SIEMENS

SINAMICS G120P and SINAMICS G120P Cabinet pump, fan, compressor converters

SINAMICS Drives

Catalog D 35

Edition 2014

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

Motion Control Drives D 31
SINAMICS and Motors
for Single-Axis Drives

E86060-K5531-A101-A1-7600

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Standard Couplings

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Products for
Totally Integrated Automation

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Products for Automation and Drives CA 01
Interactive Catalog, DVD

E86060-D4001-A510-D3-7600

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Information and Ordering Platform
in the Internet:

www.siemens.com/industrymall

Additional information

You will find all the latest marketing materials, such as brochures and catalogs at
www.siemens.com/sinamics-g120p
www.siemens.com/sinamics
www.siemens.com/simotics
www.siemens.com/ids

under "Marketing materials (brochures, catalogs)".

You can order the available documents or download them in popular file formats (PDF, ZIP) from this site.

NEW New products contained in this catalog.

SINAMICS G120P and SINAMICS G120P Cabinet pump, fan, compressor converters

SINAMICS Drives

Catalog D 35 · 2014

Supersedes:
Catalog News D 31 N · 2013 Chapter 5

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-D3-7600

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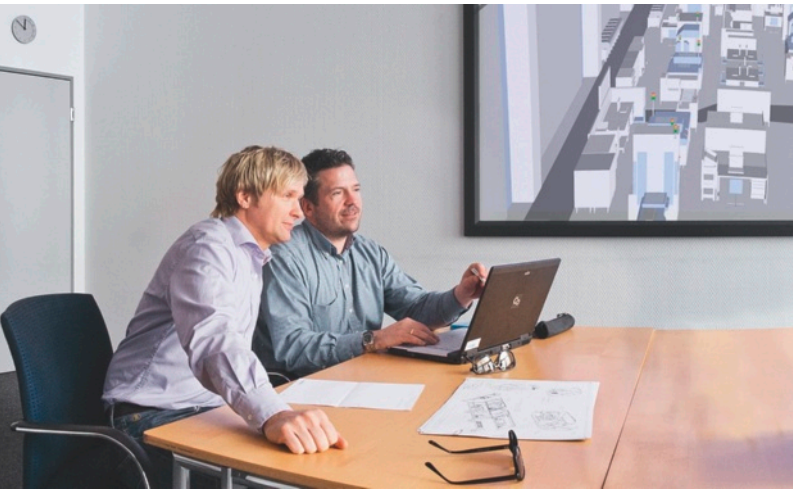
PEFC/04-31-1267

The products and systems described in this catalog are manufactured/distributed under application of a certified quality and environmental management system in accordance with ISO 9001:2008 (Certified Registration No. DE-001258 QM08) and ISO 14001:2004/Cor 1:2009 (Certified Registration No. DE-001258 UM).
The certificate is recognized by all IQNet countries.



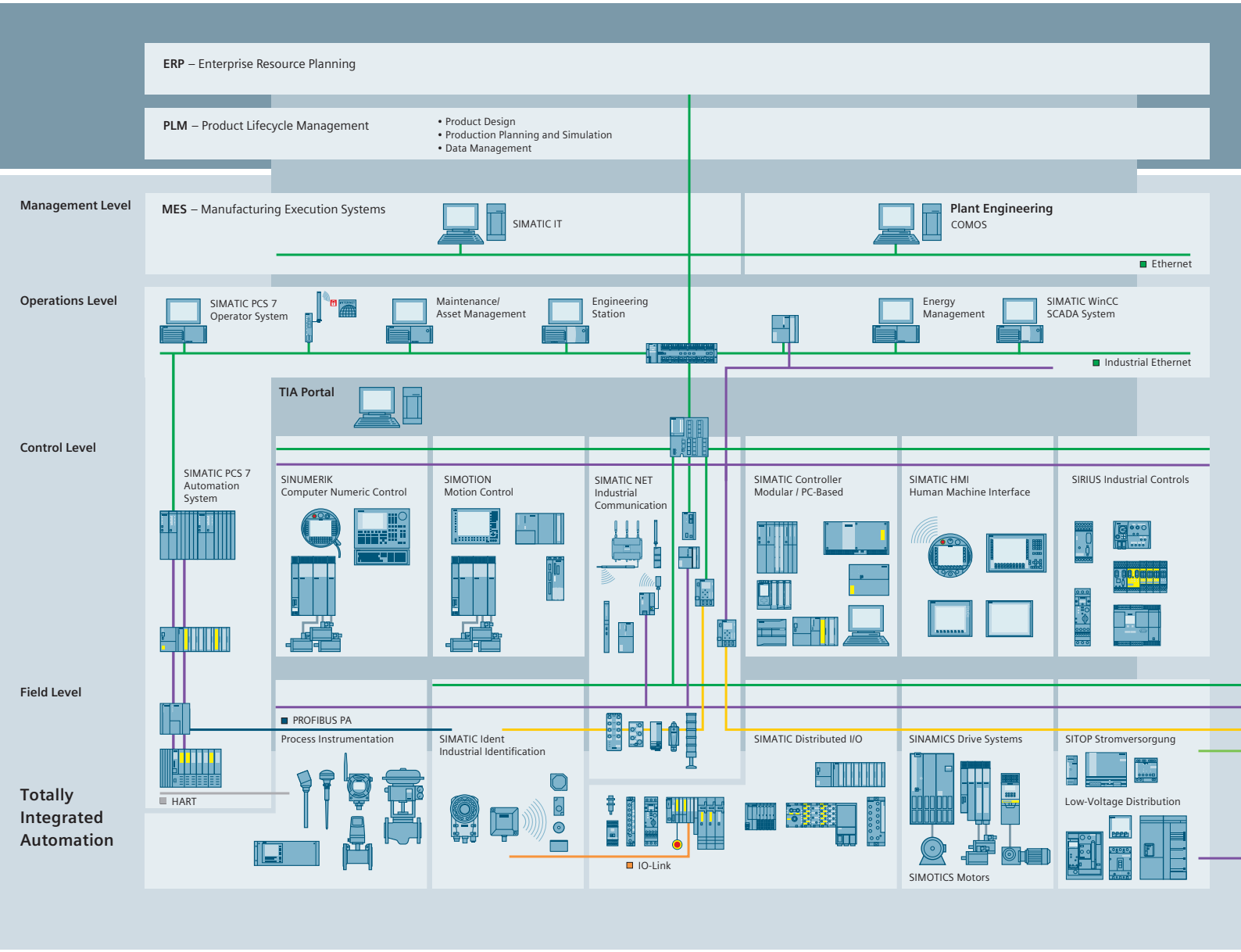
Answers for industry.

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

The Siemens Industry Sector 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. With a global workforce of more than 100 000 employees, the Industry Sector comprises the Industry Automation, Drive Technologies, and Customer Services divisions, as well as the Metals Technologies Business Unit.

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.

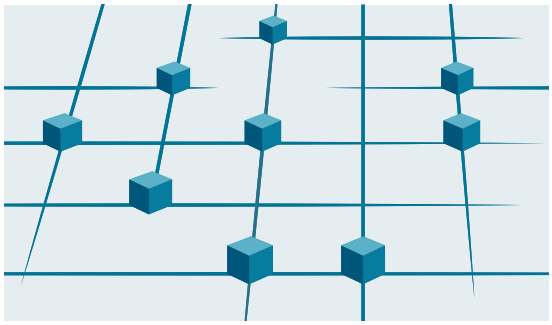
Market launch times can be reduced by up to 50% due to the combination of powerful automation technology and industrial software from Siemens Industry. At the same time, the costs for energy or waste water for a manufacturing company can be reduced significantly. In this way, we increase our customers' 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

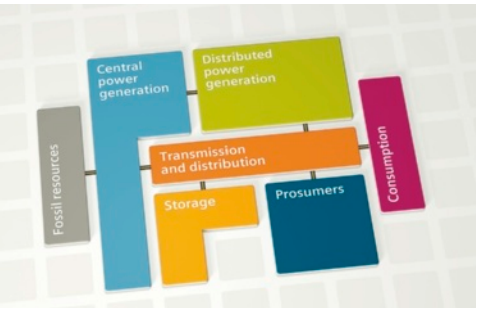
Making things right with Totally Integrated Automation

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.

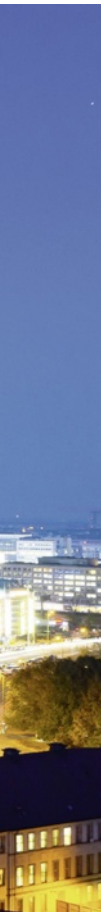


Comprehensive answers for power distribution in complex energy systems – from Siemens

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.

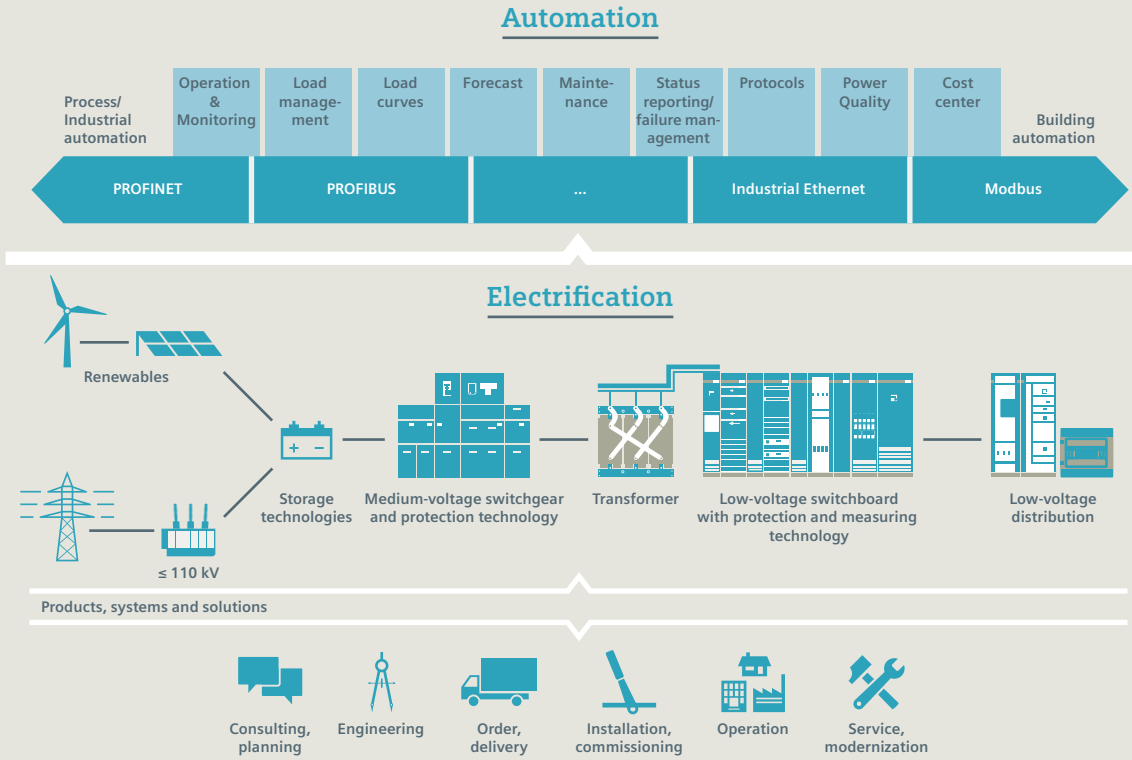
More information: www.siemens.com/tip



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 G120P is an important element of a Siemens Integrated Drive System, contributing significantly to increased efficiency, productivity, and availability in industrial production processes.

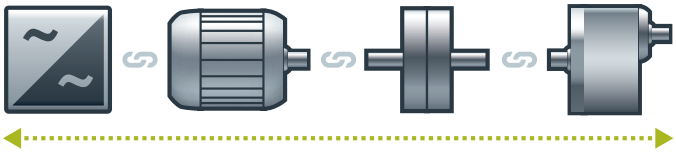
Integrated Drive Systems are Siemens' trendsetting answer to the high degree of complexity that characterizes drive and automation technology today. The world's only true one-stop solution for entire drive systems is characterized in particular by its threefold integration:

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.



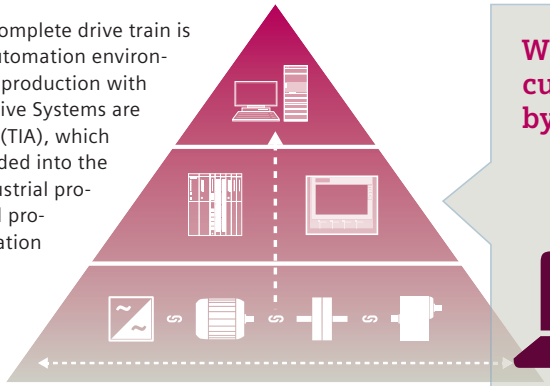
You can boost the availability of your application or plant to up to

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.



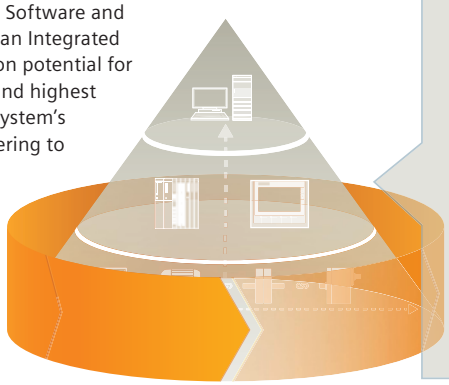
With TIA Portal you can cut your engineering time by up to

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

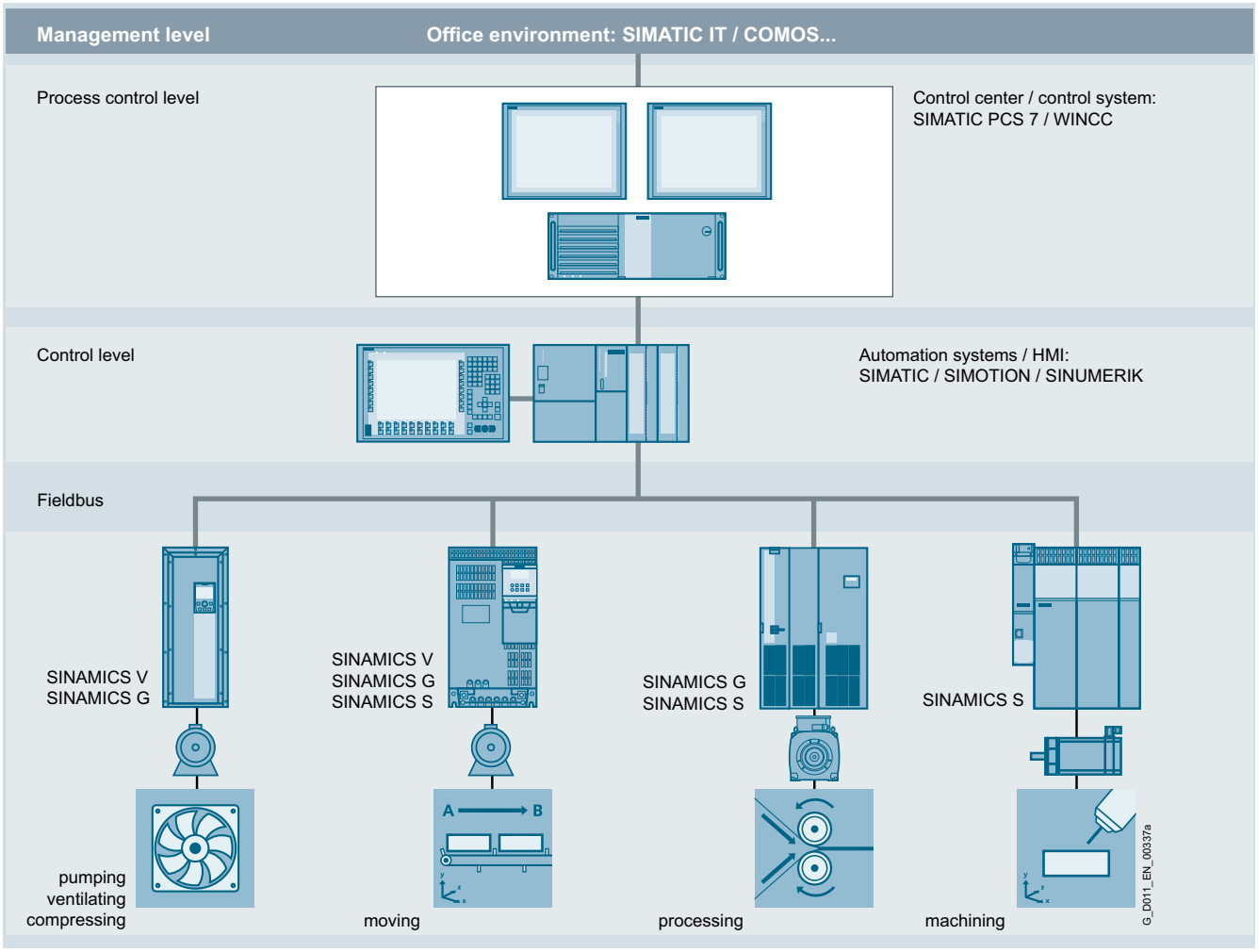
15%

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. Depending on the type of drive, a wide range of communications options are available for connection to the automation system:

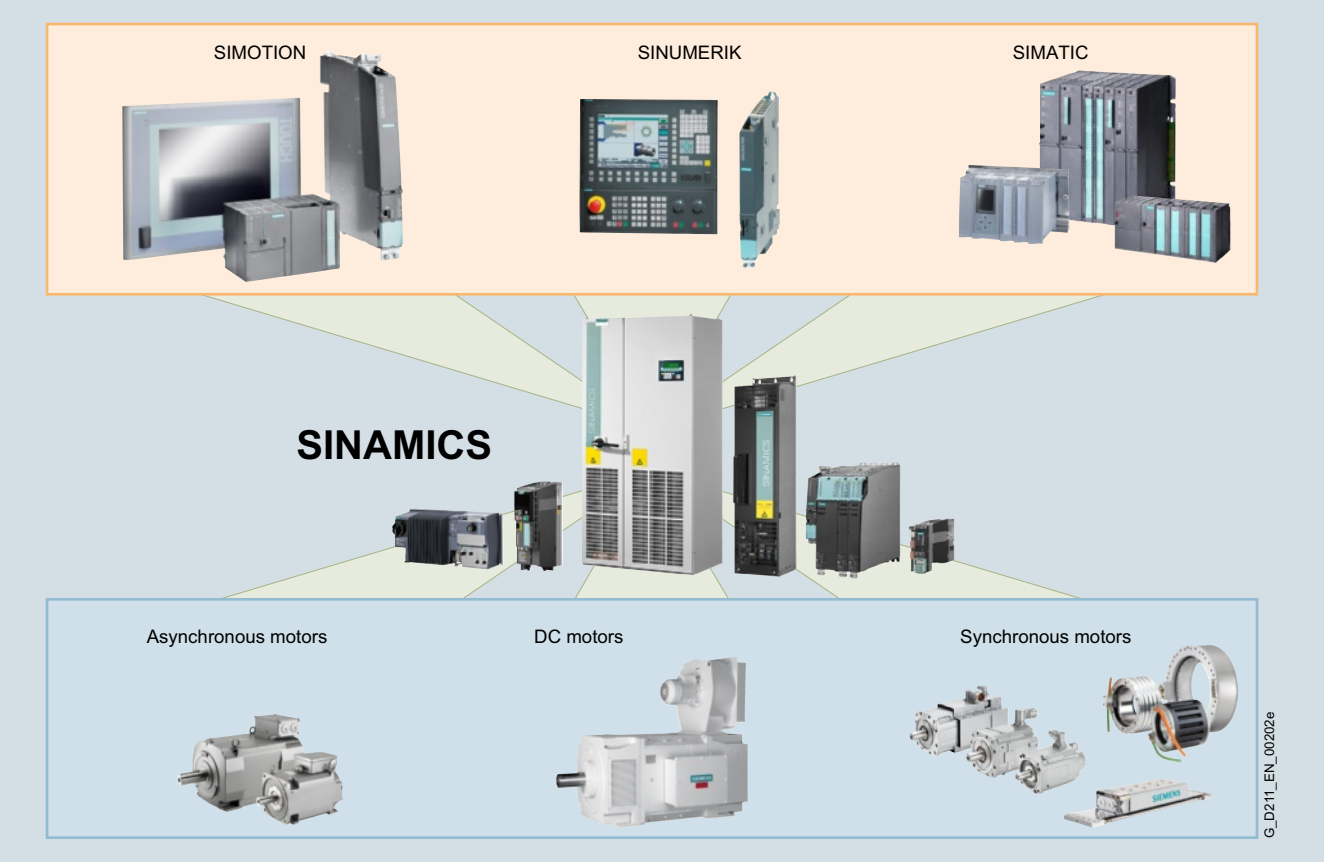
- PROFINET
- EtherNet/IP
- PROFIBUS
- AS-Interface
- USS
- CANopen
- Modbus RTU
- BACnet MS/TP

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 (continued)



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.

Overview (continued)

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 braking energy produced is converted to heat using braking resistors. SINAMICS G and SINAMICS S drives with regenerative feedback capability efficiently supply the resulting braking energy back into the line and therefore need no 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.

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.

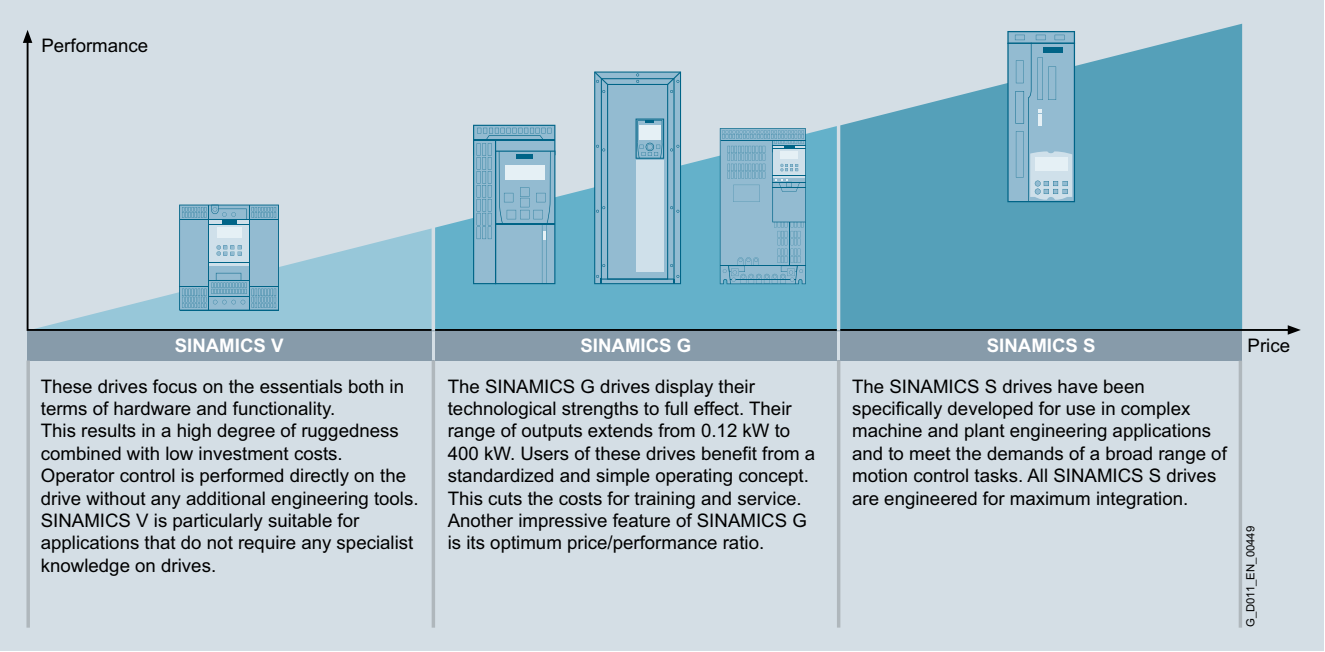
SINAMICS in combination with energy-saving motors

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.

Overview (continued)

Variants

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



Platform concept

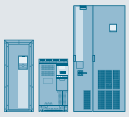
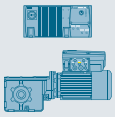
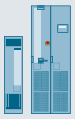
All SINAMICS variants are based on a platform concept. Joint hardware and software components, as well as standardized tools for dimensioning, configuration, and commissioning tasks ensure high-level integration across all components. SINAMICS handles a wide variety of drive tasks with no system gaps.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

Quality management according to 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 (continued)

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 ... 15 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 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)									

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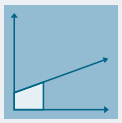
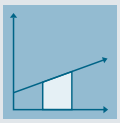
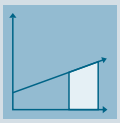
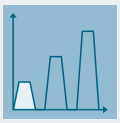
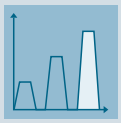
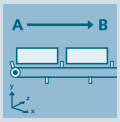
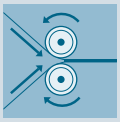
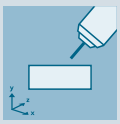
Application

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

The SINAMICS G120P is a cost-effective, space-saving drive for pump and fan drives, which is easy to operate and has a wide range of functions. As a consequence, it is especially well-suited for building automation, the process industry, the water industry as well as for heating, ventilation and air conditioning (HVAC).

Specific application examples and descriptions are available on the Internet at
www.siemens.com/sinamics-applications

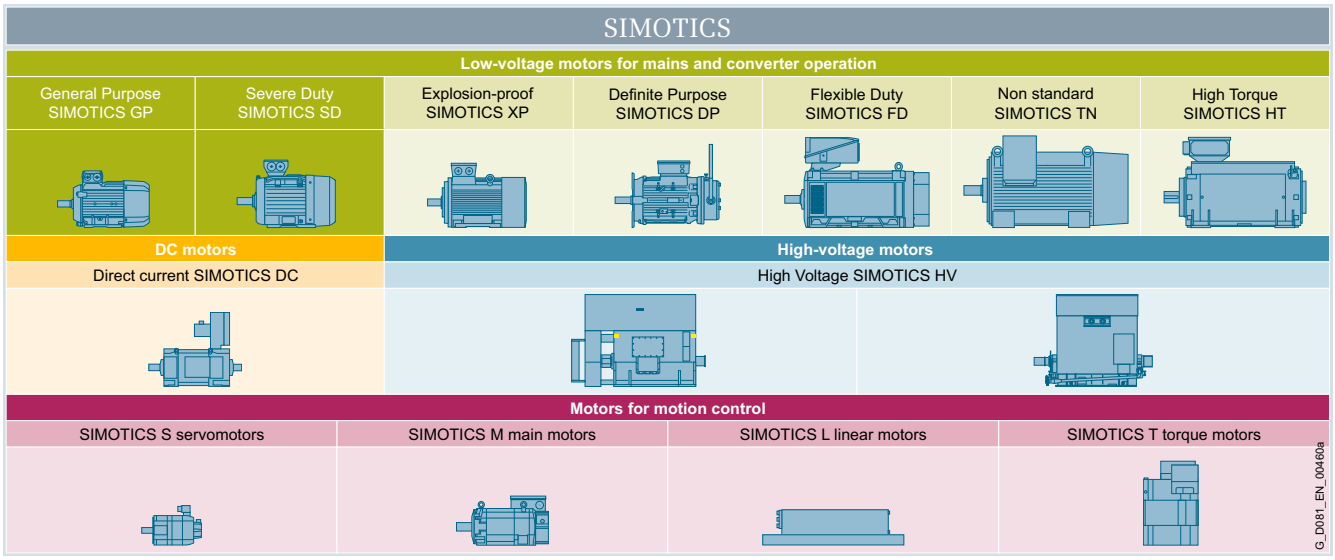
More information

You may also be interested in these drives:

- More performance in the control cabinet in IP20 degree of protection ⇒ SINAMICS G130, SINAMICS G150
- With 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, SINAMICS S120, SINAMICS S150

[1] Industry-specific drives.

Overview



SIMOTICS overview

More 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.

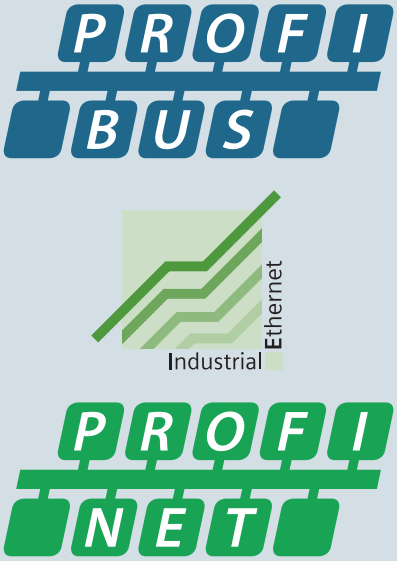
A dense network of skill sets and servicing expertise around the world

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 drives 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.



Communication overview

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.

Log	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 sever	–	–	–	–	–	–	–	–		–	–	–	–	✓	✓

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.

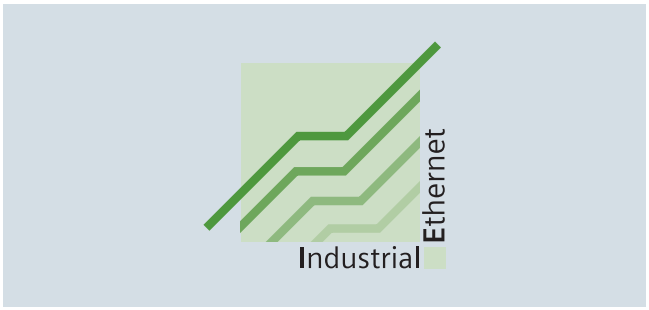
PROFIBUS with SINAMICS

SINAMICS uses the PROFIBUS DP protocol.

The SINAMICS drives can only be used as DP slaves.

2

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:

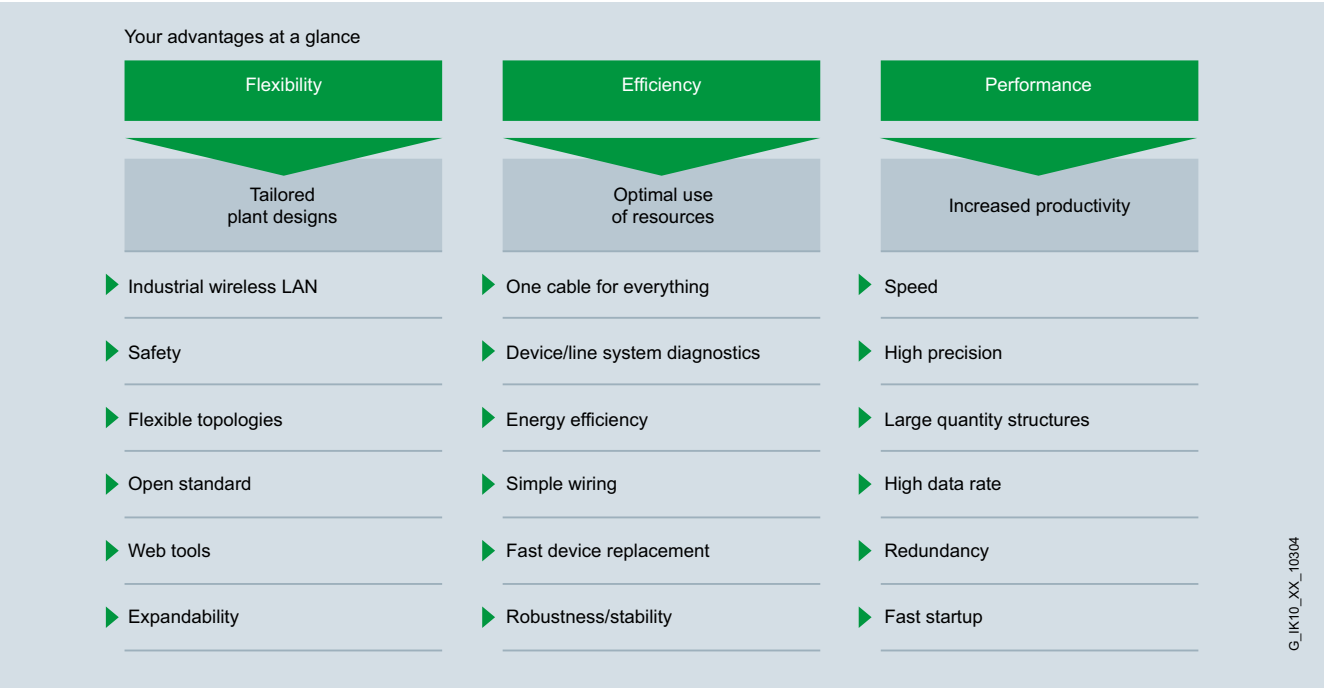
- HTTP/HTTPS: Hypertext Transfer Protocol
  Using a standard Internet browser, it is possible to retrieve predefined Web pages containing diagnostic information from the device. Furthermore, user-defined Web pages can be stored in the device which contain information defined by the user.
- SNMP: Simple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

Overview

PROFINET – the Ethernet standard for automation

PROFINET is the world's leading Industrial Ethernet standard for automation with more that 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).

2

Overview (continued)

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.

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 by 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 a 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 (continued)

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.

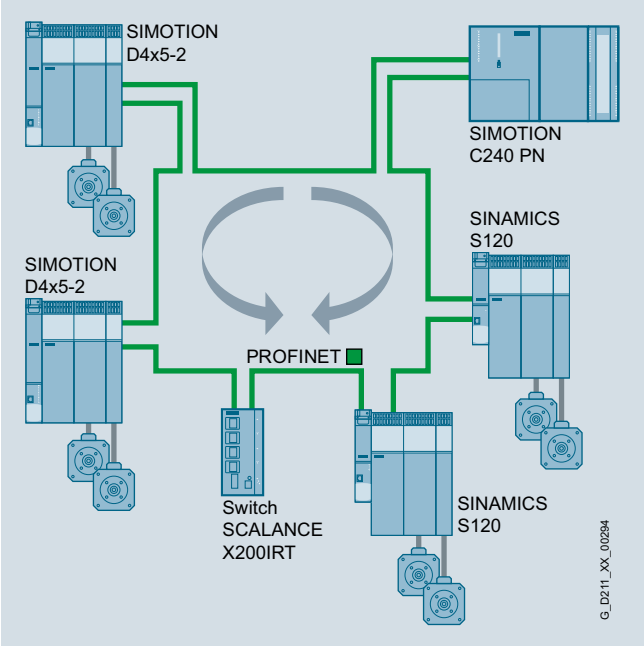
High data rate

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 converters 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 an 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 converters 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

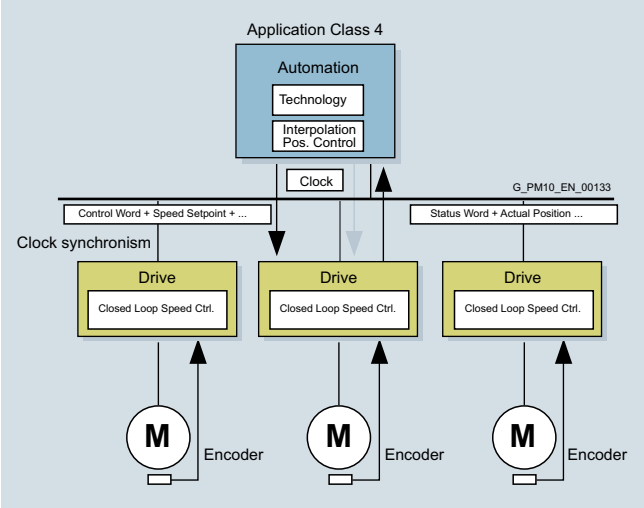
The device model of PROFIdrive

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.de

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

USS and Modbus RTU

Overview

As simple fieldbus protocols, USS (Universal Serial Interface protocol of Siemens AG, 1992) and Modbus RTU can be used both cyclically and acyclically. Based on RS 485 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.

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 RS 485 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 frequency converters, especially developed for fluid flow machines (such as pumps, fans and compressor drives), use the application profile "BACnet application-specific controller" in building automation.

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, frequency converters with CANopen support the "CiA 402 Electrical Drives" device profile.

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.

Notes

SINAMICS G120P and SINAMICS G120P Cabinet pump, fan, compressor converters

Overview

Energy awareness, economy and energy efficiency – Siemens offers an answer to these trends with the SINAMICS G120P series. SINAMICS G120P is an innovative and user-friendly converter series that has been specifically optimized for pump, fan and compressor applications in the industrial environment, but also for tasks in building automation.

SINAMICS G120P offers efficient drive solutions for a wide range of applications. With their easy handling, the drives support the user not only in optimizing existing frequency-controlled drives, but also in converting fixed-speed drives and in retrofitting.

The SINAMICS G120P converter series features advanced hardware and software functions that make a substantial contribution towards saving energy and thus make more careful use of our natural resources.

SINAMICS G120P in degree of protection IP20, PM230 Power Module, frame size FSB

SINAMICS G120P in degree of protection IP20, PM240 Power Module, frame size FSF

SINAMICS G120P in degree of protection IP20, PM330 Power Module, frame size GX

SINAMICS G120P in degree of protection IP20, PM230 Power Module, frame size FSC Push Through (with Control Unit and BOP-2 operator panel)

Overview (continued)

SINAMICS G120P in degree of protection IP55, PM230 Power Module, frame size FSB

SINAMICS G120P Cabinet, converter cabinet units, versions A and C

User-friendliness

A high degree of user-friendliness is one of the main characteristics of the SINAMICS G120P:

- Operator panel with plain text display and extensive diagnostics functions (IOP)
- Simple application-specific commissioning wizard "on board" the Intelligent Operator Panel (IOP)
- Plain text scripts for integration in the STARTER commissioning tool for more demanding applications
- SINAMICS SD card for storing parameter settings, cloning and local commissioning

Guided operation using wizards

SINAMICS G120P offers two basic options for guided parameterization/setting in a target application:

Commissioning of simple applications
using application wizards integrated in the IOP operator panel

The following wizards are available:

- Basic commissioning
- Pump with/without PID control
- Fan with/without PID control
- Compressor with/without PID control
- PID setting
- Boost setting

An appropriate connection diagram for the standard wiring can be found in the documentation of the IOP operator panel.

Commissioning of more demanding applications
using plain text scripts through solution-based dialog prompting in the STARTER commissioning tool

The wizards support setpoint input for process values and setpoint exchange using timers. Not only this, they also allow easy integration of technological functions such as cascade connection or sleep mode. The connection diagrams for standard wiring that are required for the wizards are also supplied.

The following wizards are available:

- Fan for exhaust air with closed-loop control of pressure/air quality
- Fan for cooling tower with closed-loop control of cooling water temperature
- Fan for stairwell with closed-loop control of pressure and essential service mode
- Fan for tunnel/parking garage with closed-loop control of air quality and essential service mode
- Fan for supply air with closed-loop control of pressure/temperature/air quality/flowrate
- Pumps with closed-loop control of pressure
- Pumps with closed-loop control of level
- Pumps for cooling circuits with closed-loop control of temperature
- Compressor with closed-loop control of pressure

Benefits

Energy efficiency

SINAMICS G120P increases the efficiency and minimizes energy consumption in the complete process chain. The converter has integrated hardware as well as software functions as standard. The main features are:

- PM230 Power Modules up to 90 kW: Extremely high active power component of apparent power thanks to efficient converter topology. For the same drive power, the converter requires a lower line current than comparable converters
- Flux reduction through automatic adaptation of the motor current to the prevailing load conditions with closed-loop control modes U/f (ECO) and vector without sensor (SLVC) and savings of up to 5 % under partial load conditions
- Sleep mode dependent on setpoints in the process
- Automatic switchover to line operation is possible at rated speed (bypass mode)

Optimum energy management through innovative technology

Optimized converter topology for PM230 Power Modules

- Compliance with limits for line harmonic distortion in accordance with EN 61000-3-2, EN 61000-3-12 or EN 61000-3-4 (R_{SCE} >250) without a line reactor
- Reduced apparent power as a result of high power factor λ = 0.9
- Smaller cable cross-sections can be used because mains power consumption is reduced

Flux reduction

- Energy-saving capability through automatic adaptation of the magnetic flux in the motor to prevailing load conditions (lower motor losses under partial load conditions)

Sleep mode

- Energy-saving capability: The drive is started/stopped in line with the currently applicable setpoints, thereby avoiding excessive mechanical loads

High efficiency

- $\eta \geq$ 98 % with PM330 Power Module

Straightforward, application-specific commissioning and operation using operator panel

- Local commissioning without specialized knowledge of converters using application-specific wizards
- Unique: SINAMICS SD memory card for pre-parameterization and cloning of converter data sets
- Data backup for easy replacement
- USB port integrated on the CU230P-2 Control Unit for commissioning and easy diagnostics using the STARTER commissioning tool
- Commissioning/diagnostics and controlling of converters

Flexible deployment of integrated functions

- PLC functions for local control tasks
  Flexible use of integrated function blocks → No need for additional, external components
- 4 integrated PID controllers
  Distributed closed-loop control for motor-independent process control without higher-level controller (PLC)
- 3 freely programmable digital timer switches
  Control for freely selectable daily and weekly programs

Flexible deployment across a wide range of applications

- Isolated digital inputs with separate potential group
- Isolated analog inputs
  - Potential transfer avoided
  - EMC-compliant design without the need for additional components in line with process industry requirements
- Pt1000/LG-Ni1000 temperature sensor interface
  - Direct connection of temperature sensors without external interface unit
- 230 V AC relay
  - Direct control for auxiliary equipment, e.g. reactor or valve actuators
- Terminal strip X9 at PM330 Power Module
  - Input for external 24 V DC supply
  - Input for external alarm/fault
  - Input for EMERGENCY OFF/EMERGENCY STOP
  - Control of the main contactor
  - "DC link charged" enable signal

Flexible, modular system for challenging environmental conditions

- Operation possible at ambient temperatures of up to +60 °C
- Modular design of power and control electronics
  - Power range can be easily extended
  - Fast exchange of power units
- Removable operator panel for built-in and wall-mounted units
  - Protection against unauthorized access
  - Degree of protection IP54/UL Type 12 with IOP operator panel
  - Degree of protection IP55/UL Type 12 with BOP-2 operator panel or blanking cover
  - Degree of protection IP20 with IOP, BOP-2 operator panel or blanking cover
  - Degree of protection IP20 Push Through variant with IOP, BOP-2 operator panel or blanking cover
- Replacement of individual components without the need for reinstallation

Application

The specialist for pump, fan and compressor applications

SINAMICS G120P is ideally suited to pump applications (centrifugal pumps, oscillating and rotating pumps), fan applications (axial and radial fans) and compressor applications (cooling compressors, air and gas compressors). They are deployed in industrial environments, in the process industry and water industry and in building automation.

SINAMICS G120P is ideally suited for the following applications:

- Circulating pumps for heating and cooling systems
- Pumps for pressure boosting stations
- Level control
- Fans in cooling towers
- Fans for air intake and discharge
- Fans for tunnels and multi-storey car parks
- Fans for stairwells
- Compressors for supplying compressed air

Reliable operation in harsh environments

SINAMICS G120P is suitable for use under harsh environmental conditions:

- High degree of protection IP55 for installation outside the control cabinet
- Degree of protection IP20 for use in the control cabinet
- Degree of protection IP20 Push Through variant for space-saving design when installed in the control cabinet; power losses are dissipated using an external heat sink, separate internal air circulation
- Operation possible at ambient temperatures of up to 60 °C
- Coated modules for increased resistance to humidity and dust

Design

Modular design

SINAMICS G120P is a modular converter system comprising the following components.

- CU230P-2 Control Unit
- Power Module
- Operator panel or blanking cover

CU230P-2 Control Unit

The converter communication interface is defined when selecting the Control Unit (FW V4.5 and higher).

- CU230P-2 HVAC → USS, Modbus RTU, BACnet MS/TP, P1 protocol
- CU230P-2 DP → PROFIBUS
- CU230P-2 PN → PROFINET, EtherNet/IP
- CU230P-2 CAN → CANopen

The CU230P-2 Control Unit controls and monitors the Power Module and the connected motor using several different closed-loop control modes that can be selected. It supports communication to a local or central controller as well as to the monitoring equipment, and allows all process-related auxiliary equipment and external components to be connected (sensors, valves, contactors, etc.).

Power Modules

The Power Module is selected depending on the power requirement and the application. State-of-the-art IGBT technology with pulse-width modulation is used for reliable and flexible motor operation. Comprehensive protection functions provide a high degree of protection for the Power Module and the motor.

Power Modules in degree of protection IP20 are intended for installation in a control cabinet.

- PM230 with integrated filter class A, degree of protection IP20, 0.37 kW to 75 kW
- PM230 without integrated line filter, degree of protection IP20, 0.37 kW to 75 kW
- PM230 with integrated filter class A, degree of protection IP20 Push Through variant, 3 kW to 18.5 kW
- PM230 without integrated line filter, degree of protection IP20 Push Through variant, 3 kW to 18.5 kW
- PM240 with integrated filter class A, degree of protection IP20, 90 kW
- PM240 without integrated line filter, degree of protection IP20, 110 kW and 132 kW
- PM330 without integrated line filter, degree of protection IP20, 160 kW to 400 kW

Power Modules in degree of protection IP55 can be erected as distributed units outside a control cabinet.

