and neodym.

The remaining digits indicate the method of calculation used for the respective raw material. If no surcharge is added for a raw material, a "-" is used.

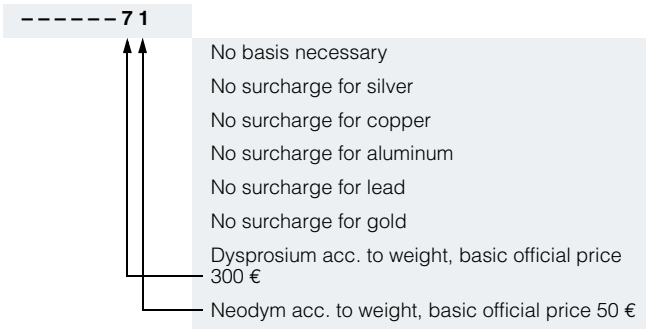
1st digit	List or customer net price using the percentage method
2nd digit	for silver (AG)[1)]
3rd digit	for copper (CU)[1)]
4th digit	for aluminum (AL)[1)]
5th digit	for lead (PB)[1)]
6th digit	for gold (AU)[1)]
7th digit	for dysprosium (Dy)
8th digit	for neodym (Nd)

Weight method

The weight method uses the basic official price, the average price and the raw material weight. In order to calculate the surcharge, the basic official price must be subtracted from the average price. The difference is then multiplied by the raw material weight.

The basic official price can be found in the table below using the number (1 to 9) of the respective digit of the metal factor. Your Sales contact can inform you of the raw material weight.

Metal factor examples



5) For a different method of calculation, refer to the separate explanation for these raw materials on the previous page.

6) Source: Asian Metal Ltd (www.asianmetal.com)

Metal surcharges

Values of the metal factor

Percentage method	Basic official price in €	Step range in €	% surcharge 1st step	% surcharge 2nd step	% surcharge 3rd step	% surcharge 4th step	% surcharge per additional step
			Price in €	Price in €	Price in €	Price in €	
			150.01 - 200.00	200.01 - 250.00	250.01 - 300.00	300.01 - 350.00	
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
G	150	50	1.0	2.0	3.0	4.0	1.0
H	150	50	1.2	2.4	3.6	4.8	1.2
I	150	50	1.6	3.2	4.8	6.4	1.6
J	150	50	1.8	3.6	5.4	7.2	1.8
			175.01 - 225.00	225.01 - 275.00	275.01 - 325.00	325.01 - 375.00	
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
			225.01 - 275.00	275.01 - 325.00	325.01 - 375.00	375.01 - 425.00	
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
			150.01 - 175.00	175.01 - 200.00	200.01 - 225.00	225.01 - 250.00	
Y	150	25	0.3	0.6	0.9	1.2	0.3
			400.01 - 425.00	425.01 - 450.00	450.01 - 475.00	475.01 - 500.00	
Z	400	25	0.1	0.2	0.3	0.4	0.1
	Price basis (1st digit)						
L	Calculation based on the list price						
N	Calculation based on the customer net price (discounted list price)						
Weight method	**Basic official price in €**						
1	50	Calculation based on raw material weight					
2	100						
3	150						
4	175						
5	200						
6	225						
7	300						
8	400						
9	555						
Miscellaneous							
-	No metal surcharge						

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

Conversion tables

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
		Circular Mils (MCM)
120	0000000	250
150	–	300
185	–	350

1) The table shows approximate SWG/AWG/MCM sizes nearest to standard metric sizes; the cross-sections do not match exactly.

Conditions of sale and delivery

1. General Provisions

By using this catalog you can acquire hardware and software products described therein from Siemens AG subject to the following Terms and Conditions of Sale and Delivery (hereinafter referred to as "T&C"). Please note that the scope, the quality and the conditions for supplies and services, including software products, by any Siemens entity having a registered office outside Germany, shall be subject exclusively to the General Terms and Conditions of the respective Siemens entity. The following T&C apply exclusively for orders placed with Siemens Aktiengesellschaft, Germany.

1.1 For customers with a seat or registered office in Germany

For customers with a seat or registered office in Germany, the following applies subordinate to the T&C:

- the "General Terms of Payment"[1)] and,
- for software products, the "General License Conditions for Software Products for Automation and Drives for Customers with a Seat or Registered Office in Germany"[1)] and,
- for other supplies and services, the "General Conditions for the Supply of Products and Services of the Electrical and Electronics Industry"[1)].

1.2 For customers with a seat or registered office outside Germany

For customers with a seat or registered office outside Germany, the following applies subordinate to the T&C:

- the "General Terms of Payment"[1)] and,
- for software products, the "General License Conditions for Software Products for Automation and Drives for Customers with a Seat or Registered Office outside of Germany"[1)] and
- for other supplies and/or services, the "General Conditions for Supplies of Siemens Industry for Customers with a Seat or Registered Office outside of Germany"[1)].

2. Prices

The prices are in € (Euro) ex point of delivery, exclusive of packaging.

The sales tax (value added tax) is not included in the prices. It shall be charged separately at the respective rate according to the applicable statutory legal regulations.

Prices are subject to change without prior notice. We will charge the prices valid at the time of delivery.

To compensate for variations in the price of raw materials (e.g. silver, copper, aluminum, lead, gold, dysprosium and neodym), surcharges are calculated on a daily basis using the so-called metal factor for products containing these raw materials. A surcharge for the respective raw material is calculated as a supplement to the price of a product if the basic official price of the raw material in question is exceeded.

The metal factor of a product indicates the basic official price (for those raw materials concerned) as of which the surcharges on the price of the product are applied, and with what method of calculation.

You will find a detailed explanation of the metal factor on the page headed "Metal surcharges".

To calculate the surcharge (except in the cases of dysprosium and neodym), the official price from the day prior to that on which the order was received or the release order was effected is used.

To calculate the surcharge applicable to dysprosium and neodym ("rare earths"), the corresponding three-month basic average price in the quarter prior to that in which the order was received or the release order was effected is used with a one-month buffer (details on the calculation can be found in the explanation of the metal factor).

3. Additional Terms and Conditions

The dimensions are in mm. In Germany, according to the German law on units in measuring technology, data in inches apply only to devices for export.

Illustrations are not binding.

Insofar as there are no remarks on the individual pages of this catalog - especially with regard to data, dimensions and weights given - these are subject to change without prior notice.

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We shall not be obligated to fulfill any agreement if such fulfillment is prevented by any impediments arising out of national or international foreign trade or customs requirements or any embargoes and/or other sanctions.

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The export indications can be viewed in advance in the description of the respective goods on the Industry Mall, our online catalog system. Only the export labels "AL" and "ECCN" indicated on order confirmations, delivery notes and invoices are authoritative.

Even without a label, or with label "AL:N" or "ECCN:N", authorization may be required i.a. due to the final disposition and intended use of goods.

If you transfer goods (hardware and/or software and/or technology as well as corresponding documentation, regardless of the mode of provision) delivered by us or works and services (including all kinds of technical support) performed by us to a third party worldwide, you must comply with all applicable national and international (re-)export control regulations.

If required for the purpose of conducting export control checks, you (upon request by us) shall promptly provide us with all information pertaining to the particular end customer, final disposition and intended use of goods delivered by us respectively works and services provided by us, as well as to any export control restrictions existing in this relation.

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1) The text of the Terms and Conditions of Siemens AG can be downloaded at www.siemens.com/automation/salesmaterial-as/catalog/en/terms_of_trade_en.pdf

Catalogs

Industry Automation, Drive Technologies and Low-Voltage Power Distribution

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System Solutions for Industry Interactive Catalog on DVD	*Catalog*
Products for Automation and Drives, Low-Voltage Power Distribution and Electrical Installation Technology	**CA 01**