- PM230 with integrated filter class A, degree of protection IP55/UL Type 12, 0.37 kW up to 90 kW
- PM230 with integrated filter class B, degree of protection IP55/UL Type 12, 0.37 kW up to 90 kW

SINAMICS G120P units rated for outputs of 110 kW and higher are also available as control cabinet version SINAMICS G120P Cabinet.

- SINAMICS G120P Cabinet, degrees of protection IP20/IP21/IP23/IP43/IP54, 110 kW to 400 kW, with and without line filter

Operator panel or blanking cover

- Intelligent Operator Panel IOP, degree of protection IP54/UL Type 12
  The IOP supports 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. Integrated application wizards interactively guide users through the commissioning process.
- Basic Operator Panel BOP-2, degree of protection IP55/UL Type 12
  The menu prompting and the 2-line display facilitate fast and user-friendly commissioning of the converter. Simultaneous display of the parameter and parameter value, as well as parameter filtering, means that basic commissioning of a drive can also be performed without a printed parameter list.
- Blanking cover, degree of protection IP55/UL Type 12
  The blanking cover is mounted on the Power Module in place of an operator panel, provided that an operator panel is not required.

The operator panel supports user-friendly local commissioning, control and diagnostics and enables complete converter data sets to be pre-parameterized and cloned.

Note regarding PM230 Power Modules in degree of protection IP55/UL Type 12:
It is essential to plug on an operator panel or the blanking cover in order to achieve degree of protection IP54/IP55/UL Type 12.

Line-side power components

The following line-side power components are available for the SINAMICS G120P converters:

- Line filters for PM230, PM240, PM330 Power Modules and SINAMICS G120P Cabinet
  With an additional line filter, the Power Module complies with a higher radio interference class.
- Line reactors for PM240, PM330 Power Modules and SINAMICS G120P Cabinet
  Line reactors smooth the current drawn by the converter 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 converter.
  SINAMICS G120P Cabinet units feature a cabinet-integrated line reactor as standard.

Note:
A line reactor must not be used in combination with a PM230 Power Module.

Recommended line-side power components

This is a recommendation for additional line-side components, such as fuses and circuit breakers/motor starter protectors (line-side components must be dimensioned in accordance with IEC standards).

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

Design (continued)

DC link components

The following DC link components are available for the SINAMICS G120P converters:

- Braking Module for PM330 Power Modules and SINAMICS G120P Cabinet
  A Braking Module and the matching braking resistor are required to achieve controlled braking of a drive. The Braking Module houses the power electronics and the associated control circuit.
- Braking resistors for PM240, PM330 Power Modules and SINAMICS G120P Cabinet
  Excess energy in the DC link is dissipated via the braking resistor.

Load-side power components

Various load-side power components are available for the SINAMICS G120P converters. These allow the use of longer shielded motor cables and increase the motor service life:

- 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 filters for PM230 and PM240 Power Modules
  Sine-wave filters limit the 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.
- dv/dt filters plus VPL for PM330 Power Modules and SINAMICS G120P Cabinet
  dv/dt filters plus VPL (Voltage Peak Limiter) limit the voltage rate-of-rise dv/dt to values of <500 V/µs and the typical voltage peaks to values according to the limit value curve to IEC/TS 60034-17: 2006.
  Standard motors with standard insulation and without insulated bearings with a supply voltage of up to 480 V can be used for converter operation if a dv/dt filter plus VPL is used.
- dv/dt filters compact plus VPL for PM330 Power Modules and SINAMICS G120P Cabinet
  dv/dt filters compact plus VPL (Voltage Peak Limiter) limit the voltage rate-of-rise dv/dt to values of <1600 V/µs and the typical voltage peaks to values according to the limit value curve A to IEC 60034-25: 2007.
  Standard motors with standard insulation and without insulated bearings with a supply voltage of up to 480 V can be used for converter operation if a dv/dt filter compact plus VPL is used.

Optional accessories

- Line-side cable connection, left, for PM330 Power Modules
- Push Through mounting frame for PM230 Power Modules
- SINAMICS memory card (SD card)
- PC inverter connection kit 2
- Shield connection kits for CU230P-2 Control Units (with PM230 and PM240 Power Modules)
- Shield connection kits and shield plates for PM230 and PM240 Power Modules

Spare parts

- Shield plate for PM230 Power Modules
- Mounting set for PM230 Power Modules
- Terminal Cover Kit (for PM230 and PM240 Power Modules)
- Fan units and replacement fans

Function

Technology function

Functions specific to pumps, fans and compressors are already integrated, e.g.:

- **Automatic restart**
  Application restart after a power failure or fault occurrence
- **Flying restart**
  Connection of the converter when the motor is running
- **Flux reduction**
  Automatic adaptation of the motor current to the prevailing load conditions in U/f control mode (ECO mode) as well as in sensorless vector control mode
- **Cascade control**
  Load-dependent connection and disconnection of a maximum of three additional motors by the converter in order to provide a largely constant output power (implemented by means of an additional external circuit)
- **Sleep mode**
  Startup or shutdown of the drive when the relevant value drops below an external setpoint or the internal PID controller setpoint
- **4 integrated PID controllers**
  One PID controller for controlling the drive speed as a function of pressure, temperature, flowrate, fill level, air quality and other process variables, and a further three PID controllers with freely configurable outputs, e.g. for controlling valves (heating, cooling) or flaps
- **Emergency mode**
  Special converter operating mode that enhances the availability of the drive system in the event of a fire
- **Multi-zone control**
  - Closed-loop control of a zone with up to 3 sensors for pressure or temperature, or
  - Closed-loop control of two independent zones, each with one sensor
- **Bypass mode**
  When the setpoint is reached or a fault occurs, the system changes over to line operation (implemented by means of an additional external circuit)
- **Programmable timer switches**
- **Real-time clock**
  For time-dependent process controls, e.g. to reduce the temperature of a heating control at night
- **Freely programmable logical function blocks**
  For simulating simple PLC functions

Configuration

The following electronic configuring guides and engineering tools are available for SINAMICS G120P:

SinaSave energy efficiency tool

Use SinaSave to calculate potential energy savings

The web-based tool SinaSave can be used to estimate the potential savings which can be achieved over the entire lifecycle, e.g. for pump and fan applications, thanks to SINAMICS. The tool takes into consideration all important plant-specific quantities, such as the power and load data of the application, the relevant control mode and the operation profile for the application in question. The result delivered by the tool specifies the potential enery savings which can be achieved with the specific application in conjunction with the Integrated Drive System or the drive component. The tool also provides a monetary evaluation of the potential savings and estimates the payback period.

Drive Technology Configurator (DT Configurator)

Configuring drive system products

The Drive Technology Configurator (DT Configurator) helps you to select the optimum products for an application – starting with gear units, motors, drives and the associated options and components and ending with controllers, software licenses and connection technology. Whether with little or detailed knowledge of products: You can easily, quickly and efficiently configure your particular drive using product group preselectors, targeted navigation through selection menus or by entering article numbers directly to select the products.

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

Configuring made simple and systematic

The SIZER for Siemens Drives engineering tool is used to configure low-voltage drive systems: Using the application as the prime reference, this tool provides step-by-step support in defining the mechanical system and designing converters, motors and gear units. It also helps the user to configure other system components and to design open-loop and closed-loop control functions. In addition to engineering results such as characteristics, technical specifications and installation and dimensional drawings, SIZER for Siemens Drives also provides calculations pertaining to performance and load-dependent power requirements.

SIZER WEB ENGINEERING engineering tool

Drive engineering – flexible, customized and user-friendly

A solution for a drive task can be identified quickly with the web-based tool: menu-prompted workflows guide the user through the technical selection and dimensioning of products and drive systems, including the accessories.

Based on an integrated inquiry functionality, SIZER WEB ENGINEERING also offers you special customized solutions for applications which cannot be addressed using "Standard Products"; i.e. the focus is on flexibility and customized solutions.

Comprehensive documentation, such as data sheets, startup calculations, dimensional drawings, offer documentation and a lot more are integrated in the tool. The result: Customized solutions for any drive task.

The product groups supported are:

- High-voltage motors
- Low-voltage motors
- Medium-voltage converters
- Low-voltage converters
- DC converters

The tool can also be used to design the following drive systems:

- Medium-voltage systems
- Low-voltage systems
  - Basic single-axis applications for pumps, fans, and compressors
  - Complex applications
    (on condition that: SIZER for Siemens Drives is installed)

STARTER commissioning tool

Commissioning and diagnostics – intelligent and easy

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

SINAMICS Startdrive commissioning tool

SINAMICS engineering in the TIA Portal

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 drives. 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.

Technical specifications

Unless explicitly specified otherwise, the following technical specifications are valid for all the following components of the pump, fan, compressor SINAMICS G120P and SINAMICS G120P Cabinet converters.

Mechanical specifications	
Vibratory load	
• Storage in accordance with EN 60721-3-1	
- Drives and components, frame sizes FSA to FSF	Class 1M2 Deflection: 1.5 mm at 5 ... 9 Hz Acceleration: 0.5 × *g* at 9 ... 200 Hz
- Drives and components, frame sizes GX and HX	Class 1M2 Deflection: 1.5 mm at 5 ... 9 Hz Acceleration: 0.5 × *g* at 9 ... 200 Hz
- SINAMICS G120P Cabinet	Class 1M2 Deflection: 1.5 mm at 5 ... 9 Hz Acceleration: 0.5 × *g* at 9 ... 200 Hz
• Transport [1] acc. to EN 60721-3-2	
- Drives and components, frame sizes FSA to FSC [2]	Class 1M2
- Drives and components, frame sizes FSD to FSF	Class 2M3
- Drives and components, frame sizes GX and HX	Test Fc according to EN 60068-2-6 Deflection: ±1.5 mm at 5 ... 9 Hz Acceleration: 0.5 × *g* at 9 ... 200 Hz
- SINAMICS G120P Cabinet	Class 2M2
• Operation acc. to EN 60721-3-3	
- Drives and components, frame sizes FSA to FSF	Class 3M1
- Drives and components, frame sizes GX and HX	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
- SINAMICS G120P Cabinet	Class 3M2
Shock load	
• Storage in accordance with EN 60721-3-1	
- Drives and components, frame sizes FSA to FSF	Class 1M2
- Drives and components, frame sizes GX and HX	Test Fc according to EN 60068-2-6 Deflection: ±1.5 mm at 5 ... 9 Hz Acceleration: 0.5 × *g* at 9 ... 200 Hz
- SINAMICS G120P Cabinet	Class 1M2 Acceleration: 40 m/s^2 (4 × *g*) at 22 ms
• Transport [1] acc. to EN 60721-3-2	
- Drives and components, frame sizes FSA to FSC [2]	Class 1M2
- Drives and components, frame sizes FSD to FSF	Class 2M3
- Drives and components, frame sizes GX and HX	Test Fc according to EN 60068-2-6 Deflection: ±1.5 mm at 5 ... 9 Hz Acceleration: 0.5 × *g* at 9 ... 200 Hz
- SINAMICS G120P Cabinet	Class 2M2
• Operation acc. to EN 60721-3-3	
- Drives and components, frame sizes FSA to FSC	Class 3M2
- Drives and components, frame sizes FSD to FSF	Class 3M1
- Drives and components, frame sizes GX and HX	Test Ea according to EN 60068-2-27 Acceleration: 49 m/s^2 (5 × *g*) at 30 ms or 147 m/s^2 (15 × *g*) at 11 ms
- SINAMICS G120P Cabinet	Class 3M2

[1] In transport packaging.
[2] In product packaging.

Technical specifications (continued)

Ambient conditions	
Safety class According to EN 61800-5-1	Class I (with protective conductor system) and class III (PELV)
Touch protection	According to EN 50274 and BGV A3 when used as intended
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 Frame sizes FSA to FSF: >40 … 60 °C (104 … 140 °F) see derating characteristics Frame sizes GX, HX and SINAMICS G120P Cabinet: >40 ... 50 °C (>104 ... 122 °F) see derating characteristics
• High overload (HO)	Frame sizes FSA to FSF: 0 ... 50 °C (32 ... 122 °F) without derating >50 ... 60 °C (>122 ... 140 °F) see derating characteristics Frame sizes GX, HX and SINAMICS G120P Cabinet: 0 ... 40 °C (32 ... 104 °F) without derating >40 ... 50 °C (>104 ... 122 °F) see derating characteristics
Installation altitude	Up to 1000 m (3281 ft) above sea level without derating, >1000 m (3281 ft) see derating characteristics
Permissible ambient and coolant temperature (air) during operation for Control Units and supplementary system components	With CU230P-2 HVAC/DP/CAN with/without blanking cover: -10 ... 60 °C (14 ... 140 °F) With CU230P-2 PN with/without blanking cover: -10 ... 55 °C (14 ... 131 °F) With IOP/BOP-2: 0 ... 50 °C (32 ... 122 °F) Derating of 3 K/1000 m applies to Control Units as of an installation altitude of 1000 m above sea level.
Climatic ambient conditions	
• Storage [1] acc. to EN 60721-3-1	
- Drives and components, frame sizes FSA to FSF	Temperature -40 ... +70 °C (-40 ... +158 °F) Relative air humidity <95 %, without condensation
- Drives and components, frame sizes GX, HX und SINAMICS G120P Cabinet	Class 1K4 Temperature -25 ... +55°C (-13 ... +131 °F) Relative air humidity 5 ... 95 %
• Transport [1] acc. to EN 60721-3-2	
- Drives and components, frame sizes FSA to FSF	Class 2K4 Temperature -40 ... +70 °C (-40 ... +158 °F) Max. air humidity 95% at 40 °C (104 °F)
- Drives and components, frame sizes GX, HX und SINAMICS G120P Cabinet	Class 2K3 Temperature -25 ... +70 °C (-13 ... +158 °F), -40°C (104 °F) permissible for 24 h Relative air humidity 5 ... 95 % at 40 °C (104 °F)
• Operation acc. to EN 60721-3-3	
- Drives and components, frame sizes FSA to FSF	Class 3K3 Condensation, splashwater, and ice formation not permitted (EN 60204, Part 1)
- Drives and components, frame sizes GX, HX und SINAMICS G120P Cabinet	Class 3K3 Temperature 0 ... 40°C (32 ... 104 °F), up to 50 °C (122 °F) with derating Relative air humidity 5 ... 95 % 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
Pollution degree According to EN 61800-5-1	2

[1] In transport packaging.

Technical specifications (continued)

Standards	
Compliance with standards	
• Drives and components, frame sizes FSA to FSF	UL [1], cUL [2], CE, C-Tick
• Drives, frame sizes GX and HX	cULus, CE, C-Tick, GOST-R (EAC), KC
• SINAMICS G120P Cabinet	CE, C-Tick, GOST-R (EAC), KC
CE marking	According to Low-Voltage Directive 2006/95/EC
EMC Directive According to EN 61800-3	
• PM240: Frame size FSF with integrated line filter class A	The Power Modules maintain the limit values for conducted interference and noise radiation of Category C2 according to EN 61800-3.
• PM230: Frame sizes FSA to FSF with integrated line filter class A, degree of protection IP20/UL Open Type and IP55/UL Type 12	The Power Modules comply with Category C2 according to EN 61800-3.
• PM230: Frame sizes FSA to FSF with integrated line filter class B, degree of protection IP55/UL Type 12	The Power Modules comply with the limit values for low-frequency line harmonics and conducted interference according to Category C1. They comply with the limit values for field-conducted interference emissions according to Category C2.
• PM330: Frame sizes GX and HX	Category C3 [3]
• PM330: Frame sizes GX and HX with additional line filter class A	Category C2 [4]
• SINAMICS G120P Cabinet	Category C3 [5]
• SINAMICS G120P Cabinet with additional line filter class A	Category C2 [5]

Note:

The EMC product standard EN 61800-3 does not apply directly to a frequency converter but to a PDS (Power Drive System), which comprises the complete circuitry, motor and cables in addition to the converter. The frequency converters on their own do not generally require identification according to the EMC Directive.

[1] UL approval for frame sizes FSD to FSF degree of protection IP55/ UL Type 12 will be available soon.

[2] Applies to PM230 Power Modules frame sizes FSA to FSC and PM240 Power Modules with integrated line filter class A.

[3] Standard configuration: Devices installed in the control cabinet with EMC-compatible configuration, line reactor u_K = 2 %, shielded motor cable (e.g. Protoflex EMC) with max. 100 m cable length. Line harmonics acc. to EN 61000-2-4: Class 3, THD(U) total = 10 % for typical line conditions (R_{SC} >10);THD(I) total: typically 30 ... 45 % (15 > R_{SC} >50).

[4] Use in the second environment, for boundary conditions refer to [3].

[5] For boundary conditions refer to [3], cabinet is configured accordingly in version A.

Technical specifications (continued)

Compliance with standards

CE marking

The SINAMICS G120P and SINAMICS G120P Cabinet converters meet the requirements of the Low-Voltage Directive 2006/95/EC.

Low-Voltage Directive

The converters 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

Converters in UL category NMMS certified to UL and cUL, in compliance with UL508C. UL list numbers E121068 and E192450.

For use in environments with pollution degree 2.

On the Internet at www.ul.com

Machinery Directive

The converters 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.

Functional safety

SINAMICS G120P and SINAMICS G120P Cabinet are not intended for use in installations with functional safety as defined by ISO 13849-1, IEC 61508-x.

EMC Directive

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

The following explanatory information applies to SINAMICS G120P and SINAMICS G120P Cabinet converters supplied by Siemens AG:

- The EMC product standard EN 61800-3 does not apply directly to an converter but to a PDS (Power Drive System), which comprises the complete circuitry, motor and cables in addition to the converter.
- Converters are normally only supplied to experts for installation in machines or systems. An converter must, therefore, only be considered as a component which, on its own, is not subject to the EMC product standard EN 61800-3. The converter's operating instructions, however, specifies the conditions regarding compliance with the product standard if the converter 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 converters 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 converters 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 G120P and SINAMICS G120P Cabinet, 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 converters. Since converters 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. EN 61000-2-4 is applicable to units rated for >75 A.
- Regardless of the configuration with SINAMICS G120P and SINAMICS G120P Cabinet 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.

Technical specifications (continued)

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 G120P product family, the PM230 and PM240 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.

Power Modules

General technical specifications

Power Modules	PM230	PM240	PM330	Cabinet
System operating voltage	380 ... 480 V ±10 % 3 AC			
Grid requirement **Short-circuit power R_{SC}**	>100	>25 >100 line reactor recommended	>33 line reactor recommended	>33 line reactor installed as standard
Input frequency	47 ... 63 Hz			
Output frequency				
• Control mode U/f	0 ... 550 Hz, in firmware V4.7 and higher, due to legal requirements, the maximum output frequency is restricted to 550 Hz	0 ... 550 Hz, in firmware V4.7 and higher, due to legal requirements, the maximum output frequency is restricted to 550 Hz	0 ... 100 Hz	0 ... 100 Hz
• Control type Vector	0 ... 240 Hz	0 ... 240 Hz	0 ... 100 Hz	0 ... 100 Hz
Pulse frequency	4 kHz Higher pulse frequencies up to 16 kHz, see derating data	75 kW HO: 4 kHz From 90 kW HO: 2 kHz Higher pulse frequencies up to 16 kHz, see derating data	Self-adjusting up to 4 kHz	Self-adjusting up to 4 kHz
Power factor λ	0.9	0.7 ... 0.85	0.75 ... 0.93	0.75 ... 0.93
Offset factor cos φ	0.95	0.95	0.96	0.96
Efficiency	86 ... 98 %	95 ... 98 %	>98 %	>98 %
Output voltage, max. As % of input voltage	95 %	95 %	97 %	97 %
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	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	1.35 × base-load current I_L (i.e. 135 % overload) for 3 s **or** 1.1 × base-load current I_L (i.e. 110 % overload) for 60 s within a cycle time of 300 s	1.35 × base-load current I_L (i.e. 135 % overload) for 3 s **or** 1.1 × base-load current I_L (i.e. 110 % overload) for 60 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	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	1.5 × base-load current I_H (i. e. 150 % overload) for 60 s within a cycle time of 300 s	1.5 × base-load current I_H (i. e. 150 % overload) for 60 s within a cycle time of 300 s
Possible braking methods	IP55/UL Type 12: DC braking IP20 standard / IP20 Push Through: DC braking	DC braking Dynamic braking with integrated braking chopper	DC braking Dynamic braking with optional Braking Module	DC braking Dynamic braking with optional Braking Module

Technical specifications (continued)

Power Modules	PM230	PM240	PM330	Cabinet
Overvoltage category acc. to IEC 61800-5-1	III	III	Supply circuits: III Non-supply circuits: II	III
Degree of protection	IP55/UL Type 12 (with BOP-2 or blanking cover) IP54/UL Type 12 (with IOP) IP20 (Standard or Push Through)	IP20	IP20	Standard: IP20 Optional: IP21, IP23, IP43 and IP54
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
Protection functions	• Undervoltage • Overvoltage • Overcurrent/overload • Overtemperature • Ground fault • Short-circuit • Stall protection • Motor blocking protection • Motor overtemperature • Parameter locking			
Rated short-circuit current SCCR acc. to UL (Short-Circuit Current Rating) [1]	Degree of protection IP55 frame sizes FSA to FSC: 40 kA Degree of protection IP55 frame sizes FSD to FSF and degree of protection IP20: 65 kA	65 kA	100 kA [2]	–
Rated short-circuit current acc. to IEC [2]	–	–	100 kA [2]	65 kA [2]
Compliance with standards	UL [3], cUL [4], CE, C-Tick, SEMI F47	UL, cUL, CE, C-Tick, SEMI F47	cULus, CE, C-Tick, GOST-R (EAC), KC	CE, C-Tick, GOST-R (EAC), KC
CE marking	According to Low-Voltage Directive 2006/95/EC, EMC Directive 2004/108/EC			

[1] Applies to industrial control cabinet installations to NEC Article 409/ UL 508A/508C.

[2] In combination with the fuses specified in section Recommended line-side power components.

[3] UL approval for frame sizes FSD to FSF degree of protection IP55/ UL Type 12 will be available soon.

[4] Applies to PM230 Power Modules, frame sizes FSA to FSC.

Accessories

Optional accessories

Shield connection kit 1 for CU230P-2 HVAC/DP/CAN Control Units

Shield connection kit 1 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.

Shield connection kit 3 for CU230P-2 PN, CU240E-2 PN and CU240E-2 PN-F Control Units

Shield connection kit 3 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.

SINAMICS memory card (SD card)

The parameter settings for an inverter can be stored on the SINAMICS SD memory card. The SINAMICS SD card can be used to pre-parameterize inverters and to clone complete inverter data sets. 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 top of the Control Unit.

PC inverter connection kit 2

For controlling and commissioning the inverter directly from a PC, if the STARTER commissioning tool has been installed on the PC.

Installation kit for line-side cable connection, left, for PM330 Power Modules

This installation kit allows supply cables to be brought in from the left-hand side of the PM330 Power Module instead of from the right. It is then possible to install the Power Module in the cabinet without any clearance at the top.

Spare parts

Mounting set for PM230 Power Modules

Depending on the frame size, different mounting sets are available for the PM230 Power Modules.

Fan units for PM230 Power Modules

The PM230 Power Module is equipped with an internal and an external fan unit. Both of these can be replaced if necessary.

Replacement fans

The fans for PM240 and PM330 Power Modules are available to order as replacement fans.

3

Overview

The core elements of a fully integrated drive system are frequency converters, motors, couplings and gear units. Siemens offers all the required components in top manufacturing quality from a single source, perfectly integrated – operating perfectly together, for all performance classes.

As a standard solution or tailored to individual requirements: no other provider on the market is able to offer a comparable portfolio. All Siemens drive components are optimally tuned to each other so that they interact ideally in every application.

Siemens Integrated Drive Systems turn simple drive components into real systems. Drive technology based on IDS ensures maximum productivity, energy efficiency and reliability in every automation environment and over the entire product lifecycle.

SINAMICS G120P frequency converters

SINAMICS G120P is an important element of an integrated drive system. The core elements of a fully integrated drive system are SINAMICS G120P frequency converters, motor types SIMOTICS SD and GP (VSD10 Line) and SIMOTICS FD, as well as couplings. Vertical integration is achieved by the CU230P-2 Control Unit.

Drives with a quadratic load torque ($M \sim n^2$), such as drives for pumps and fans, require the full torque at rated speed. Generally, increased starting torques or load surges do not occur.

The following applies to selection of a suitable converter for drives with a quadratic load torque: The rated current of the converter must be at least as large as the motor current at full torque in the required load point.

SIMOTICS GP and SIMOTICS SD – VSD10 Line motors

VSD10 Line motors are based on the 1LE1 platform and are available in the following versions:

- General Purpose Motors, shaft heights from 100 to 160, aluminum
- Severe Duty Motors, shaft heights from 100 to 315, cast iron

These motors are optimized for operation on a SINAMICS G120 converter. They are intended solely for converter-fed operation. They must not be connected directly to a mains supply.

Functions integrated as standard for converter-fed operation:

- Insulation system optimized for converter-fed operation
- Built-in KTY temperature sensor
- Bearing insulation NDE (shaft height 280/315)

The VSD10 Line provides the link to the SIMOTICS FD series for converter-fed motors.

SIMOTICS FD motors

The new generation of SIMOTICS FD (Flexible Duty) low-voltage motors will be available in four shaft heights with output ratings ranging from 200 kW to 1600 kW and higher. SIMOTICS FD motors are based on an innovative modular system. These air-cooled and water-cooled converter motors are available in numerous different versions and therefore suitable for a wide variety of applications in a host of different industries.

SIMOTICS FD in shaft height 315 is designed for operation on SINAMICS G120P converters with output ratings ranging from 200 kW to 400 kW.

FLENDER couplings as part of the drive system

A drive system comprises individual machines, including the motor and gear unit. Couplings combine these components and frequently also establish the connection to the driven machine.

The coupling can perform other tasks in addition to the transmission of rotary motion and torque, such as:

- Compensation for **shaft misalignment** with low restorative forces
- Influencing of intrinsic torsional frequency and **damping**
- Torque interruption or limitation in response to **overload**
- Electrical **insulation**, noise insulation
- Function in **explosive environments**

Overview of relevant coupling types

Design	Description
N-EUPEX	**Flexible cam coupling** • Universally implementable coupling for compensation of shaft misalignment • Suitable for plug-in installation and easy assembly with three-part design Rated torque: 19 ... 62000 Nm
RUPEX	**Flexible pin and bush coupling** • Fail-safe, universal coupling for medium to very high torques with a good misalignment range • Compact design, low weights and mass moments of inertia • Suitable for plug-in assembly Rated torque: 200 ... 1300000 Nm
ARPEX	**All-steel couplings** • Zero-backlash, torsionally rigid coupling • For compensating radial, angular, and axial shaft misalignment by means of two flexible lamella packages made of stainless spring steel • Easy assembly thanks to compact lamella packages Rated torque: 92 ... 1450000 Nm

Overview tables

The tables on the following pages provide an overview of all converters with associated line-side and load-side components, DC link components and motors and of the available Control Units with operator panels. A guide as to which couplings are compatible with specific motors can be found in Catalog Add-On D 35 AO.

Overview (continued)

SINAMICS G120P

Rated power [1]		Rated output current I_{rated} [2]	Power based on the base-load current I_H [3]		Base-load current I_H [3]	**Power Module**			
400 V	460 V		400 V	460 V		Frame size	Type	Without integrated line filter	With integrated line filter class A (category C2)
kW	hp	A	**kW**	hp	A			Article No.	Article No.
Power Modules, degree of protection IP20, 380 ... 480 V 3 AC									
0.37	0.50	1.3	**0.25**	0.33	0.9	FSA	PM230	**6SL3210-1NE11-3UL1**	**6SL3210-1NE11-3AL1**
0.55	0.75	1.7	**0.37**	0.5	1.3	FSA	PM230	**6SL3210-1NE11-7UL1**	**6SL3210-1NE11-7AL1**
0.75	1.0	2.2	**0.55**	0.75	1.7	FSA	PM230	**6SL3210-1NE12-2UL1**	**6SL3210-1NE12-2AL1**
1.1	1.5	3.1	**0.75**	1.0	2.2	FSA	PM230	**6SL3210-1NE13-1UL1**	**6SL3210-1NE13-1AL1**
1.5	2.0	4.1	**1.1**	1.5	3.1	FSA	PM230	**6SL3210-1NE14-1UL1**	**6SL3210-1NE14-1AL1**
2.2	3.0	5.9	**1.5**	2.0	4.1	FSA	PM230	**6SL3210-1NE15-8UL1**	**6SL3210-1NE15-8AL1**
3.0	4.0	7.7	**2.2**	3.0	5.9	FSA	PM230	**6SL3210-1NE17-7UL1**	**6SL3210-1NE17-7AL1**
4.0	5.0	10.2	**3.0**	4.0	7.7	FSB	PM230	**6SL3210-1NE21-0UL1**	**6SL3210-1NE21-0AL1**
5.5	7.5	13.2	**4.0**	5.0	10.2	FSB	PM230	**6SL3210-1NE21-3UL1**	**6SL3210-1NE21-3AL1**
7.5	10	18	**5.5**	7.5	13.2	FSB	PM230	**6SL3210-1NE21-8UL1**	**6SL3210-1NE21-8AL1**
11.0	15	26	**7.5**	10	18	FSC	PM230	**6SL3210-1NE22-6UL1**	**6SL3210-1NE22-6AL1**
15.0	20	32	**11.0**	15	26	FSC	PM230	**6SL3210-1NE23-2UL1**	**6SL3210-1NE23-2AL1**
18.5	25	38	**15.0**	20	32	FSC	PM230	**6SL3210-1NE23-8UL1**	**6SL3210-1NE23-8AL1**
22	30	45	**18.5**	25	38	FSD	PM230	**6SL3210-1NE24-5UL0**	**6SL3210-1NE24-5AL0**
30	40	60	**22**	30	45	FSD	PM230	**6SL3210-1NE26-0UL0**	**6SL3210-1NE26-0AL0**
37	50	75	**30**	40	60	FSE	PM230	**6SL3210-1NE27-5UL0**	**6SL3210-1NE27-5AL0**
45	60	90	**37**	50	75	FSE	PM230	**6SL3210-1NE28-8UL0**	**6SL3210-1NE28-8AL0**
55	75	110	**45**	60	90	FSF	PM230	**6SL3210-1NE31-1UL0**	**6SL3210-1NE31-1AL0**
75	100	145	**55**	75	110	FSF	PM230	**6SL3210-1NE31-5UL0**	**6SL3210-1NE31-5AL0**
90	125	178	**75**	100	145	FSF	PM240	**6SL3224-0BE37-5UA0**	**6SL3224-0BE37-5AA0**
110	150	205	**90**	125	178	FSF	PM240	**6SL3224-0BE38-8UA0**	–
132	200	250	**110**	150	205	FSF	PM240	**6SL3224-0BE41-1UA0**	–
160	200	300	**132**	150	240	GX	PM330	**6SL3310-1PE33-0AA0**	–
200	250	370	**160**	200	296	GX	PM330	**6SL3310-1PE33-7AA0**	–
250	300	460	**200**	200	368	GX	PM330	**6SL3310-1PE34-6AA0**	–
315	400	585	**250**	300	468	HX	PM330	**6SL3310-1PE35-8AA0**	–
355	450	655	**250**	300	491	HX	PM330	**6SL3310-1PE36-6AA0**	–
400	500	735	**315**	350	551	HX	PM330	**6SL3310-1PE37-4AA0**	–
Power Modules Push Through, degree of protection IP20, 380 ... 480 V 3 AC									
3.0	4	7.7	**2.2**	3	5.9	FSA	PM230	**6SL3211-1NE17-7UL1**	**6SL3211-1NE17-7AL1**
7.5	10	18	**5.5**	7.5	13.2	FSB	PM230	**6SL3211-1NE21-8UL1**	**6SL3211-1NE21-8AL1**
18.5	25	38	**15.0**	20	32	FSC	PM230	**6SL3211-1NE23-8UL1**	**6SL3211-1NE23-8AL1**

[1] PM230 and PM240:
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).
PM330:
Rated power based on the base-load current I_L. The base-load current I_L is based on the duty cycle for low overload (LO).

[2] PM230 and PM240:
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).

Overview (continued)

SINAMICS G120P				
Rated power		Power Module	**Control Unit** CU230P-2	**Operator panel** IOP or BOP-2
400 V	460 V			
kW	hp	Type	Article No.	Article No.
Power Modules, degree of protection IP20, 380 ... 480 V 3 AC				
0.37	0.50	6SL3210-1NE11-3 . L1	**6SL3243-0BB30-1■ ■ ■**	**6SL3255-0AA00-4■ ■ ■**
0.55	0.75	6SL3210-1NE11-7 . L1		
0.75	1.0	6SL3210-1NE12-2 . L1		
1.1	1.5	6SL3210-1NE13-1 . L1		
1.5	2.0	6SL3210-1NE14-1 . L1		
2.2	3.0	6SL3210-1NE15-8 . L1		
3.0	4.0	6SL3210-1NE17-7 . L1		
4.0	5.0	6SL3210-1NE21-0 . L1		
5.5	7.5	6SL3210-1NE21-3 . L1		
7.5	10	6SL3210-1NE21-8 . L1		
11.0	15	6SL3210-1NE22-6 . L1		
15.0	20	6SL3210-1NE23-2 . L1		
18.5	25	6SL3210-1NE23-8 . L1		
22	30	6SL3210-1NE24-5 . L0		
30	40	6SL3210-1NE26-0 . L0		
37	50	6SL3210-1NE27-5 . L0		
45	60	6SL3210-1NE28-8 . L0		
55	75	6SL3210-1NE31-1 . L0		
75	100	6SL3210-1NE31-5 . L0		
90	125	6SL3224-0BE37-5 . L0		
110	150	6SL3224-0BE38-8UA0		
132	200	6SL3224-0BE41-1UA0		
160	200	6SL3310-1PE33-0AA0		
200	250	6SL3310-1PE33-7AA0		
250	300	6SL3310-1PE34-6AA0		
315	400	6SL3310-1PE35-8AA0		
355	450	6SL3310-1PE36-6AA0		
400	500	6SL3310-1PE37-4AA0		
Power Modules, Push Through, degree of protection IP20, 380 ... 480 V 3 AC				
3.0	4	6SL3211-1NE17-7 . L1	**6SL3243-0BB30-1■ ■ ■**	**6SL3255-0AA00-4■ ■ ■**
7.5	10	6SL3211-1NE21-8 . L1		
18.5	25	6SL3211-1NE23-8 . L1		

SINAMICS G120P Control Unit	Fieldbus protocols			
CU230P-2 HVAC	• USS • Modbus RTU • BACnet MS/TP • P1 Protokoll	**H**	**A**	**3**
CU230P-2 DP	• PROFIBUS DP	**P**	**A**	**3**
CU230P-2 PN	• PROFINET • EtherNet/IP	**F**	**A**	**0**
CU230P-2 CAN	• CANopen	**C**	**A**	**3**

Operator panel				
IOP	Intelligent Operator Panel	**J**	**A**	**0**
BOP-2	Basic Operator Panel	**C**	**A**	**1**

Overview (continued)

SINAMICS G120P

Rated power		Power Module	Line-side components				
			Line filter class A (Category C2)	**Line filter class B** (Category C1)	**Line reactor**	**Main contactor**	**Switch disconnector**
400 V	460 V		Only in combination with Power Modules without integrated line filter	Only in combination with Power Modules without integrated line filter			
kW	hp	Type	Article No.	Article No.	Article No.	Type	Type
Power Modules, degree of protection IP20, 380 ... 480 V 3 AC							
0.37	0.50	6SL3210-1NE11-3 . L1	–	**6SL3203-0BE17-7BA0**	–	–	–
0.55	0.75	6SL3210-1NE11-7 . L1	–	**6SL3203-0BE17-7BA0**	–	–	–
0.75	1.0	6SL3210-1NE12-2 . L1	–	**6SL3203-0BE17-7BA0**	–	–	–
1.1	1.5	6SL3210-1NE13-1 . L1	–	**6SL3203-0BE17-7BA0**	–	–	–
1.5	2.0	6SL3210-1NE14-1 . L1	–	**6SL3203-0BE17-7BA0**	–	–	–
2.2	3.0	6SL3210-1NE15-8 . L1	–	**6SL3203-0BE17-7BA0**	–	–	–
3.0	4.0	6SL3210-1NE17-7 . L1	–	**6SL3203-0BE17-7BA0**	–	–	–
4.0	5.0	6SL3210-1NE21-0 . L1	–	**6SL3203-0BE21-8BA0**	–	–	–
5.5	7.5	6SL3210-1NE21-3 . L1	–	**6SL3203-0BE21-8BA0**	–	–	–
7.5	10	6SL3210-1NE21-8 . L1	–	**6SL3203-0BE21-8BA0**	–	–	–
11.0	15	6SL3210-1NE22-6 . L1	–	**6SL3203-0BE23-8BA0**	–	–	–
15.0	20	6SL3210-1NE23-2 . L1	–	**6SL3203-0BE23-8BA0**	–	–	–
18.5	25	6SL3210-1NE23-8 . L1	–	**6SL3203-0BE23-8BA0**	–	–	–
22	30	6SL3210-1NE24-5 . L0	–	**6SL3203-0BE27-5BA0**	–	–	–
30	40	6SL3210-1NE26-0 . L0	–	**6SL3203-0BE27-5BA0**	–	–	–
37	50	6SL3210-1NE27-5 . L0	–	**6SL3203-0BE31-1BA0**	–	–	–
45	60	6SL3210-1NE28-8 . L0	–	**6SL3203-0BE31-1BA0**	–	–	–
55	75	6SL3210-1NE31-1 . L0	–	**6SL3203-0BE31-8BA0**	–	–	–
75	100	6SL3210-1NE31-5 . L0	–	**6SL3203-0BE31-8BA0**	–	–	–
90	125	6SL3224-0BE37-5 . L0	–	–	**6SE6400-3CC11-7FD0**	–	–
110	150	6SL3224-0BE38-8UA0	**6SL3203-0BE32-5AA0**	–	**6SL3000-0CE32-3AA0**	–	–
132	200	6SL3224-0BE41-1UA0	**6SL3203-0BE32-5AA0**	–	**6SL3000-0CE32-8AA0**	–	–
160	200	6SL3310-1PE33-0AA0	**6SL3000-0BE33-1AA0**	–	**6SL3000-0CE33-3AA0**	**3RT1456** [1]	**3KL5730**
200	250	6SL3310-1PE33-7AA0	**6SL3000-0BE33-1AA0**	–	**6SL3000-0CE35-1AA0**	**3RT1456** [1]	**3KL5730**
250	300	6SL3310-1PE34-6AA0	**6SL3000-0BE35-0AA0**	–	**6SL3000-0CE35-1AA0**	**3RT1456** [2]	**3KL6130**
315	400	6SL3310-1PE35-8AA0	**6SL3760-0MR00-0AA0**	–	**6SL3000-0CE36-3AA0**	**3RT1456** [2]	**3KL6130**
355	450	6SL3310-1PE36-6AA0	**6SL3760-0MR00-0AA0**	–	**6SL3000-0CE37-7AA0**	**3RT1466** [2]	**3KL6230**
400	500	6SL3310-1PE37-4AA0	**6SL3760-0MR00-0AA0**	–	**6SL3000-0CE37-7AA0**	**3RT1466** [2]	**3KL6230**
Power Modules, Push Through, degree of protection IP20, 380 ... 480 V 3 AC							
3.0	4	6SL3211-1NE17-7 . L1	–	**6SL3203-0BE17-7BA0**	–	–	–
7.5	10	6SL3211-1NE21-8 . L1	–	**6SL3203-0BE21-8BA0**	–	–	–
18.5	25	6SL3211-1NE23-8 . L1	–	**6SL3203-0BE23-8BA0**	–	–	–

[1] 2 units
[2] 3 units

Overview (continued)

SINAMICS G120P					
Rated power		Power Module	Recommended line-side power components		DC link components
			IEC-compliant		Braking Module / braking resistor
			Fuse	Circuit breaker	
400 V	460 V		Type 3NE1 (UL) or 3NA3		
kW	hp	Type	Article No.	Article No.	Article No.
Power Modules, degree of protection IP20, 380 ... 480 V 3 AC					
0.37	0.50	6SL3210-1NE11-3 . L1	**3NE1813-0**	–	–
0.55	0.75	6SL3210-1NE11-7 . L1	**3NE1813-0**	–	–
0.75	1.0	6SL3210-1NE12-2 . L1	**3NE1813-0**	–	–
1.1	1.5	6SL3210-1NE13-1 . L1	**3NE1813-0**	–	–
1.5	2.0	6SL3210-1NE14-1 . L1	**3NE1813-0**	–	–
2.2	3.0	6SL3210-1NE15-8 . L1	**3NE1813-0**	–	–
3.0	4.0	6SL3210-1NE17-7 . L1	**3NE1813-0**	–	–
4.0	5.0	6SL3210-1NE21-0 . L1	**3NE1815-0**	–	–
5.5	7.5	6SL3210-1NE21-3 . L1	**3NE1815-0**	–	–
7.5	10	6SL3210-1NE21-8 . L1	**3NE1815-0**	–	–
11.0	15	6SL3210-1NE22-6 . L1	**3NE1817-0**	–	–
15.0	20	6SL3210-1NE23-2 . L1	**3NE1817-0**	–	–
18.5	25	6SL3210-1NE23-8 . L1	**3NE1817-0**	–	–
22	30	6SL3210-1NE24-5 . L0	**3NE1818-0**	–	–
30	40	6SL3210-1NE26-0 . L0	**3NE1820-0**	–	–
37	50	6SL3210-1NE27-5 . L0	**3NE1021-0**	–	–
45	60	6SL3210-1NE28-8 . L0	**3NE1022-0**	–	–
55	75	6SL3210-1NE31-1 . L0	**3NE1224-0**	–	–
75	100	6SL3210-1NE31-5 . L0	**3NE1225-0**	–	–
90	125	6SL3224-0BE37-5 . L0	**3NA3144**	**3VL4731-.DC36- ....** *)	Integrated braking chopper **6SE6400-4BD24-0FA0**
110	150	6SL3224-0BE38-8UA0	–	**3VL4731-.DC36- ....** *)	Integrated braking chopper **6SE6400-4BD26-0FA0**
132	200	6SL3224-0BE41-1UA0	–	**3VL4731-.DC36- ....** *)	Integrated braking chopper **6SE6400-4BD26-0FA0**
160	200	6SL3310-1PE33-0AA0	**3NA3260**	–	**6SL3760-1AE32-6AA0/ 6SE7032-5FS87-2DC0**
200	250	6SL3310-1PE33-7AA0	**3NA3365**	–	
250	300	6SL3310-1PE34-6AA0	**3NE1435-2**	–	
315	400	6SL3310-1PE35-8AA0	**3NE1437-2**	–	
355	450	6SL3310-1PE36-6AA0	**3NE1438-2**	–	
400	500	6SL3310-1PE37-4AA0	**3NE1448-2**	–	
Power Modules, Push Through, degree of protection IP20, 380 ... 480 V 3 AC					
3.0	4	6SL3211-1NE17-7 . L1	**3NE1813-0**	–	–
7.5	10	6SL3211-1NE21-8 . L1	**3NE1815-0**	–	–
18.5	25	6SL3211-1NE23-8 . L1	**3NE1817-0**	–	–

*) See Catalog LV 10 for Article No. supplements.

Overview (continued)

SINAMICS G120P						
Rated power		Power Module	Load-side power components			
400 V	460 V		Output reactor	Sine-wave filter	dv/dt filter plus VPL	dv/dt filter compact plus VPL
kW	hp	Type	Article No.	Article No.	Article No.	Article No.
Power Modules, degree of protection IP20, 380 ... 480 V 3 AC						
0.37	0.50	6SL3210-1NE11-3 . L1	**6SL3202-0AE16-1CA0**	–	–	–
0.55	0.75	6SL3210-1NE11-7 . L1	**6SL3202-0AE16-1CA0**	–	–	–
0.75	1.0	6SL3210-1NE12-2 . L1	**6SL3202-0AE16-1CA0**	–	–	–
1.1	1.5	6SL3210-1NE13-1 . L1	**6SL3202-0AE16-1CA0**	–	–	–
1.5	2.0	6SL3210-1NE14-1 . L1	**6SL3202-0AE16-1CA0**	–	–	–
2.2	3.0	6SL3210-1NE15-8 . L1	**6SL3202-0AE16-1CA0**	–	–	–
3.0	4.0	6SL3210-1NE17-7 . L1	**6SL3202-0AE18-8CA0**	–	–	–
4.0	5.0	6SL3210-1NE21-0 . L1	**6SL3202-0AE21-8CA0**	–	–	–
5.5	7.5	6SL3210-1NE21-3 . L1	**6SL3202-0AE21-8CA0**	–	–	–
7.5	10	6SL3210-1NE21-8 . L1	**6SL3202-0AE21-8CA0**	–	–	–
11.0	15	6SL3210-1NE22-6 . L1	**6SL3202-0AE23-8CA0**	–	–	–
15.0	20	6SL3210-1NE23-2 . L1	**6SL3202-0AE23-8CA0**	–	–	–
18.5	25	6SL3210-1NE23-8 . L1	**6SL3202-0AE23-8CA0**	–	–	–
22	30	6SL3210-1NE24-5 . L0	**6SE6400-3TC03-8DD0**	**6SL3202-0AE24-6SA0**	–	–
30	40	6SL3210-1NE26-0 . L0	**6SE6400-3TC05-4DD0**	**6SL3202-0AE26-2SA0**	–	–
37	50	6SL3210-1NE27-5 . L0	**6SE6400-3TC08-0ED0**	**6SL3202-0AE28-8SA0**	–	–
45	60	6SL3210-1NE28-8 . L0	**6SE6400-3TC07-5ED0**	**6SL3202-0AE28-8SA0**	–	–
55	75	6SL3210-1NE31-1 . L0	**6SE6400-3TC14-5FD0**	**6SL3202-0AE31-5SA0**	–	–
75	100	6SL3210-1NE31-5 . L0	**6SE6400-3TC15-4FD0**	**6SL3202-0AE31-5SA0**	–	–
90	125	6SL3224-0BE37-5 . L0	**6SE6400-3TC14-5FD0**	**6SL3202-0AE31-8SA0**	–	–
110	150	6SL3224-0BE38-8UA0	**6SL3000-2BE32-1AA0**	**6SL3000-2CE32-3AA0**	–	–
132	200	6SL3224-0BE41-1UA0	**6SL3000-2BE32-6AA0**	**6SL3000-2CE32-3AA0**	–	–
160	200	6SL3310-1PE33-0AA0	**6SL3000-2BE33-2AA0**	–	**6SL3000-2DE35-0AA0**	**6SL3000-2DE35-0EA0**
200	250	6SL3310-1PE33-7AA0	**6SL3000-2BE33-8AA0**	–	**6SL3000-2DE35-0AA0**	**6SL3000-2DE35-0EA0**
250	300	6SL3310-1PE34-6AA0	**6SL3000-2BE35-0AA0**	–	**6SL3000-2DE35-0AA0**	**6SL3000-2DE35-0EA0**
315	400	6SL3310-1PE35-8AA0	**6SL3000-2AE36-1AA0**	–	**6SL3000-2DE38-4AA0**	**6SL3000-2DE38-4EA0**
355	450	6SL3310-1PE36-6AA0	**6SL3000-2AE38-4AA0**	–	**6SL3000-2DE38-4AA0**	**6SL3000-2DE38-4EA0**
400	500	6SL3310-1PE37-4AA0	**6SL3000-2AE38-4AA0**	–	**6SL3000-2DE38-4AA0**	**6SL3000-2DE38-4EA0**
Power Modules, Push Through, degree of protection IP20, 380 ... 480 V 3 AC						
3.0	4	6SL3211-1NE17-7 . L1	**6SL3202-0AE18-8CA0**	–	–	–
7.5	10	6SL3211-1NE21-8 . L1	**6SL3202-0AE21-8CA0**	–	–	–
18.5	25	6SL3211-1NE23-8 . L1	**6SL3202-0AE23-8CA0**	–	–	–

Overview (continued)

SINAMICS G120P

Rated power		Rated output current I_{rated}	Power Module	Recommended SIMOTICS motors (see Catalogs D 81.1 and D 81.8 for article numbers and details)			
				SIMOTICS GP General Purpose	**SIMOTICS SD Severe Duty**	**SIMOTICS FD Flexible Duty High Efficiency**	
400 V	460 V			Aluminum, 4-pole	Cast iron, 4-pole	Cast iron, 4-pole Air cooling/ self-ventilation	Cast iron, 4-pole Air cooling/ self-ventilation
kW	hp	A	Type	Type	Type	Type	Type
Power Modules, degree of protection IP20, 380 ... 480 V 3 AC							
0.37	0.50	1.3	6SL3210-1NE11-3 . L1	–	–	–	–
0.55	0.75	1.7	6SL3210-1NE11-7 . L1	**1LE1001-0DB2.-....**	–	–	–
0.75	1.0	2.2	6SL3210-1NE12-2 . L1	**1LE1001-0DB3.-....**	–	–	–
1.1	1.5	3.1	6SL3210-1NE13-1 . L1	**1LE1001-0EB0.-....**	–	–	–
1.5	2.0	4.1	6SL3210-1NE14-1 . L1	**1LE1001-0EB4.-....**	–	–	–
2.2	3.0	5.9	6SL3210-1NE15-8 . L1	**1LE1092-1AB4.-....**	**1LE1592-1AB4.-....**	–	–
3.0	4.0	7.7	6SL3210-1NE17-7 . L1	**1LE1092-1AB5.-....**	**1LE1592-1AB5.-....**	–	–
4.0	5.0	10.2	6SL3210-1NE21-0 . L1	**1LE1092-1BB2.-....**	**1LE1592-1BB2.-....**	–	–
5.5	7.5	13.2	6SL3210-1NE21-3 . L1	**1LE1092-1CB0.-....**	**1LE1592-1CB0.-....**	–	–
7.5	10	18	6SL3210-1NE21-8 . L1	**1LE1092-1CB2.-....**	**1LE1592-1CB2.-....**	–	–
11.0	15	26	6SL3210-1NE22-6 . L1	**1LE1092-1DB2.-....**	**1LE1592-1DB2.-....**	–	–
15.0	20	32	6SL3210-1NE23-2 . L1	**1LE1092-1DB4.-....**	**1LE1592-1DB4.-....**	–	–
18.5	25	38	6SL3210-1NE23-8 . L1	–	**1LE1592-1EB2.-....**	–	–
22	30	45	6SL3210-1NE24-5 . L0	–	**1LE1592-1EB4.-....**	–	–
30	40	60	6SL3210-1NE26-0 . L0	–	**1LE1592-2AB5.-....**	–	–
37	50	75	6SL3210-1NE27-5 . L0	–	**1LE1592-2BB0.-....**	–	–
45	60	90	6SL3210-1NE28-8 . L0	–	**1LE1592-2BB2.-....**	–	–
55	75	110	6SL3210-1NE31-1 . L0	–	**1LE1592-2CB2.-....**	–	–
75	100	145	6SL3210-1NE31-5 . L0	–	**1LE1592-2DB0.-....**	–	–
90	125	178	6SL3224-0BE37-5 . L0	–	**1LE1592-2DB2.-....**	–	–
110	150	205	6SL3224-0BE38-8UA0	–	**1LE1592-3AB0.-....**	–	–
132	200	250	6SL3224-0BE41-1UA0	–	**1LE1592-3AB2.-....**	–	–
160	200	300	6SL3310-1PE33-0AA0	–	**1LE1592-3AB4.-....**	–	–
200	250	370	6SL3310-1PE33-7AA0	–	**1LE1592-3AB5.-....**	–	**1LQ1222-3AC11-4...**
250	300	460	6SL3310-1PE34-6AA0	–	–	**1LM1222-3AC31-3...**	**1LQ1222-3AB11-1...**
315	400	585	6SL3310-1PE35-8AA0	–	–	**1LM1222-3AC71-3...** **1LM1222-3AB31-2...** **1LM1222-3AB51-1...**	**1LQ1222-3AB31-2...** **1LQ1222-3AC51-3...**
355	450	655	6SL3310-1PE36-6AA0	–	–	–	**1LQ1222-3AB71-1...** **1LQ1222-3AC71-3...**
400	500	735	6SL3310-1PE37-4AA0	–	–	–	**1LQ1222-3AB71-2...**
Power Modules, Push Through, degree of protection IP20, 380 ... 480 V 3 AC							
3.0	4	7.7	6SL3211-1NE17-7 . L1	**1LE1092-1AB5.-....**	**1LE1592-1AB5.-....**	–	–
7.5	10	18	6SL3211-1NE21-8 . L1	**1LE1092-1CB2.-....**	**1LE1592-1CB2.-....**	–	–
18.5	25	38	6SL3211-1NE23-8 . L1	–	**1LE1592-1EB2.-....**	–	–

Recommended **FLENDER standard couplings** Types N-EUPEX, RUPEX and ARPEX, refer to Catalog Add-On D 35 AO and Catalog MD 10.1.

Overview (continued)

SINAMICS G120P									
Rated power [1]		Rated output current I_{rated} [2]	Power based on the base-load current I_H [3]		Base-load current I_H [3]	**Power Module**			
400 V	460 V		400 V	460 V		Frame size	Type	With integrated line filter class A (Category C2)	With integrated line filter class B (Category C1)
kW	hp	A	**kW**	hp	A			Article No.	Article No.
Power Modules, degree of protection IP55/UL Type 12, 380 ... 480 V 3 AC									
0.37	0.50	1.3	**0.25**	0.33	0.9	FSA	PM230	**6SL3223-0DE13-7AA0**	**6SL3223-0DE13-7BA0**
0.55	0.75	1.7	**0.37**	0.5	1.3	FSA	PM230	**6SL3223-0DE15-5AA0**	**6SL3223-0DE15-5BA0**
0.75	1.0	2.2	**0.55**	0.75	1.7	FSA	PM230	**6SL3223-0DE17-5AA0**	**6SL3223-0DE17-5BA0**
1.1	1.5	3.1	**0.75**	1.0	2.2	FSA	PM230	**6SL3223-0DE21-1AA0**	**6SL3223-0DE21-1BA0**
1.5	2.0	4.1	**1.1**	1.5	3.1	FSA	PM230	**6SL3223-0DE21-5AA0**	**6SL3223-0DE21-5BA0**
2.2	3.0	5.9	**1.5**	2.0	4.1	FSA	PM230	**6SL3223-0DE22-2AA0**	**6SL3223-0DE22-2BA0**
3.0	4.0	7.7	**2.2**	3.0	5.9	FSA	PM230	**6SL3223-0DE23-0AA0**	**6SL3223-0DE23-0BA0**
4.0	5.0	10.2	**3.0**	4.0	7.7	FSB	PM230	**6SL3223-0DE24-0AA0**	**6SL3223-0DE24-0BA0**
5.5	7.5	13.2	**4.0**	5.0	10.2	FSB	PM230	**6SL3223-0DE25-5AA0**	**6SL3223-0DE25-5BA0**
7.5	10	18	**5.5**	7.5	13.2	FSB	PM230	**6SL3223-0DE27-5AA0**	**6SL3223-0DE27-5BA0**
11.0	15	26	**7.5**	10	18	FSC	PM230	**6SL3223-0DE31-1AA0**	**6SL3223-0DE31-1BA0**
15.0	20	32	**11.0**	15	26	FSC	PM230	**6SL3223-0DE31-5AA0**	**6SL3223-0DE31-5BA0**
18.5	25	38	**15.0**	20	32	FSC	PM230	**6SL3223-0DE31-8AA0**	**–**
18.5	25	38	**15.0**	20	32	FSD	PM230	**–**	**6SL3223-0DE31-8BA0**
22	30	45	**18.5**	25	38	FSD	PM230	**6SL3223-0DE32-2AA0**	**6SL3223-0DE32-2BA0**
30	40	60	**22**	30	45	FSD	PM230	**6SL3223-0DE33-0AA0**	**6SL3223-0DE33-0BA0**
37	50	75	**30**	40	60	FSE	PM230	**6SL3223-0DE33-7AA0**	**6SL3223-0DE33-7BA0**
45	60	90	**37**	50	75	FSE	PM230	**6SL3223-0DE34-5AA0**	**6SL3223-0DE34-5BA0**
55	75	110	**45**	60	90	FSF	PM230	**6SL3223-0DE35-5AA0**	**6SL3223-0DE35-5BA0**
75	100	145	**55**	75	110	FSF	PM230	**6SL3223-0DE37-5AA0**	**6SL3223-0DE37-5BA0**
90	125	178	**75**	100	145	FSF	PM230	**6SL3223-0DE38-8AA0**	**6SL3223-0DE38-8BA0**

[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).

Overview (continued)

SINAMICS G120P				
Rated power		Power Module	**Control Unit**	**Operator panel**
400 V	460 V		CU230P-2	IOP or BOP-2
kW	hp	Type	Article No.	Article No.
Power Modules, degree of protection IP55/UL Type 12, 380 ... 480 V 3 AC				
0.37	0.50	6SL3223-0DE13-7 . A0	**6SL3243-0BB30-1■ ■ ■**	**6SL3255-0AA00-4■ ■ ■**
0.55	0.75	6SL3223-0DE15-5 . A0		
0.75	1.0	6SL3223-0DE17-5 . A0		
1.1	1.5	6SL3223-0DE21-1 . A0		
1.5	2.0	6SL3223-0DE21-5 . A0		
2.2	3.0	6SL3223-0DE22-2 . A0		
3.0	4.0	6SL3223-0DE23-0 . A0		
4.0	5.0	6SL3223-0DE24-0 . A0		
5.5	7.5	6SL3223-0DE25-5 . A0		
7.5	10	6SL3223-0DE27-5 . A0		
11.0	15	6SL3223-0DE31-1 . A0		
15.0	20	6SL3223-0DE31-5 . A0		
18.5	25	6SL3223-0DE31-8 . A0		
22	30	6SL3223-0DE32-2 . A0		
30	40	6SL3223-0DE33-0 . A0		
37	50	6SL3223-0DE33-7 . A0		
45	60	6SL3223-0DE34-5 . A0		
55	75	6SL3223-0DE35-5 . A0		
75	100	6SL3223-0DE37-5 . A0		
90	125	6SL3223-0DE38-8 . A0		

SINAMICS G120P Control Unit	Fieldbus protocols			
CU230P-2 HVAC	• USS • Modbus RTU • BACnet MS/TP • P1 Protokoll	**H**	**A**	**3**
CU230P-2 DP	• PROFIBUS DP	**P**	**A**	**3**
CU230P-2 PN	• PROFINET • EtherNet/IP	**F**	**A**	**0**
CU230P-2 CAN	• CANopen	**C**	**A**	**3**

Operator panel				
IOP	Intelligent Operator Panel	**J**	**A**	**0**
BOP-2	Basic Operator Panel	**C**	**A**	**1**

Overview (continued)

SINAMICS G120P						
Rated power		Power Module	Recommended line-side power components		Load-side power components	
			IEC-compliant			
400 V	460 V		Fuse type 3NA3	Circuit breaker/ motor starter protector	Output reactor	Sine-wave filter
kW	hp	Type	Article No.	Article No.	Article No.	Article No.
Power Modules, degree of protection IP55/UL Type 12, 380 ... 480 V 3 AC						
0.37	0.50	6SL3223-0DE13-7 . A0	**3NA3803**	**3RV2011-1CA10**	**6SL3202-0AE16-1CA0**	–
0.55	0.75	6SL3223-0DE15-5 . A0	**3NA3803**	**3RV2011-1DA10**	**6SL3202-0AE16-1CA0**	–
0.75	1.0	6SL3223-0DE17-5 . A0	**3NA3803**	**3RV2011-1FA10**	**6SL3202-0AE16-1CA0**	–
1.1	1.5	6SL3223-0DE21-1 . A0	**3NA3803**	**3RV2011-1GA10**	**6SL3202-0AE16-1CA0**	–
1.5	2.0	6SL3223-0DE21-5 . A0	**3NA3803**	**3RV2011-1JA10**	**6SL3202-0AE16-1CA0**	–
2.2	3.0	6SL3223-0DE22-2 . A0	**3NA3803**	**3RV2011-1KA10**	**6SL3202-0AE16-1CA0**	–
3.0	4.0	6SL3223-0DE23-0 . A0	**3NA3803**	**3RV2021-4AA10**	**6SL3202-0AE18-8CA0**	–
4.0	5.0	6SL3223-0DE24-0 . A0	**3NA3805**	**3RV2021-4BA10**	**6SL3202-0AE21-8CA0**	–
5.5	7.5	6SL3223-0DE25-5 . A0	**3NA3807**	**3RV2021-4BA10**	**6SL3202-0AE21-8CA0**	–
7.5	10	6SL3223-0DE27-5 . A0	**3NA3810**	**3RV1031-4EA10**	**6SL3202-0AE21-8CA0**	–
11.0	15	6SL3223-0DE31-1 . A0	**3NA3814**	**3RV1031-4FA10**	**6SL3202-0AE23-8CA0**	–
15.0	20	6SL3223-0DE31-5 . A0	**3NA3820**	**3RV1031-4HA10**	**6SL3202-0AE23-8CA0**	–
18.5	25	6SL3223-0DE31-8AA0	**3NA3820**	**3RV1042-4KA10**	**6SL3202-0AE23-8CA0**	–
18.5	25	6SL3223-0DE31-8BA0	**3NA3820**	**3RV1042-4KA10**	**6SL3202-0AE23-8CA0**	–
22	30	6SL3223-0DE32-2 . A0	**3NA3822**	**3RV1042-4KA10**	**6SE6400-3TC03-8DD0**	**6SL3202-0AE24-6SA0**
30	40	6SL3223-0DE33-0 . A0	**3NA3824**	**3RV1042-4MA10**	**6SE6400-3TC05-4DD0**	**6SL3202-0AE26-2SA0**
37	50	6SL3223-0DE33-7 . A0	**3NA3830**	**3VL1712-.DD33-....** *)	**6SE6400-3TC08-0ED0**	**6SL3202-0AE28-8SA0**
45	60	6SL3223-0DE34-5 . A0	**3NA3832**	**3VL1716-.DD33-....** *)	**6SE6400-3TC07-5ED0**	**6SL3202-0AE28-8SA0**
55	75	6SL3223-0DE35-5 . A0	**3NA3836**	**3VL3720-.DC36-....** *)	**6SE6400-3TC14-5FD0**	**6SL3202-0AE31-5SA0**
75	100	6SL3223-0DE37-5 . A0	**3NA3140**	**3VL3725-.DC36-....** *)	**6SE6400-3TC15-4FD0**	**6SL3202-0AE31-5SA0**
90	125	6SL3223-0DE38-8 . A0	**3NA3144**	**3VL4731-.DC36-....** *)	**6SE6400-3TC14-5FD0**	**6SL3202-0AE31-8SA0**

*) See Catalog LV 10 for Article No. supplements.

Overview (continued)

SINAMICS G120P					
Rated power		Rated output current I_{rated}	Power Module	Recommended SIMOTICS motors (see Catalog D 81.1 for article numbers and details)	
400 V	460 V			SIMOTICS GP General Purpose	SIMOTICS SD Severe Duty
				Aluminum, 4-pole	Cast iron, 4-pole
kW	hp	A	Type	Type	Type
Power Modules, degree of protection IP55/UL Type 12, 380 ... 480 V 3 AC					
0.37	0.50	1.3	6SL3223-0DE13-7 . A0	–	–
0.55	0.75	1.7	6SL3223-0DE15-5 . A0	**1LE1001-0DB2.-....**	–
0.75	1.0	2.2	6SL3223-0DE17-5 . A0	**1LE1001-0DB3.-....**	–
1.1	1.5	3.1	6SL3223-0DE21-1 . A0	**1LE1001-0EB0.-....**	–
1.5	2.0	4.1	6SL3223-0DE21-5 . A0	**1LE1001-0EB4.-....**	–
2.2	3.0	5.9	6SL3223-0DE22-2 . A0	**1LE1092-1AB4.-....**	**1LE1592-1AB4.-....**
3.0	4.0	7.7	6SL3223-0DE23-0 . A0	**1LE1092-1AB5.-....**	**1LE1592-1AB5.-....**
4.0	5.0	10.2	6SL3223-0DE24-0 . A0	**1LE1092-1BB2.-....**	**1LE1592-1BB2.-....**
5.5	7.5	13.2	6SL3223-0DE25-5 . A0	**1LE1092-1CB0.-....**	**1LE1592-1CB0.-....**
7.5	10	18	6SL3223-0DE27-5 . A0	**1LE1092-1CB2.-....**	**1LE1592-1CB2.-....**
11.0	15	26	6SL3223-0DE31-1 . A0	**1LE1092-1DB2.-....**	**1LE1592-1DB2.-....**
15.0	20	32	6SL3223-0DE31-5 . A0	**1LE1092-1DB4.-....**	**1LE1592-1DB4.-....**
18.5	25	38	6SL3223-0DE31-8 . A0	–	**1LE1592-1EB2.-....**
22	30	45	6SL3223-0DE32-2 . A0	–	**1LE1592-1EB4.-....**
30	40	60	6SL3223-0DE33-0 . A0	–	**1LE1592-2AB5.-....**
37	50	75	6SL3223-0DE33-7 . A0	–	**1LE1592-2BB0.-....**
45	60	90	6SL3223-0DE34-5 . A0	–	**1LE1592-2BB2.-....**
55	75	110	6SL3223-0DE35-5 . A0	–	**1LE1592-2CB2.-....**
75	100	145	6SL3223-0DE37-5 . A0	–	**1LE1592-2DB0.-....**
90	125	178	6SL3223-0DE38-8 . A0	–	**1LE1592-2DB2.-....**

Recommended **FLENDER standard couplings** Types N-EUPEX, RUPEX and ARPEX, refer to Catalog Add-On D 35 AO and Catalog MD 10.1.

Overview (continued)

SINAMICS G120P Cabinet						SINAMICS G120P Cabinet				Control Unit	Operator panel
Rated power [1]		Rated output current I_{rated}	Power based on the base-load current I_H [2]		Base-load current I_H [2]	Frame size	Type	Version A All available line connection components can be installed as required	Version C Especially space-saving design	CU230P-2 (It is essential to specify one of the order codes below)	Intelligent Operator Panel IOP
400 V	460 V		400 V	460 V							
kW	hp	A	**kW**	hp	A			Article No.	Article No.	Order code	
Degree of protection IP20, 380 ... 480 V 3 AC											
110	125	205	**90**	100	164	GX	PM330	**6SL3710-1PE32-1AA0-Z**	**6SL3710-1PE32-1CA0-Z**	■ ■ ■	Mounted in door as standard
132	150	245	**110**	100	196			**6SL3710-1PE32-5AA0-Z**	**6SL3710-1PE32-5CA0-Z**		
160	200	300	**132**	150	240			**6SL3710-1PE33-0AA0-Z**	**6SL3710-1PE33-0CA0-Z**		
200	250	370	**160**	200	296			**6SL3710-1PE33-7AA0-Z**	**6SL3710-1PE33-7CA0-Z**		
250	300	460	**200**	200	368			**6SL3710-1PE34-6AA0-Z**	**6SL3710-1PE34-6CA0-Z**		
315	400	585	**250**	300	468	HX		**6SL3710-1PE35-8AA0-Z**	**6SL3710-1PE35-8CA0-Z**		
355	450	655	**250**	300	491			**6SL3710-1PE36-6AA0-Z**	**6SL3710-1PE36-6CA0-Z**		
400	500	735	**315**	350	551			**6SL3710-1PE37-4AA0-Z**	**6SL3710-1PE37-4CA0-Z**		

SINAMICS G120P Control Unit	Fieldbus protocols	
CU230P-2 HVAC	• USS • Modbus RTU • BACnet MS/TP • P1 Protokoll	**K 9 8**
CU230P-2 DP	• PROFIBUS DP	**K 9 7**
CU230P-2 PN	• PROFINET • EtherNet/IP	**K 9 6**
CU230P-2 CAN	• CANopen	**K 9 9**

SINAMICS G120P Cabinet			Line-side components			Recommended line-side power components	
Rated power		SINAMICS G120P Cabinet	**Line filter class A** (Category C2)	**Line Harmonics Filter**	**Line reactor**	**Fuse type 3NA3**	**Fuse type 3NE1 (cULus)**
400 V	460 V		Only in combination with version A	Only in combination with version A			
kW	hp	Type	Order code	Order code		Article No.	Article No.
Degree of protection IP20, 380 ... 480 V 3 AC							
110	125	6SL3710-1PE32-1...	**L00**	**L01**	Installed in control cabinet as standard	**3NA3144**	**3NE1230-2**
132	150	6SL3710-1PE32-5...				**3NA3252**	**3NE1331-2**
160	200	6SL3710-1PE33-0...				**3NA3260**	**3NE1333-2**
200	250	6SL3710-1PE33-7...				**3NA3365**	**3NE1334-2**
250	300	6SL3710-1PE34-6...				**3NA3372**	**3NE1435-2**
315	400	6SL3710-1PE35-8...				**3NA3372**	**3NE1437-2**
355	450	6SL3710-1PE36-6...				**3NA3475**	**3NE1438-2**
400	500	6SL3710-1PE37-4...				**3NA3475**	**3NE1448-2**

[1] Rated power based on the base-load current I_L. The base-load current I_L is 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).

Overview (continued)

SINAMICS G120P Cabinet

Rated power		SINAMICS G120P Cabinet	DC link components	Load-side power components		
			Braking Module / braking resistor	Motor reactor	dv/dt filter plus VPL	dv/dt filter compact plus VPL
400 V	460 V			Only in combination with version A	Only in combination with version A	Only in combination with version A
kW	hp	Type	Order code	Order code	Order code	Order code
Degree of protection IP20, 380 ... 480 V 3 AC						
110	125	6SL3710-1PE32-1...	**L62**	**L08**	**L07**	**L10**
132	150	6SL3710-1PE32-5...				
160	200	6SL3710-1PE33-0...				
200	250	6SL3710-1PE33-7...				
250	300	6SL3710-1PE34-6...				
315	400	6SL3710-1PE35-8...				
355	450	6SL3710-1PE36-6...				
400	500	6SL3710-1PE37-4...				

SINAMICS G120P Cabinet

Rated power		Rated output current I_{rated}	SINAMICS G120P Cabinet	Recommended SIMOTICS motors (see Catalogs D 81.1 and D 81.8 for article numbers and details)			
				SIMOTICS GP General Purpose	SIMOTICS SD Severe Duty	SIMOTICS FD Flexible Duty High Efficiency	
400 V	460 V			Aluminum, 4-pole	Cast iron, 4-pole	Cast iron, 4-pole Air cooling/ self-ventilation	Cast iron, 4-pole Air cooling/ self-ventilation
kW	hp	A	Type		Type	Type	Type
Degree of protection IP20, 380 ... 480 V 3 AC							
110	125	205	6SL3710-1PE32-1...	–	**1LE1592-3AB0.-....**	–	–
132	150	245	6SL3710-1PE32-5...	–	**1LE1592-3AB0.-....**	–	–
160	200	300	6SL3710-1PE33-0...	–	**1LE1592-3AB2.-....** **1LE1592-3AB4.-....**	–	–
200	250	370	6SL3710-1PE33-7...	–	**1LE1592-3AB5.-....**	–	**1LQ1222-3AC11-4...**
250	300	460	6SL3710-1PE34-6...	–	–	**1LM1222-3AC31-3...**	**1LQ1222-3AB11-1...**
315	400	585	6SL3710-1PE35-8...	–	–	**1LM1222-3AC71-3...** **1LM1222-3AB31-2...** **1LM1222-3AB51-1...**	**1LQ1222-3AB31-2...** **1LQ1222-3AC51-3...**
355	450	655	6SL3710-1PE36-6...	–	–	–	**1LQ1222-3AB71-1...** **1LQ1222-3AC71-3...**
400	500	735	6SL3710-1PE37-4...	–	–	–	**1LQ1222-3AB71-2...**

Recommended **FLENDER standard couplings** Types N-EUPEX, RUPEX and ARPEX, refer to Catalog Add-On D 35 AO and Catalog MD 10.1.

SINAMICS G120P, built-in and wall-mounted units, degrees of protection IP20, IP54 and IP55

4

Overview

Example: CU230P-2 PN Control Unit

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.

Note:

Shield plates and shield connection kits are available. These can be used in the wiring installation for the Control Units and PM230/PM240 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.

PM330 Power Modules are supplied with the accessories needed to create an EMC-compliant wiring installation for Control Units and Power Modules. The Control Unit mounting surface on the Power Modules has mounting slots for shielding terminals.

Function

Below is a list of functions sorted according to the following categories:

Control modes

- Linear and quadratic torque characteristic for fluid flow and positive displacement machines
- ECO mode for additional energy saving in U/f control mode
- Sensorless vector control for sophisticated control tasks and high-output motors

Connections

- 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

Interfaces

- PROFINET, EtherNet/IP, PROFIBUS, USS, BACnet MS/TP, P1 protocol, CANopen and Modbus-RTU communication

Software functions

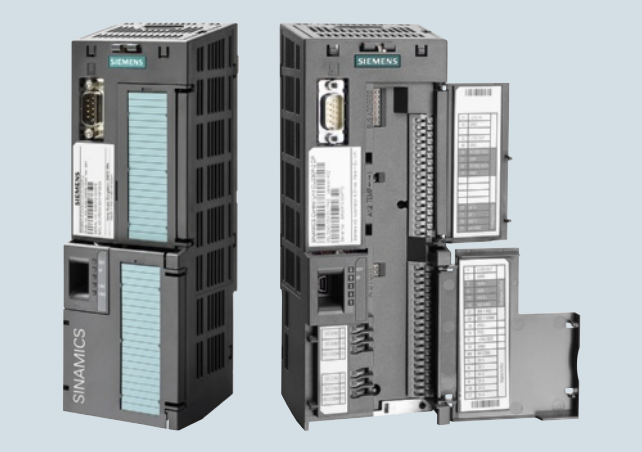
- Automatic restart function after power failure
- Automatic restart
- Flying restart
- Skip frequencies
- 1 PID controller for the closed-loop control of the motor speed as process controller for temperature, pressure, air quality or levels
- 3 freely-programmable PID controllers
- Sleep mode
- Load check function to monitor belts and flow
- Cascade control
- Multi-zone control
- Essential service mode
- Real time clock with three time generators

IOP wizards for special applications with and without PID controller, such as

- Pumps: Positive displacement (constant load torque) and centrifugal pumps (quadratic load torque)
- Fans: Radial and axial fans (quadratic load torque)
- Compressors: Positive displacement (constant load torque) and fluid flow machines (quadratic load torque)

Design

CU230P-2 HVAC, CU230P-2 DP, CU230P-2 PN and CU230P-2 CAN Control Units

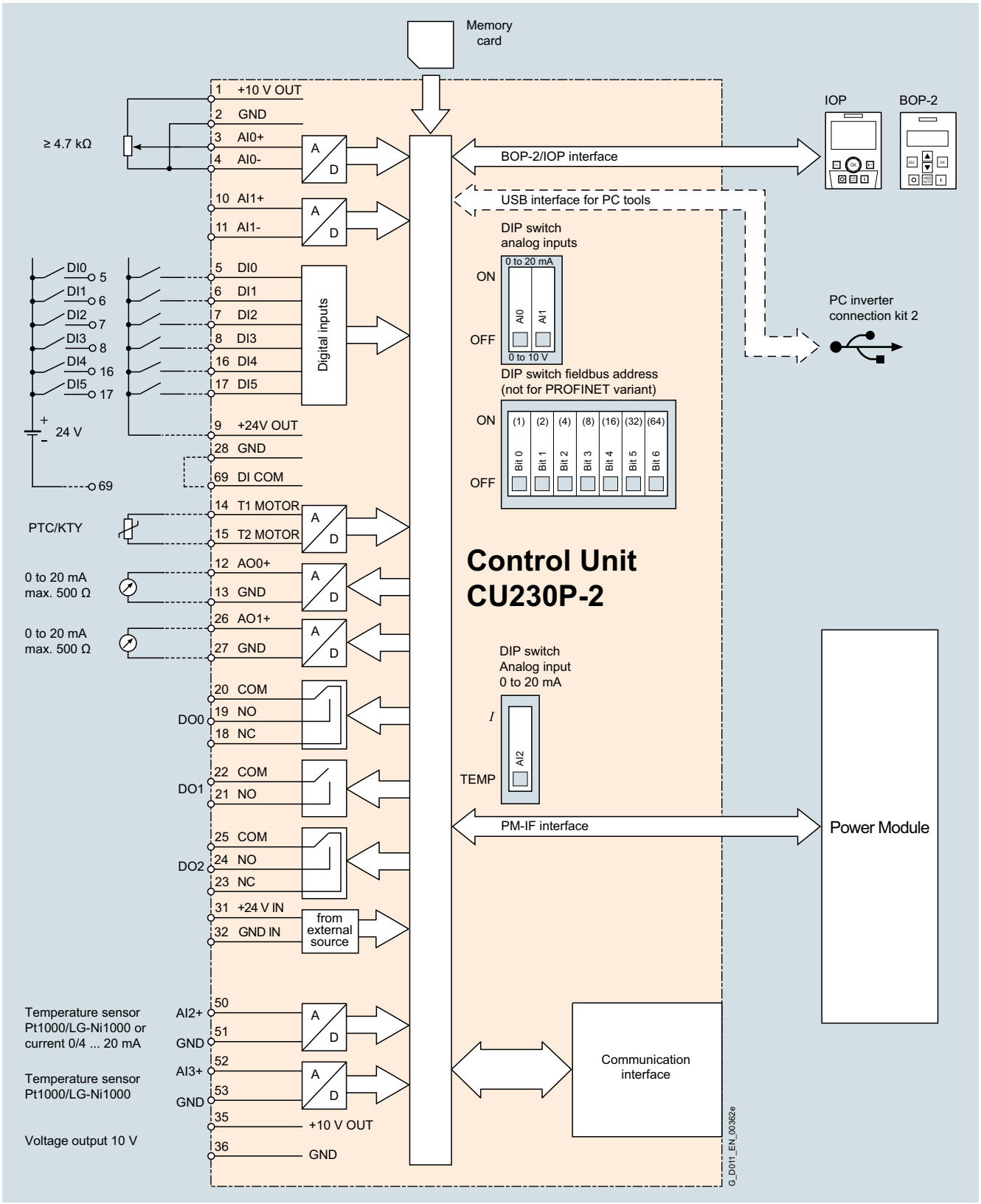


Example: CU230P-2 Control Unit with open and closed terminal covers

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]
Analog inputs (AI)		
3	AI0+	Differential input, switchable between current and 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 and 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
Motor temperature sensor interface		
14	T1 MOTOR	Positive input for motor temperature sensor Type: PTC, KTY sensor, 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).

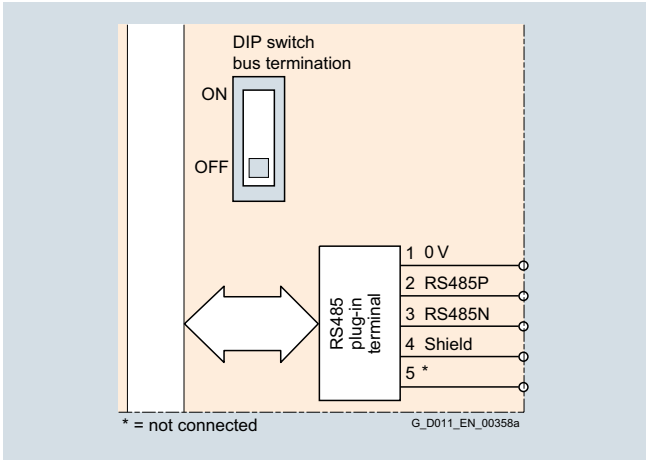
Integration



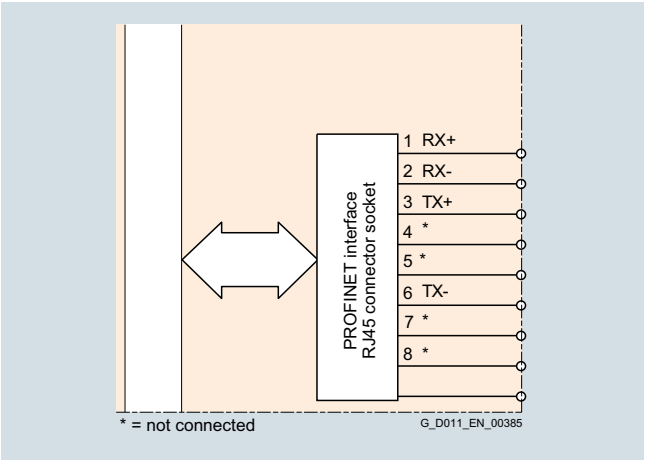
Connection diagram for the CU230P-2 Control Unit series

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

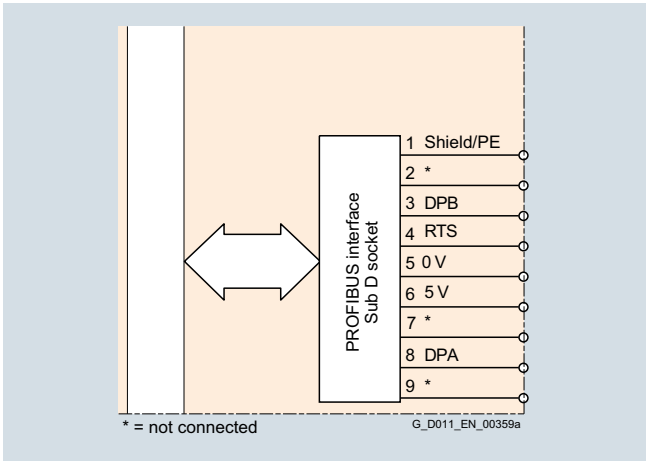
Integration (continued)



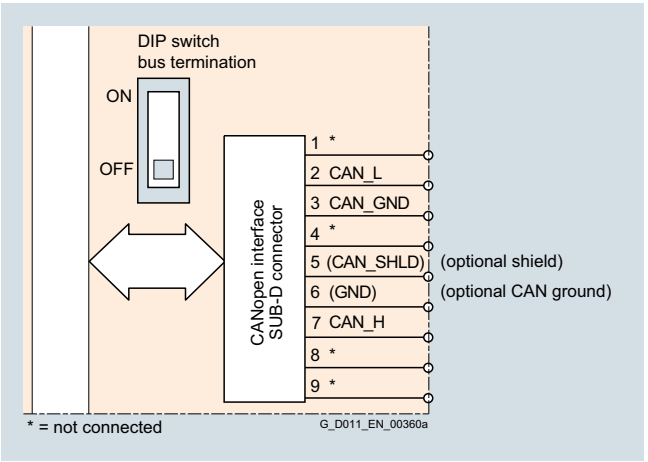
Communication interface USS, Modbus RTU, BACnet MS/TP, P1 protocol for CU230P-2 HVAC



Communication interface PROFINET, EtherNet/IP



PROFIBUS DP communication interface



CANopen communication interface

Selection and ordering data

Fieldbus	Profile	Inputs	Outputs	Integrated safety technology	Designation	**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, sleep mode, essential service mode, multi-zone control						
• USS • Modbus RTU • BACnet MS/TP • P1 protocol	–	6 digital 4 analog	3 digital 2 analog	–	CU230P-2 HVAC	**6SL3243-0BB30-1HA3**
• PROFIBUS DP	• PROFIdrive				CU230P-2 DP	**6SL3243-0BB30-1PA3**
• PROFINET	• PROFIdrive • PROFIenergy				CU230P-2 PN	**6SL3243-0BB30-1FA0**
• EtherNet/IP - ODVA AC drive - SINAMICS profile	–					
• CANopen	–				CU230P-2 CAN	**6SL3243-0BB30-1CA3**

Optional firmware memory cards for CU230P-2 Control Units

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

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

CU230P-2 Control Units

Technical specifications

Control Unit	CU230P-2 HVAC	CU230P-2 DP	CU230P-2 PN	CU230P-2 CAN
	6SL3243-0BB30-1HA3	6SL3243-0BB30-1PA3	6SL3243-0BB30-1FA0	6SL3243-0BB30-1CA3
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			
Protective insulation	PELV according to EN 50178 Protective separation from the line supply using double/reinforced insulation			
Power loss, max.	5 W			
Interfaces				
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	5.5 mA			
Digital outputs	3 relays			
• 2 relay changeover contacts	250 V AC, 2 A (inductive load) 30 V DC, 5 A (ohmic load) The following applies to UL-compliant installations: 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)			
Analog inputs	Analog inputs are protected against inputs in a voltage range of ± 30 V and have a common-mode voltage in the ± 15 V range			
• 2 differential inputs	Switchable with DIP switch between voltage and current: -10 ... +10 V, 0/4 ... 20 mA, 12-bit resolution			
	These differential inputs can be configured as additional digital inputs. Switching thresholds: 0 → 1: Rated voltage 4 V 1 → 0: Rated voltage 1.6 V			
• 1 non-isolated input	Switchable with DIP switch between 0/4 ... 20 mA current and temperature sensor type Pt1000/LG-Ni1000, 12-bit resolution			
• 1 non-isolated input	Temperature sensor type Pt1000/LG-Ni1000, 12-bit resolution			
Analog outputs	The analog outputs have short circuit protection			
• 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			
PTC/KTY interface	1 motor temperature sensor input, sensors that can be connected PTC, KTY and bimetal, accuracy ±5 °C			
Bus interface				
Fieldbus protocols	• USS • Modbus RTU • BACnet MS/TP • P1 protocol (switchable using software)	• PROFIBUS DP	• PROFINET • EtherNet/IP - ODVA AC drive - SINAMICS profile	• CANopen
Profile	–	• PROFIdrive	• PROFIdrive • 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, PROFIdrive profile V4.1, device name can be stored on the device Max. 100 Mbit/s (full duplex)	9-pin SUB-D connector, insulated, Max. 1 Mbit/s Bus terminating resistor that can be switched in

Technical specifications (continued)

Control Unit	CU230P-2 HVAC 6SL3243-0BB30-1HA3	CU230P-2 DP 6SL3243-0BB30-1PA3	CU230P-2 PN 6SL3243-0BB30-1FA0	CU230P-2 CAN 6SL3243-0BB30-1CA3
Tool interfaces				
Memory card	SINAMICS SD card			
Operator panels				
• Intelligent Operator Panel IOP	Can be directly plugged on			
• Basic Operator Panel BOP-2	Can be directly plugged on			
• Blanking cover	Required when no operator panel is plugged in order to achieve degree of protection IP55 on PM230 Power Modules degree of protection IP55/UL Type 12			
PC interface	USB (connection via PC inverter connection kit 2)			
Open-loop/closed-loop control techniques				
U/f linear/quadratic/parameterizable	✓			
U/f with flux current control (FCC)	✓			
U/f ECO; linear/quadratic	✓			
Vector control, sensorless	✓			
Torque control, sensorless	✓			
Software functions				
Setpoint input	✓			
Fixed frequencies	16, parameterizable			
JOG	✓			
Digital motorized potentiometer (MOP)	✓			
Ramp smoothing	✓			
Extended ramp-function generator (with ramp smoothing OFF3)	✓			
Slip compensation	✓			
Signal interconnection with BICO technology	✓			
Free function blocks (FFB) for logical and arithmetic operations	✓			
Switchable drive data sets (DDS)	✓ (4)			
Switchable command data sets (CDS)	✓ (4)			
Flying restart	✓			
Automatic restart after line supply failure or operating fault (AR)	✓			
Technology controller (internal PID)	✓			
Sleep 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	✓			
Auto-ramping (V_{dcmax} controller)	✓			
Kinetic buffering (V_{dcmin} controller)	✓			
Possible braking functions	• DC braking (PM230, PM240, PM330, Cabinet) • Dynamic braking with integrated braking chopper and external braking resistor (PM240) • Dynamic braking with optional Braking Module and braking resistor (PM330, Cabinet)			

Technical specifications (continued)

Control Unit	CU230P-2 HVAC 6SL3243-0BB30-1HA3	CU230P-2 DP 6SL3243-0BB30-1PA3	CU230P-2 PN 6SL3243-0BB30-1FA0	CU230P-2 CAN 6SL3243-0BB30-1CA3
Mechanical specifications and ambient conditions				
Degree of protection	IP20			
Signal cable cross-section	0.15 ... 1.5 mm^2 (AWG28 ... AWG16)			
Operating temperature	For CU230P-2 HVAC/DP/CAN: -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) Derating of 3 K/1000 m applies to Control Units as of an installation altitude of 1000 m above sea level.			
Storage temperature	-40 ... +70 °C (-40 ... +158 °F)			
Relative humidity	<95 % RH, condensation not permissible			
Dimensions • Width • Height • Depth	 73 mm 199 mm 65.5 mm			
Weight, approx.	0.61 kg			

4

Overview

PM230 Power Modules, degree of protection IP20,
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, degree of protection IP54, frame sizes FSA to FSF (with operator panel)

PM230 Power Modules are designed for applications involving pumps, fans and compressors with a quadratic 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 61000-3-12 or IEC 61000-3-4 are maintained for $R_{SCE} > 250$.
    R_{SCE} is the short-circuit power ratio $S_{sc\ line}/S_{inverter}$ acc. to EN 61000-3-2, EN 61000-3-12 or EN 61000-3-4 and is identical to R_{SC} acc. to IEC 60146-1-1 in the case of three-phase devices.
  - 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 IP55/UL Type 12 are available with integrated line filter class A for Category C2 installations in accordance with EN 61800-3. The PM230 Power Modules with integrated filter class B that are available as an alternative also comply with the conducted interference requirements for Category C1 in accordance with EN 61800-3.

Frame sizes FSA to FSF of the PM230 Power Module in degree of protection IP20 are available with integrated line filter class A for Category C2 installations in accordance with EN 61800-3, 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 C2 installations in accordance with EN 61800-3, 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 length between the inverter and motor is limited to max. 25 m.