Building Control	
GAMMA Building Control	ET G1

Drive Systems	
SINAMICS G130 Drive Converter Chassis Units SINAMICS G150 Drive Converter Cabinet Units	D 11
SINAMICS GM150, SINAMICS SM150 Medium-Voltage Converters	D 12
SINAMICS PERFECT HARMONY GH180 Medium-Voltage Air-Cooled Drives Germany Edition	D 15.1
SINAMICS G180 Converters – Compact Units, Cabinet Systems, Cabinet Units Air-Cooled and Liquid-Cooled	D 18.1
SINAMICS S120 Chassis Format Units and Cabinet Modules SINAMICS S150 Converter Cabinet Units	D 21.3
SINAMICS DCM DC Converter, Control Module	D 23.1
SINAMICS DCM Cabinet	D 23.2
SINAMICS and Motors for Single-Axis Drives	D 31
SINAMICS G120P and SINAMICS G120P Cabinet pump, fan, compressor converters	D 35
Three-Phase Induction Motors SIMOTICS HV, SIMOTICS TN • Series H-compact • Series H-compact PLUS	D 84.1
Asynchronous Motors Standardline	D 86.1
Synchronous Motors with Permanent-Magnet Technology, HT-direct	D 86.2
DC Motors	DA 12
SIMOREG DC MASTER 6RA70 Digital Chassis Converters	DA 21.1
SIMOREG K 6RA22 Analog Chassis Converters	DA 21.2
Digital: SIMOREG DC MASTER 6RM70 Digital Converter Cabinet Units	*DA 22*
SIMOVERT PM Modular Converter Systems	DA 45
SIEMOSYN Motors	DA 48
MICROMASTER 420/430/440 Inverters	DA 51.2
MICROMASTER 411/COMBIMASTER 411	DA 51.3
SIMODRIVE 611 universal and POSMO	DA 65.4
Note: Additional catalogs on SIMODRIVE or SINAMICS drive systems and SIMOTICS motors with SINUMERIK and SIMOTION can be found under Motion Control	
Low-Voltage Three-Phase-Motors	
SIMOTICS Low-Voltage Motors	D 81.1
SIMOTICS FD Flexible Duty Motors	D 81.8
MOTOX Geared Motors	D 87.1
SIMOGEAR Geared Motors	MD 50.1
SIMOGEAR Gearboxes with adapter	MD 50.11
Mechanical Driving Machines	
FLENDER Standard Couplings	MD 10.1
FLENDER High Performance Couplings	MD 10.2
FLENDER SIG Standard industrial gear unit	MD 30.1
FLENDER SIP Standard industrial planetary gear units	MD 31.1

Process Instrumentation and Analytics	
Field Instruments for Process Automation	FI 01
Digital: SIPART Controllers and Software	*MP 31*
Products for Weighing Technology	WT 10
Digital: Process Analytical Instruments	*PA 01*
Digital: Process Analytics, Components for the System Integration	*PA 11*

Digital: These catalogs are only available as a PDF.

Low-Voltage Power Distribution and Electrical Installation Technology	*Catalog*
SENTRON · SIVACON · ALPHA Protection, Switching, Measuring and Monitoring Devices, Switchboards and Distribution Systems	LV 10
Standards-Compliant Components for Photovoltaic Plants	LV 11
3WT Air Circuit Breakers up to 4000 A	LV 35
3VT Molded Case Circuit Breakers up to 1600 A	LV 36
Digital: SIVACON System Cubicles, System Lighting and System Air-Conditioning	*LV 50*
Digital: ALPHA Distribution Systems	*LV 51*
ALPHA FIX Terminal Blocks	LV 52
SIVACON S4 Power Distribution Boards	LV 56
Digital: SIVACON 8PS Busbar Trunking Systems	*LV 70*
Digital: DELTA Switches and Socket Outlets	*ET D1*

Motion Control	
SINUMERIK & SIMODRIVE Automation Systems for Machine Tools	NC 60
SINUMERIK & SINAMICS Equipment for Machine Tools	NC 61
SINUMERIK 840D sl Type 1B Equipment for Machine Tools	NC 62
SINUMERIK 808 Equipment for Machine Tools	NC 81.1
SINUMERIK 828 Equipment for Machine Tools	NC 82
SIMOTION, SINAMICS S120 & SIMOTICS Equipment for Production Machines	PM 21
Drive and Control Components for Cranes	CR 1

Power Supply	
Power supply SITOP	KT 10.1

Safety Integrated	
Safety Technology for Factory Automation	SI 10

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

SIMATIC Ident	
Industrial Identification Systems	ID 10

SIMATIC Industrial Automation Systems	
Products for Totally Integrated Automation	ST 70
SIMATIC PCS 7 Process Control System System components	ST PCS 7
SIMATIC PCS 7 Process Control System Technology components	ST PCS 7 T
Add-ons for the SIMATIC PCS 7 Process Control System	ST PCS 7 AO

SIMATIC NET	
Industrial Communication	IK PI

SIRIUS Industrial Controls	
SIRIUS Industrial Controls	IC 10

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For the secure operation of Siemens products and solutions, it is necessary to take suitable preventive action (e.g. cell protection concept) and integrate each component into a holistic, state-of-the-art industrial security concept. Thirdparty products that may be in use should also be considered. For more information about industrial security, visit
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