The permissible cable lengths between inverter and motor are limited. Longer cables can be used if output reactors are connected for PM230 (see load-side power components).

The line system configurations that are supported are symmetrical systems with grounded neutral point.

PM230 Power Modules do not support Control Units with Safety Integrated. Safety functions can be implemented by means of external switching devices.

Overview (continued)

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.

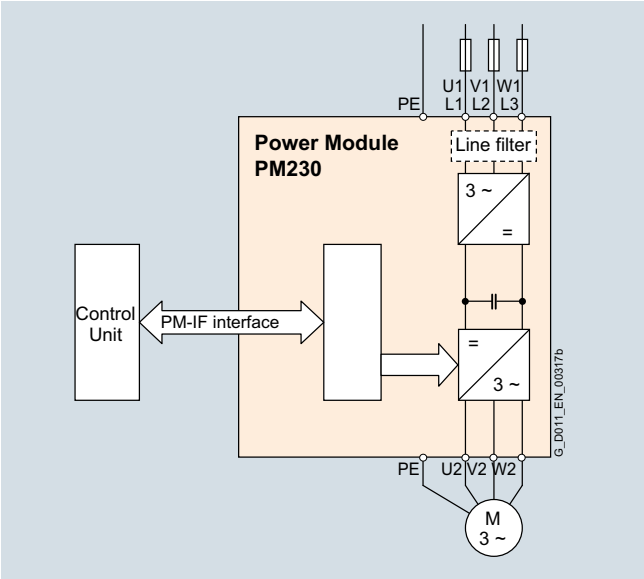
For further information, see Shield connection kits and Shield plates for Control Units and Power Modules in section Supplementary system components.

Integration

PM230 Power Modules have the following connections and interfaces:

- PM-IF interface to connect the PM230 Power Module to the Control Unit. The PM230 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

PM230 Power Modules communicate with the Control Unit via the PM-IF interface.



Connection diagram for PM230 Power Module with or without integrated line filter class A or B

Power components that are optionally available depending on the Power Module used

The following line-side and load-side power components are optionally available in the appropriate frame sizes for the Power Modules:

	Frame size					
	FSA	**FSB**	**FSC**	**FSD**	**FSE**	**FSF**
PM230 Power Module (IP54/IP55)						
Available frame sizes	✓	✓	✓	✓	✓	✓
Line-side power components						
Line filter class A	I	I	I	I	I	I
Line filter class B	I	I	I	I	I	I
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
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

U = Base component
S = Lateral mounting
I = Integrated
F = Power Modules available with and without integrated filter class A
– = Not possible

[1] A line reactor is not required and must not be used in conjunction with a PM230 Power Module.

[2] Lateral mounting is the only possible option for Push Through variants.

Integration (continued)

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					
Frame size	**FSA**	**FSB**	**FSC**	**FSD**	**FSE**	**FSF**
PM230 Power Module, degree of protection IP20						
Available frame sizes	✓	✓	✓	✓	✓	✓
Without output reactor/sine-wave filter	25/100	25/100	25/100	25/100	25/100	25/100
With optional output reactor						
• At 380 ... 415 V 3 AC	150/225	150/225	150/225	–	–	–
• At 440 ... 480 V 3 AC	100/150	100/150	100/150	–	–	–
• At 380 -10 % ... 400 V 3 AC	–	–	–	200/300	200/300	200/300
• At 401 ... 480 V +10 % 3 AC	–	–	–	200/300	200/300	200/300
With optional sine-wave filter						
• At 380 -10 % ... 400 V 3 AC	–	–	–	200/300	200/300	200/300
• At 401 ... 480 V +10 % 3 AC	–	–	–	200/300	200/300	200/300
With integrated line filter class A (EMC category C3)						
• At 380 ... 415 V 3 AC	50/–	50/–	50/–	50/–	50/–	50/–
• At 440 ... 480 V 3 AC	50/–	50/–	50/–	50/–	50/–	50/–
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/–	50/–	50/–	50/–	50/–	50/–
• At 440 ... 480 V 3 AC	50/–	50/–	50/–	50/–	50/–	50/–
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/–	150/–	150/–	–	–	–
• At 440 ... 480 V 3 AC	100/–	100/–	100/–	–	–	–

[1] Further information is available on the Internet at www.siemens.com/sinamics-g120/documentation

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 IP55/UL Type 12

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 IP55/ UL Type 12 with integrated line filter class A**	**PM230 Power Module degree of protection IP55/ UL Type 12 with integrated line filter class B**
400 V	460 V		400 V	460 V				
kW	hp	A	**kW**	hp	A		Article No.	Article No.
380 ... 480 V 3 AC								
0.37	0.50	1.3	**0.25**	0.33	0.9	FSA	**6SL3223-0DE13-7AA0**	**6SL3223-0DE13-7BA0**
0.55	0.75	1.7	**0.37**	0.5	1.3	FSA	**6SL3223-0DE15-5AA0**	**6SL3223-0DE15-5BA0**
0.75	1.0	2.2	**0.55**	0.75	1.7	FSA	**6SL3223-0DE17-5AA0**	**6SL3223-0DE17-5BA0**
1.1	1.5	3.1	**0.75**	1.0	2.2	FSA	**6SL3223-0DE21-1AA0**	**6SL3223-0DE21-1BA0**
1.5	2.0	4.1	**1.1**	1.5	3.1	FSA	**6SL3223-0DE21-5AA0**	**6SL3223-0DE21-5BA0**
2.2	3.0	5.9	**1.5**	2.0	4.1	FSA	**6SL3223-0DE22-2AA0**	**6SL3223-0DE22-2BA0**
3.0	4.0	7.7	**2.2**	3.0	5.9	FSA	**6SL3223-0DE23-0AA0**	**6SL3223-0DE23-0BA0**
4.0	5.0	10.2	**3.0**	4.0	7.7	FSB	**6SL3223-0DE24-0AA0**	**6SL3223-0DE24-0BA0**
5.5	7.5	13.2	**4.0**	5.0	10.2	FSB	**6SL3223-0DE25-5AA0**	**6SL3223-0DE25-5BA0**
7.5	10	18	**5.5**	7.5	13.2	FSB	**6SL3223-0DE27-5AA0**	**6SL3223-0DE27-5BA0**
11.0	15	26	**7.5**	10	18	FSC	**6SL3223-0DE31-1AA0**	**6SL3223-0DE31-1BA0**
15.0	20	32	**11.0**	15	26	FSC	**6SL3223-0DE31-5AA0**	**6SL3223-0DE31-5BA0**
18.5	25	38	**15.0**	20	32	FSC	**6SL3223-0DE31-8AA0**	–
						FSD	–	**6SL3223-0DE31-8BA0**
22	30	45	**18.5**	25	38	FSD	**6SL3223-0DE32-2AA0**	**6SL3223-0DE32-2BA0**
30	40	60	**22**	30	45	FSD	**6SL3223-0DE33-0AA0**	**6SL3223-0DE33-0BA0**
37	50	75	**30**	40	60	FSE	**6SL3223-0DE33-7AA0**	**6SL3223-0DE33-7BA0**
45	60	90	**37**	50	75	FSE	**6SL3223-0DE34-5AA0**	**6SL3223-0DE34-5BA0**
55	75	110	**45**	60	90	FSF	**6SL3223-0DE35-5AA0**	**6SL3223-0DE35-5BA0**
75	100	145	**55**	75	110	FSF	**6SL3223-0DE37-5AA0**	**6SL3223-0DE37-5BA0**
90	125	178	**75**	100	145	FSF	**6SL3223-0DE38-8AA0**	**6SL3223-0DE38-8BA0**

It is essential to plug on an operator panel or the blanking cover in order to achieve degree of protection IP54/IP55/ UL Type 12.
For further information, see Operator panels and blanking cover for PM230 Power Modules in section Supplementary system components.

Note:

The power data in hp units are based on the NEC/CEC standards for the North American market.

[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 (continued)

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
400 V	460 V		400 V	460 V				
kW	hp	A	**kW**	hp	A		Article No.	Article No.
380 ... 480 V 3 AC								
0.37	0.50	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	1.0	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**	1.0	2.2	FSA	NEW **6SL3210-1NE13-1UL1**	NEW **6SL3210-1NE13-1AL1**
1.5	2.0	4.1	**1.1**	1.5	3.1	FSA	NEW **6SL3210-1NE14-1UL1**	NEW **6SL3210-1NE14-1AL1**
2.2	3.0	5.9	**1.5**	2.0	4.1	FSA	NEW **6SL3210-1NE15-8UL1**	NEW **6SL3210-1NE15-8AL1**
3.0	4.0	7.7	**2.2**	3.0	5.9	FSA	NEW **6SL3210-1NE17-7UL1**	NEW **6SL3210-1NE17-7AL1**
4.0	5.0	10.2	**3.0**	4.0	7.7	FSB	NEW **6SL3210-1NE21-0UL1**	NEW **6SL3210-1NE21-0AL1**
5.5	7.5	13.2	**4.0**	5.0	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**
11.0	15	26	**7.5**	10	18	FSC	NEW **6SL3210-1NE22-6UL1**	NEW **6SL3210-1NE22-6AL1**
15.0	20	32	**11.0**	15	26	FSC	NEW **6SL3210-1NE23-2UL1**	NEW **6SL3210-1NE23-2AL1**
18.5	25	38	**15.0**	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
400 V	460 V		400 V	460 V				
kW	hp	A	**kW**	hp	A		Article No.	Article No.
380 ... 480 V 3 AC								
3.0	4.0	7.7	**2.2**	3.0	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	**15.0**	20	32	FSC	NEW **6SL3211-1NE23-8UL1**	NEW **6SL3211-1NE23-8AL1**

Note:

The power data in hp units are based on the NEC/CEC standards for the North American market.

[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

	PM230 Power Modules	
Degree of protection	**IP55/UL Type 12 (with BOP-2 or blanking cover) IP54/UL Type 12 with IOP**	**IP20/UL Open Type (Standard or Push Through variants)**
Power (low overload LO)	0.37 ... 90 kW	0.37 ... 75 kW
Rated output current (low overload LO)	1.3 ... 178 A	1.3 ... 145 A
Power (high overload HO)	0.25 ... 75 kW	0.25 ... 55 kW
Rated output current (high overload HO)	0.9 ... 145 A	0.9 ... 110 A
System operating voltage	380 ... 480 V ±10 % 3 AC	
Grid requirement Short-circuit power R_{SC}	>100	
Input frequency	47 ... 63 Hz	
Output frequency		
• Control mode U/f	0 ... 550 Hz, in firmware V4.7 and higher, due to legal requirements, the maximum output frequency is restricted to 550 Hz	
• Control type Vector	0 ... 240 Hz	
Pulse frequency	4 kHz for higher pulse frequencies up to 16 kHz, see derating data	
Power factor λ	0,9	
Output voltage, max. as % of input voltage	95 %	
Overload capability		
• Low overload (LO)	Note: When the overload capability is used, the base-load current I_L is not reduced.	
- Frame sizes 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	
- Frame sizes FSD to FSF	1.1 × base-load current I_L (i. e. 110 % overload) for 60 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.	
- Frame sizes 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	
- Frame sizes FSD to FSF	1.5 × base-load current I_H (i. e. 150 % overload) for 60 s within a cycle time of 300 s	
Electromagnetic compatibility	• Devices with line filter class A for applications according to Categories C3 and C2 • Devices with line filter class B for applications according to Category C2 and compliance with conducted interference requirements of Category C1	• Devices without line filter • Devices with line filter class A for applications according to Categories C3 and C2 • Devices with line filter class B for applications according to Category C2 and compliance with conducted interference requirements of Category C1
Possible braking methods	DC braking	
Operating temperature		
• 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 >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	
Installation altitude	Up to 1000 m (3281 ft) above sea level without derating, > 1000 m (3281 ft) see derating characteristics	
Protection functions	• Undervoltage • Overvoltage • Overcurrent/overload • Ground fault • Short-circuit • Stall protection • Motor blocking protection • Motor overtemperature • Inverter overtemperature • Parameter locking	
Compliance with standards	UL [1], cUL [2], CE, C-Tick, SEMI F47	
SCCR (Short Circuit Current Rating) [3]	Frame sizes FSA to FSC: 40 kA Frame sizes FSD to FSF: 65 kA	65 kA
CE marking	According to Low-Voltage Directive No. 2006/95/EC, EMC Directive 2004/108/EC	

[1] UL approval for frame sizes FSD to FSF degree of protection IP55/ UL Type 12 will be available soon.

[2] Applies to PM230 Power Modules, frame sizes FSA to FSC.

[3] Applies to industrial control cabinet installations to NEC article 409/ UL 508A.

Technical specifications (continued)

PM230 Power Modules degree of protection IP55/UL Type 12

Line voltage 380 ... 480 V 3 AC		**PM230 Power Modules, degree of protection IP55/UL Type 12**				
With integrated line filter class A		6SL3223-0DE13-7AA0	6SL3223-0DE15-5AA0	6SL3223-0DE17-5AA0	6SL3223-0DE21-1AA0	6SL3223-0DE21-5AA0
With integrated line filter class B		6SL3223-0DE13-7BA0	6SL3223-0DE15-5BA0	6SL3223-0DE17-5BA0	6SL3223-0DE21-1BA0	6SL3223-0DE21-5BA0
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
• I_{max}	A	2	2.6	3.4	4.7	6.2
Rated power						
• Based on I_L	kW (hp)	0.37 (0.50)	0.55 (0.74)	0.75 (1.01)	1.1 (1.48)	1.5 (2.01)
• Based on I_H	kW (hp)	0.25 (0.34)	0.37 (0.50)	0.55 (0.74)	0.75 (1.01)	1.1 (1.48)
Rated pulse frequency	kHz	4	4	4	4	4
Efficiency η		0.86	0.9	0.92	0.94	0.95
Power loss at rated current	kW (hp)	0.06 (0.08)	0.06 (0.08)	0.06 (0.08)	0.07 (0.09)	0.08 (0.11)
Cooling air requirement	m^3/s (ft^3/s)	0.007 (0.2)	0.007 (0.2)	0.007 (0.2)	0.007 (0.2)	0.007 (0.2)
Sound pressure level L_{pA} (1 m)	dB	61.9	61.9	61.9	61.9	61.9
24 V DC power supply for Control Unit	A	1	1	1	1	1
Input current [3]						
• 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. [4]						
• Shielded	m (ft)	25 (82.03)	25 (82.03)	25 (82.03)	25 (82.03)	25 (82.03)
• Unshielded	m (ft)	100 (328.10)	100 (328.10)	100 (328.10)	100 (328.10)	100 (328.10)
Degree of protection [5]		IP55/UL Type 12	IP55/UL Type 12	IP55/UL Type 12	IP55/UL Type 12	IP55/UL Type 12
Dimensions						
• Width	mm (in)	154 (6.06)	154 (6.06)	154 (6.06)	154 (6.06)	154 (6.06)
• Height	mm (in)	460 (18.11)	460 (18.11)	460 (18.11)	460 (18.11)	460 (18.11)
• Depth						
- Without operator panel	mm (in)	249 (9.80)	249 (9.80)	249 (9.80)	249 (9.80)	249 (9.80)
- With operator panel, max.	mm (in)	266 (10.47)	266 (10.47)	266 (10.47)	266 (10.47)	266 (10.47)
Frame size		FSA	FSA	FSA	FSA	FSA
Weight, approx.	kg (lb)	4.3 (9.48)	4.3 (9.48)	4.3 (9.48)	4.3 (9.48)	4.3 (9.48)

[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] 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.

[4] Max. motor cable length 25 m (82 ft) (shielded) for PM230 Power Modules with integrated line filter to maintain the limit values of EN 61800-3 Category C2 (filter A) or C1 table 14 (filter B). With unshielded cables, Categories C2 and C1 are not achieved.

[5] It is essential to plug on an operator panel or the blanking cover in order to achieve degree of protection IP54/IP55/UL Type 12.
For further information, see Operator panels and blanking cover for PM230 Power Modules in section Supplementary system components.

Technical specifications (continued)

Line voltage 380 ... 480 V 3 AC		PM230 Power Modules, degree of protection IP55/UL Type 12				
With integrated line filter class A		6SL3223-0DE22-2AA0	6SL3223-0DE23-0AA0	6SL3223-0DE24-0AA0	6SL3223-0DE25-5AA0	6SL3223-0DE27-5AA0
With integrated line filter class B		6SL3223-0DE22-2BA0	6SL3223-0DE23-0BA0	6SL3223-0DE24-0BA0	6SL3223-0DE25-5BA0	6SL3223-0DE27-5BA0
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
• I_{max}	A	8.9	11.8	15.4	20.4	27
Rated power						
• Based on I_L	kW (hp)	2.2 (2.95)	3 (4.02)	4 (5.36)	5.5 (7.38)	7.5 (10.06)
• Based on I_H	kW (hp)	1.5 (2.01)	2.2 (2.95)	3 (4.02)	4 (5.36)	5.5 (7.38)
Rated pulse frequency	kHz	4	4	4	4	4
Efficiency η		0.96	0.96	0.97	0.97	0.97
Power loss	kW (hp)	0.1 (0.13)	0.12 (0.16)	0.14 (0.19)	0.18 (0.24)	0.24 (0.32)
at rated current						
Cooling air requirement	m^3/s (ft^3/s)	0.007 (0.2)	0.007 (0.2)	0.009 (0.3)	0.009 (0.3)	0.009 (0.3)
Sound pressure level	dB	61.9	61.9	62.8	62.8	62.8
L_{pA} (1 m)						
24 V DC power supply	A	1	1	1	1	1
for Control Unit						
Input current [3]						
• Rated current	A	6.1	8	11	14	19
• Based on I_H	A	4.2	6.1	8	11	14
Line supply connection		Screw terminals, plug-in	Screw terminals, plug-in	Screw terminals, plug-in	Screw terminals, plug-in	Screw terminals, plug-in
U1/L1, V1/L2, W1/L3						
• Conductor cross-section	mm^2	1 ... 2.5	1 ... 2.5	2.5 ... 6	4 ... 6	4 ... 6
Motor connection		Screw terminals, plug-in	Screw terminals, plug-in	Screw terminals, plug-in	Screw terminals, plug-in	Screw terminals, plug-in
U2, V2, W2						
• Conductor cross-section	mm^2	1 ... 2.5	1 ... 2.5	2.5 ... 6	4 ... 6	4 ... 6
Motor cable length, max. [4]						
• Shielded	m (ft)	25 (82.03)	25 (82.03)	25 (82.03)	25 (82.03)	25 (82.03)
• Unshielded	m (ft)	100 (328.10)	100 (328.10)	100 (328.10)	100 (328.10)	100 (328.10)
Degree of protection [5]		IP55/UL Type 12	IP55/UL Type 12	IP55/UL Type 12	IP55/UL Type 12	IP55/UL Type 12
Dimensions						
• Width	mm (in)	154 (6.06)	154 (6.06)	180 (7.09)	180 (7.09)	180 (7.09)
• Height	mm (in)	460 (18.11)	460 (18.11)	540 (21.26)	540 (21.26)	540 (21.26)
• Depth						
- Without operator panel	mm (in)	249 (9.80)	249 (9.80)	249 (9.80)	249 (9.80)	249 (9.80)
- With operator panel, max.	mm (in)	266 (10.47)	266 (10.47)	266 (10.47)	266 (10.47)	266 (10.47)
Frame size		FSA	FSA	FSB	FSB	FSB
Weight, approx.	kg (lb)	4.3 (9.48)	4.3 (9.48)	6.3 (9.48)	6.3 (9.48)	6.3 (9.48)

[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] 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.

[4] Max. motor cable length 25 m (82 ft) (shielded) for PM230 Power Modules with integrated line filter to maintain the limit values of EN 61800-3 Category C2 (filter A) or C1 table 14 (filter B). With unshielded cables, Categories C2 and C1 are not achieved.

[5] It is essential to plug on an operator panel or the blanking cover in order to achieve degree of protection IP54/IP55/UL Type 12.
For further information, see Operator panels and blanking cover for PM230 Power Modules in section Supplementary system components.

Technical specifications (continued)

Line voltage 380 ... 480 V 3 AC		**PM230 Power Modules, degree of protection IP55/UL Type 12**					
With integrated line filter class A		6SL3223-0DE31-1AA0	6SL3223-0DE31-5AA0	6SL3223-0DE31-8AA0	–	6SL3223-0DE32-2AA0	6SL3223-0DE33-0AA0
With integrated line filter class B		6SL3223-0DE31-1BA0	6SL3223-0DE31-5BA0	–	6SL3223-0DE31-8BA0	6SL3223-0DE32-2BA0	6SL3223-0DE33-0BA0
Output current							
at 50 Hz 400 V 3 AC							
• Rated current I_{rated} [1]	A	26	32	38	38	45	60
• Base-load current I_L [1]	A	26	32	38	38	45	60
• Base-load current I_H [2]	A	18	26	32	32	38	45
• I_{max}	A	39	52	64	64	76	90
Rated power							
• Based on I_L	kW (hp)	11 (14.75)	15 (20.12)	18.5 (24.81)	18.5 (24.81)	22 (29.50)	30 (40.23)
• Based on I_H	kW (hp)	7.5 (10.06)	11 (14.75)	15 (20.12)	15 (20.12)	18.5 (24.81)	22 (29.50)
Rated pulse frequency	kHz	4	4	4	4	4	4
Efficiency η		0.97	0.97	0.98	0.97	0.97	0.97
Power loss	kW (hp)	0.32 (0.43)	0.39 (0.52)	0.46 (0.62)	0.52 (0.70)	0.52 (0.70)	0.68 (0.91)
at rated current							
Cooling air requirement	m^3/s (ft^3/s)	0.02 (0.7)	0.02 (0.7)	0.02 (0.7)	0.039 (1.4)	0.039 (1.4)	0.039 (1.4)
Sound pressure level	dB	66.1	66.1	66.1	56	56	56
L_{pA} (1 m)							
24 V DC power supply	A	1	1	1	1	1	1
for Control Unit							
Input current [3]							
• Rated current	A	27	33	39	39	42	56
• Based on I_H	A	19	27	33	33	36	42
Line supply connection		Screw terminals, plug-in	Screw terminals, plug-in	Screw terminals, plug-in	M6 screw studs	M6 screw studs	M6 screw studs
U1/L1, V1/L2, W1/L3							
• Conductor cross-section	mm^2	6 ... 16	10 ... 16	10 ... 16	16 ... 35	16 ... 35	16 ... 35
Motor connection		Screw terminals, plug-in	Screw terminals, plug-in	Screw terminals, plug-in	M6 screw studs	M6 screw studs	M6 screw studs
U2, V2, W2							
• Conductor cross-section	mm^2	6 ... 16	10 ... 16	10 ... 16	16 ... 35	16 ... 35	16 ... 35
Motor cable length, max. [4]							
• Shielded	m (ft)	25 (82.03)	25 (82.03)	25 (82.03)	25 (82.03)	25 (82.03)	25 (82.03)
• Unshielded	m (ft)	100 (328.10)	100 (328.10)	100 (328.10)	100 (328.10)	100 (328.10)	100 (328.10)
Degree of protection [5]		IP55/UL Type 12	IP55/UL Type 12	IP55/UL Type 12	IP55/UL Type 12	IP55/UL Type 12	IP55/UL Type 12
Dimensions							
• Width	mm (in)	230 (9.06)	230 (9.06)	230 (9.06)	320 (12.60)	320 (12.60)	320 (12.60)
• Height	mm (in)	620 (24.41)	620 (24.41)	620 (24.41)	640 (25.20)	640 (25.20)	640 (25.20)
• Depth							
- Without operator panel	mm (in)	249 (9.80)	249 (9.80)	249 (9.80)	329 (12.95)	329 (12.95)	329 (12.95)
- With operator panel, max.	mm (in)	266 (10.47)	266 (10.47)	266 (10.47)	346 (13.62)	346 (13.62)	346 (13.62)
Frame size		FSC	FSC	FSC	FSD	FSD	FSD
Weight, approx.	kg (lb)	9.5 (20.95)	9.5 (20.95)	9.5 (20.95)	31 (68.36)	31 (68.36)	31 (68.36)

[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] 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.

[4] Max. motor cable length 25 m (82 ft) (shielded) for PM230 Power Modules with integrated line filter to maintain the limit values of EN 61800-3 Category C2 (filter A) or C1 table 14 (filter B). With unshielded cables, Categories C2 and C1 are not achieved.

[5] It is essential to plug on an operator panel or the blanking cover in order to achieve degree of protection IP54/IP55/UL Type 12.
For further information, see Operator panels and blanking cover for PM230 Power Modules in section Supplementary system components.

Technical specifications (continued)

Line voltage 380 ... 480 V 3 AC		PM230 Power Modules, degree of protection IP55/UL Type 12				
With integrated line filter class A		6SL3223-0DE33-7AA0	6SL3223-0DE34-5AA0	6SL3223-0DE35-5AA0	6SL3223-0DE37-5AA0	6SL3223-0DE38-8AA0
With integrated line filter class B		6SL3223-0DE33-7BA0	6SL3223-0DE34-5BA0	6SL3223-0DE35-5BA0	6SL3223-0DE37-5BA0	6SL3223-0DE38-8BA0
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
• I_{max}	A	120	150	180	220	290
Rated power						
• Based on I_L	kW (hp)	37 (49.62)	45 (60.35)	55 (73.76)	75 (100.58)	90 (120.69)
• Based on I_H	kW (hp)	30 (40.23)	37 (49.62)	45 (60.35)	55 (73.76)	75 (100.58)
Rated pulse frequency	kHz	4	4	4	4	4
Efficiency η		0.97	0.97	0.97	0.97	0.97
Power loss at rated current	kW (hp)	0.99 (1.33)	1.2 (1.61)	1.4 (1.88)	1.9 (2.55)	2.3 (3.08)
Cooling air requirement	m^3/s (ft^3/s)	0.039 (1.4)	0.039 (1.4)	0.117 (4.1)	0.117 (4.1)	0.117 (4.1)
Sound pressure level L_{pA} (1 m)	dB	56	56	61	61	61
24 V DC power supply for Control Unit	A	1	1	1	1	1
Input current [3]						
• 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 studs	M6 screw studs	M8 screw studs	M8 screw studs	M8 screw studs
• Conductor cross-section	mm^2	25 ... 50	25 ... 50	35 ... 120	35 ... 120	35 ... 120
Motor connection U2, V2, W2		M6 screw studs	M6 screw studs	M8 screw studs	M8 screw studs	M8 screw studs
• Conductor cross-section	mm^2	25 ... 50	25 ... 50	35 ... 120	35 ... 120	35 ... 120
Motor cable length, max. [4]						
• Shielded	m (ft)	25 (82.03)	25 (82.03)	25 (82.03)	25 (82.03)	25 (82.03)
• Unshielded	m (ft)	100 (328.10)	100 (328.10)	100 (328.10)	100 (328.10)	100 (328.10)
Degree of protection [5]		IP55/UL Type 12	IP55/UL Type 12	IP55/UL Type 12	IP55/UL Type 12	IP55/UL Type 12
Dimensions						
• Width	mm (in)	320 (12.60)	320 (12.60)	410 (16.14)	410 (16.14)	410 (16.14)
• Height	mm (in)	751 (29.57)	751 (29.57)	915 (36.02)	915 (36.02)	915 (36.02)
• Depth						
- Without operator panel	mm (in)	329 (12.95)	329 (12.95)	416 (16.38)	416 (16.38)	416 (16.38)
- With operator panel, max.	mm (in)	346 (13.62)	346 (13.62)	433 (17.05)	433 (17.05)	433 (17.05)
Frame size		FSE	FSE	FSF	FSF	FSF
Weight, approx.	kg (lb)	37 (81.59) (with filter class A) 38 (83.79) (with filter class B)	37 (81.59) (with filter class A) 38 (83.79) (with filter class B)	70 (154.35)	70 (154.35)	70 (154.35)

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) 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.

4) Max. motor cable length 25 m (82 ft) (shielded) for PM230 Power Modules with integrated line filter to maintain the limit values of EN 61800-3 Category C2 (filter A) or C1 table 14 (filter B). With unshielded cables, Categories C2 and C1 are not achieved.

5) It is essential to plug on an operator panel or the blanking cover in order to achieve degree of protection IP54/IP55/UL Type 12.
For further information, see Operator panels and blanking cover for PM230 Power Modules in section Supplementary system components.

Technical specifications (continued)

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
• I_{max}	A	2	2.6	3.4	4.7	6.2
Rated power						
• Based on I_L	kW (hp)	0.37 (0.50)	0.55 (0.74)	0.75 (1.01)	1.1 (1.48)	1.5 (2.01)
• Based on I_H	kW (hp)	0.25 (0.34)	0.37 (0.50)	0.55 (0.74)	0.75 (1.01)	1.1 (1.48)
Rated pulse frequency	kHz	4	4	4	4	4
Efficiency η		0.89	0.93	0.93	0.94	0.95
Power loss at rated current	kW (hp)	0.04 (0.05)	0.04 (0.05)	0.05 (0.07)	0.06 (0.08)	0.07 (0.09)
Cooling air requirement	m^3/s (ft^3/s)	0.002 (0.1)	0.002 (0.1)	0.005 (0.2)	0.005 (0.2)	0.005 (0.2)
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 [3]						
• 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. [4]						
• Shielded	m (ft)	25 (82.03)	25 (82.03)	25 (82.03)	25 (82.03)	25 (82.03)
• Unshielded	m (ft)	100 (328.10)	100 (328.10)	100 (328.10)	100 (328.10)	100 (328.10)
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] 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.

[4] 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 (continued)

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
• I_{max}	A	8.9	11.8	15.4	20.4	27
Rated power						
• Based on I_L	kW (hp)	2.2 (2.95)	3 (4.02)	4 (5.36)	5.5 (7.38)	7.5 (10.06)
• Based on I_H	kW (hp)	1.5 (2.01)	2.2 (2.95)	3 (4.02)	4 (5.36)	5.5 (7.38)
Rated pulse frequency	kHz	4	4	4	4	4
Efficiency η		0.96	0.96	0.97	0.97	0.97
Power loss	kW (hp)	0.08 (0.11)	0.11(0.15)	0.12 (0.16)	0.15 (0.20)	0.24 (0.32)
at rated current						
Cooling air requirement	m^3/s (ft^3/s)	0.005 (0.2)	0.005 (0.2)	0.009 (0.3)	0.009 (0.3)	0.009 (0.3)
Sound pressure level	dB	<50	<50	<62	<62	<62
L_{pA} (1 m)						
24 V DC power supply	A	1	1	1	1	1
for Control Unit						
Input current [3]						
• Rated current	A	6.1	8	11	14	19
• Based on I_H	A	4.2	6.1	8	11	14
Line supply connection		Screw terminals, plug-in	Screw terminals, plug-in	Screw terminals, plug-in	Screw terminals, plug-in	Screw terminals, plug-in
U1/L1, V1/L2, W1/L3						
• Conductor cross-section	mm^2	1.5 ... 2.5	1.5 ... 2.5	1.5 ... 6	1.5 ... 6	1.5 ... 6
Motor connection		Screw terminals, plug-in	Screw terminals, plug-in	Screw terminals, plug-in	Screw terminals, plug-in	Screw terminals, plug-in
U2, V2, W2						
• 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. [4]						
• Shielded	m (ft)	25 (82.03)	25 (82.03)	25 (82.03)	25 (82.03)	25 (82.03)
• Unshielded	m (ft)	100 (328.10)	100 (328.10)	100 (328.10)	100 (328.10)	100 (328.10)
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 (11.50)	292 (11.50)	292 (11.50)
• 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] 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.

[4] 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 (continued)

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
• I_{max}	A	39	52	64	57	67
Rated power						
• Based on I_L	kW (hp)	11 (24.26)	15 (33.08)	18.5 (40.79)	22 (48.51)	30 (66.15)
• Based on I_H	kW (hp)	7.5 (16.54)	11 (24.26)	15 (33.08)	18.5 (40.79)	22 (48.51)
Rated pulse frequency	kHz	4	4	4	4	4
Efficiency η		0.97	0.97	0.98	0.98	0.97
Power loss	kW (hp)	0.3 (0.66)	0.35 (0.77)	0.45 (0.99)	0.52 (1.15)	0.68 (1.50)
at rated current						
Cooling air requirement	m^3/s (ft^3/s)	0.019 (0.7)	0.019 (0.7)	0.019 (0.7)	0.08 (2.8)	0.08 (2.8)
Sound pressure level	dB	<65	<65	<65	<60	<60
L_{pA} (1 m)						
24 V DC power supply	A	1	1	1	1	1
for Control Unit						
Input current [3]						
• Rated current	A	27	33	39	42	56
• Based on I_H	A	19	27	33	36	42
Line supply connection		Screw terminals, plug-in	Screw terminals, plug-in	Screw terminals, plug-in	M6 screw studs	M6 screw studs
U1/L1, V1/L2, W1/L3						
• Conductor cross-section	mm^2	6 ... 16	6 ... 16	6 ... 16	16 ... 35	16 ... 35
Motor connection		Screw terminals, plug-in	Screw terminals, plug-in	Screw terminals, plug-in	M6 screw studs	M6 screw studs
U2, V2, W2						
• Conductor cross-section	mm^2	6 ... 16	6 ... 16	6 ... 16	16 ... 35	16 ... 35
Motor cable length, max. [4]						
• Shielded	m (ft)	25 (82.03)	25 (82.03)	25 (82.03)	25 (82.03)	25 (82.03)
• Unshielded	m (ft)	100 (328.10)	100 (328.10)	100 (328.10)	100 (328.10)	100 (328.10)
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 (9.92)	4.5 (9.92)	4.5 (9.92)	11 (24.26)	11 (24.26)
• With integrated line filter	kg (lb)	5.1 (11.25)	5.1 (11.25)	5.1 (11.25)	14 (30.87)	14 (30.87)

[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] 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.

[4] 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 (continued)

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
• I_{max}	A	90	112	135	165
Rated power					
• Based on I_L	kW (hp)	37 (49.62)	45 (60.35)	55 (73.76)	75 (100.58)
• Based on I_H	kW (hp)	30 40.23)	37 (49.62)	45 (60.35)	55 (73.76)
Rated pulse frequency	kHz	4	4	4	4
Efficiency η		0.97	0.97	0.97	0.97
Power loss	kW (hp)	0.99 (1.33)	1.2 (1.61)	1.4 (1.88)	2 (2.68)
at rated current					
Cooling air requirement	m^3/s (ft^3/s)	0.08 (2.8)	0.08 (2.8)	0.15 (5.3)	0.15 (5.3)
Sound pressure level	dB	<60	<60	<60	<60
L_{pA} (1 m)					
24 V DC power supply	A	1	1	1	1
for Control Unit					
Input current [3]					
• Rated current	A	70	84	102	135
• Based on I_H	A	56	70	84	102
Line supply connection		M6 screw studs	M6 screw studs	M8 screw studs	M8 screw studs
U1/L1, V1/L2, W1/L3					
• Conductor cross-section	mm^2	25 ... 50	25 ... 50	35 ... 120	35 ... 120
Motor connection		M6 screw studs	M6 screw studs	M8 screw studs	M8 screw studs
U2, V2, W2					
• Conductor cross-section	mm^2	25 ... 50	25 ... 50	35 ... 120	35 ... 120
Motor cable length, max. [4]					
• Shielded	m (ft)	25 (82.03)	25 (82.03)	25 (82.03)	25 (82.03)
• Unshielded	m (ft)	100 (328.10)	100 (328.10)	100 (328.10)	100 (328.10)
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 (25.00)	635 (25.00)	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 (33.08)	15 (33.08)	34 (74.97)	34 (74.97)
• With integrated line filter	kg (lb)	22 (48.51)	22 (48.51)	46 (101.43)	46 (101.43)

[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] 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.

[4] 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 (continued)

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
• I_{max}	A	11.8	27	64
Rated power				
• Based on I_L	kW (hp)	3 (4.02)	7.5 (10.06)	18.5 (24.81)
• Based on I_H	kW (hp)	2.2 (2.95)	5.5 (7.38)	15 (20.12)
Rated pulse frequency	kHz	4	4	4
Efficiency η		0.96	0.97	0.98
Power loss	kW (hp)	0.11 (0.15)	0.24 (0.32)	0.45 (0.60)
at rated current				
Cooling air requirement	m^3/s (ft^3/s)	0.005 (0.2)	0.009 (0.3)	0.019 (0.7)
Sound pressure level	dB	<56	<62	<65
L_{pA} (1 m)				
24 V DC power supply	A	1	1	1
for Control Unit				
Input current [3]				
• Rated current	A	8	19	39
• Based on I_H	A	6.1	14	33
Line supply connection		Screw terminals, plug-in	Screw terminals, plug-in	Screw terminals, plug-in
U1/L1, V1/L2, W1/L3				
• Conductor cross-section	mm^2	1.5 ... 2.5	4 ... 6	6 ... 16
Motor connection		Screw terminals, plug-in	Screw terminals, plug-in	Screw terminals, plug-in
U2, V2, W2				
• Conductor cross-section	mm^2	1 ... 2.5	4 ... 6	10 ... 16
Motor cable length, max. [4]				
• Shielded	m (ft)	25 (82.03)	25 (82.03)	25 (82.03)
• Unshielded	m (ft)	100 (328.10)	100 (328.10)	100 (328.10)
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 (11.91)
• With integrated line filter	kg (lb)	1.9 (4.19)	3.6 (7.94)	6 (13.23)

[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] 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.

[4] 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.

Characteristic curves

Derating data for PM230 Power Modules

Pulse frequency

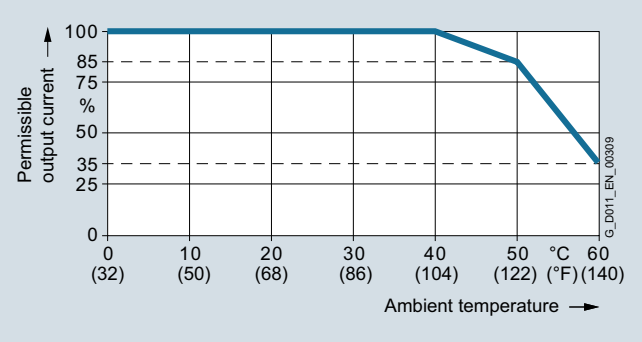
Rated power [1]		Rated output current in A for a pulse frequency of						
400 V	460 V							
kW	hp	4 kHz	6 kHz	8 kHz	10 kHz	12 kHz	14 kHz	16 kHz
0.37	0.5	1.3	1.11	0.91	0.78	0.65	0.59	0.52
0.55	0.75	1.7	1.45	1.19	1.02	0.85	0.77	0.68
0.75	1.0	2.2	1.87	1.54	1.32	1.10	0.99	0.88
1.1	1.5	3.1	2.64	2.17	1.86	1.55	1.40	1.24
1.5	2.0	4.1	3.49	2.87	2.46	2.05	1.85	1.64
2.2	3.0	5.9	5.02	4.13	3.54	2.95	2.66	2.36
3.0	4.0	7.7	6.55	5.39	4.62	3.85	3.47	3.08
4.0	5.0	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	18.0	15.3	12.6	10.8	9.0	8.1	7.2
11.0	15	26.0	22.1	18.2	15.6	13.0	11.7	10.4
15.0	20	32.0	27.2	22.4	19.2	16.0	14.4	12.8
18.5	25	38.0	32.3	26.6	22.8	19.0	17.1	15.2
22	30	45.0	38.25	31.5	27.0	22.5	20.25	18.0
30	40	60.0	51.0	42.0	36.0	30.0	27.0	24.0
37	50	75.0	63.75	52.5	45.0	37.5	33.75	30.0
45	60	90.0	76.5	63.0	54.0	45.0	40.5	36.0
55	75	110	93.5	77.0	66.0 [2]	55.0 [2]	49.5 [2]	44.0 [2]
75	100	145	123.3	101.5	–	–	–	–
90	125	178	151.3	124.6	–	–	–	–

[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).

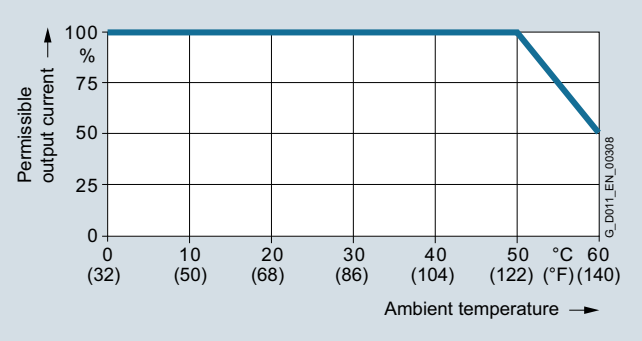
[2] Values apply only to IP20 variants.

Characteristic curves (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.

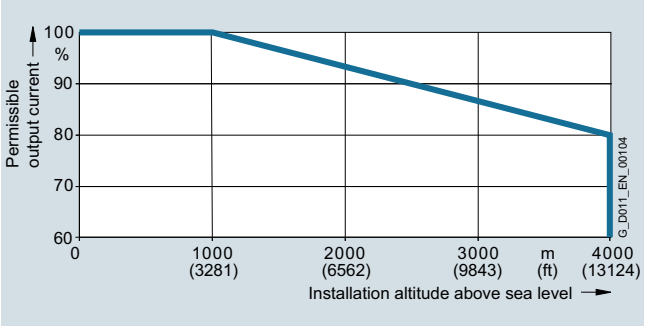
Installation altitude

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

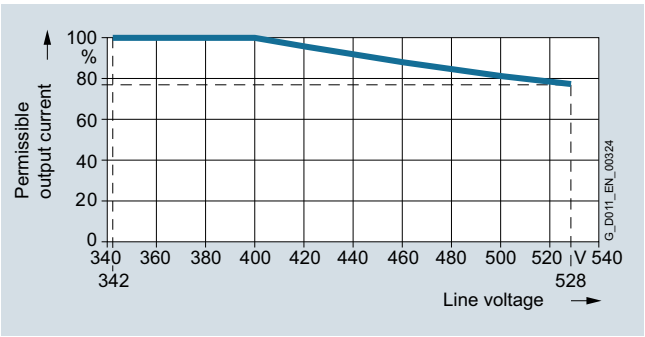
Note:

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

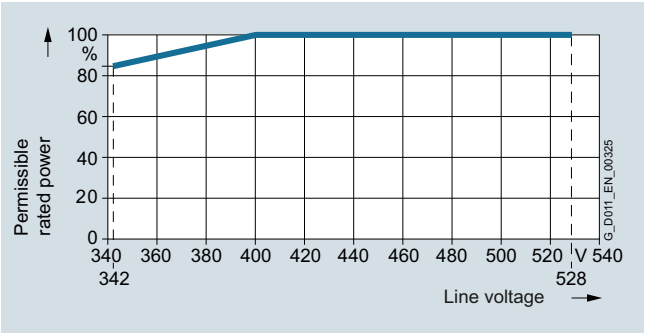


Permissible output current as a function of the installation altitude for PM230 Power Modules, frame sizes FSA to FSF

System operating voltage



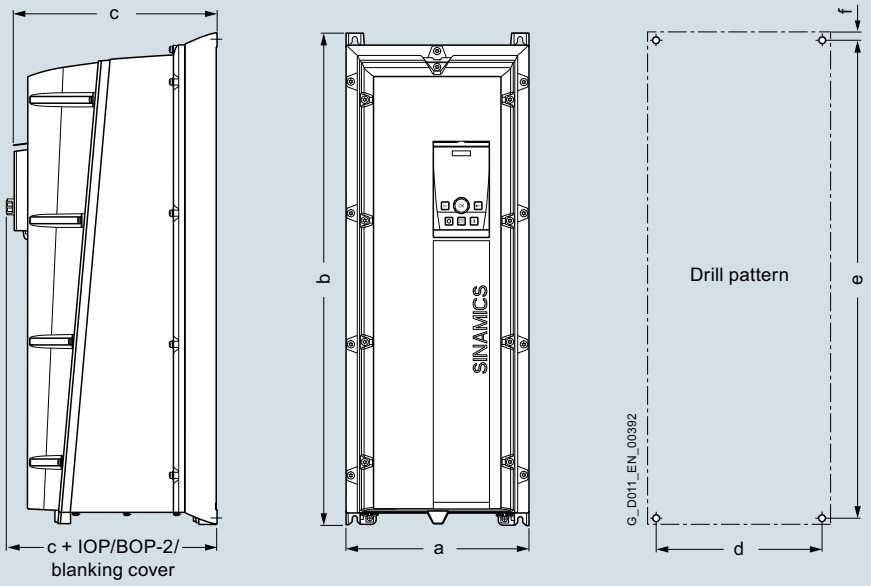
Permissible output current as a function of the line voltage for PM230 Power Modules, frame sizes FSA to FSF



Permissible rated power as a function of the line voltage for PM230 Power Modules, frame sizes FSA to FSF

Dimensional drawings

PM230 Power Modules, degree of protection IP55/UL Type 12



Principle dimension drawing and drill pattern for PM230 Power Modules, degree of protection IP55/UL Type 12 with integrated line filter class A/B

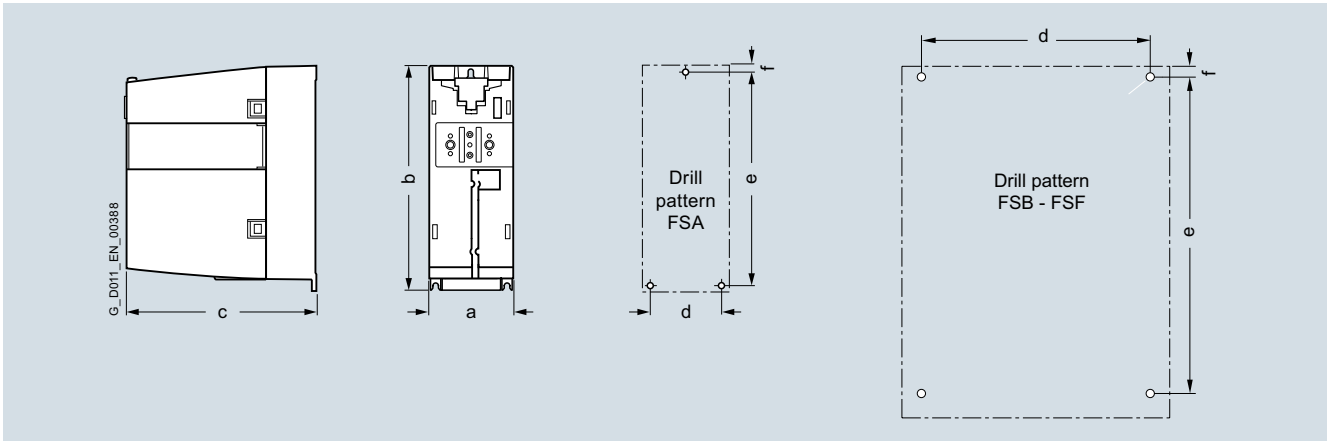
Frame size	**Dimensions** in mm (inches)			**Drilling dimensions** in mm (inches)			**Cooling clearance** in mm (inches)			**Mounting**
	a (width)	b (height)	c (depth) [1]	d	e	f	top	bottom	side	With bolts, nuts and washers
PM230 Power Modules, degree of protection IP55/UL Type 12 with integrated line filter class A/B										
FSA	154 (6.06)	460 (18.11)	249 (9.8)	132 (5.19)	445 (17.51)	11 (0.43)	100 (3.94)	0 (0)	0 (0)	4 × M4
FSB	180 (7.08)	540 (21.25)	249 (9.8)	158 (5.9)	524 (20.62)	11 (0.43)	100 (3.94)	0 (0)	0 (0)	4 × M4
FSC	230 (9.05)	620 (24.4)	249 (9.8)	208 (8.18)	604 (23.77)	11 (0.43)	125 (4.92)	0 (0)	0 (0)	4 × M5
FSD	320 (12.59)	640 (25.19)	329 (12.95)	285 (11.22)	600 (23.62)	17.5 (0.69)	300 (11.81)	0 (0)	50 (1.97) [2]	4 × M8
FSE	320 (12.59)	751 (29.56)	329 (12.95)	285 (11.22)	710 (27.95)	17.5 (0.69)	300 (11.81)	0 (0)	50 (1.97) [2]	4 × M8
FSF	410 (16.14)	915 (36.02)	416 (16.38)	370 (14.56)	870 (34.25)	20 (0.79)	350 (13.78)	0 (0)	50 (1.97) [2]	4 × M8

[1] Increased depth:
- When the IOP is plugged on, the depth increases by 17 mm (0.67 in)
- When the BOP-2/blanking cover is plugged on, the depth increases by 7 mm (0.28 in)

[2] Up to 40 °C (104 °F) without any lateral clearance.

Dimensional drawings (continued)

PM230 Power Modules, degree of protection IP20, 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

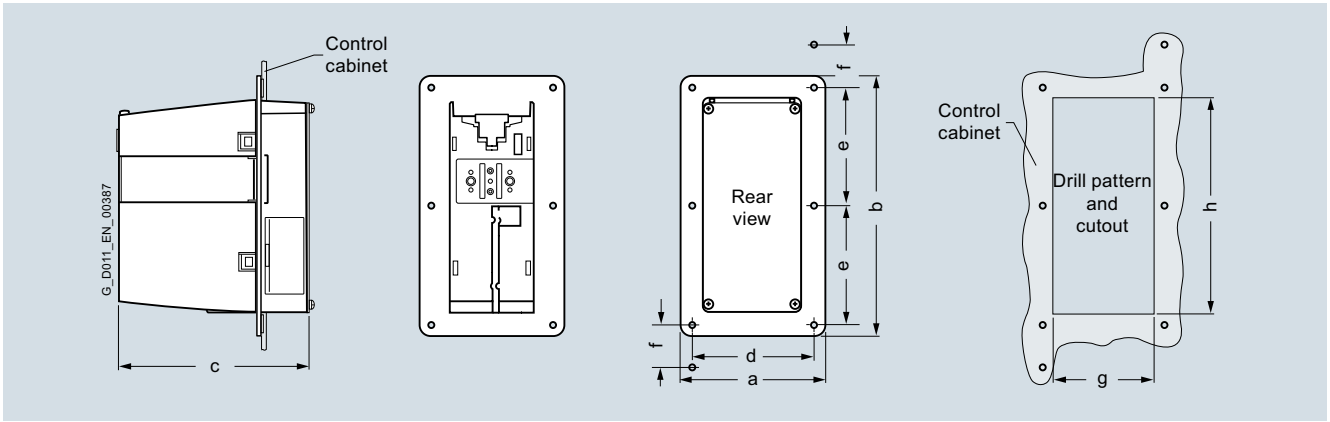
Frame size	Dimensions in mm (inches)			Drilling dimensions in mm (inches)			Cooling clearance in mm (inches)			Mounting
	a (width)	b (height)	c (depth) [1]	d	e	f	top	bottom	side [2]	With bolts
PM230 Power Modules, degree of protection IP20, Standard variant, with/without integrated line filter class 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 × 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

[1] Increased depth:
- When the CU230P-2 Control Unit is plugged on, the depth increases by 58 mm (2.28 in) for FSA to FSC and by 49 mm (1.93 in) for FSD to FSF
- When the IOP is plugged on, the depth increases by a further 22 mm (0.87 in)
- When the BOP-2 is plugged on, 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 (continued)

PM230 Power Modules, degree of protection IP20, 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

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 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 IOP is plugged on, the depth increases by a further 22 mm (0.87 in)
- When the BOP-2 is plugged on, 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.

Overview

Line filter for Power Modules frame size FSA

With an additional line filter, 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.

Line filters that are optionally available depending on the Power Module used

	Frame size					
	FSA	**FSB**	**FSC**	**FSD**	**FSE**	**FSF**
PM230 Power Module degree of protection IP55/UL Type 12						
Available frame sizes	✓	✓	✓	✓	✓	✓
Line-side power components						
Line filter class A	I	I	I	I	I	I
Line filter class B	I	I	I	I	I	I
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	U	U	S	S	S

U = Base component
S = Lateral mounting
I = Integrated
F = Power Modules available with and without integrated filter class A
– = Not possible

1) Lateral mounting is the only possible option for Push Through variants.

Selection and ordering data

Rated power		SINAMICS G120P PM230 Power Module Degree of protection IP20 Standard variant			Line filter class B according to EN 55011
400 V	460 V				
kW	hp	Type 6SL3210-...	Frame size		Article No.
380 ... 480 V 3 AC					
0.37	0.50	1NE11-3UL1	FSA	NEW	**6SL3203-0BE17-7BA0**
0.55	0.75	1NE11-7UL1			
0.75	1.0	1NE12-2UL1			
1.1	1.5	1NE13-1UL1			
1.5	2	1NE14-1UL1			
2.2	3	1NE15-8UL1			
3.0	4	1NE17-7UL1			
4.0	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		SINAMICS G120P PM230 Power Module Degree of protection IP20 Push Through variant			Line filter class B according to EN 55011
400 V	460 V				
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**

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
• Conductor 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 (3.61)
PE connection		On housing with M5 screw stud	On housing with M5 screw stud	On housing with M6 screw stud	On housing with M6 screw stud	On housing with M8 screw stud	On housing with 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 (3.86)	4 (8.82)	7.3 (16.1)	7.6 (16.8)	11.9 (26.2)	21.7 (47.8)
Suitable for PM230 Power Module Degree of protection IP20 Standard variant	Type	6SL3210-1NE11-3UL0 6SL3210-1NE11-7UL0 6SL3210-1NE12-2UL0 6SL3210-1NE13-1UL0 6SL3210-1NE14-1UL0 6SL3210-1NE15-8UL0 6SL3210-1NE17-7UL0	6SL3210-1NE21-0UL0 6SL3210-1NE21-3UL0 6SL3210-1NE21-8UL0	6SL3210-1NE22-6UL0 6SL3210-1NE23-2UL0 6SL3210-1NE23-8UL0	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 (only lateral mounting)	Type	6SL3211-1NE17-7UL0	6SL3211-1NE21-8UL0	6SL3211-1NE23-8UL0	–	–	–
• Frame size		FSA	FSB	FSC	FSD	FSE	FSF

Selection and ordering data

The following table lists recommendations for additional line-side components, such as fuses and circuit breakers/motor starter protectors. 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 or 3NE1 (UL-compliant – corresponds to (UL)) are required for North America.

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/motor starter protectors can be found in Catalogs LV 10, IC 10 and IC 10 AO.

Rated power [1]		SINAMICS G120P PM230 Power Modules Degree of protection IP55/ UL Type 12		IEC-compliant			UL/cUL-compliant		
				Fuse		Circuit breaker/ motor starter protector	Fuse	Fuse type	
400 V	460 V	Type		Current	Type 3NA3		Type 3NE1 (UL)	Class J	Current
kW	hp	6SL3223-...	Frame size	A	Article No.	Article No.	Article No.	Class	A
380 ... 480 V 3 AC									
0.37	0.50	0DE13-7 . A0	FSA	10	**3NA3803**	**3RV2011-1CA10**	–	J	10
0.55	0.75	0DE15-5 . A0	FSA			**3RV2011-1DA10**	–		
0.75	1.0	0DE17-5 . A0	FSA			**3RV2011-1FA10**	–		
1.1	1.5	0DE21-1 . A0	FSA			**3RV2011-1GA10**	–		
1.5	2	0DE21-5 . A0	FSA			**3RV2011-1JA10**	–	J	15
2.2	3	0DE22-2 . A0	FSA			**3RV2011-1KA10**	–	J	20
3.0	4	0DE23-0 . A0	FSA			**3RV2021-4AA10**	–	J	30
4.0	5	0DE24-0 . A0	FSB	16	**3NA3805**	**3RV2021-4BA10**	–	J	40
5.5	7.5	0DE25-5 . A0	FSB	20	**3NA3807**		–	J	50
7.5	10	0DE27-5 . A0	FSB	25	**3NA3810**	**3RV1031-4EA10**	–	J	70
11.0	15	0DE31-1 . A0	FSC	35	**3NA3814**	**3RV1031-4FA10**	–		
15.0	20	0DE31-5 . A0	FSC	50	**3NA3820**	**3RV1031-4HA10**	–		
18.5	25	0DE31-8AA0	FSC			**3RV1042-4KA10**	–		
		0DE31-8BA0	FSD				**3NE1817-0**	–	–
22	30	0DE32-2 . A0	FSD	63	**3NA3822**		**3NE1818-0**	–	–
30	40	0DE33-0 . A0	FSD	80	**3NA3824**	**3RV1042-4MA10**	**3NE1820-0**	–	–
37	50	0DE33-7 . A0	FSE	100	**3NA3830**	**3VL1712-.DD33-....** *)	**3NE1021-0**	–	–
45	60	0DE34-5 . A0	FSE	125	**3NA3832**	**3VL1716-.DD33-....** *)	**3NE1022-0**	–	–
55	75	0DE35-5 . A0	FSF	160	**3NA3836**	**3VL3720-.DC36-....** *)	**3NE1224-0**	–	–
75	100	0DE37-5 . A0	FSF	200	**3NA3140**	**3VL3725-.DC36-....** *)	**3NE1225-0**	–	–
90	125	0DE38-8 . A0	FSF	250	**3NA3144**	**3VL4731-.DC36-....** *)	**3NE1227-0**	–	–

[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).

*) See Catalog LV 10 for Article No. supplements.

Selection and ordering data (continued)

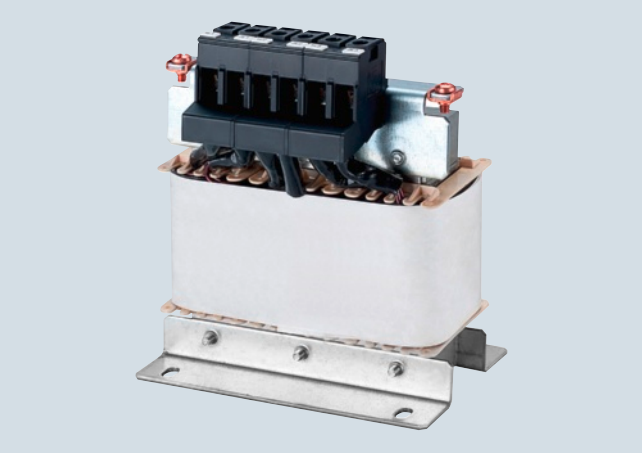
Rated power [1]		SINAMICS G120 PM230 Power Modules Degree of protection IP20 Standard variant		IEC-compliant Fuse		UL/cUL-compliant Fuse	Fuse type	
400 V	460 V	Type		Current	Type 3NE1 (🇺🇸)	Type 3NE1 (🇺🇸)	Class J	Current
kW	hp	6SL3210-...	Frame size	A	Article No.	Article No.	Class	A
80 ... 480 V 3 AC								
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	1.0	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					
3.0	4	1NE17-7 . L1	FSA					
4.0	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					
11.0	15	1NE22-6 . L1	FSC	50	**3NE1817-0**	**3NE1817-0**	J	50
15.0	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**	–	–

Rated power [1]		SINAMICS G120 PM230 Power Modules Degree of protection IP20 Push Through variant		IEC-compliant Fuse		UL/cUL-compliant Fuse	Fuse type	
400 V	460 V	Type		Current	Type 3NE1 (🇺🇸)	Type 3NE1 (🇺🇸)	Class J	Current
kW	hp	6SL3211-...	Frame size	A	Article No.	Article No.	Class	A
380 ... 480 V 3 AC								
3.0	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

[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).

Output reactors

Overview



Output reactor for PM230 Power Modules, 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 Power Module

Integration

Output reactors that are optionally available depending on the Power Module used

The following load-side power components are optionally available in the appropriate frames sizes for the Power Modules:

	Frame size					
	FSA	**FSB**	**FSC**	**FSD**	**FSE**	**FSF**
PM230 Power Module, degree of protection IP20 or IP55/UL Type 12						
Available frame sizes	✓	✓	✓	✓	✓	✓
Load-side power components						
Output reactor	S	S	S	S	S	S

S = Lateral mounting
– = Not possible

Selection and ordering data

Rated power		SINAMICS G120P PM230 Power Modules degree of protection IP20	SINAMICS G120P PM230 Power Modules degree of protection IP55/UL Type 12			Output reactor
400 V	460 V					
kW	hp	Type 6SL3210-...	Type 6SL3223-...	Frame size		Article No.
380 ... 480 V 3 AC						
0.37	0.50	1NE11-3 . L1	0DE13-7 . A0	FSA	NEW	**6SL3202-0AE16-1CA0**
0.55	0.75	1NE11-7 . L1	0DE15-5 . A0			
0.75	1.0	1NE12-2 . L1	0DE17-5 . A0			
1.1	1.5	1NE13-1 . L1	0DE21-1 . A0			
1.5	2	1NE14-1 . L1	0DE21-5 . A0			
2.2	3	1NE15-8 . L1	0DE22-2 . A0			
3.0	4	1NE17-7 . L1	0DE23-0 . A0	FSA	NEW	**6SL3202-0AE18-8CA0**
4.0	5	1NE21-0 . L1	0DE24-0 . A0	FSB	NEW	**6SL3202-0AE21-8CA0**
5.5	7.5	1NE21-3 . L1	0DE25-5 . A0			
7.5	10	1NE21-8 . L1	0DE27-5 . A0			
11	15	1NE22-6 . L1	0DE31-1 . A0	FSC	NEW	**6SL3202-0AE23-8CA0**
15	20	1NE23-2 . L1	0DE31-5 . A0			
18.5	25	1NE23-8 . L1	0DE31-8 . A0			
22	30	1NE24-5 . L0	0DE32-2 . A0	FSD		**6SE6400-3TC03-8DD0**
30	40	1NE26-0 . L0	0DE33-0 . A0	FSD		**6SE6400-3TC05-4DD0**
37	50	1NE27-5 . L0	0DE33-7 . A0	FSE		**6SE6400-3TC08-0ED0**
45	60	1NE28-8 . L0	0DE34-5 . A0	FSE		**6SE6400-3TC07-5ED0**
55	75	1NE31-1 . L0	0DE35-5 . A0	FSF		**6SE6400-3TC14-5FD0**
75	100	1NE31-5 . L0	0DE37-5 . A0	FSF		**6SE6400-3TC15-4FD0**
90	125	–	0DE38-8 . A0	FSF		**6SE6400-3TC14-5FD0**

Rated power		SINAMICS G120P PM230 Power Module Degree of protection IP20 Push Through variant			Output reactor
400 V	460 V				
kW	hp	Typ 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**

Output reactors

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 (hp)	0.09 (1.21)	0.08 (1.07)	0.08 (1.07)	0.11 (0.15)
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					
• 380 V -10 % ... 415 V +10 % 3 AC					
- Shielded	m (ft)	150 (492.15)	150 (492.15)	150 (492.15)	150 (492.15)
- Unshielded	m (ft)	225 (738.23)	225 (738.23)	225 (738.23)	225 (738.23)
• 440 ... 480 V +10 % 3 AC					
- Shielded	m (ft)	100 (328.10)	100 (328.10)	100 (328.10)	100 (328.10)
- Unshielded	m (ft)	150 (492.15)	150 (492.15)	150 (492.15)	150 (492.15)
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)
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 (7.50)	3.9 (8.60)	10.1 (22.27)	11.2 (24.70)
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 PM230 Power Module degree of protection IP55/ UL Type 12	Type	6SL3223-0DE13-7 . A0 6SL3223-0DE15-5 . A0 6SL3223-0DE17-5 . A0 6SL3223-0DE21-1 . A0 6SL3223-0DE21-5 . A0 6SL3223-0DE22-2 . A0	6SL3223-0DE23-0 . A0	6SL3223-0DE24-0 . A0 6SL3223-0DE25-5 . A0 6SL3223-0DE27-5 . A0	6SL3223-0DE31-1 . A0 6SL3223-0DE31-5 . A0 6SL3223-0DE31-8 . A0
• Frame size		FSA	FSA	FSB	FSC

Technical specifications (continued)

Line voltage 380 ... 480 V 3 AC		Output reactor			
		6SE6400-3TC03-8DD0	**6SE6400-3TC05-4DD0**	**6SE6400-3TC08-0ED0**	**6SE6400-3TC07-5ED0**
Rated current	A	45 [1]	68 [1]	104 [1]	90 [1]
Power loss	kW (hp)	0.2 (0.27)	0.2 (0.27)	0.17 (0.23)	0.27 (0.36)
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
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
PE connection		M6 screw	M6 screw	M6 screw	M6 screw
Cable length, max. between output reactor and motor					
• 380 V -10 % ... 480 V +10 % 3 AC					
- Shielded	m (ft)	200 (656.20)	200 (656.20)	200 (656.20)	200 (656.20)
- Unshielded	m (ft)	300 (984.30)	300 (984.30)	300 (984.30)	300 (984.30)
Dimensions					
• Width	mm (in)	225 (8.86)	225 (8.86)	225 (8.86)	270 (10.63)
• Height	mm (in)	210 (8.27)	210 (8.27)	210 (8.27)	248 (9.76)
• Depth	mm (in)	179 (7.05)	150 (5.91)	150 (5.91)	209 (8.23)
Possible as base component		No	No	No	No
Degree of protection		IP00	IP00	IP00	IP00
Weight, approx.	kg (lb)	16.1 (35.50)	10.7 (23.59)	10.4 (22.93)	24.9 (54.90)
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 PM230 Power Module degree of protection IP55/ UL Type 12	Type	6SL3223-0DE32-2UA0 6SL3223-0DE32-2AA0	6SL3223-0DE33-0UA0 6SL3223-0DE33-0AA0	6SL3223-0DE33-7UA0 6SL3223-0DE33-7AA0	6SL3223-0DE34-5UA0 6SL3223-0DE34-5AA0
• Rated power of the Power Module	kW (hp)	22 (29.50)	30 (40.23)	37 (49.62)	45 (60.35)
• Rated current I_{rated} of the Power Module	A	45	60	75	90
• Frame size		FSD	FSD	FSE	FSE

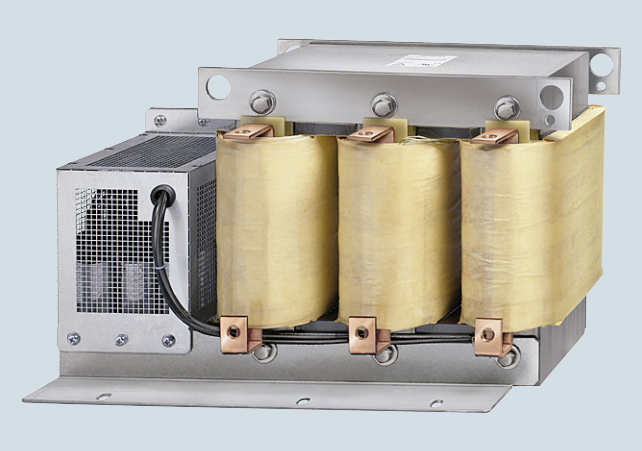
[1] On the rating plate of the reactor the current is specified according to high overload HO, which is lower than the indicated value for the low overload current of the Power Module.

Technical specifications (continued)

Line voltage 380 ... 480 V 3 AC		Output reactor		
		6SE6400-3TC14-5FD0	6SE6400-3TC15-4FD0	6SE6400-3TC14-5FD0
Rated current	A	178 [1]	178 [1]	178 [1]
Power loss	kW (hp)	0.47 (0.63)	0.25 (0.34)	0.47 (0.63)
Connection to the Power Module		Flat connector for M8 cable lug	Flat connector for M8 cable lug	Flat connector for M8 cable lug
Motor connection		Flat connector for M8 cable lug	Flat connector for M8 cable lug	Flat connector for M8 cable lug
PE connection		M8 screw	M6 screw	M8 screw
Cable length, max. between output reactor and motor				
• 380 V -10 % ... 480 V +10 % 3 AC				
- Shielded	m (ft)	200 (656.20)	200 (656.20)	200 (656.20)
- Unshielded	m (ft)	300 (984.30)	300 (984.30)	300 (984.30)
Dimensions				
• Width	mm (in)	350 (13.78)	270 (10.63)	350 (13.78)
• Height	mm (in)	321 (12.64)	248 (9.76)	321 (12.64)
• Depth	mm (in)	288 (11.34)	209 (8.23)	288 (11.34)
Possible as base component		No	No	No
Degree of protection		IP00	IP00	IP00
Weight, approx.	kg (lb)	51.5 (113.56)	24 (52.92)	51.5 (113.56)
Suitable for PM230 Power Module degree of protection IP20	Type	6SL3210-1NE31-1UL0 6SL3210-1NE31-1AL0	6SL3210-1NE31-5UL0 6SL3210-1NE31-5AL0	–
Suitable for PM230 Power Module degree of protection IP55/ UL Type 12	Type	6SL3223-0DE35-5UA0 6SL3223-0DE35-5AA0	6SL3223-0DE37-5UA0 6SL3223-0DE37-5AA0	6SL3223-0DE38-8UA0 6SL3223-0DE38-8AA0
• Rated power of the Power Module	kW (hp)	55 (73.76)	75 (100.58)	90 (120.69)
• Rated current I_{rated} of the Power Module	A	110	145	178
• Frame size		FSF	FSF	FSF

[1] On the rating plate of the reactor the current is specified according to high overload HO, which is lower than the indicated value for the low overload current of the Power Module.

Overview



Sine-wave filter

Sine-wave filters limit the the rate of voltage rise (*dv/dt*) and the peak voltages on the motor winding. Similarly 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
- 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.

Integration

Sine-wave filters that are optionally available depending on the Power Module used

	Frame size					
	FSA	**FSB**	**FSC**	**FSD**	**FSE**	**FSF**
PM230 Power Module, degree of protection IP20 or IP55/UL Type 12						
Available frame sizes	✓	✓	✓	✓	✓	✓
Load-side power components						
Sine-wave filter	–	–	–	S	S	S

S = Lateral mounting
– = Not possible

Selection and ordering data

Rated power		SINAMICS G120P PM230 Power Modules degree of protection IP20	SINAMICS G120P PM230 Power Modules degree of protection IP55/UL Type 12		**Sine-wave filter**
400 V kW	460 V hp	Type 6SL3210-...	Type 6SL3223-...	Frame size	Article No.
380 ... 480 V 3 AC					
22	30	1NE24-5 . L0	0DE32-2 . A0	FSD	**6SL3202-0AE24-6SA0**
30	40	1NE26-0 . L0	0DE33-0 . A0	FSD	**6SL3202-0AE26-2SA0**
37	50	1NE27-5 . L0	0DE33-7 . A0	FSE	**6SL3202-0AE28-8SA0**
45	60	1NE28-8 . L0	0DE34-5 . A0	FSE	
55	75	1NE31-1 . L0	0DE35-5 . A0	FSF	**6SL3202-0AE31-5SA0**
75	100	1NE31-5 . L0	0DE37-5 . A0	FSF	
90	125	–	0DE38-8 . A0	FSF	**6SL3202-0AE31-8SA0**

Technical specifications

Line voltage 380 ... 480 V 3 AC		Sine-wave filter			
		6SL3202-0AE24-6SA0	6SL3202-0AE26-2SA0	6SL3202-0AE28-8SA0	
Rated current	A	47	61.8	92	92
Power loss	kW (hp)	0.185 (0.25)	0.152 (0.20)	0.251(0.34)	0.251(0.34)
Connection to the Power Module		Screw terminals	Screw terminals	Screw terminals	Screw terminals
• Conductor cross-section	mm^2	50	50	95	95
Motor connection		Screw terminals	Screw terminals	Screw terminals	Screw terminals
• Conductor cross-section	mm^2	50	50	95	95
PE connection		M6 screw	M6 screw	M8 screw	M8 screw
Cable length, max. between sine-wave filter and motor					
• 380 ... 480 V ±10 % 3 AC					
- Shielded	m (ft)	200	200	200	200
- Unshielded	m (ft)	300	300	300	300
Dimensions					
• Width	mm (in)	250	250	275	275
• Height	mm (in)	315	305	368	368
• Depth	mm (in)	262	262	275	275
Possible as base component		No	No	No	No
Degree of protection		IP00	IP00	IP00	IP00
Weight, approx.	kg (lb)	24.0	34.0	45.0	45.0
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 PM230 Power Module degree of protection IP55/ UL Type 12	Type	6SL3223-0DE32-2UA0 6SL3223-0DE32-2AA0	6SL3223-0DE33-0UA0 6SL3223-0DE33-0AA0	6SL3223-0DE33-7UA0 6SL3223-0DE33-7AA0	6SL3223-0DE34-5UA0 6SL3223-0DE34-5AA0
• Rated power of the Power Module	kW (hp)	22 (29.50)	30 (40.23)	37 (49.62)	45 (60.35)
• Rated current I_{rated} of the Power Module	A	45	60	75	90
• Frame size		FSD	FSD	FSE	FSE

Line voltage 380 ... 480 V 3 AC		Sine-wave filter		
		6SL3202-0AE31-5SA0		6SL3202-0AE31-8SA0
Rated current	A	150	150	182
Power loss	kW (hp)	0.43 (0.58)	0.43 (0.58)	0.47 (0.63)
Connection to the Power Module		Screw terminals	Screw terminals	Screw terminals
• Conductor cross-section	mm^2	150	150	150
Motor connection		Screw terminals	Screw terminals	Screw terminals
• Conductor cross-section	mm^2	150	150	150
PE connection		M8 screw	M6 screw	M8 screw
Cable length, max. between sine-wave filter and motor				
• 380 ... 480 V ±10 % 3 AC				
- Shielded	m (ft)	200 (656.20)	200 (656.20)	200 (656.20)
- Unshielded	m (ft)	300 (984.30)	300 (984.30)	300 (984.30)
Dimensions				
• Width	mm (in)	350 (13.78)	350 (13.78)	350 (13.78)
• Height	mm (in)	440 (17.32)	440 (17.32)	468 (18.43)
• Depth	mm (in)	305 (12.01)	305 (12.01)	305 (12.01)
Possible as base component		No	No	No
Degree of protection		IP00	IP00	IP00
Weight, approx.	kg (lb)	63.0 (138.42)	63.0 (138.42)	80.0 (176.40)
Suitable for PM230 Power Module degree of protection IP20	Type	6SL3210-1NE31-1UL0 6SL3210-1NE31-1AL0	6SL3210-1NE31-5UL0 6SL3210-1NE31-5AL0	–
Suitable for PM230 Power Module degree of protection IP55/ UL Type 12	Type	6SL3223-0DE35-5UA0 6SL3223-0DE35-5AA0	6SL3223-0DE37-5UA0 6SL3223-0DE37-5AA0	6SL3223-0DE38-8UA0 6SL3223-0DE38-8AA0
• Rated power of the Power Module	kW (hp)	55 (73.76)	75 (100.58)	90 (120.69)
• Rated current I_{rated} of the Power Module	A	110	145	178
• Frame size		FSF	FSF	FSF

Overview

SINAMICS G120 PM240 Power Module, frame size FSF

PM240 Power Modules have an integrated braking chopper.

The permissible cable lengths between inverter and motor are limited. Longer cables can be used if output reactors are connected (see load-side power components).

Line reactors are available to minimize line harmonics as well as voltage and current peaks (see line-side components).

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.

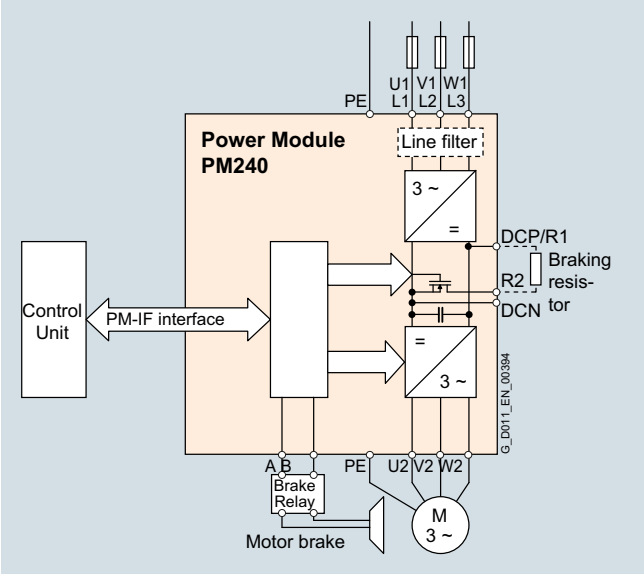
Note:

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.

Integration

All PM240 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
- Terminals DCP/R1 and R2 for connection of an external braking resistor
- Control for the Brake Relay for controlling a motor brake



Connection diagram for PM240 Power Module with or without integrated line filter class A

Available optional power and DC link components

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
	FSF
PM240 Power Module with integrated braking chopper	
Line-side power components	
Line filter class A	F/S [1]
Line reactor	S
DC link components	
Braking resistor	S
Load-side power components	
Output reactor	S
Sine-wave filter	S

S = Lateral mounting

F = Power Modules available with and without integrated filter class A

[1] PM240 Power Modules, frame size FSF, 110 kW and higher, are available only without an integrated filter class A. An optional line filter class A for lateral mounting is available instead.

Integration (continued)

General design information

- 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	Lateral mounting	
Frame size	Left of the inverter (for line-side power components)	Right of the inverter (for load-side power components and DC link components)
FSF	Line filter and/or line reactor	Output reactor or sine-wave filter and/or braking resistor

Maximum permissible cable lengths from the motor to the inverter when using output reactors or sine-wave filters depending on the voltage range

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:

PM240 Power Module, frame size FSF, with integrated braking chopper	Maximum permissible motor cable lengths (shielded/unshielded) in m
Without output reactor/sine-wave filter	50/100
With optional output reactor	200/300
With optional sine-wave filter	200/300

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 size FSF, with a shielded motor cable.

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)			
400 V	460 V								
kW	hp		A	A	mm^2	50 m	100 m	150 m	200 m
90	125	FSF	178	145	95	100 %	100 %	100 %	95 %

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 new 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.

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
400 V	460 V		400 V	460 V				
kW	hp	A	**kW**	hp	A		Article No.	Article No.
380 ... 480 V 3 AC								
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**	–

Note:

The power data in hp units are based on the NEC/CEC standards for the North American market.

[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	PM240
System operating voltage	380 ... 480 V ±10 % 3 AC
Grid requirement **Short-circuit power R_{SC}**	>25 >100 line reactor recommended
Input frequency	47 ... 63 Hz
Output frequency	
• Control mode U/f	0 ... 550 Hz, in firmware V4.7 and higher, due to legal requirements, the maximum output frequency is restricted to 550 Hz
• Control type Vector	0 ... 240 Hz
Pulse frequency	75 kW (HO): 4 kHz as of 90 kW (HO): 2 kHz Higher pulse frequencies up to 16 kHz, see derating data
Power factor λ	0.7 ... 0.85
Offset factor cos φ	0.95
Inverter efficiency	95 ... 98 %
Output voltage, max. As % of input voltage	95 %
Overload capability	
• Low overload (LO) Note: When the overload capability is used, the base-load current I_L is not reduced.	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
• High overload (HO) Note: When the overload capability is used, the base-load current I_H is not reduced.	75 kW (HO): 2 × base-load current I_H (i. e. 20 % 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

Power Modules	PM240
Electromagnetic compatibility	• Devices without line filter • Devices with line filter class A for compliance with conducted and radiated interference requirements of Category C2
Possible braking methods	• DC braking • Dynamic braking with integrated braking chopper
Degree of protection	IP20
Operating temperature	
• 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 >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	Internal ventilation, power units with increased air cooling by built-in fans
Installation altitude	Up to 1000 m (3281 ft) above sea level without derating, > 1000 m (3281 ft) see derating characteristics
Protection functions	• Undervoltage • Overvoltage • Overcurrent/overload • Ground fault • Short-circuit • Stall protection • Motor blocking protection • Motor overtemperature • Inverter overtemperature • Parameter locking
Rated short-circuit current SCCR (Short-Circuit Current Rating) [1]	65 kA
Compliance with standards	UL, cUL, CE, C-Tick, SEMI F47
CE marking	According to Low-Voltage Directive No. 2006/95/EC, EMC Directive 2004/108/EC

[1] Applies to industrial control cabinet installations to NEC article 409/ UL 508A.

Technical specifications (continued)

PM240 Power Modules

Line voltage 380 ... 480 V 3 AC		PM240 Power Modules		
Without integrated line filter		6SL3224-0BE37-5UA0	6SL3224-0BE38-8UA0	6SL3224-0BE41-1UA0
With integrated line filter		6SL3224-0BE37-5AA0	–	–
Output current				
at 50 Hz 400 V 3 AC				
• Rated current I_{rated} [1]	A	178	205	250
• Base-load current I_L [1]	A	178	205	250
• Base-load current I_H [2]	A	145	178	205
• I_{max}	A	290	308	375
Rated power				
• Based on I_L	kW (hp)	90 (120.69)	110 (147.51)	132 (177.01)
• Based on I_H	kW (hp)	75 (100.58)	90 (120.69)	110 (147.51)
Rated pulse frequency	kHz	4	2	2
Efficiency η		>0.97	>0.97	>0.97
Power loss	kW (hp)	2.31 (3.10)	2.43 (3.26)	2.53 (3.39)
at rated current				
Cooling air requirement	m^3/s (ft^3/s)	0.15 (5.3)	0.15 (5.3)	0.15 (5.3)
Sound pressure level	dB	<65	<65	<65
L_{pA} (1 m)				
24 V DC power supply	A	1	1	1
for Control Unit				
Rated input current [3]				
• With line reactor	A	186	210	250
• Without line reactor	A	204	245	299
Length of cable to braking resistor, max.	m (ft)	15 (49.22)	15 (49.22)	15 (49.22)
Line supply connection		M8 screw studs	M8 screw studs	M8 screw studs
U1/L1, V1/L2, W1/L3				
• Conductor cross-section	mm^2	25 ... 120	25 ... 120	25 ... 120
Motor connection		M8 screw studs	M8 screw studs	M8 screw studs
U2, V2, W2				
• Conductor cross-section	mm^2	25 ... 120	25 ... 120	25 ... 120
DC link connection, connection for braking resistor		M8 screw studs	M8 screw studs	M8 screw studs
DCP/R1, DCN, R2				
• Conductor cross-section	mm^2	25 ... 120	25 ... 120	25 ... 120
PE connection		On housing with M8 screw	On housing with M8 screw	On housing with M8 screw
Motor cable length [4], **max.**				
• Shielded	m (ft)	50 (164.05)	50 (164.05)	50 (164.05)
• Unshielded	m (ft)	100 (328.10)	100 (328.10)	100 (328.10)
Degree of protection		IP20	IP20	IP20
Dimensions				
• Width	mm (in)	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)
- With integrated line filter	mm (in)	934	–	–
• Depth				
- Without operator panel	mm (in)	316 (12.44)	316 (12.44)	316 (12.44)
- With operator panel, max.	mm (in)	387 (15.24)	387 (15.24)	387 (15.24)
Frame size		FSF	FSF	FSF
Weight, approx.				
• Without integrated line filter	kg (lb)	36 (79.38)	39 (86.00)	39 (86.00)
• With integrated line filter	kg (lb)	52 (114.66)	–	–

[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] 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 %. These current values without line reactor are specified on the rating plate of the Power Module.

[4] Max. motor cable length 25 m (82 ft) (shielded) for PM240 Power Modules with integrated line filter to maintain the limit values acc. to EN 61800-3 Category C2.

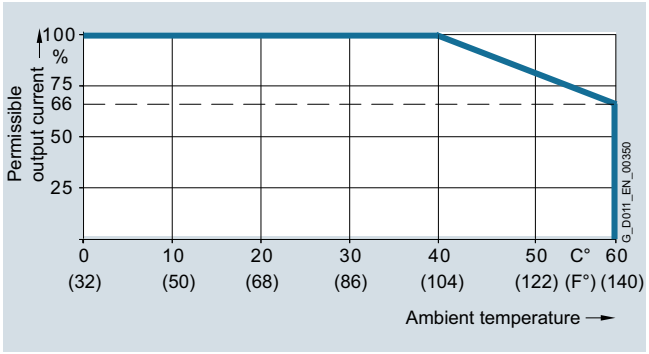
Characteristic curves

Derating data, PM240 Power Modules

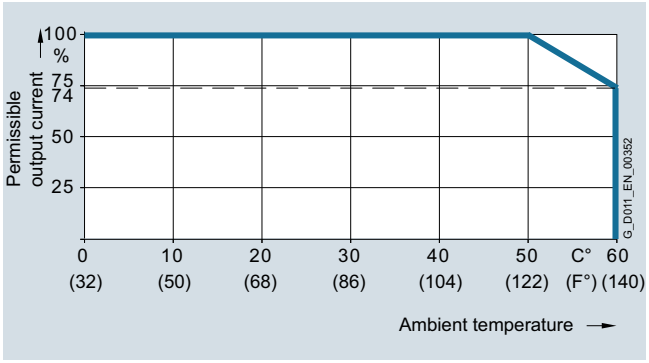
Pulse frequency

Rated power		**Rated output current in A** for a pulse frequency of			
400 V	460 V				
kW	hp	2 kHz	4 kHz	6 kHz	8 kHz
90	125	–	178	151.3	124.6
110	150	205 [1]	178	–	–
132	200	250 [1]	202	–	–

Ambient temperature



Low overload (LO) for PM240 Power Modules, frame size FSF



High overload (HO) for PM240 Power Modules, frame size 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.

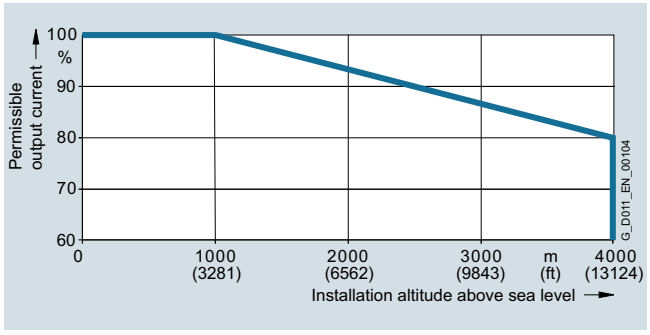
Installation altitude

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.

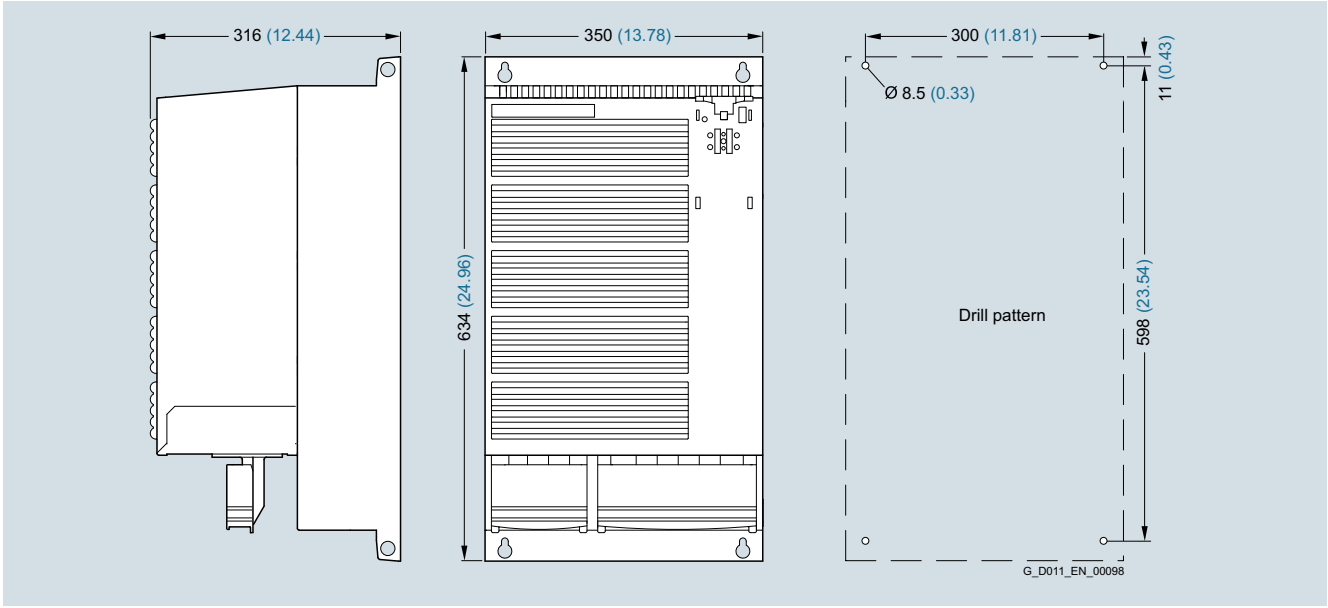


Permissible output current as a function of the installation altitude for PM240 Power Modules, frame size FSF

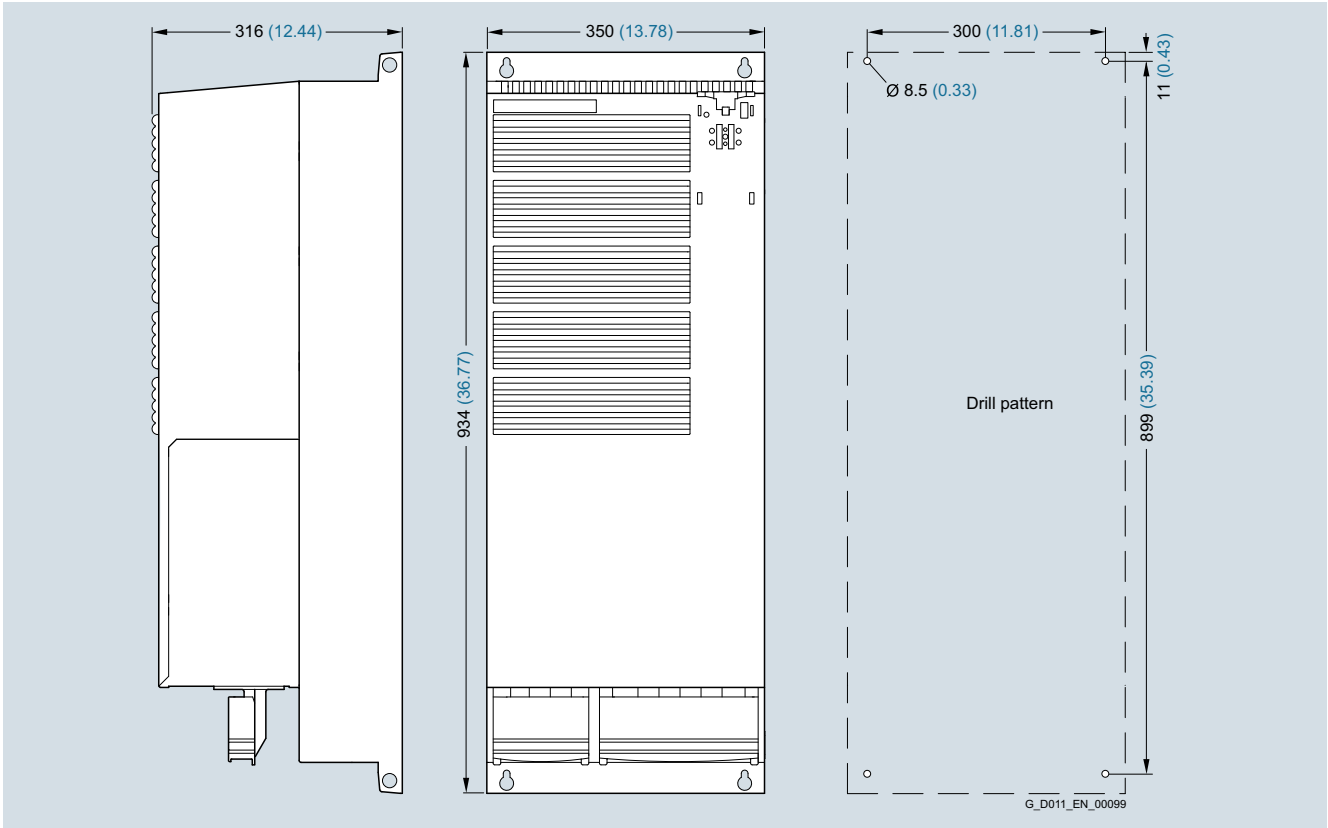
[1] The pulse frequency can only be switched over from 4 kHz (default) to 2 kHz for the low overload (LO) duty cycle.

Dimensional drawings

PM240 Power Modules, degree of protection IP20



Principle dimension drawing and drill pattern for PM240 Power Modules, frame size FSF, degree of protection IP20, without integrated line filter class A



Principle dimension drawing and drill pattern for PM240 Power Modules, frame size FSF, degree of protection IP20, with integrated line filter class A

Increased depth:

- When the CU230P-2 Control Unit is plugged on, the depth increases by 49 mm (1.93 in)
- When the IOP is plugged on, the depth increases by a further 22 mm (0.87 in)
- When the BOP-2 is plugged on, the depth increases by a further 12 mm (0.47 in)

Overview

Line filter

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

Integration

Available optional line filters

	Frame size
	FSF
PM240 Power Module with integrated braking chopper	
Line-side power components	
Line filter class A	F/S [1]

S = Lateral mounting

F = Power Modules available with and without integrated filter class A

Selection and ordering data

Rated power		SINAMICS G120 PM240 Power Module		**Line filter class A according to EN 55011**
400 V	460 V			
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		

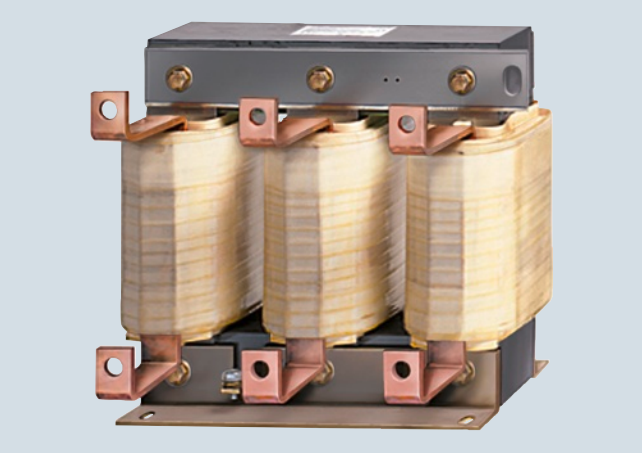
Technical specifications

Line voltage 380 ... 480 V 3 AC	**Line filter class A** 6SL3203-0BE32-5AA0
Rated current	250 A
Line supply connection L1, L2, L3	On housing with M8 screw stud
Load connection L1', L2', L3'	On housing with M8 screw stud
PE connection	Flat connector for M10 screw
Degree of protection	IP00
Dimensions	
• Width	240 mm
• Height	360 mm
• Depth	116 mm
Weight, approx.	12.4 kg
Suitable for PM240 Power Module	6SL3224-0BE38-8UA0 6SL3224-0BE41-1UA0
• Frame size	FSF

[1] PM240 FSF Power Modules, 110 kW and higher, are available only without an integrated filter class A. An optional line filter class A for lateral mounting is available instead.

Line reactors

Overview



Line reactor

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

Available optional line reactors

	Frame size
	FSF
PM240 Power Module with integrated braking chopper	
Line-side power components	
Line reactor	S

S = Lateral mounting

Selection and ordering data

Rated power		SINAMICS G120 PM240 Power Module		**Line reactor**
400 V	460 V			
kW	hp	Type 6SL3224-...	Frame size	Article No.
380 ... 480 V 3 AC				
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**

Technical specifications

Line voltage 380 ... 480 V 3 AC		**Line reactor**		
		6SE6400-3CC11-7FD0	6SL3000-0CE32-3AA0	6SL3000-0CE32-8AA0
Rated current	A	186	224	278
Power loss at 50/60 Hz, approx.	W	280/360	240/270	210/250
Line supply connection U1, V1, W1		Flat connector for M10 cable lug	Flat connector for M10 screw	Flat connector for M10 screw
Load connection		Flat connector for M10 cable lug	Flat connector for M10 screw	Flat connector for M10 screw
PE connection		On housing with M8 screw stud	M6 screw	M6 screw
Degree of protection		IP00	IP00	IP00
Dimensions				
• Width	mm (in)	240 (9.45)	270 (10.63)	270 (10.63)
• Height	mm (in)	228 (8.98)	248 (9.76)	248 (9.76)
• Depth	mm (in)	141 (5.55)	200 (7.87)	200 (7.87)
Weight, approx.	kg (lb)	25 (55.13)	24 (52.92)	24 (52.92)
Suitable for PM240 Power Module	Type	6SL3224-0BE37-5 . A0	6SL3224-0BE38-8UA0	6SL3224-0BE41-1UA0
• Frame size		FSF	FSF	FSF

Selection and ordering data

The following table lists recommendations for additional line-side components, such as fuses and circuit breakers/motor starter protectors. 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 or 3NE1 (UL-compliant – corresponds to) are required for North America.

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/motor starter protectors can be found in Catalogs LV 10, IC 10 and IC 10 AO.

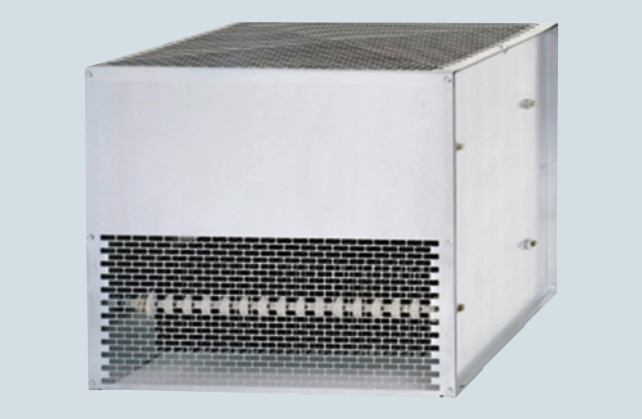
Rated power [1]		SINAMICS G120 PM240 Power Modules		**IEC-compliant**			**UL/cUL-compliant**		
				Fuse		**Circuit breaker**	**Fuse**	**Fuse type**	
400 V	460 V	Type		Current	Type 3NA3		Type 3NE1 ( )	Class J	Current
kW	hp	6SL3224-...	Frame size	A	Article No.	Article No.	Article No.	Class	A
380 ... 480 V 3 AC									
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

[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.

Braking resistors

Overview



Braking resistor

Excess energy in the DC link is dissipated in the braking resistor. The braking resistors are intended for use with PM240 Power Modules which feature an integrated braking chopper, but cannot regenerate energy to the supply system. 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 at the side next to the PM240 Power Modules.

The braking resistors for the Power Modules of frame size FSF should be placed outside the control cabinet or outside the switchgear room so that the heat loss is removed from the area of the Power Modules. The level of air conditioning required is therefore reduced.

Every braking resistor has a temperature switch (UL-listed). The temperature switch can be evaluated to prevent consequential damage if the braking resistor overheats.

Integration

Available optional braking resistors

	Frame size
	FSF
PM240 Power Module with integrated braking chopper	
DC link components	
Braking resistor	S

S = Lateral mounting

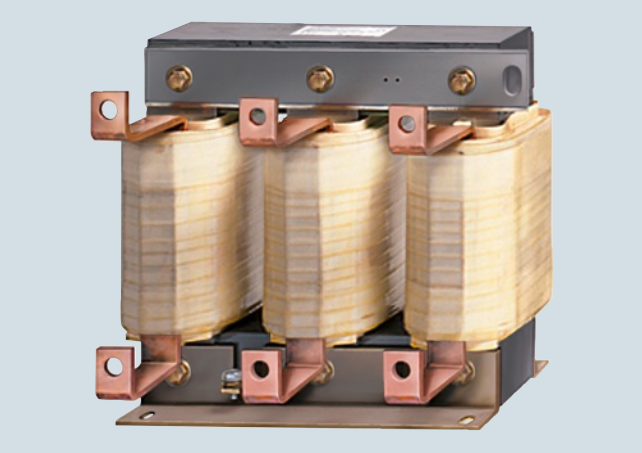
Selection and ordering data

Rated power		SINAMICS G120 PM240 Power Module		**Braking resistor**
400 V	460 V			
kW	hp	Typ 6SL3224-...	Frame size	Article No.
380 ... 480 V 3 AC				
90	125	0BE37-5 . A0	FSF	**6SE6400-4BD24-0FA0**
110	150	0BE38-8UA0	FSF	**6SE6400-4BD26-0FA0**
132	200	0BE41-1UA0		

Technical specifications

Line voltage 380 V ... 480 V 3 AC		**Braking resistor**	
		6SE6400-4BD24-0FA0	6SE6400-4BD26-0FA0
Resistance	Ω	8.2	5.5
Rated power P_{DB} (Continuous braking power)	kW (hp)	4 (5.36)	5.6 (7.51)
Peak power P_{max} (cycle time 12 s)	kW (hp)	80 (107.28)	120 (160.92)
Power connections		M6 screw studs	M6 screw studs
Thermostatic switch • Contact load, max.		NC contact 250 V AC/2.5 A	NC contact 250 V AC/2.5 A
Degree of protection		IP20	IP20
Frame size		FSF	FSF
Dimensions • Width • Height • Depth	 mm (in) mm (in) mm (in)	 395 (15.55) 650 (25.59) 315 (12.40)	 526 (20.71) 301 (11.85) 484 (19.06
Weight, approx.	kg (lb)	16.7 (36.82)	17.5 (38.59)
Suitable for PM240 Power Module • Frame size	Type	6SL3224-0BE37-5UA0 6SL3224-0BE37-5AA0 FSF	6SL3224-0BE38-8UA0 6SL3224-0BE41-1UA0 FSF

Overview



Output reactor

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
- Max. permissible pulse frequency 4 kHz
- The output reactor must be installed as close as possible to the Power Module

Integration

Available optional output reactors

	Frame size
	FSF
PM240 Power Module with integrated braking chopper	
Load-side power components	
Output reactor	S

S = Lateral mounting

Selection and ordering data

Rated power		SINAMICS G120 PM240 Power Modules		**Output reactor**
400 V	460 V			
kW	hp	Type 6SL3224-...	Frame size	Article No.
380 ... 480 V 3 AC				
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**

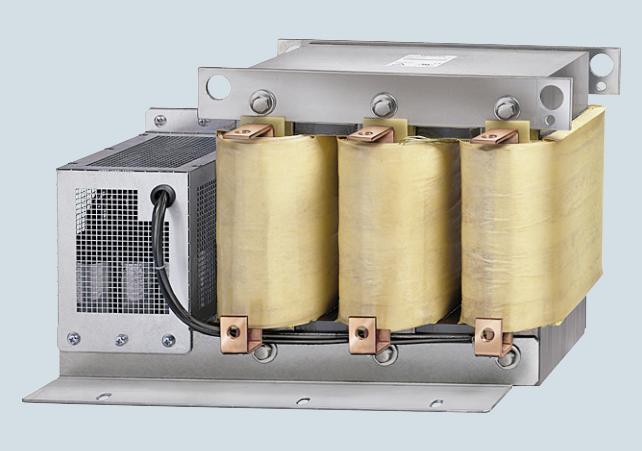
Output reactors

Technical specifications

Line voltage 380 ... 480 V 3 AC		Output reactor		
		6SE6400-3TC14-5FD0	6SL3000-2BE32-1AA0	6SL3000-2BE32-6AA0
Rated current	A	178 [1]	210	260
Power loss	kW (hp)	0.47 (0.63)	0.49 (0.66)	0.5 (0.67)
Connection to the Power Module		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 M10 screw	Flat connector for M10 screw
PE connection		M8 screw	M8 screw	M8 screw
Cable length, max. between output reactor and motor • 380 V -10 % ... 480 V +10 % 3 AC - Shielded - Unshielded	 m (ft) m (ft)	 200 (656.20) 300 (984.30)	 200 (656.20) 300 (984.30)	 200 (656.20) 300 (984.30)
Dimensions • Width • Height • Depth	 mm (in) mm (in) mm (in)	 350 (13.78) 321(12.64) 288 (11.34)	 300 (11.81) 285 (11.22) 257(10.12)	 300 (11.81) 315 (12.40) 277 (10.91)
Degree of protection		IP00	IP00	IP00
Weight, approx.	kg (lb)	51.5 (113.56)	60 (132.30)	66 (145.53)
Suitable for PM240 Power Module	Type	6SL3224-0BE37-5UA0 6SL3224-0BE37-5AA0	6SL3224-0BE38-8UA0	6SL3224-0BE41-1UA0
• Rated power of the Power Module	kW (hp)	90 (120.69)	110 (147.51)	132 (177.01)
• Rated current I_{rated} of the Power Module	A	178	205	250
• Frame size		FSF	FSF	FSF

[1] On the rating plate of the reactor the current is specified according to high overload HO, which is lower than the indicated value for the low overload current of the Power Module.

Overview



Sine-wave filter

Sine-wave filters limit the 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
- Only a pulse frequency of 4 kHz is permissible for rated outputs of 110 kW and higher. 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
- A derating of 5 % must be observed when the appropriate PM240 Power Module is selected

Integration

Available optional sine-wave filters

	Frame size
	FSF
PM240 Power Module with integrated braking chopper	
Load-side power components	
Sine-wave filter	S

S = Lateral mounting

Selection and ordering data

Rated power		SINAMICS G120 PM240 Power Module		**Sine-wave filter**
400 V	460 V			
kW	hp	Type 6SL3224-...	Frame size	Article No.
3 AC 380 ... 480 V				
90	125	0BE37-5 . A0	FSF	**6SL3202-0AE31-8SA0**
110	150	0BE38-8UA0	FSF	**6SL3000-2CE32-3AA0**
132	200	0BE41-1UA0		

4

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)		
		6SL3202-0AE31-8SA0	6SL3000-2CE32-3AA0	
Rated current	A	182	225	225
Power loss	kW (hp)	0.47 (0.63)	0.221 (0.30)	0.221 (0.30)
Connection to the Power Module		Screw terminals	1 x hole for M10	1 x hole for M10
• Conductor cross-section	mm^2	150		
Motor connection		Screw terminals	1 x hole for M10	1 x hole for M10
• Conductor cross-section	mm^2	150		
PE connection		M8 screw	1 x hole for M10	1 x hole for M10
Cable length, max. between sine-wave filter and motor				
• 380 ... 480 V ±10 % 3 AC				
- Shielded	m (ft)	200 (656.20)	300 (984.30)	300 (984.30)
- Unshielded	m (ft)	300 (984.30)	450 (1 476.45)	450 (1 476.45)
Dimensions				
• Width	mm (in)	350 (13.78)	620 (24.41)	620 (24.41)
• Height	mm (in)	468 (18.43)	300 (11.81)	300 (11.81)
• Depth	mm (in)	305 (12.01)	320 (12.60)	320 (12.60)
Degree of protection		IP00	IP00	IP00
Weight, approx.	kg (lb)	80 (176.40)	124 (273.42)	124 (273.42)
Suitable for PM240 Power Module	Type	6SL3224-0BE37-5UA0 6SL3224-0BE37-5AA0	6SL3224-0BE38-8UA0	6SL3224-0BE41-1UA0
• Rated power of the Power Module	kW (hp)	90 (120.69)	110 (147.51)	132 (177.01)
• Rated current I_{rated} of the Power Module	A	178	205	250
• Frame size		FSF	FSF	FSF

Overview

PM330 Power Module, degree of protection IP20, frame size GX

PM330 Power Modules have been specifically developed for driving pumps, fans and compressors with quadratic characteristic for use in HVAC applications. They have a connection to an external Braking Module (1-quadrant applications). The Power Modules can be installed very flexibly in customer-specific cabinets with the associated system components.

The PM330 Power Modules produce only low apparent power losses. In addition to the energy-related advantages, environmental stressing is also reduced.

To reduce emissions, the PM330 Power Modules are equipped with a radio interference suppression filter as standard (in accordance with the limit values defined in Category C3). The PM330 Power Modules equipped with a line filter also meet the limits for use in the first environment (Category C2) as specified in EN 61800-3 [1].

The PM330 Power Modules are designed for connection to grounded TN/TT systems and non-grounded IT systems.

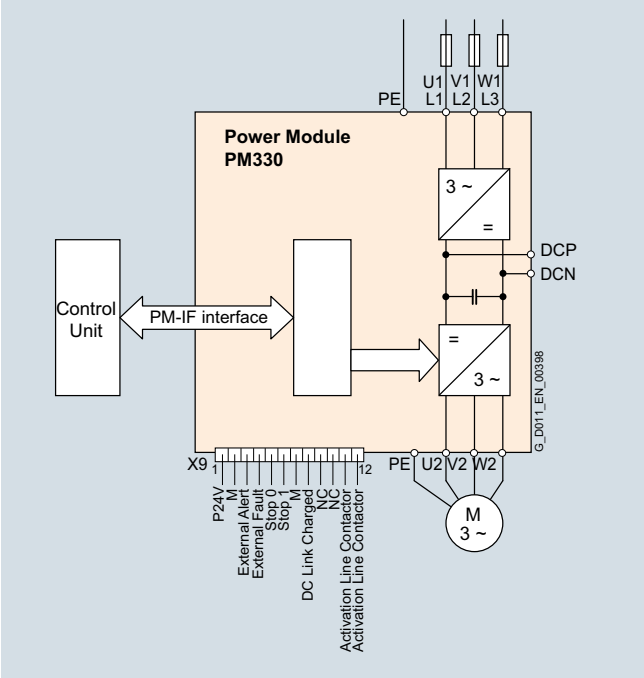
PM330 Power Modules do not support Control Units with Safety Integrated. Safety functions can be implemented by means of external switching devices.

Integration

The PM330 Power Modules have the following connections and interfaces:

- PM-IF interface to connect the PM330 Power Module to the Control Unit. The PM330 Power Module also supplies power to the Control Unit using an integrated power supply.
- Motor connection and line supply connection via screw studs
- DC-link connection for Braking Module
- PE (protective earth) connections
- Terminal block X9
  - Input for external 24 V DC supply
  - Input for external alarm/fault
  - Input for EMERGENCY OFF / EMERGENCY STOP
  - Control of the main contactor
  - "DC link charged" enable signal

PM330 Power Modules communicate with the Control Unit via the PM-IF interface.



Connection diagram for PM330 Power Module

Power components that are available depending on the Power Module used

The following line-side power components, DC link components and load-side power components can be ordered additionally in the appropriate frames size for the Power Modules:

PM330 Power Module	Frame size GX	Frame size HX
Line-side power components		
Line filter	✓	✓
Line reactor	✓	✓
DC link components		
Braking Module with braking resistor	✓	✓
Load-side power components		
Output reactor	✓	✓
dv/dt filter plus VPL	✓	✓
dv/dt filter compact plus VPL	✓	✓

[1] To comply with Category C2, shielded cables must also be used between the converter and motor with a maximum permissible cable length of 100 m. Longer cables can be used if output reactors and output filters are connected (see section Load-side power components).

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)**

The modules support at least 2-pole and 4-pole low-voltage motors depending on the rated output current. The rated power is merely a guide value. For a description of the overload performance, please refer to the section containing the Power Module characteristics.

Rated power [1]		Rated output current I_{rated}	Base-load current I_L [2]	Power based on the base-load current I_H [3]		Base-load current I_H [3]	Frame size		**PM330 Power Module Degree of protection IP20**
400 V	460 V			400 V	460 V				
kW	hp	A	A	**kW**	hp	A			Article No.
380 ... 480 V 3 AC									
160	200	300	290	**132**	150	240	GX	NEW	**6SL3310-1PE33-0AA0**
200	250	370	360	**160**	200	296	GX	NEW	**6SL3310-1PE33-7AA0**
250	300	460	450	**200**	200	368	GX	NEW	**6SL3310-1PE34-6AA0**
315	400	585	570	**250**	300	468	HX	NEW	**6SL3310-1PE35-8AA0**
355	450	655	640	**250**	300	491	HX	NEW	**6SL3310-1PE36-6AA0**
400	500	735	720	**315**	350	551	HX	NEW	**6SL3310-1PE37-4AA0**

[1] Rated power based on the base-load current I_L.
[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).

Technical specifications

General technical specifications

	PM330 Power Modules
Input data	
Line voltage	380 ... 480 V ±10 % 3 AC
Starting current	< rated input current (refer to power-dependent data)
Input frequency	47 ... 63 Hz
Grid requirement **Short-circuit power R_{SC}**	>33 line reactor required
Output data	
Output voltage	0 V 3 AC ... ≤ (line voltage × 0.97)
Output current	See power-dependent data
Output frequency	0 ... 100 Hz
Pulse frequency	Self-adjusting up to 4 kHz
Power factor λ	0.75 ... 0.93
Offset factor cos φ	0.96
Further technical specifications	
Overvoltage category to IEC 61800-5-1	• Overvoltage category III: Supply circuits • Overvoltage category II: Non-supply circuits
Braking methods	• DC braking • Dynamic braking with external Braking Module with braking resistor
Type of cooling	Forced air cooling AF to EN 60146
Protection functions	• Undervoltage • Overvoltage • Overcurrent/overload • Ground fault • Short-circuit • Stall protection • Motor blocking protection • Motor overtemperature • Converter overtemperature/fan failure • Parameter locking • Detection of single-phase motor cable break • Line phase failure
Standards	
Compliance with standards	cULus (File No.: E192450), CE, C-Tick, GOST-R (EAC), KC
CE marking	According to EMC Directive No. 2004/108/EC and Low-Voltage Directive No. 2006/95/EC
RI suppression	According to EMC product standard for variable-speed drives EN 61800-3, "second environment". Can be operated in the "first environment" if line filters are installed.

Technical specifications (continued)

PM330 Power Modules

Line voltage 380 ... 480 V 3 AC		PM330 Power Modules					
		6SL3310-1PE33-0AA0	6SL3310-1PE33-7AA0	6SL3310-1PE34-6AA0	6SL3310-1PE35-8AA0	6SL3310-1PE36-6AA0	6SL3310-1PE37-4AA0
Rated power [1]							
• Based on the base-load current I_L							
- At 400 V/50 Hz	kW	**160**	**200**	**250**	**315**	**355**	**400**
- At 460 V/60 Hz	hp	200	250	300	400	450	500
• Based on the base-load current I_H							
- At 400 V/50 Hz	kW	132	160	200	250	250	315
- At 460 V/60 Hz	hp	150	200	200	300	300	350
Output current at 50 Hz 3 AC							
• Rated current I_{rated} (400 V ±10 %)	A	300	370	460	585	655	735
• Rated current I_{rated} (480 V ±10 %)	A	245	308	369	487	526	602
• Base-load current I_L (400 V ±10 %) [2]	A	290	360	450	570	640	720
• Base-load current I_L (480 V ±10 %) [2]	A	240	302	361	477	515	590
• Base-load current I_H (400 V ±10 %) [3]	A	240	296	368	468	491	551
• Base-load current I_H (480 V ±10 %) [3]	A	196	247	295	390	394	452
• Max. output current I_{max}	A	392	486	608	770	864	972
Rated pulse frequency	kHz	2	2	2	2	2	2
Input current [4]							
• Rated current I_{rated} (400 V ±10 %)	A	317	375	469	597	668	750
• Rated current I_{rated} (480 V ±10 %)	A	262	314	376	497	536	614
• Base-load current I_L (400 V ±10 %) [2]	A	307	365	459	585	654	735
• Base-load current I_L (480 V ±10 %) [2]	A	257	308	368	486	525	602
• Base-load current I_H (400 V ±10 %) [3]	A	254	300	375	477	501	562
• Base-load current I_H (480 V ±10 %) [3]	A	210	251	301	397	402	461
• Max. input current	A	415	493	620	785	881	992
Short-circuit current rating per IEC in conjunction with the specified fuses	kA	100	100	100	100	100	100
Rated short-circuit current SCCR (Short Circuit Current Rating) in accordance with UL508C (up to 600 V) in conjunction with the specified fuses	kA	100	100	100	100	100	100
Minimum short-circuit current [5]							
• For 3NE1 fuses	A	4400	5200	6300	9000	10000	12000
• For 3NA3 fuses	A	9500	14000	20000	20000	30000	30000
Efficiency η At rated current I_{rated} (400 V/40 °C)		0.98	0.98	0.981	0.981	0.98	0.981
Power loss At rated current I_{rated} (400 V/40 °C)	kW (hp)	3.642 (4.88)	4.414 (5.92)	5.125 (6.87)	6.791 (9.11)	7.687 (10.31)	8.385 (11.24)
Coolant requirements	m^3/s (ft^3/s)	0.21 (7.4)	0.21 (7.4)	0.21 (7.4)	0.36 (12.7)	0.36 (12.7)	0.36 (12.7)
Coolant		of air	of air	of air	of air	of air	of air
Sound pressure level L_{pA} (1 m)	dB	74	74	74	74	74	74
Power requirement 24 V DC supply	A	0.5	0.5	0.5	0.5	0.5	0.5

[1] Rated power of a typical 4-pole standard induction motor based on the base-load current I_L or I_H at 400 V 3 AC/50 Hz (kW) or 460 V 3 AC/60 Hz (hp).

[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] 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] 10 ms value from current-time characteristic for reliable tripping of installed protection devices.

Technical specifications (continued)

Line voltage 380 ... 480 V 3 AC		PM330 Power Modules					
		6SL3310-1PE33-0AA0	6SL3310-1PE33-7AA0	6SL3310-1PE34-6AA0	6SL3310-1PE35-8AA0	6SL3310-1PE36-6AA0	6SL3310-1PE37-4AA0
Line supply connection U1/L1, V1/L2, W1/L3		M12 screw	M12 screw	M12 screw	M12 screw	M12 screw	M12 screw
• Conductor cross section, max. (IEC)	mm^2	2 × 240	2 × 240	2 × 240	4 × 240	4 × 240	4 × 240
Motor connection U2, V2, W2		M12 screw	M12 screw	M12 screw	M12 screw	M12 screw	M12 screw
• Conductor cross section, max. (IEC)	mm^2	2 × 240	2 × 240	2 × 240	4 × 240	4 × 240	4 × 240
DC link connection DCP, DCN		M12 screw	M12 screw	M12 screw	M12 screw	M12 screw	M12 screw
• Conductor cross section, max. (IEC)	mm^2	2 × 240	2 × 240	2 × 240	4 × 240	4 × 240	4 × 240
PE/GND connection		M12 screw	M12 screw	M12 screw	M12 screw	M12 screw	M12 screw
• Conductor cross section, max. (IEC)	mm^2	3 × 240	3 × 240	3 × 240	6 × 240	6 × 240	6 × 240
Cable length, max. between Power Module and motor							
• When compliant with categories C2 and C3 according to EN 61800-3 shielded	m (ft)	100 (328.10)	100 (328.10)	100 (328.10)	100 (328.10)	100 (328.10)	100 (328.10)
• When non-compliant with the limit values for RI suppression and without output reactor or dv/dt filter unshielded	m (ft)	200 (656.20)	200 (656.20)	200 (656.20)	200 (656.20)	200 (656.20)	200 (656.20)
• When non-compliant with the limit values for RI suppression with output reactor or dv/dt filter shielded/unshielded	m (ft)	300/450 (984.30/1476.45)	300/450 (984.30/1476.45)	300/450 (984.30/1476.45)	300/450 (984.30/1476.45)	300/450 (984.30/1476.45)	300/450 (984.30/1476.45)
Degree of protection		IP20	IP20	IP20	IP20	IP20	IP20
Dimensions							
• Width	mm (in)	452 (17.80)	452 (17.80)	452 (17.80)	548 (21.57)	548 (21.57)	548 (21.57)
• Height	mm (in)	1447 (56.97)	1447 (56.97)	1447 (56.97)	1696 (66.77)	1696 (66.77)	1696 (66.77)
• Depth	mm (in)	327.5 (12.89)	327.5 (12.89)	327.5 (12.89)	393 (15.47)	393 (15.47)	393 (15.47)
Frame size		GX	GX	GX	HX	HX	HX
Weight, approx.	kg (lb)	101 (222.71)	102 (224.91)	107 (235.94)	155 (341.78)	155 (341.78)	157 (346.19)
Minimum size of control cabinet for installation of a Power Module							
• Width	mm (in)	No specifications	No specifications	No specifications	800 (31.50)	800 (31.50)	800 (31.50)
• Height	mm (in)	No specifications	No specifications	No specifications	2000 (78.74)	2000 (78.74)	2000 (78.74)
• Depth	mm (in)	No specifications	No specifications	No specifications	600 (23.62)	600 (23.62)	600 (23.62)

Note:

If the minimum short-circuit current is not reached, the activation time of the fuses is increased, which can lead to damage.

Characteristic curves

Derating data

The PM330 Power Modules and the associated system components are rated for an ambient temperature of 40 °C and installation altitudes of up to 1000 m above sea level. At ambient temperatures of > 40 °C, the output current must be reduced. Ambient temperatures above 50 °C are not permissible.

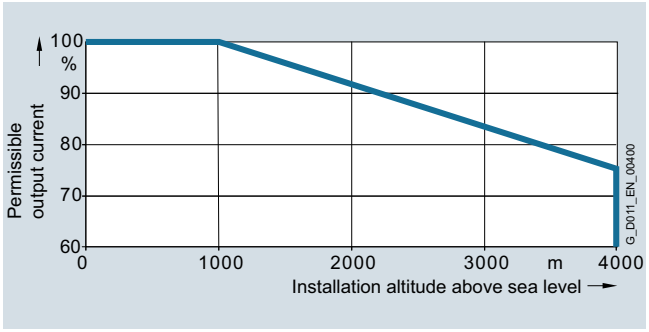
At installation altitudes > 1000 m above sea level, it must be taken into account that the air pressure, and therefore air density, decreases as the height increases. As a consequence, the cooling efficiency and the insulation capacity of the air also decrease. Due to the reduced cooling efficiency, it is necessary, on the one hand, to reduce the ambient temperature, and on the other hand, to lower heat loss in the built-in unit by reducing the output current.

As additional measure for installation altitudes from 2000 m up to 4000 m, an isolating transformer is required in order to reduce transient overvoltages according to EN 60664-1.

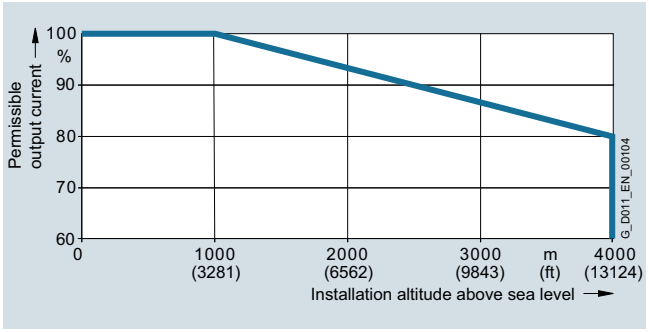
Automatic adjustment of pulse frequency

In the factory setting, the drive starts with a pulse frequency of 4 kHz and reduces the pulse frequency automatically to the associated required frequencies when loaded. When the load decreases, the pulse frequency is increased automatically up to 4 kHz. The values of the rated current apply to a pulse frequency of 2 kHz and an ambient temperature of 40 °C and are reached at any time by the automatic adaptation of the output pulse frequency.

Current derating as a function of the installation altitude



Permissible output current as a function of the installation altitude for PM330 Power Modules, frame size GX

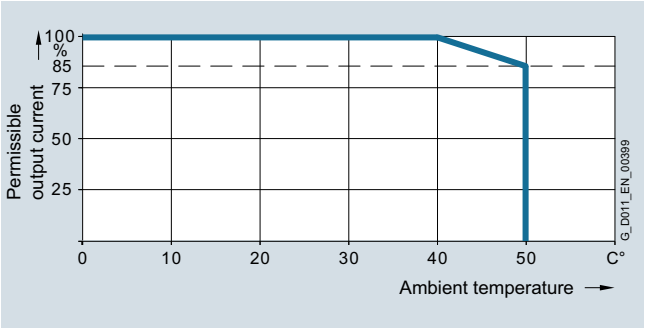


Permissible output current as a function of the installation altitude for PM330 Power Modules, frame size HX

Note:

The connected motors and power elements must be considered separately.

Current derating as a function of the ambient temperature



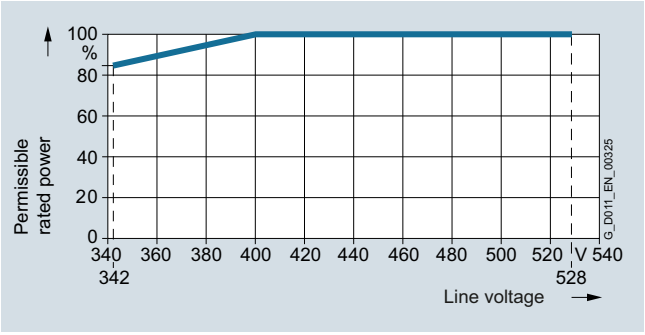
Low overload (LO) and high overload (HO) for PM330 Power Modules

Note:

The operating temperature ranges of the Control Units must be taken into account (see technical specifications of Control Units).

Current derating as a function of the line voltage

The PM330 Power Modules supply a constant power over the full permissible range of line voltage.



Rated power as a function of the line voltage

The constant power results in current derating as a function of the line voltage.

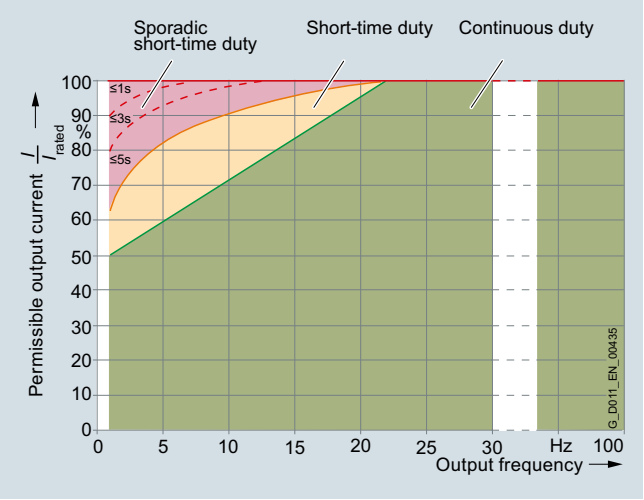
PM330 Power Module	Rated output current I_{rated} At 380 ... 400 V	380 V	400 V	415 V	460 V	480 V
	A	%	%	%	%	%
6SL3310-1PE33-0AA0	300	100	100	96.6	86.2	81.6
6SL3310-1PE33-7AA0	370	100	100	96.9	87.8	83.7
6SL3310-1PE34-6AA0	460	100	100	96.4	85.4	80.6
6SL3310-1PE35-8AA0	585	100	100	96.9	87.8	83.7
6SL3310-1PE36-6AA0	655	100	100	96.4	85.4	80.6
6SL3310-1PE37-4AA0	735	100	100	96.6	86.6	82.1

Characteristic curves (continued)

Operating ranges

An additional dimensioning aid is available for all converters with a PM330 Power Module. The purpose of this aid is to ensure the constant reliable operation of the converter, in particular with regard to service life expectancy.

The dimensioning aid clearly distinguishes between continuous operating ranges and short-time operating ranges. As a result, due consideration can be given to operating ranges when the plant is configured. For further details, please refer to the diagram below and the explanatory text.



Continuous operation (green area) permissible.

Short-time operation (yellow area) permissible for 2 % of the total operating period without significant reduction in the converter service life; no overload reaction triggered by the thermal monitoring model.

Sporadic short-time operation (red area) permissible for only very short, rare operating states lasting less than 0.1 % of the total operating period without significant reduction in the converter service life; no overload reaction triggered by the thermal monitoring model on condition of compliance with the duty times specified in the diagram.

Overload capability

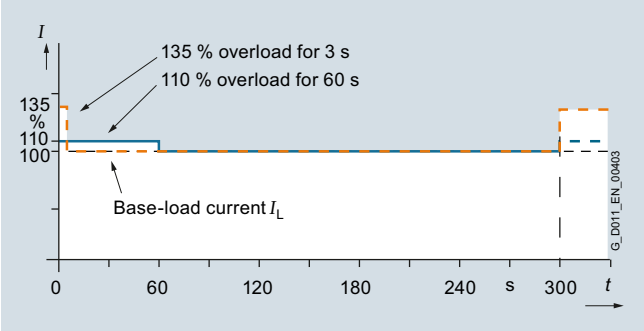
PM330 Power Modules have an overload reserve e.g. to handle breakaway torques. If larger surge loads occur, this must be taken into account when configuring. In drives with overload requirements, the appropriate base-load current must, therefore, be used as a basis for the required load.

The unit can operate in two different duty cycles in the permissible continuous operating range shown in the diagram (green area). Depending on how the system is dimensioned, the relevant base-load current is effective as a rated quantity.

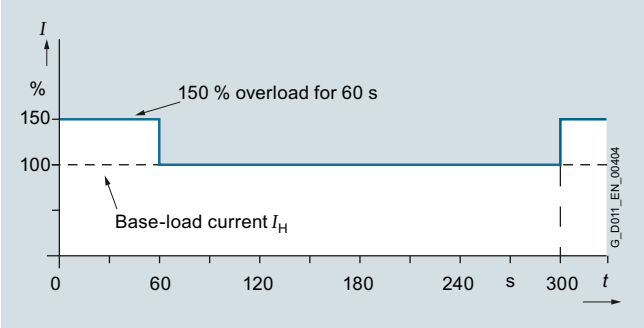
The criterion for overload is that the drive is operated with its base-load current before and after the overload occurs on the basis of a duty cycle duration of 300 s.

The base-load current for a low overload I_L is the basis for a duty cycle of 110 % for 60 s or 135 % for 3 s.

The base-load current I_H for a high overload is based on a duty cycle of 150 % for 60 s.



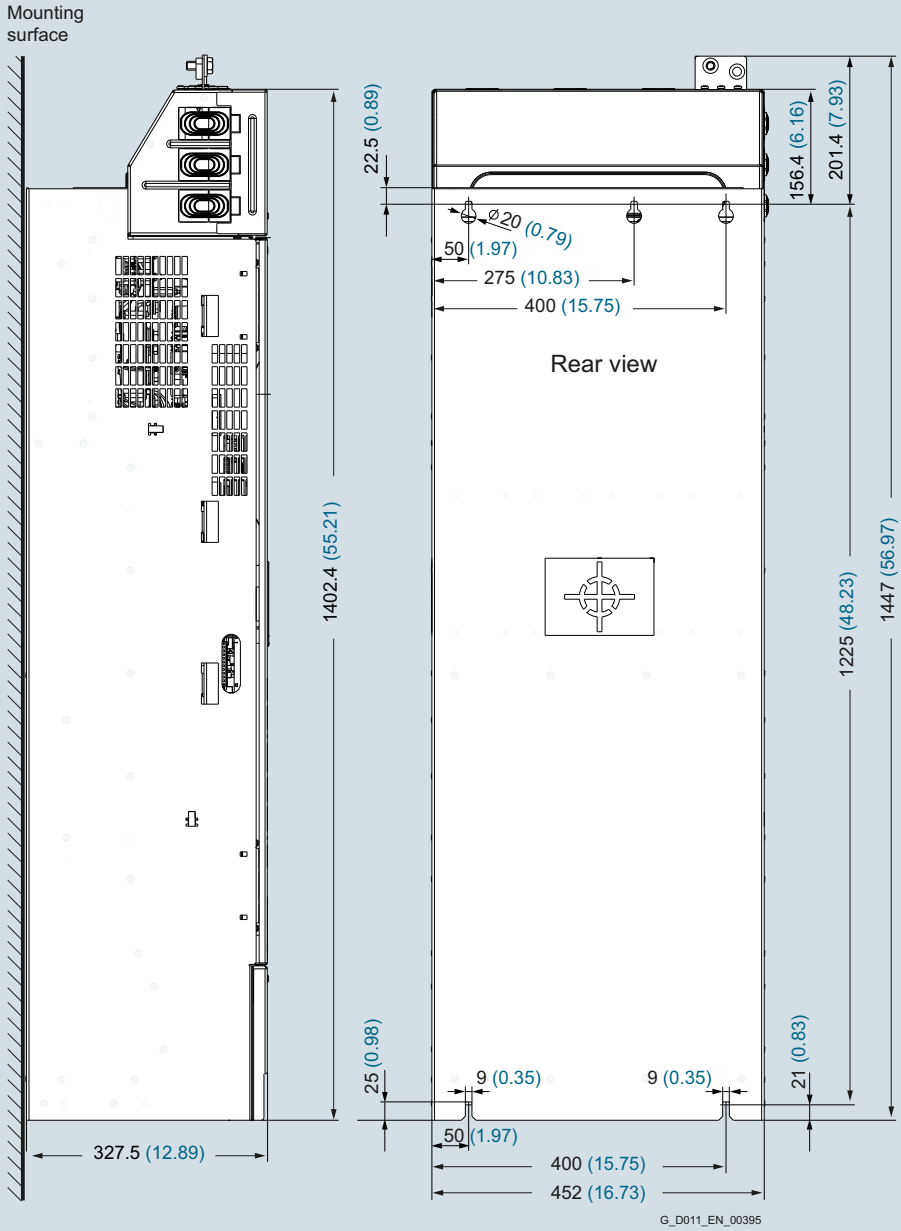
Overload capability, low overload



Overload capability, high overload

4

Dimensional drawings



Principle dimension drawing and drill pattern for PM330 Power Modules, frame size GX

Secured with M8 bolts

Ventilation clearance required at top and bottom: 200 mm (7.87 in)

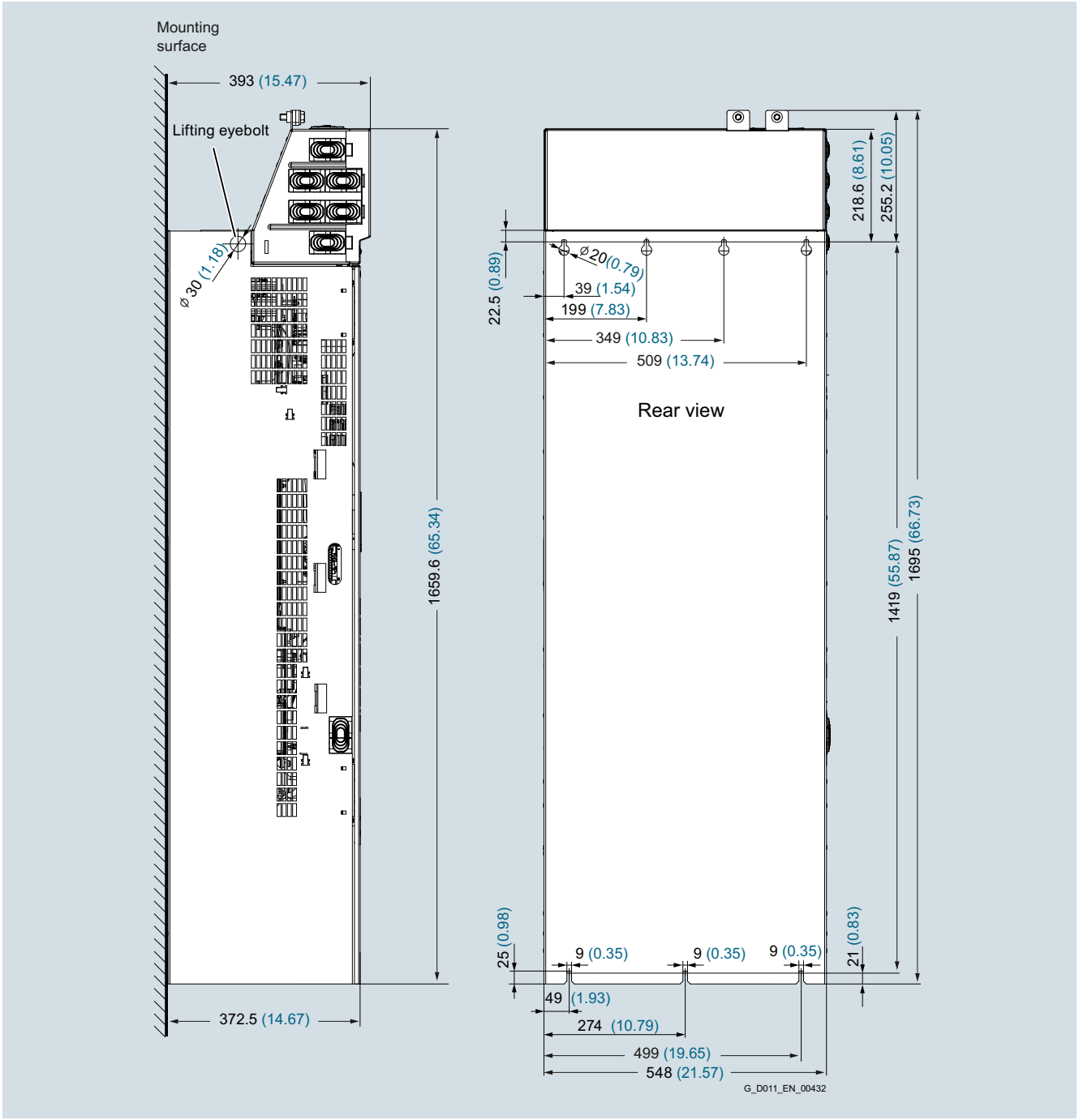
Ventilation clearance required at sides: 30 mm (1.18 in)

Ventilation clearance required at front: 30 mm (1.18 in)

The PM330 Power Modules are designed for installation in a control cabinet.

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

Dimensional drawings (continued)



Principle dimension drawing and drill pattern for PM330 Power Modules, frame size HX

Secured with M8 bolts

Ventilation clearance required at the top: 200 mm (7.87 in)

Ventilation clearance required at the bottom: 250 mm (9.84 in)

Ventilation clearance required at sides: 30 mm (1.18 in)

Ventilation clearance required at front: 100 mm (3.94 in)

The PM330 Power Modules are designed for installation in a control cabinet.

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

Line filters

Overview

Line filter for Power Modules, frame size GX

To limit the emitted interference, the converters are equipped as standard with a radio interference suppression filter that conforms to the limits defined in Category C3. Equipped with an additional line filter, the PM330 Power Module also meet the limits for use in the first environment (Category C2) as specified in EN 61800-3 [1].

The PM330 Power Modules comply with the immunity requirements defined in EN 61800-3 as standard for the second environment.

In conjunction with line reactors, line filters also limit the conducted interference emitted by the Power Modules to the limit values of Category C2 defined in product standard EN 61800-3. When combined with a plant design rigorously based on the EMC installation guidelines, the limit values at the installation site will conform to the requirements for the first environment.

The line filters are suitable for connection to grounded systems (TN or TT systems with grounded neutral point).

Selection and ordering data

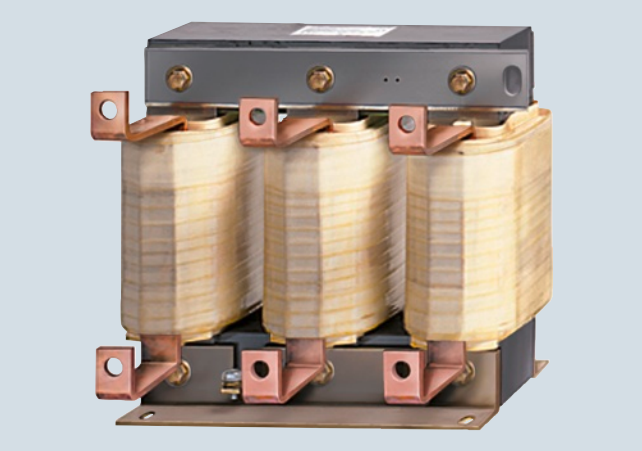
Rated power		SINAMICS G120P, PM330 Power Modules		**Line filter in accordance with EN 61800-3 Category C2**
400 V kW	460 V hp	Type 6SL3310-...	Frame size	Article No.
380 ... 480 V 3 AC				
160	200	1PE33-0AA0	GX	**6SL3000-0BE33-1AA0**
200	250	1PE33-7AA0		
250	300	1PE34-6AA0		**6SL3000-0BE35-0AA0**
315	400	1PE35-8AA0	HX	**6SL3760-0MR00-0AA0**
355	450	1PE36-6AA0		
400	500	1PE37-4AA0		

Technical specifications

Line voltage 380 ... 480 V 3 AC		**Line filter**		
		6SL3000-0BE33-1AA0	6SL3000-0BE35-0AA0	6SL3760-0MR00-0AA0
Rated current	A	400	600	1200
Power loss	kW (hp)	0.047 (0.06)	0.06 (0.08)	0.106 (0.14)
Line supply connection L1, L2, L3		Connecting lugs for M10, provided for busbar connection	Connecting lugs for M10, provided for busbar connection	Connecting lugs for M12, provided for busbar connection
Load connection L1', L2', L3'		Connecting lugs for M10, provided for busbar connection	Connecting lugs for M10, provided for busbar connection	Connecting lugs for M12, provided for busbar connection
PE connection		Grounded via housing	Grounded via housing	Grounded via housing
Degree of protection		IP00	IP00	IP00
Dimensions				
• Width	mm (in)	360 (14.17)	360 (14.17)	425 (16.73)
• Height	mm (in)	116 (4.57)	116 (4.57)	148 (5.83)
• Depth	mm (in)	240 (9.45)	240 (9.45)	265 (10.43)
Weight, approx.	kg (lb)	12.7 (28.00)	19.9 (43.88)	25 (55.13)
Suitable for PM330 Power Module		6SL3310-1PE33-0AA0 6SL3310-1PE33-7AA0	6SL3310-1PE34-6AA0	6SL3310-1PE35-8AA0 6SL3310-1PE36-6AA0 6SL3310-1PE37-4AA0
• Frame size		GX	GX	HX

[1] Applies to shielded motor cable lengths of up to 100 m.

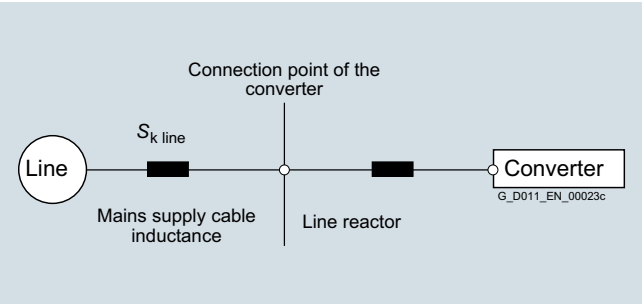
Overview



Line reactor

A line reactor is needed for high short-circuit power levels, partly to protect the actual converter against excessive harmonic currents, and thus against overload, and partly to limit line harmonics to the permitted values. The harmonic currents are limited by the total inductance comprising the line reactor and mains supply cable inductance. Line reactors can be omitted if the mains supply cable inductance is increased sufficiently, i.e., the value of R_{SC} must be sufficiently small.

R_{SC} = Relative Short-Circuit power: Ratio of short-circuit power $S_{k\ Line}$ at the supply connection point to the fundamental apparent power S_{inv} of the connected converters (to IEC 60146-1-1).



PM330 Power Module requirements:

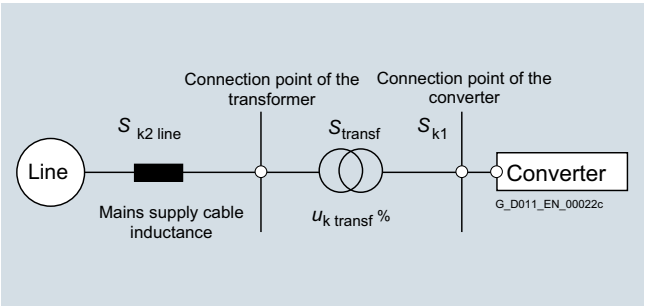
Power kW (hp)	Line reactor can be omitted for R_{SC}	Line reactor required for R_{SC}
<200	≤43	>43
200 ... 500	≤33	>33

It is recommended that a line reactor is always connected on the line side of the converter, as in practice, it is often not known on which supply configuration individual converters are to be operated, i.e. which supply short-circuit power is present at the converter connection point.

A line reactor can only be dispensed with when the value for R_{SC} is less than that in the above table. This is the case, when the converter, as shown in the following figure, is connected to the line through a transformer with the appropriate rating.

Notice:

A line reactor is always needed if a line filter is used.



In this case, the line short-circuit power S_{k1} at the connection point of the converter is approximately:

S_{k1} = S_{transf} / ($u_{k\ transf}$ + S_{transf} / $S_{k2\ line}$)

S_{transf} = Transformer rated power

$S_{k2\ line}$ = Short-circuit power of the higher-level voltage level

$u_{k\ transf}$ = Relative short-circuit voltage

Line reactors

Selection and ordering data

Rated power		SINAMICS G120P, PM330 Power Modules		**Line reactor**
400 V	460 V			
kW	hp	Type 6SL3310-...	Frame size	Article No.
380 ... 480 V 3 AC				
160	200	1PE33-0AA0	GX	**6SL3000-0CE33-3AA0**
200	250	1PE33-7AA0		**6SL3000-0CE35-1AA0**
250	300	1PE34-6AA0		
315	400	1PE35-8AA0	HX	**6SL3000-0CE36-3AA0**
355	450	1PE36-6AA0		**6SL3000-0CE37-7AA0**
400	500	1PE37-4AA0		

Technical specifications

Line voltage 380 ... 480 V 3 AC		**Line reactor**			
		6SL3000-0CE33-3AA0	6SL3000-0CE35-1AA0	6SL3000-0CE36-3AA0	6SL3000-0CE37-7AA0
$I_{th\ max}$	A	331	508	628	773
Nominal inductance L_{rated}	µH	52	42	27	22
Power loss	kW (hp)	0.267 (0.36)	0.365 (0.49)	0.368 (0.49)	0.351 (0.47)
Line supply connection 1U1, 1V1, 1W1		1 × hole for M10, provided for busbar connection	1 × hole for M12, provided for busbar connection	1 × hole for M12, provided for busbar connection	1 × hole for M12, provided for busbar connection
Load connection 1U2, 1V2, 1W2		1 × hole for M10, provided for busbar connection	1 × hole for M12, provided for busbar connection	1 × hole for M12, provided for busbar connection	1 × hole for M12, provided for busbar connection
PE connection		M6 screw	M6 screw	M6 screw	M6 screw
Degree of protection		IP00	IP00	IP00	IP00
Dimensions					
• Width	mm (in)	270 (10.63)	300 (11.81)	300 (11.81)	300 (11.81)
• Height	mm (in)	248 (9.76)	269 (10.59)	269 (10.59)	269 (10.59)
• Depth	mm (in)	200 (7.87)	212 (8.35)	212 (8.35)	212 (8.35)
Weight, approx.	kg (lb)	27.8 (61.30)	38 (83.79)	41.4 (91.29)	51.3 (113.12)
Suitable for PM330 Power Module	Type	6SL3310-1PE33-0AA0	6SL3310-1PE33-7AA0 6SL3310-1PE34-6AA0	6SL3310-1PE35-8AA0	6SL3310-1PE36-6AA0 6SL3310-1PE37-4AA0
• Rated power of the Power Module	kW (hp)	160 (214.56)	200, 250 (268.20, 335.25)	315 (422.42)	355, 400 (476.06, 536.40)
• Frame size		GX	GX	HX	HX

Selection and ordering data

The table below lists recommended ratings for input-end switching and fuse protection elements for compliance with IEC standards.

Notes for use in compliance with IEC standards:

3NA3 or 3NE1 fuses are recommended for European countries.

Notes for use in compliance with UL regulations:

UL-approved fuses must be used in North America.

- Examples of fuses:
  - Class J and class L fuses, supplied by Cooper Bussmann

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

Rated power [1]		SINAMICS G120 PM330 Power Modules		Main contactor acc. to IEC	**Switch disconnector acc. to IEC**			**Cable protection fuse incl. semiconductor protection [2] IEC-compliant**		**Cable protection fuse acc. to IEC**			**Cable protection fuse acc. to UL/cUL, Class J/L**	
400 V	460 V	Type 6SL3310-...	Frame size	Type	Rated current	Minimum short-circuit current	Type	Rated current	Article No.	Rated current	Minimum short-circuit current	Article No.	Rated current	Reference No. [3]
kW	hp				A	A		A		A	A		A	
380 ... 480 V 3 AC														
160	200	1PE33-0AA0	GX	3RT1456 (2 units)	400	4400	3KL5730	450	**3NE1333-2**	400	9500	**3NA3260**	400	DFJ-400 Class J
200	250	1PE33-7AA0	GX	3RT1456 (2 units)	400	5200	3KL5730	500	**3NE1334-2**	500	14000	**3NA3365**	500	DFJ-500 Class J
250	300	1PE34-6AA0	GX	3RT1456 (3 units)	630	6300	3KL6130	560	**3NE1435-2**	630	20000	**3NA3372**	600	DFJ-600 Class J
315	400	1PE35-8AA0	HX	3RT1456 (3 units)	630	9000	3KL6130	710	**3NE1437-2**				650	KTU650 Class L
355	450	1PE36-6AA0	HX	3RT1466 (3 units)	800	10000	3KL6230	800	**3NE1438-2**	800	30000	**3NA3475**	700	KTU700 Class L
400	500	1PE37-4AA0	HX	3RT1466 (3 units)	800	12000	3KL6230	850	**3NE1448-2**				800	KTU800 Class L

Note:

Important! Note the minimum short-circuit current required to trip the protection devices. If the minimum short-circuit current is not reached, the activation time of the fuses is increased, which can lead to damage.

[1] Rated power based on the rated output current I_{rated}.

[2] Suitable for 3KL switch disconnector.

[3] Recommendation: Class J or class L fuse supplied by Cooper Bussmann.

Overview

Braking Module

A Braking Module and the matching braking resistor are needed by the drive when it brakes or needs to be stopped for a specific reason, e.g. for an EMERGENCY STOP. Large fans which are caused to rotate by air flow are a typical application. In such instances, it is important to consider operating states which could result in speeds in excess of the desired maximum speed but also the possibility of reversal of rotational direction during restart from standstill. A braking unit is also required if the fan must be brought to a standstill within a defined time period.

The Braking Module houses the power electronics and the associated control circuit. The supply voltage for the electronics is taken from the DC link.

During operation, the DC link power is converted into heat loss in an external braking resistor.

The activation threshold of the Braking Module can be adjusted by means of a switch. The braking power values indicated in the technical specifications apply to the upper activation threshold.

Design

The Braking Module is designed for installation in the control cabinet. It must always be mounted vertically.

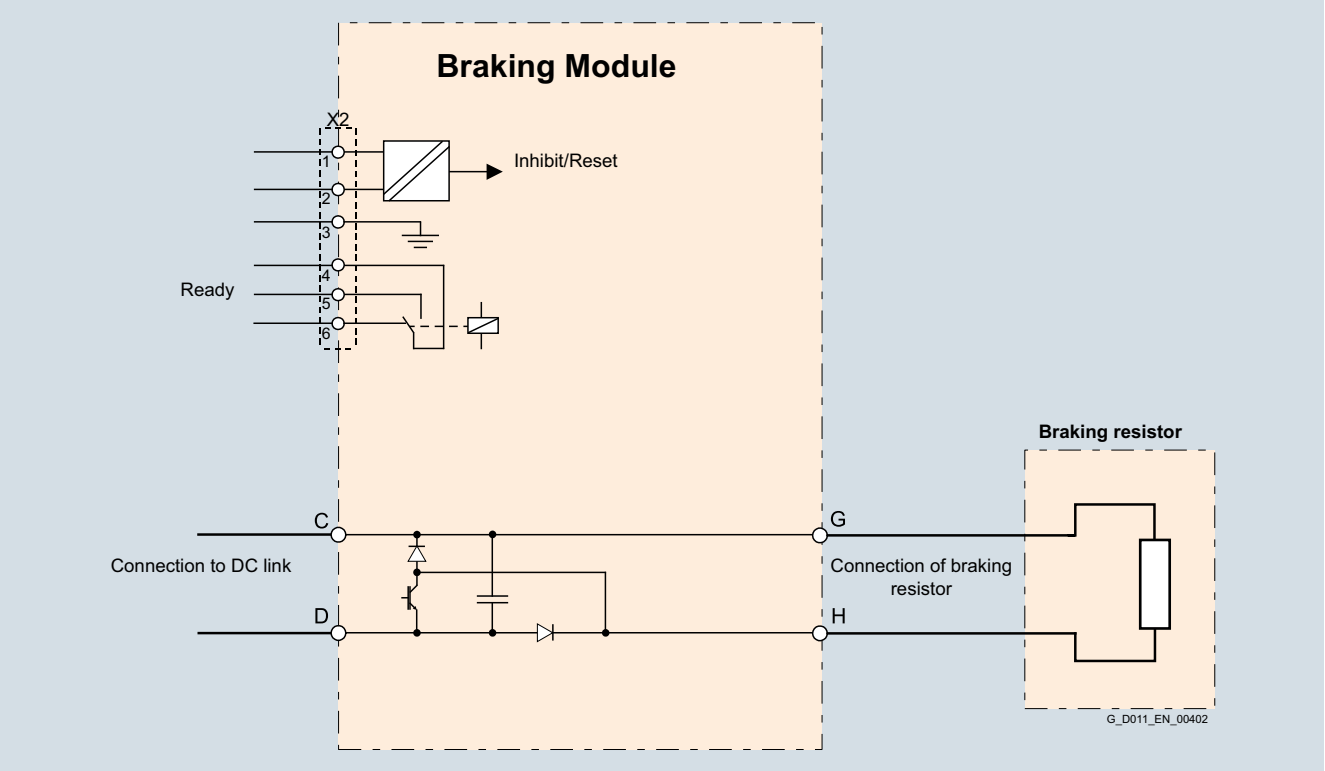
A Braking Module is assigned its own dedicated braking resistor. The Braking Module is connected to the DC link by means of flexible cables.

The Braking Module has the following interfaces as standard:

- DC link connection
- Connection for braking resistor
- 1 digital input (inhibit Braking Module/reset error)
- 1 digital output (Braking Module faulty/ready)

A switch is provided for adjusting the activation threshold.

Integration



Connection example of a Braking Module

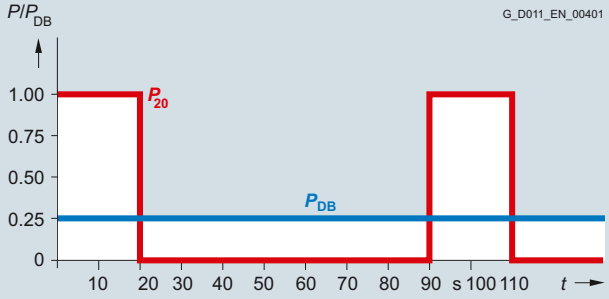
Selection and ordering data

Rated power		SINAMICS G120P PM330 Power Modules		Braking Module
400 V	460 V			
kW	hp	Type 6SL3310-...	Frame size	Article No.
380 ... 480 V 3 AC				
160	200	1PE33-0AA0	GX	**6SL3760-1AE32-6AA0**
200	250	1PE33-7AA0		
250	300	1PE34-6AA0		
315	400	1PE35-8AA0	HX	
355	450	1PE36-6AA0		
400	500	1PE37-4AA0		

Technical specifications

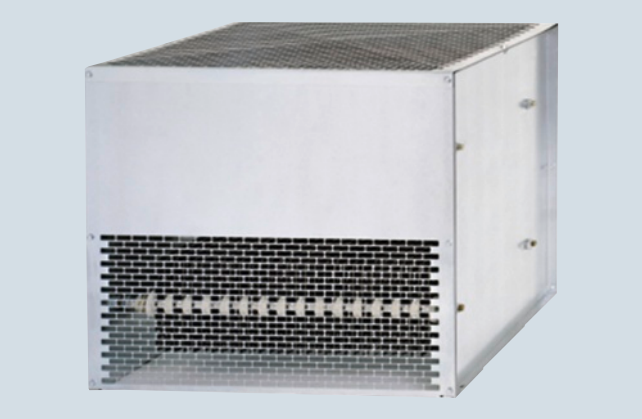
Line voltage 380 ... 480 V 3 AC	**Braking Module** 6SL3760-1AE32-6AA0
Rated power P_{DB} (Continuous braking power)	50 kW
Power P_{20}	200 kW
Braking current for P_{DB}	65 A
Activation thresholds (adjustable via switch)	670 V / 770 V (factory setting)
Connectable resistance for P_{DB}	3.1 Ω
Digital input	
• Voltage	24 V
• Low level (an open digital input is interpreted as "low")	<3 V
• High level	<7 V
• Current consumption at 24 V DC, typ.	0.01 mA
• Conductor cross-section, max.	2.5 mm^2
Digital output	
• AC voltage, max.	250 V
• Load current per digital output, max.	2 A
• Conductor cross-section, max.	2.5 mm^2
Power loss, max.	0.1 kW
Braking resistor connection	Screw terminal
• Conductor cross-section, max.	35 mm^2
• Cable length, max.	100 m
DC link connection	Screw terminal
• Conductor cross-section, max.	35 mm^2
• Cable length, max.	3 m
Degree of protection	IP20
Dimensions	
• Width	180 mm
• Height	220 mm
• Depth	152 mm
Weight, approx.	5.5 kg

Characteristic curves



Load diagram for Braking Modules and braking resistor

Overview



Braking resistor

Excess energy in the DC link is dissipated in the braking resistor.

The braking resistor is connected to the Braking Module. The braking resistor is positioned outside the cabinet or switchgear room. This enables the resulting heat loss to be removed from the area of the Power Modules. The level of air conditioning required is therefore reduced.

A temperature switch (NC contact) is fitted. This responds when the maximum permissible temperature is exceeded and can be evaluated by a controller. The maximum permissible cable length between the Braking Module and braking resistor is 100 m.

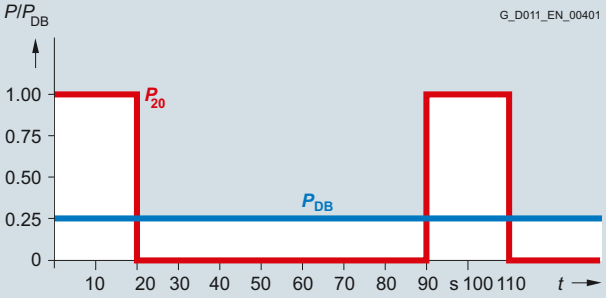
Selection and ordering data

Rated power P_{DB} kW (hp)	Braking Module	**Braking resistor** Article No.
380 ... 480 V 3 AC		
50	6SL3760-1AE32-6AA0	**6SE7032-5FS87-2DC0**

Technical specifications

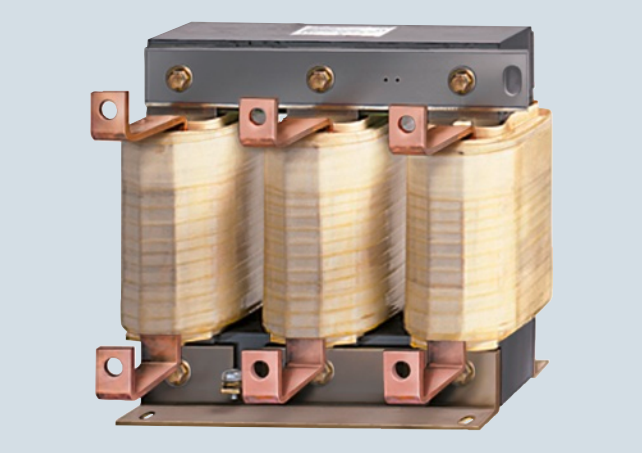
Line voltage 380 V ... 480 V 3 AC	**Braking resistor** 6SE7032-5FS87-2DC0
Resistance	3.1 Ω (± 10 %)
Rated power P_{DB} (Continuous braking power)	50 kW
Power P_{20}	200 kW
Current, max.	378 A
Cable connections • Power cable, max. • PE/GND, max.	M12 stud 70 mm^2 50 mm^2
Cable length to Braking Module, max.	≤100 m
Degree of protection	IP20
Dimensions • Width • Height • Depth	 740 mm 1325 mm 485 mm
Weight, approx.	109 kg
Suitable for Braking Module	6SL3760-1AE32-6AA0

Characteristic curves



Load diagram for Braking Modules and braking resistor

Overview



Output reactor

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 converter. As a result, the converter 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 100 Hz
- Max. permissible pulse frequency 4 kHz
- The output reactor must be installed as close as possible to the Power Module.

Selection and ordering data

Rated power		SINAMICS G120 PM330 Power Modules		**Output reactor**
400 V	460 V			
kW	hp	Type 6SL3310-...	Frame size	Article No.
380 ... 480 V 3 AC				
160	200	1PE33-0AA0	GX	**6SL3000-2BE33-2AA0**
200	250	1PE33-7AA0	GX	**6SL3000-2BE33-8AA0**
250	300	1PE34-6AA0	GX	**6SL3000-2BE35-0AA0**
315	400	1PE35-8AA0	HX	**6SL3000-2AE36-1AA0**
355	450	1PE36-6AA0	HX	**6SL3000-2AE38-4AA0**
400	500	1PE37-4AA0		

Technical specifications

Line voltage 380 ... 480 V 3 AC		**Output reactor**				
		6SL3000-2BE33-2AA0	6SL3000-2BE33-8AA0	6SL3000-2BE35-0AA0	6SL3000-2AE36-1AA0	6SL3000-2AE38-4AA0
Rated current	A	310	380	490	605	840
Power loss	kW (hp)	0.422 (0.57)	0.447 (0.60)	0.448 (0.60)	0.798 (1.07)	0.834 (1.12)
Connection						
• To Power Module		1 × hole for M10	1 × hole for M10	1 × hole for M12	1 × hole for M12	1 × hole for M12
• To load		1 × hole for M10	1 × hole for M10	1 × hole for M12	1 × hole for M12	1 × hole for M12
• PE		M8 screw	M8 screw	M8 screw	M10 screw	M10 screw
Cable length, max. between output reactor and motor						
• Shielded	m (ft)	300 (984.30)	300 (984.30)	300 (984.30)	300 (984.30)	300 (984.30)
• Unshielded	m (ft)	450 (1476.45)	450 (1476.45)	450 (1476.45)	450 (1476.45)	450 (1476.45)
Dimensions						
• Width	mm (in)	300 (11.81)	300 (11.81)	300 (11.81)	410 (16.14)	410 (16.14)
• Height	mm (in)	285 (11.22)	285 (11.22)	365 (14.37)	392 (15.43)	392 (15.43)
• Depth	mm (in)	257 (10.12)	277 (10.91)	277 (10.91)	292 (11.50)	292 (11.50)
Degree of protection		IP00	IP00	IP00	IP00	IP00
Weight, approx.	kg (lb)	62 (136.71)	73 (160.97)	100 (220.50)	130 (286.65)	140 (308.70)
Suitable for PM330 Power Module	Type	6SL3310-1PE33-0AA0	6SL3310-1PE33-7AA0	6SL3310-1PE34-6AA0	6SL3310-1PE35-8AA0	6SL3310-1PE36-6AA0 6SL3310-1PE37-4AA0
• Rated power of the Power Module	kW (hp)	160 (214.56)	200 (268.20)	250 (335.25)	315 (422.42)	355, 400 (476.06, 536.40)
• Frame size		GX	GX	GX	HX	HX

dv/dt filter plus VPL

Overview

dv/dt filter plus VPL (**V**oltage **P**eak **L**imiter) limit the voltage rate-of-rise *dv*/*dt* to values < 500 V/µs and the typical voltage peaks to the following values according to the limit value curve to IEC/TS 60034-17: 2006:

< 1000 V at U_{line} < 575 V

Standard motors with standard insulation and without insulated bearings can be used for converter operation if a dv/dt filter plus VPL is used.

The dv/dt filter plus VPL are designed for the following maximum motor cable lengths:

- Shielded cables: 300 m (e.g. Protodur NYCWY)
- Unshielded cables: 450 m (e.g. Protodur NYY)

For shorter cable lengths (100 m shielded, 150 m unshielded) also refer to dv/dt filter compact plus VPL.

Note:

The maximum permissible cable length between the dv/dt filter and Power Module is 5 m.

Design

The dv/dt filter plus VPL consists of two components, which are also separately supplied as mechanical units:

- dv/dt reactor
- Voltage limiting network, which cuts off the voltage peaks and feeds the energy back into the DC link.

Selection and ordering data

Rated power		SINAMICS G120 PM330 Power Module		dv/dt filter plus VPL
400 V	460 V			
kW	hp	Type 6SL3310-...	Frame size	Article No.
160	200	1PE33-0AA0	GX	**6SL3000-2DE35-0AA0**
200	250	1PE33-7AA0		
250	300	1PE34-6AA0		
315	400	1PE35-8AA0	HX	**6SL3000-2DE38-4AA0**
355	450	1PE36-6AA0		
400	500	1PE37-4AA0		

Technical specifications

Line voltage 380 ... 480 V 3 AC		**dv/dt filter plus VPL**	
		6SL3000-2DE35-0AA0	6SL3000-2DE38-4AA0
$I_{th\ max}$	A	490	840
Degree of protection		IP00	IP00
Cable length, max. between dv/dt filter and motor			
• Shielded	m (ft)	300 (984.30)	300 (984.30)
• Unshielded	m (ft)	450 (1476.45)	450 (1476.45)
Conformity		CE	CE
Approvals, acc. to		cURus	cURus
dv/dt reactor			
Power loss, max.			
• At 50 Hz	kW (hp)	0.874 (1.17)	1.106 (1.48)
• At 60 Hz	kW (hp)	0.904 (1.21)	1.115 (1.50)
Connections			
• To Power Module		1 × hole for M12	1 × hole for M12
• To load		1 × hole for M12	1 × hole for M12
• PE		M6 screw	M6 screw
Dimensions			
• Width	mm (in)	460 (18.11)	460 (18.11)
• Height	mm (in)	370 (14.57)	385 (15.16)
• Depth	mm (in)	275 (10.83)	312 (12.28)
Weight, approx.	kg (lb)	122 (269.01)	149 (328.55)
Voltage Peak Limiter (VPL)			
Power loss, max.			
• At 50 Hz	kW (hp)	0.042 (0.06)	0.077 (0.10)
• At 60 Hz	kW (hp)	0.039 (0.05)	0.072 (0.10)
Connections			
• To dv/dt reactor		70 mm^2 terminals	1 x hole for M8
• To DC link (DC)		70 mm^2 terminals	1 x hole for M8
• PE		35 mm^2 terminals	M8 stud
Dimensions			
• Width	mm (in)	392 (15.43)	309 (12.17)
• Height	mm (in)	285 (11.22)	1 312.5 (51.67)
• Depth	mm (in)	210 (8.27)	400 (15.75)
Weight, approx.	kg (lb)	16 (35.28)	48 (105.84)
Suitable for PM330 Power Module		6SL3310-1PE33-0AA0 6SL3310-1PE33-7AA0 6SL3310-1PE34-6AA0	6SL3310-1PE35-8AA0 6SL3310-1PE36-6AA0 6SL3310-1PE37-4AA0
• Frame size		GX	HX

dv/dt filters compact plus VPL

Overview

dv/dt filters compact plus VPL (**V**oltage **P**eak **L**imiter) limit the voltage rate-of-rise *dv/dt* to values < 1600 V/µs and the typical voltage peaks to the following values according to limit value curve A to IEC 60034-25: 2007:

- < 1150 V at U_{line} < 575 V

Standard motors with standard insulation and without insulated bearings can be used for converter operation if a dv/dt filter compact plus VPL is used.

dv/dt filters compact plus VPL are designed for the following maximum motor cable lengths:

- Shielded cables: 100 m (e.g. Protodur NYCWY)
- Unshielded cables: 150 m (e.g. Protodur NYY)

For longer cable lengths (> 100 m shielded, > 150 m unshielded) refer to dv/dt filter plus VPL.

Note:

- The max. permissible cable length between the dv/dt filter and Power Module is 5 m.
- Operation with output frequencies < 10 Hz is permissible for max. 5 min.

Design

The dv/dt filter compact plus VPL consists of two components, which are supplied together as a compact mechanical unit:

- dv/dt reactor
- Voltage limiting network, which cuts off the voltage peaks and feeds the energy back into the DC link.

Selection and ordering data

Rated power		SINAMICS G120 PM330 Power Module		dv/dt filter compact plus VPL
400 V	460 V			
kW	hp	Type 6SL3310-...	Frame size	Article No.
380 ... 480 V 3 AC				
160	200	1PE33-0AA0	GX	**6SL3000-2DE35-0EA0**
200	250	1PE33-7AA0		
250	300	1PE34-6AA0		
315	400	1PE35-8AA0	HX	**6SL3000-2DE38-4EA0**
350	450	1PE36-6AA0		
400	500	1PE37-4AA0		

Technical specifications

Line voltage 380 ... 480 V 3 AC		**dv/dt filter compact plus VPL**	
		6SL3000-2DE35-0EA0	6SL3000-2DE38-4EA0
Rated current	A	490	840
$I_{th\ max}$	A	490	840
Power loss, max.			
• At 50 Hz	kW (hp)	0.29 (0.39)	0.518 (0.69)
• At 60 Hz	kW (hp)	0.296 (0.40)	0.529 (0.71)
Connections			
• To Power Module		1 × hole for M10, provided for busbar connection	1 × hole for M12, provided for busbar connection
• To load		1 × hole for M10, provided for busbar connection	1 × hole for M12, provided for busbar connection
• PE		Threaded socket M6	Threaded socket M6
DC link connection, DCPS, DCNS		Threaded socket M8	Hole for M8
• Conductor cross section, max. (IEC)	mm^2	25	50
Cable length, max. between dv/dt filter and motor			
• Shielded	m (ft)	100 (328.10)	100 (328.10)
• Unshielded	m (ft)	150 (492.15)	150 (492.15)
Degree of protection		IP00	IP00
Dimensions			
• Width	mm (in)	350 (13.78)	440 (17.32)
• Height	mm (in)	317 (12.48)	369 (14.53)
• Depth	mm (in)	260 (10.24)	311 (12.24)
Weight, approx.	kg (lb)	61 (134.51)	103 (227.12)
Suitable for PM330 Power Module		6SL3310-1PE33-0AA0 6SL3310-1PE33-7AA0 6SL3310-1PE34-6AA0	6SL3310-1PE35-8AA0 6SL3310-1PE36-6AA0 6SL3310-1PE37-7AA0
• Frame size		GX	HX

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) • IOP installed as standard in the control cabinet door with SINAMICS G120P Cabinet • Available as a handheld version (with PM230 in degree of protection IP55, degree of protection IP55/UL Type 12 is no longer provided at the connection point) • The IOP includes a standard language package with 5 languages (English, French, German, Italian and Spanish). Additional language packages are available [1)]	• 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 • 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 • Status display with freely selectable units to specify physical values	• Direct manual operation of the drive – you can simply toggle between the automatic and manual modes – • 2-line display for showing up to 2 process values with text • 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)] Further information is available 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 drive 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 a drive unit into the IOP and downloaded into other drive units of the same type as required.

The IOP includes a standard language package with 5 languages (English, French, German, Italian and Spanish). Additional language packages are available [1].

The IOP can be installed in control cabinet doors using the optionally available door mounting kit (not possible in conjunction with the PM230 Power Module in degree of protection IP55).

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.

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 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] Further information is available at
http://support.automation.siemens.com/WW/view/en/67273266

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
- 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 includes a standard language package with 5 languages (English, French, German, Italian and Spanish). Additional language packages are available [1)]
- Simple update of languages, wizards and firmware updates via USB [1)]

Integration

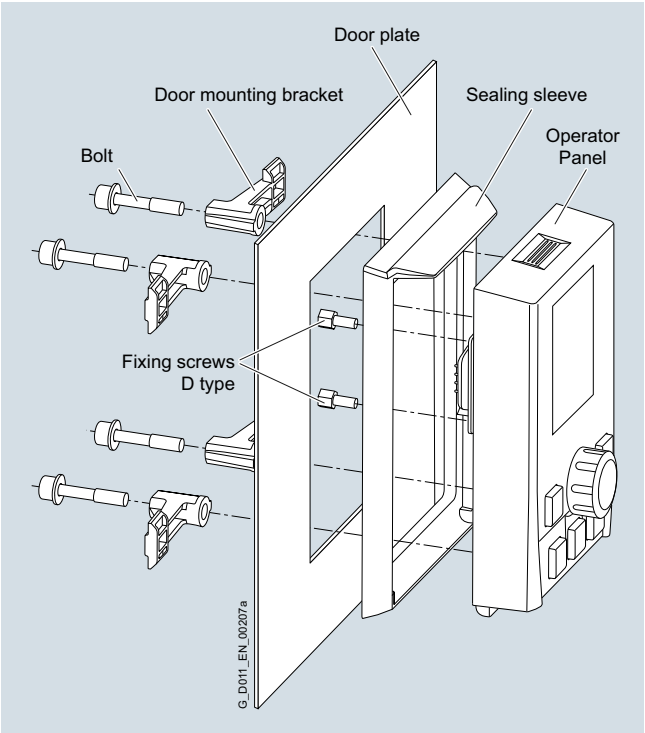
Mounting the IOP on a Control Unit

The IOP can be directly plugged onto the Control Unit.

CU230P-2 Control Unit with plugged-on IOP

Door mounting

An IOP can be installed in a control cabinet door in a few simple steps using the optionally available door mounting kit (not possible in conjunction with the PM230 Power Module in degree of protection IP55). Degree of protection IP54/UL Type 12 is achieved with door mounting.



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 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/16.41 ft long, also supplies voltage to the IOP directly via the Control Unit)	**6SL3256-0AP00-0JA0**

[1)] Further information is available 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 key to switch over from automatic to manual mode.

Diagnostics can easily be performed on the connected drive 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 a drive unit 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).

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

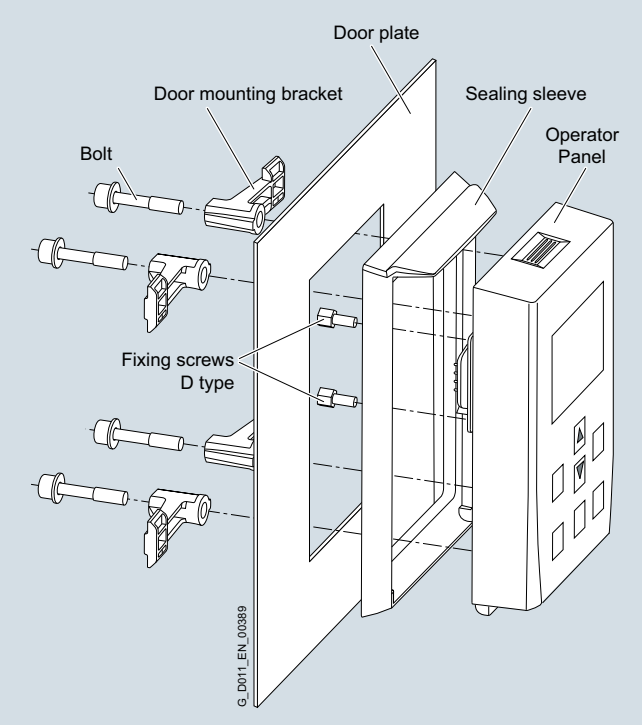
Mounting the BOP-2 on a CU230P-2 Control Unit

The BOP-2 can be directly plugged onto a CU230P-2 Control Unit.

PM230 Power Module and CU230P-2 Control Unit with plugged-on BOP-2

Door mounting

A BOP-2 can be installed in a control cabinet door in a few simple steps using the optionally available door mounting kit (not possible in conjunction with the PM230 Power Module in degree of protection IP55). Degree of protection IP55 is achieved for door mounting.



Door mounting kit with plugged-on BOP-2

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**

Blanking cover for PM230 Power Modules

Overview

PM230 Power Module, degree of protection IP55/UL Type 12, frame size FSC, with blanking cover

The blanking cover is mounted on the Power Module in place of an operator panel, if an operator panel is not required. When the blanking cover is plugged onto the PM230 Power Module, degree of protection IP55/UL Type 12 is achieved.

Selection and ordering data

Description	Article No.
Blanking cover For PM230 Power Modules degree of protection IP55/UL Type 12	**6SL3256-1BA00-0AA0**

Push Through mounting frame for PM230 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.

Selection and ordering data

Description	Article No.
Push Through mounting frame	
• For PM230 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

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 commissioning tool.

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

4

Overview

PC inverter connection kit 2

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

- parameterized (commissioning, optimization)
- monitored (diagnostics)
- controlled (master control via the STARTER commissioning tool [1] 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 suitable for the following SINAMICS G120 Control Units:

- CU230P-2 HVAC
- CU230P-2 DP
- CU230P-2 PN
- CU230P-2 CAN
- CU240B-2
- CU240B-2 DP
- CU240E-2
- CU240E-2 DP
- CU240E-2 PN
- CU240E-2 F
- CU240E-2 DP-F
- CU240E-2 PN-F
- CU250S-2

Selection and ordering data

Description	Article No.
PC inverter connection kit 2 for CU230P-2, CU240B-2, CU240E-2 and CU250S-2 Control Units including USB cable (length 3 m (9.84 ft))	**6SL3255-0AA00-2CA0**

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

Shield connection kits for CU230P-2 Control Units

Overview

The shield connection kit offers for all signal and communication cables

- Optimum shield connection
- Strain relief

A shield connection kit contains the following:

- A matching shield bonding plate
- All of the necessary connecting and retaining elements for mounting

The shield connection kits are suitable for the following SINAMICS G120 Control Units in combination with PM230/PM240 Power Modules:

- CU230P-2 HVAC
- CU230P-2 DP
- CU230P-2 PN
- CU230P-2 CAN

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 3 For CU230P-2 PN Control Units	**6SL3264-1EA00-0HB0**

Shield connection kits and plates for PM230/240 Power Modules

Overview

PM230 Power Modules, frame sizes FSA to FSC, are supplied with a shield plate for motor and signal cables.

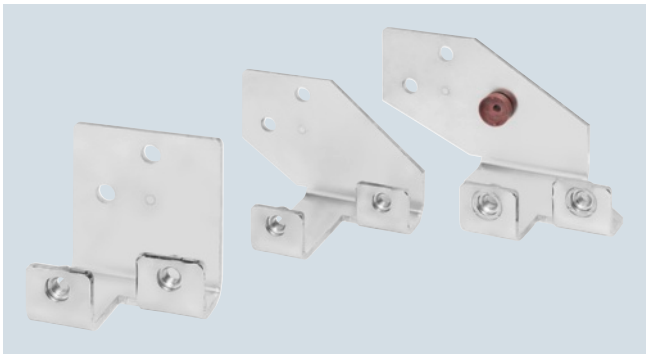
Shield connection sets can be supplied for PM230 Power Modules frame sizes FSD to FSF, IP20 degree of protection in the standard variant and for PM240 Power Modules frame size FSF.

Selection and ordering data

Description	Article No.
Shield plate For PM230 Power Module degree of protection IP20 • 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 Standard variants	
• Frame sizes FSD and FSE	**6SL3262-1AD00-0DA0**
• Frame size FSF	**6SL3262-1AF00-0DA0**
Shield connection kit For PM240 Power Module	
• Frame size FSF	**6SL3262-1AF00-0DA0**

Installation kit for line-side cable connection for PM330

Overview



Installation kit for line-side cable connection, left, for PM330, frame size HX

This installation kit allows supply cables to be connected on the left-hand side of the PM330 Power Module instead of on the right. The Power Module can then be installed higher in the control cabinet, allowing more efficient use of the available cabinet space. In many cases, use of this installation kit also helps in the implementation of effective cabinet cooling.

Information about installation can be found in the SINAMICS G120P Hardware Installation Manual for the PM330 Power Module.

Selection and ordering data

Rated power		SINAMICS G120 PM330 Power Module			**Installation kit for line-side cable connection, left**
kW	hp	Type 6SL3310-...	Frame size		Article No.
380 ... 480 V 3 AC					
160	200	1PE33-0AA0	GX		**6SL3366-1LG00-0PA0**
200	250	1PE33-7AA0			
250	300	1PE34-6AA0			
315	400	1PE35-8AA0	HX	NEW	**6SL3366-1LH00-0PA0**
355	450	1PE36-6AA0			
400	500	1PE37-4AA0			

Spare parts kit for Control Units

Overview

The spare part 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 part kit for Control Units NEW CU230P-2, CU240B-2, CU240E-2, CU240E-2 F and CU250S-2	**6SL3200-0SK01-0AA0**

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 Standard variants (and SINAMICS G120C)	
• Frame size FSA	**6SL3266-1EA00-0KA0**
• Frame size FSB	**6SL3266-1EB00-0KA0**
• Frame size FSC	**6SL3266-1EC00-0KA0**
Shield plate For PM230 Power Module degree of protection IP20 Push Through variants	
• Frame size FSA	**6SL3266-1EA00-0DA0**
• Frame size FSB	**6SL3266-1EB00-0DA0**
• Frame size FSC	**6SL3266-1EC00-0DA0**

Mounting sets for PM 230 Power Modules

Overview

The following parts are supplied from the factory for each PM230 Power Module in degree of protection IP55/UL Type 12 or IP20:

Frame sizes FSA to FSC	Frame sizes FSD to FSF (only for Power Modules in degree of protection IP55/UL Type 12)
• 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	• 1 adapter cable for connecting the CU230P-2 HVAC/DP/PN/CAN Control Units to the operator panel (e.g. IOP) • 4 clips to connect the shields of signal cables • 6 serrated strips including mounting material for the motor and supply cables • 4 sleeves (pre-installed in the cutouts for the signal cables of the cable bonding plate) • 1 cable bonding plate without cutouts for customers to configure their own connection system • 1 cabinet key • 2-page Quick Start Guide with mounting instructions

A **mounting set** can be ordered for every frame size in degree of protection IP55/UL Type 12 or IP20. It contains the following parts:

Frame sizes FSA to FSC	Frame sizes FSD to FSF (only for Power Modules in degree of protection IP55/UL Type 12)
• 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	• 1 adapter cable including mounting material • 6 serrated strips including mounting material for the motor and supply cables • 1 cabinet key

Selection and ordering data

Description	Article No.
Mounting set For PM230 Power Modules degree of protection IP55/UL Type 12 or IP20	
• Frame size FSA	**6SL3200-0SK02-0AA0**
• Frame size FSB	**6SL3200-0SK03-0AA0**
• Frame size FSC	**6SL3200-0SK04-0AA0**
Mounting set For PM230 Power Modules degree of protection IP55/UL Type 12	
• Frame size FSD	**6SL3200-0SK05-0AA0**
• Frame size FSE	**6SL3200-0SK06-0AA0**
• Frame size FSF	**6SL3200-0SK07-0AA0**

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

Selection and ordering data

Description	Article No.
Terminal cover kit For frame sizes FSD and FSE	**6SL3200-0SM11-0AA0**

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

Selection and ordering data

Description	Article No.
Terminal cover kit For frame size FSF	**6SL3200-0SM12-0AA0**

Fan units for PM230 Power Modules

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. When selecting the external fan units, please note the hardware version printed on the device rating plate. The following pictures show the mounting location of internal and external fan units as an example:

PM230 Power Module, degree of protection IP55/UL Type 12, frame size FSC, with external fan unit in heat sink

PM230 Power Module, degree of protection IP55/UL Type 12, frame size FSC, with internal fan unit above CU230P-2 Control Unit

Selection and ordering data

Rated power		PM230 Power Module degree of protection IP55/UL Type 12		**External fan unit**	**Internal fan unit**
400 V kW	460 V hp	Type 6SL3223-...	Frame size	Article No.	Article No.
380 ... 480 V 3 AC					
0.37	0.50	0DE13-7 . A0	FSA	Up to hardware version A02: **6SL3200-0SF21-0AA0** From hardware version 04: **6SL3200-0SF21-0AA1**	**6SL3200-0SF31-0AA0**
0.55	0.75	0DE15-5 . A0			
0.75	1.0	0DE17-5 . A0			
1.1	1.5	0DE21-1 . A0			
1.5	2.0	0DE21-5 . A0			
2.2	3.0	0DE22-2 . A0			
3.0	4.0	0DE23-0 . A0			
4.0	5.0	0DE24-0 . A0	FSB	Up to hardware version A02: **6SL3200-0SF22-0AA0** From hardware version 04: **6SL3200-0SF22-0AA1**	
5.5	7.5	0DE25-5 . A0			
7.5	10	0DE27-5 . A0			
11.0	15	0DE31-1 . A0	FSC	**6SL3200-0SF23-0AA0**	
15.0	20	0DE31-5 . A0			
18.5	25	0DE31-8AA0			
18.5	25	0DE31-8BA0	FSD	**6SL3200-0SF24-0AA0**	**6SL3200-0SF32-0AA0**
22	30	0DE32-2 . A0			
30	40	0DE33-0 . A0			
37	50	0DE33-7 . A0	FSE		
45	60	0DE34-5 . A0			
55	75	0DE35-5 . A0	FSF	**6SL3200-0SF26-0AA0**	
75	100	0DE37-5 . A0			
90	125	0DE38-8 . A0			

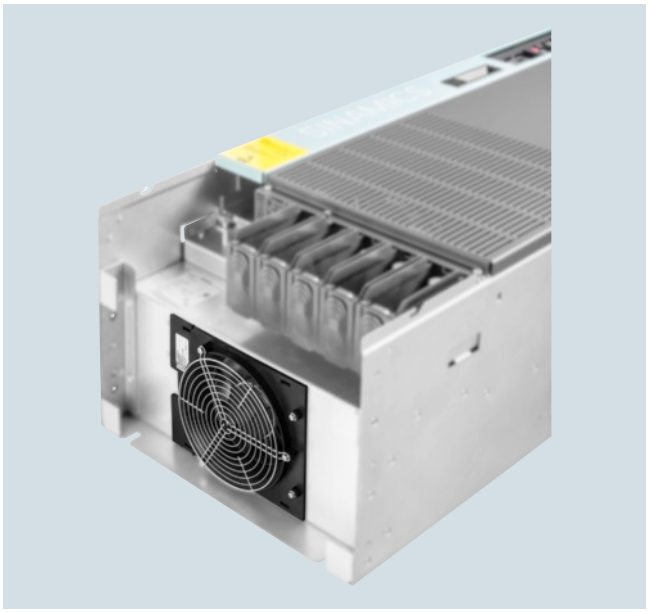
Selection and ordering data (continued)

Rated power		PM230 Power Module degree of protection IP20 Standard variant		**External fan unit**
400 V	460 V			
kW	hp	Type 6SL3210-...	Frame size	Article No.
380 ... 480 V 3 AC				
0.37	0.50	1NE11-3 . L1	FSA	**–**
0.55	0.75	1NE11-7 . L1		
0.75	1.0	1NE12-2 . L1	FSA	**6SL3200-0SF12-0AA0**
1.1	1.5	1NE13-1 . L1		
1.5	2.0	1NE14-1 . L1		
2.2	3.0	1NE15-8 . L1		
3.0	4.0	1NE17-7 . L1		
4.0	5.0	1NE21-0 . L1	FSB	**6SL3200-0SF13-0AA0**
5.5	7.5	1NE21-3 . L1		
7.5	10	1NE21-8 . L1		
11.0	15	1NE22-6 . L1	FSC	**6SL3200-0SF14-0AA0**
15.0	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**
400 V	460 V			
kW	hp	Type 6SL3211-...	Frame size	Article No.
380 ... 480 V 3 AC				
3.0	4.0	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**

Replacement fans

Overview



PM330 Power Module frame size GX with base-mounted fan

The fans for PM240 and PM330 Power Modules are available to order as replacement fans.

Selection and ordering data

Rated power		PM240 Power Module		Replacement fan
400 V	460 V			
kW	hp	Type 6SL3224-...	Frame size and number of fans	Article No.
380 ... 480 V 3 AC				
90	125	0BE37-5 . A0	FSF, 2 fans	**6SL3200-0SF07-0AA0** (includes 2 replacement fans)
110	150	0BE38-8UA0		**6SL3200-0SF08-0AA0** (includes 2 replacement fans)
132	200	0BE41-1UA0		

Rated power		PM330 Power Module		Replacement fan
400 V	460 V			
kW	hp	Type 6SL3310-...	Frame size and number of fans	Article No.
380 ... 480 V 3 AC				
160	200	1PE33-0AA0	GX, 1 fan	**6SL3300-0SF01-0AA0**
200	250	1PE33-7AA0		
250	300	1PE34-6AA0		
315	400	1PE35-8AA0	HX, 2 fans	
355	450	1PE36-6AA0		
400	500	1PE37-4AA0		

SINAMICS G120P Cabinet, converter cabinet units, degree of protection IP20 to IP54

Overview

SINAMICS G120P Cabinet, converter cabinet units, versions A and C

With its SINAMICS G120P Cabinet, converter cabinet units, Siemens is offering a drive system on which all line-side and motor-side components as well as the Power Module are integrated into a specially designed cabinet enclosure. This design minimizes configuring and installation expenditure.

SINAMICS G120P Cabinet has been specially tailored to meet the requirements of drives for pumps, fans and compressors with quadratic load characteristic that have medium performance requirements with no regenerative feedback capability.

The control accuracy of the sensorless vector control is suitable for most applications, and additional actual speed value encoders are therefore superfluous.

SINAMICS G120P Cabinet offers an economic drive solution that can be matched to customer-specific requirements using a range of available components and options.

There are two versions of the converter cabinet units:

- **Version A**
  enables all optionally available line connection components, such as the main switch, main contactor, line fuses, line filter, motor-side components and additional monitoring devices to be installed
- **Version C**
  space-saving design with line reactor and optional main switch. This particularly slimline design can be used, for example, when line connection components are accommodated in a central low-voltage distribution panel (MCC) in the customer's plant or system.

SINAMICS G120P Cabinet are available for the following voltages and outputs:

Line voltage	Output range (versions A and C)
380 ... 480 V 3 AC	110 ... 400 kW

The units have degree of protection IP20 as standard. They are optionally available with degrees of protection IP21, IP23, IP43 and IP54.

Benefits

- The converters are exceptionally quiet and compact thanks to state-of-the-art IGBT power semiconductors, fan speed control as a function of temperature and reduced volumetric flow at the nominal working point.
- A rated switching frequency of 2 kHz, optimized pulse patterns and pulse frequency wobbling all help to reduce motor noise
- Individual modules and power components can be replaced quickly and easily, which ensures a higher level of plant availability. The design of replaceable components is based on the principle that they must be quick and easy to change. In addition, the "Spares on Web" Internet tool makes it easy to tailor the spare parts that are available to the task at hand (www.siemens.com/sow)
- Can be easily integrated in automation solutions by means of a standard communications interface on the Control Unit as well as a range of analog and digital interfaces
- Simple commissioning and parameterization via the IOP Intelligent Operator Panel or using the STARTER commissioning tool on a PC
- Preset software functions make it easier to tailor the converter to the individual plant. For example, the key functions for controlling pumps are stored as a preprogrammed macro in the drive
- Regarding EMC, the units are sub-divided into various zones, and as a consequence, they are extremely insensitive to disturbances and are very reliable in operation. Detailed measurements and simulations have been conducted to determine the ideal positioning of air guidance and heat dissipation partitions
- Special measures used in the construction of the cabinets ensure that they remain mechanically durable over their entire lifecycle. All components, from individual parts to the ready-to-connect cabinet, undergo rigorous testing throughout the entire production process. This guarantees a high level of functional reliability during installation and commissioning, as well as in operation

Application

Variable-speed drives are ideal for all applications that involve moving, conveying, pumping, or compressing liquids or gases.

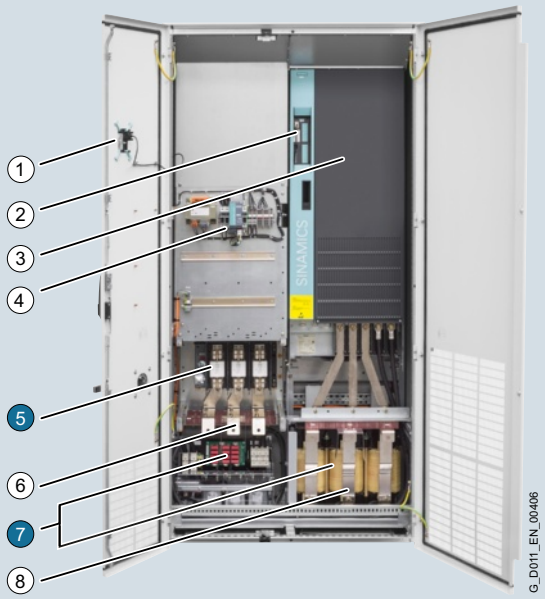
This means the following applications in particular:

- Pumps
- Fans
- Compressors

Design

SINAMICS G120P Cabinet, converter cabinet units are characterized by their modular and service-friendly design.

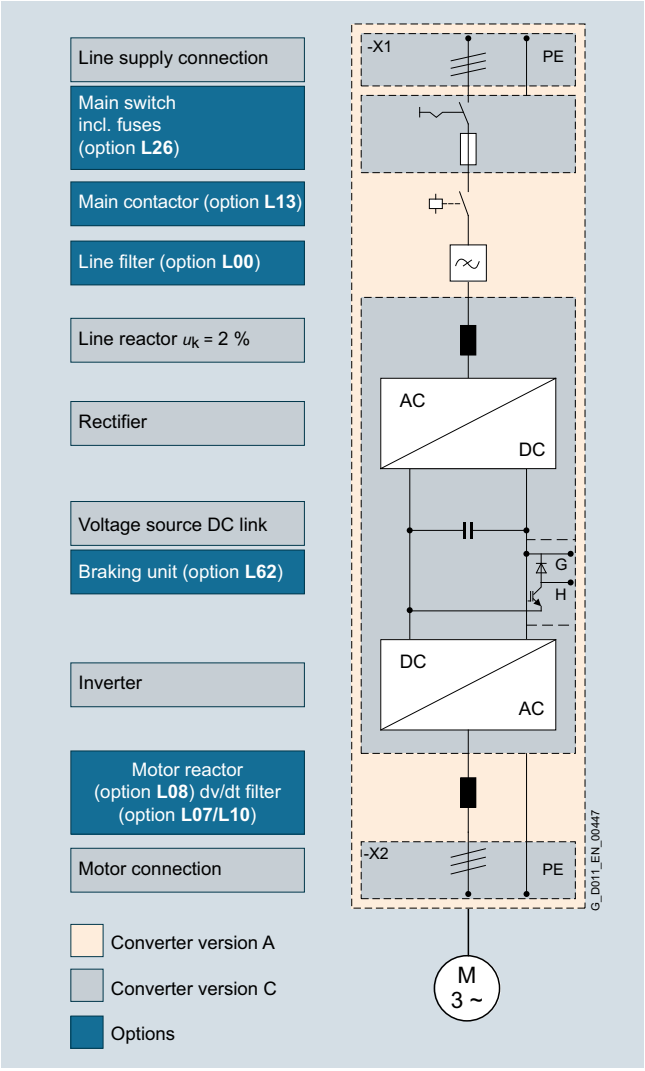
A wide range of options is available depending on the cabinet version, which permits optimum adaptation of the drive system to the respective requirements (see section Options).



1. IOP Intelligent Operator Panel
2. CU230P-2 Control Unit
3. Power Module
4. Customer connections
5. Main switch (switch disconnector with fuses, option **L26**)
6. Line supply connection
7. dv/dt filter plus VPL (option **L10**)
8. Motor connection

Standard version
Options

Example of design of a SINAMICS G120P Cabinet, converter cabinet unit, version A with a CU230P-2 Control Unit



Basic design of a SINAMICS G120P Cabinet, converter cabinet unit with several essential options

Design (continued)

Coated modules

The following converter components are equipped as standard with coated modules:

- Power Modules
- Control Units
- Intelligent Operator Panel IOP

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

Nickel-plated busbars

All of the busbars used in the converter cabinet are nickel-plated in order to achieve the best possible immunity to environmental effects. Further, the bare copper connections do not have to be cleaned for customer connections.

Note:

For some options, for technical reasons, parts of the copper busbars cannot be nickel-plated.

Crane transport aid

The converter cabinet units are supplied with a crane transport aid mounted on the top. In the case of single cabinets up to a width of 1200 mm, transport eyebolts are provided to transport the unit by crane. Transport rails are used with cabinet widths >1200 mm or for several cabinets (e.g. option L01). Rope spreaders should be used for low crane hook heights.

Degrees of protection of cabinet units

The EN 60529 standard covers the protection of electrical equipment by means of housings, covers or equivalent, and includes:

- Protection of persons against accidental contact with live or moving parts within the housing and protection of the equipment against the ingress of solid foreign matter (touch protection and protection against ingress of solid foreign bodies)
- Protection of the equipment against the ingress of water (water protection)
- Abbreviations for the internationally agreed degrees of protection

The degrees of protection are specified by abbreviations comprising the code letters IP and two digits.

Degrees of protection of the converter cabinet unit	First digit (touch protection and protection against ingress of foreign solid matter)	Second digit (protection of the equipment against the ingress of water)
IP20 (standard)	Protected against solid foreign bodies, diameter ≥ 12.5 mm.	No water protection
IP21 (option **M21**)	Protected against solid foreign bodies, diameter ≥ 12.5 mm.	Protected against drip water Vertically falling drip water shall not have a harmful effect.
IP23 (option **M23**)	Protected against solid foreign bodies, diameter ≥ 12.5 mm.	Protected against spray water Water sprayed on both sides of the vertical at an angle of up to 60° shall not have a harmful effect.
IP43 (option **M43**)	Protected against solid foreign bodies, diameter ≥ 1 mm.	Protected against spray water Water sprayed on both sides of the vertical at an angle of up to 60° shall not have a harmful effect.
IP54 (option **M54**)	Dust protected. Ingress of dust is not totally prevented, but dust must not be allowed to enter in such quantities that the functioning or safety of the equipment is impaired.	Protected against splash water Water splashing onto the enclosure from any direction shall not have a harmful effect.

Function

Intelligent Operator Panel IOP

The IOP (Intelligent Operator Panel) is mounted in the door of the cabinet units. It is used to operate and commission the drive system. The IOP is an extremely user-friendly, powerful operator panel.

The IOP supports both entry-level personnel and drive experts. Thanks to the large plain text display, the menu prompting and the application wizards, it is easy to perform commissioning. 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 pumps and fans. 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 drive 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 a drive unit into the IOP and downloaded into other drive units of the same type as required. This functionality is available only if a memory card is installed in the Control Unit.

The IOP includes a standard language package with 5 languages (English, French, German, Italian and Spanish). Additional language packages are available [1].

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

Communication with higher-level control and customer terminal block

Depending on the selected CU230P-2 Control Unit, the following interfaces for communication with the higher-level control system are provided:

- PROFINET, EtherNet/IP (option **K96**)
- PROFIBUS (option **K97**)
- USS/Modbus RTU/BACnet MS/TP, P1 protocol (option **K98**)
- CANopen (option **K99**)

The Control Unit can be connected to the higher-level control via its digital inputs and outputs.

Open-loop and closed-loop control functions

The converter control contains a high-quality, sensorless vector control with speed and current controls as well as motor and converter protection.

[1] Further information is available at
http://support.automation.siemens.com/WW/view/en/67273266

Function (continued)

Software and protective functions

The software functions available as standard are described below:

Software and protective functions	Description
Setpoint input	The setpoint can be input both internally and externally. It is applied internally as a fixed setpoint, motorized potentiometer setpoint or jog setpoint and externally via the communications interface or an analog input on the customer terminal block. The internal fixed setpoint and the motorized potentiometer setpoint can be switched over or adjusted using control commands from any interface.
Motor identification	The automatic motor identification function makes commissioning faster and easier and optimizes closed-loop control of the drive.
Ramp-function generator	An advanced ramp-function generator with separately adjustable ramping times, together with adjustable rounding times in the lower and upper speed ranges, allows the drive to be smoothly accelerated and braked. As a consequence, this avoids the drive train from being overloaded and reduces the stress on mechanical components. The down ramps can be parameterized separately for quick stop.
$V_{dc\ max}$ controller	The $V_{dc\ max}$ controller automatically prevents overvoltages in the DC link if the set down ramp is too short, for example. This may also extend the set ramp-down time.
Kinetic buffering (KIP)	In the event of supply voltage dips, the kinetic energy of the rotating drive is used to buffer the DC link so as to prevent fault trips. The converter remains operational as long as the drive can provide regenerative energy as a result of its motion and the DC link voltage does not drop below the trip threshold. When the line supply recovers within this time, the drive is again accelerated up to its setpoint speed.
Automatic restart[1]	The automatic restart switches the drive on again when the power is restored after a power failure, and ramps up to the current speed setpoint.
Flying restart[1]	The "Flying restart" function allows the converter to be switched to a motor that is still turning.
Technology controller	The technology controllers (in the form of PID controllers) can be used to implement simple closed-loop control functions. A PID controller controls the motor speed as a process controller for temperature, pressure, air quality or fill levels. Three further PID controllers are freely programmable. The P, I, and D component can be disabled.
Free function blocks	Using the freely programmable function blocks, it is easy to implement logic and arithmetic functions for controlling the SINAMICS G120P Cabinet unit. The blocks can be programmed by means of an operator panel or the STARTER commissioning tool.
***I²t* detection for motor protection**	A motor model stored in the converter software calculates the motor temperature based on the current speed and load. More exact sensing of the temperature, which also takes into account the influence of the ambient temperature, is possible by means of direct temperature sensing using KTY sensors in the motor winding.
Motor temperature evaluation	Motor protection by evaluating a temperature sensor of type KTY, PTC or bimetal NC contact. When a KTY sensor is connected, the limit values can be set for alarm or shutdown. When a PTC thermistor is connected, the system reaction to triggering of the thermistor (alarm or shutdown) can be defined.
Motor blocking protection	A blocked motor is detected and protected against thermal overloading by a fault trip.
Multi-zone control	Closed-loop control of a zone with up to 3 sensors for pressure or temperature, or closed-loop control of two independent zones each with one sensor.
Essential service mode	Special converter operating mode that enhances the availability of the drive system in the event of a fire.
Bypass [2]	When the setpoint is reached or a fault occurs, there is a changeover to mains operation.
Cascade connection [2]	Load-dependent connection and disconnection of a maximum of three additional motors by the converter in order to provide a largely constant output power.
Sleep mode	Startup or shutdown of the drive when the relevant value drops below an external setpoint or the internal PID controller setpoint

Power unit protection	Description
Ground fault monitoring at output end	A ground fault at the output end is detected by a summation current monitor and results in shutdown in grounded systems.
Electronic short-circuit protection at the output end	A short-circuit at the output end (e.g. at the converter output terminals, in the motor cable or in the motor terminal box) is detected and the converter shuts down with "fault".
Thermal overload protection	An alarm is issued first when the overtemperature threshold responds. If the temperature rises further, the unit independently adjusts the pulse frequency or output current so that a reduction in the thermal load is achieved. Once the cause of the fault has been eliminated (e.g. cooling has been improved), the original operating values are automatically resumed.

[1] Factory setting: not activated (can be parameterized)
[2] This function requires an additional external circuit.

Configuration

Cable cross-sections and connections

The table below lists the recommended and maximum possible cable connections at the line and motor ends (versions A and C).

The recommended cross-sections are based on the specified fuses. They are applicable for 3-wire cables manufactured out of copper with PVC insulation, routed horizontally in air and a permissible wire temperature of 70 °C (e.g. Protodur NYY or NYCWY) for an ambient temperature of 40 °C and individual routing.

When the conditions differ from those specified above (cable routing, cable grouping, ambient temperature), the appropriate correction factors according to IEC 60364-5-52 must be taken into account.

Rated power	Converter	**Line supply connection**			**Motor connection**			**Cabinet grounding**	
	SINAMICS G120P Cabinet versions A and C	Recommended cross-section [1]	Maximum conductor cross-section	Fixing screw	Recommended cross-section [1]	Maximum conductor cross-section	Fixing screw	Maximum conductor cross-section	Fixing screw
		IEC	IEC		IEC	IEC		IEC	
kW	6SL3710- ...	mm^2	mm^2		mm^2	mm^2		mm^2	
380 ... 480 V 3 AC									
110	1PE32-1 . A0-Z	2 × 70	2 × 240	M12	2 × 50	2 × 240	M12	3 × 240	M12
132	1PE32-5 . A0-Z	2 × 95			2 × 70				
160	1PE33-0 . A0-Z	2 × 120			2 × 95				
200	1PE33-7 . A0-Z	2 × 120			2 × 95				
250	1PE34-6 . A0-Z	2 x 185			2 x 150				
315	1PE35-8 . A0-Z	2 x 240	4 × 240		2 x 185	4 x 240		6 x 240	
355	1PE36-6 . A0-Z	3 x 185			2 x 240				
400	1PE37-4 . A0-Z	3 x 185			2 x 240				

Cable cross-sections required for connecting to the line supply and to motors

It is always recommended to use shielded - for higher power ratings - where possible symmetrical, 3-wire three-phase cables between the converter and the motor, and where required, to connect several of these cables in parallel. There are essentially 2 reasons for this:

- Only then can the high IP55 degree of protection at the motor terminal box be easily achieved. The reason for this is that cables are routed into the terminal box through glands, and the number of possible glands is restricted by the terminal box geometry. Individual cables are less suitable in achieving this.
- With symmetrical 3-wire three-phase cables, the summed ampere-turns over the cable outer diameter are equal to zero. They can easily be routed in conductive, metal cable ducts or racks without any significant currents (ground current or leakage current) being induced in these conductive, metal connections. The danger of induced leakage currents, and thus of increased cable sheath losses, is significantly higher for single-wire cables.

The cable cross-section required depends on the current being conducted in the cable. The permissible current loading of cables is defined, for example, in IEC 60364-5-52. It depends on ambient conditions, such as temperature, but also on the routing method. It should be taken into account as to whether cables are routed individually and therefore relatively well ventilated, or whether groups of cables are routed together. In the latter case, the cables have significantly poorer ventilation and can therefore heat one another up more significantly. For the relevant correction factors applicable to these boundary conditions, please refer to IEC 60364-5-52.

The table below provides a guide to the recommended cross-sections (based on IEC 60364-5-52) for PVC-insulated, 3-wire copper and aluminum cables, a permissible conductor temperature of 70 °C (e.g. Protodur NYY or NYCWY), and an ambient temperature of 40 °C.

[1] The recommendations for the North American market in AWG or MCM should be taken from the appropriate NEC (National Electrical Code) or CEC (Canadian Electrical Code) standards.

Configuration (continued)

Current-carrying capacity according to IEC 60364-5-52 at 40 °C

Cross-section 3-wire cable	Copper cable		Aluminum cable	
	Single routing	Several cables lying next to one another [1]	Single routing	Several cables lying next to one another [1]
mm^2	A	A	A	A
3 × 2.5	22	17	17	13
3 × 4.0	30	23	23	18
3 × 6.0	37	29	29	22
3 × 10	52	41	40	31
3 × 16	70	54	53	41
3 × 25	88	69	68	53
3 × 35	110	86	84	65
3 × 50	133	104	102	79
3 × 70	171	133	131	102
3 × 95	207	162	159	124
3 × 120	240	187	184	144
3 × 150	278	216	213	166
3 × 185	317	247	244	190
3 × 240	374	292	287	224

Cables must be connected in parallel for higher currents.

Note:

The recommendations for the North American market in AWG or MCM should be taken from the corresponding standards NEC (National Electrical Code) or CEC (Canadian Electrical Code).

Grounding and protective conductor cross-sections

The protective conductor must be dimensioned taking into account the following data:

- In the case of a ground fault, no impermissibly high contact voltages resulting from voltage drops on the PE conductor caused by the ground fault current may occur (< 50 V AC or < 120 V DC, IEC 61800-5-1, IEC 60364, IEC 60543).
- The PE conductor should not be excessively loaded by any ground fault current it carries.
- If it is possible for continuous currents to flow through the PE conductor when a fault occurs, the PE conductor cross-section must be dimensioned for this continuous current.
- The PE conductor cross-section should be selected according to IEC 60204-1, IEC 60439-1, IEC 60364.

Cross-section, line conductor	Minimum cross-section, external protective conductor
mm^2	mm^2
up to 16	Minimum cross-section of external conductor
16 ... 35	16
from 35	At least half the cross-section of external conductor

Note:

The recommendations for the North American market in AWG or MCM should be taken from the corresponding standards NEC (National Electrical Code) or CEC (Canadian Electrical Code).

Switchgear and motors are usually grounded separately via a local ground electrode. With this constellation, the ground fault current flows via the parallel ground connections and is divided. In spite of the relatively small protective conductor cross-sections used in accordance with the table above, no inadmissible touch voltages occur with this grounding system.

However, from experience gained with different grounding constellations, we recommend that the ground cable from the motor returns directly to the converter. For EMC reasons and to prevent bearing currents – for higher power ratings – symmetrical, 3-wire, three-phase cables should be preferentially used instead of four-wire cables. For 3-wire cables, the protection or PE wire must be routed separately or arranged symmetrically in the motor cable. The symmetry of the PE conductor is achieved using a conductor surrounding all phase conductors or using a cable with a symmetrical arrangement of the three phase conductors and three ground conductors.

Through their high-speed controllers, the converters limit the load current (motor and ground fault currents) to an rms value corresponding to the rated current. We therefore recommend the use of a PE conductor cross-section analogous to the phase conductor cross-section for grounding the control cabinet.

[1] A maximum of 9 cables may be routed directly next to one another horizontally on a cable tray.

Selection and ordering data

Rated power		Rated output current	SINAMICS G120P Cabinet, converter cabinet units	
at 400 V, 50 Hz	at 460 V, 60 Hz	at 400 V	(can be ordered only with Article No. and order code)	Control Unit (It is essential to specify one of the order codes below)
kW	hp	A	Article No.	Order code
380 ... 480 V 3 AC				
110	125	205	**6SL3710-1PE32-1■A0-Z**	■ ■ ■
132	150	245	**6SL3710-1PE32-5■A0-Z**	■ ■ ■
160	200	300	**6SL3710-1PE33-0■A0-Z**	■ ■ ■
200	250	370	**6SL3710-1PE33-7■A0-Z**	■ ■ ■
250	300	460	**6SL3710-1PE34-6■A0-Z**	■ ■ ■
315	400	585	**6SL3710-1PE35-8■A0-Z**	■ ■ ■
355	450	655	**6SL3710-1PE36-6■A0-Z**	■ ■ ■
400	500	735	**6SL3710-1PE37-4■A0-Z**	■ ■ ■

Version A All available line connection components can be installed as required		**A**
Version C Especially space-saving design		**C**
Control Unit	**CU230P-2 PN**	**K 9 6**
	CU230P-2 DP	**K 9 7**
	CU230P-2 HVAC	**K 9 8**
	CU230P-2 CAN	**K 9 9**

Note:

The power data in hp units are based on the NEC/CEC standards for the North American market.

Options

Refer also to ordering examples for orders with order codes.

Available options	Order code	Version A	Version C
Control Unit (it is essential to specify one of these four order codes)			
Control Unit CU230P-2 PN	**K96**	✓	✓
Control Unit CU230P-2 DP	**K97**	✓	✓
Control Unit CU230P-2 HVAC	**K98**	✓	✓
Control Unit CU230P-2 CAN	**K99**	✓	✓
Input-side options			
Use in the first environment to EN 61800-3 Category C2 (TN systems or TT systems with grounded neutral point) [1]	**L00**	✓	–
Clean Power version with integrated Line Harmonics Filter (380 ... 400 V ±10 %)	**L01**	✓ [3]	–
Main contactor	**L13**	✓ [3]	–
Main switch, incl. fuses	**L26**	✓	✓
Motor-side options			
dv/dt filter compact plus VPL (Voltage Peak Limiter)	**L07**	✓	–
Motor reactor	**L08**	✓	–
dv/dt filter plus VPL (Voltage Peak Limiter)	**L10**	✓	–
Motor protection and safety functions			
EMERGENCY OFF pushbutton installed in the cabinet door	**L45**	✓	–
EMERGENCY OFF Category 0, 24 V DC	**L57**	✓ [3]	–
EMERGENCY STOP Category 1, 24 V DC [2]	**L60**	✓ [3]	–
Thermistor motor protection unit (alarm)	**L83**	✓ [3]	–
Thermistor motor protection unit (shutdown)	**L84**	✓ [3]	–
PT100 evaluation unit	**L86**	✓ [3]	–
Increase in degree of protection			
Degree of protection IP21	**M21**	✓ [4]	✓
Degree of protection IP23	**M23**	✓ [3]	✓
Degree of protection IP43	**M43**	✓ [3]	✓
Degree of protection IP54	**M54**	✓ [3]	✓
Mechanical options			
Base 100 mm high, RAL 7035	**M06**	✓	✓
Cable compartment 200 mm high, RAL 7035	**M07**	✓	✓
Other options			
Provision of a cabinet-internal 230 V AC auxiliary power supply	**K74**	✓	–
Connection for external auxiliary equipment	**L19**	✓ [3]	–
Cabinet lighting with service socket	**L50**	✓	✓
Cabinet anti-condensation heating	**L55**	✓	✓
Braking unit 50 kW (P_{20} power: 200 kW) for line voltages 380 V ... 480 V	**L62**	✓	✓
EMC shielding busbar with PE busbar	**M70**	✓	✓
Documentation (standard: English/German)			
Customer documentation (circuit diagram, terminal diagram, layout diagram) in DXF format	**D02**	✓	✓
Customer documentation as hard copy	**D04**	✓	✓
Preliminary version of customer documentation	**D14**	✓	✓
Documentation language: English/French	**D58**	✓	✓
Documentation language: English/Spanish	**D60**	✓	✓
Documentation language: English/Italian	**D80**	✓	✓
Documentation language: English/Chinese	**D91**	✓	✓
Documentation language: English/Russian	**D94**	✓	✓

[1] Applies to shielded motor cable lengths ≤100 m.

[2] The stopping requirements must be taken into account with this option. Additional braking units may be required.

[3] If there is no 230 V AC power supply in the customer installation, it is essential to select option **K74** in order to ensure proper functioning of the option.

[4] If there is no 230 V AC power supply in the customer installation for frame size HX, it is essential to select option **K74** in order to provide a power supply to the fan..

✓ Option that can be ordered

– Option that cannot be ordered

Options (continued)

Available options	Order code	Version A	Version C
Languages (standard: English/German)			
Type plate data in English/French	**T58**	✓	✓
Type plate data in English/Spanish	**T60**	✓	✓
Type plate data in English/Italian	**T80**	✓	✓
Device acceptance inspections in presence of customer			
Visual acceptance	**F03**	✓	✓
Function test with no motor connected	**F71**	✓	✓
Function test with test bay motor under no-load conditions	**F75**	✓	✓
Insulation test	**F77**	✓	✓
Customer-specific acceptance inspections (on request)	**F97**	✓	✓
Device acceptance inspections without presence of customer			
Function test with no motor connected	**F72**	✓	✓
Function test with test bay motor under no-load conditions	**F74**	✓	✓
Insulation test	**F76**	✓	✓
Extension of the liability for defects			
Extension of the liability for defects by 12 months to a total of 24 months from delivery	**Q80**	✓	✓
Extension of the liability for defects by 18 months to a total of 30 months from delivery	**Q81**	✓	✓
Extension of the liability for defects by 24 months to a total of 36 months from delivery	**Q82**	✓	✓
Extension of the liability for defects by 30 months to a total of 42 months from delivery	**Q83**	✓	✓
Extension of the liability for defects by 36 months to a total of 48 months from delivery	**Q84**	✓	✓
Extension of the liability for defects by 48 months to a total of 60 months from delivery	**Q85**	✓	✓

Options (continued)

Option selection matrix

Certain options are mutually exclusive. The tables below only provide an overview. Please refer to the descriptions of the individual options for a precise description of options and other exclusions.

Interdependencies of mechanical and electrical options

	M70	L00	L01	L07	L08	L10	L13	L19	L26	L45	L50	L55	L57	L60	L62	L83	L84	L86
M70		1)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
L00	1)		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
L01	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
L07	✓	✓	✓		–	–	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
L08	✓	✓	✓	–		–	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
L10	✓	✓	✓	–	–		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
L13	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	2)	2)	✓	✓	✓	✓
L19	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
L26	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓
L45	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓
L50	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓
L55	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓
L57	✓	✓	✓	✓	✓	✓	2)	✓	✓	✓	✓	✓		–	✓	✓	✓	✓
L60	✓	✓	✓	✓	✓	✓	2)	✓	✓	✓	✓	✓	–		3)	✓	✓	✓
L62	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	3)		✓	✓	✓
L83	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓
L84	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓
L86	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	

✓ Option that can be ordered
– Option that cannot be ordered

1) Option **L00** includes option **M70**.
2) The options **L57** and **L60** always require option **L13**.
3) Option **L60** may require a braking unit for rapid standstill of the motor (option **L62**).

Options (continued)

Ordering examples

Example 1

Task:
A converter cabinet unit is needed to control the fan speed for a 180 kW fan drive for connecting to an existing 400 V MCC outgoing circuit. The rated speed of the fan is 975 rpm. Due to the prevailing ambient conditions, the converter must be mounted on a 100 mm cabinet base and have IP54 degree of protection. The installation altitude is <1000 m above sea level, the ambient temperature is 45 °C.

Solution:
Because an MCC outgoing circuit already exists, the line connection components, such as main switch, main contactor and line fuses, can be omitted and the space-saving version C can be selected. A single-phase 230 V connection for the auxiliary power supply inside the converter cabinet is not required with this configuration. Taking into account the 7.5 % derating factor for the increased ambient temperature, a converter cabinet unit with 200 kW, 400 V is sufficient for this application. The increased degree of protection and installation altitude do not necessitate additional derating. In total, the following additional options are required:

K96-K99 (selection of a fieldbus option on the CU) – required option
M06 (100 mm cabinet base)
M54 (degree of protection IP54).

The information to be stated on the order is therefore (taking PROFINET as an example):
6SL3710-1PE33-7CA0-Z
+K96 +M06 +M54

Example 2

Task:
A 160 kW pump to control the pressure equalization is to be supplied via an converter for a brand new district heating pumping station. A 400 V supply is available. The installation altitude is 350 m above sea level and the ambient temperature is maximum 35 °C. The rated speed of the pump is 740 rpm. Since the pump unit with the motor is installed in an unmanned remote station, the possibility of low ambient temperatures with risk of condensation cannot be excluded. A PROFIBUS connection must be provided to allow remote monitoring of the converter. The customer wants a ready-to-connect converter that includes a main switch, fuses and contactors for safe disconnection from the supply. The converter must also be equipped with a 230 V AC service socket and cabinet lighting system.

Solution:
An anti-condensation heating system must be provided in order to protect the converter against condensation caused by low ambient temperatures. To keep the heating system operational at all times, an external 230 V AC supply is required. The same applies to the service socket and lighting system options. Since an external 230 V AC supply is already available, there is no need to order option K74 to supply the contactor control circuit. An converter cabinet unit 160 kW, 400 V, version A, with the following options must be selected for this application:

K97 (CU230P-2 DP Control Unit),
L13 (main contactor),
L26 (main switch including fuses),
L50 (cabinet lighting system with service socket) and
L55 (cabinet anti-condensation heating system)

The information to be stated on the order is therefore:
6SL3710-1PE33-0AA0-Z
+K97 +L13 +L26 +L50 +L55

Description of options

D02
Customer documentation (circuit diagram, terminal diagram, layout diagram) in DXF format

This option can be used to order documents such as circuit diagrams, terminal diagrams, layout diagrams, and dimension drawings in DXF format, in order to process them further in CAD systems, for example. They are supplied on the documentation CD in the desired language (standard is English/German, for other languages, see options **D58, D60, D80, D91, D94**).

D04
Customer documentation as hard copy

Equipment documentation is supplied electronically on CD-ROM as standard. If the customer also requires a hard copy of the documentation and selects option **D04**, the following documents will be shipped in a folder with the converter:

- Operating instructions
- Circuit diagram
- Terminal diagram
- Layout diagram
- Dimension drawing
- Spare parts list
- Test certificate

Regardless of whether option **D04** is selected, a hard copy of the safety and transportation guidelines and a registration form are always supplied.

D14
Preliminary version of customer documentation

If documents such as circuit diagrams, terminal diagrams, layout diagrams and dimensional drawings are required in advance for system engineering, a preliminary copy of the relevant documentation can be ordered with the converter. These documents are then supplied electronically a few working days after the order has been recorded. The system-specific documentation is supplied to the customer via e-mail in the desired language (standard is English/German, for other languages, see options **D58, D60, D80, D91, D94**). The recipient's e-mail address must be provided with the order for this purpose. If option **D02** is selected at the same time, the documents are provided in the DXF format, otherwise they are sent in PDF format. In the e-mail, the recipient is also provided with a link for downloading general preliminary documentation.

D58, D60, D80, D91, D94
Documentation language

Order code	Language
D58	English/French
D60	English/Spanish
D80	English/Italian
D91	English/Chinese
D94	English/Russian

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Options (continued)

F03, F71, F75, F77, F97
Equipment acceptance in the presence of the customer

F72, F74, F76
Equipment acceptance without the presence of the customer

Option	Description
F03	**Visual acceptance** The tests are carried out with the converter de-energized. The following is included in the scope of the acceptance tests: • Checking the degree of protection • Checking the equipment (components) • Checking the equipment identifiers • Checking clearance and creepage distances • Checking cables • Checking customer documentation • Submission of the acceptance report
F71, F72	**Function test with no motor connected** After the visual inspection with the converter switched off, the converter is connected to rated voltage. No current at the converter output end. The following is included in the scope of the acceptance tests: • Visual inspection as described for option **F03** • Checking power supply • Checking protective and monitoring devices (simulation) • Checking fans • Precharging test • Function test without connected motor • Submission of the acceptance report
F74, F75	**Function test with test bay motor under no-load conditions** After the visual inspection with the converter switched off, the converter is connected to rated voltage. A small current flows at the converter's output in order to operate the test bay motor under no-load conditions. The following is included in the scope of the acceptance tests: • Visual inspection as described for option **F03** • Checking power supply • Checking protective and monitoring devices (simulation) • Checking fans • Function test with test bay motor under no-load conditions • Submission of the acceptance report
F76, F77	**Acceptance of insulation test of the converter** The following is included in the scope of the acceptance tests: • High-voltage test • Measurement of the insulation resistance • Submission of the acceptance report
F97	**Customer-specific system acceptance tests (on request)** If acceptance tests are desired which are not covered by the options **F03**, **F71/F72**, **F74/F75** or **F76/F77**, customer-specific acceptance tests/supplementary tests can be ordered using order code **F97** on request and following technical clarification.

K74
Provision of a cabinet-internal 230 V AC auxiliary power supply

If there is no 230 V AC power supply in the customer installation, option **K74** can be used to provide a cabinet-internal auxiliary power supply for the required auxiliary voltages of the external control circuits of the cabinet unit. The auxiliary voltages are generated by a transformer.

Note:

If there is no 230 V AC power supply in the customer installation, it is essential to select option **K74** in order to ensure proper functioning of options **L01, L13, L19, L57, L60, L83, L84** and **L86** and for the options **M23, M43** and **M54** with cabinet version A as well as option **M21** with cabinet version A and frame size HX.

Options **L50** and **L55** always require an external supply voltage and must not be supplied via option **K74**.

K96
CU230P-2 Control Unit PROFINET, EtherNet/IP

The converter is shipped with a CU230P-2 PN Control Unit (PROFINET).

For further information about the CU230P-2 PN Control Unit, refer to SINAMICS G120P, built-in and wall-mounted units.

K97
CU230P-2 Control Unit PROFIBUS

The converter is shipped with a CU230P-2 DP Control Unit (PROFIBUS).

For further information about the CU230P-2 DP Control Unit, refer to SINAMICS G120P, built-in and wall-mounted units.

K98
CU230P-2 HVAC Control Unit

The converter is shipped with a CU230P-2 HVAC Control Unit (USS, Modbus RTU, Bacnet MS/TP, P1 protocol).

For further information about the CU230P-2 HVAC Control Unit, refer to SINAMICS G120P, built-in and wall-mounted units.

K99
CU230P-2 CAN Control Unit

The converter is shipped with a CU230P-2 CAN Control Unit (CANopen).

For further information about the CU230P-2 CAN Control Unit, refer to SINAMICS G120P, built-in and wall-mounted units.

Options (continued)

L00
Use in the first environment to EN 61800-3, Category C2 (TN systems or TT systems with grounded neutral point)

To limit the **emitted interference**, the converters are equipped as standard with a radio interference suppression filter that conforms to the limits defined in Category C3. SINAMICS G120P Cabinet units equipped with the line filter also meet the limits for use in the first environment (Category C2) as specified in EN 61800-3. [1)]

SINAMICS G120P Cabinet units comply with the **noise immunity** requirements defined in EN 61800-3 as standard for the first and second environments.

In conjunction with line reactors, line filters also limit the conducted interference emitted by the Power Modules to the limit values of Category C2 defined in product standard EN 61800-3.

L01
Clean Power version with integrated Line Harmonics Filter

Instead of the line reactor, an innovative Line Harmonics Filter is integrated in the control cabinet; this minimizes the harmonics that occur due to the principle of operation. As a consequence, the unit fully complies with the limit values stipulated in standard IEEE 519-1992 without any exceptions (precondition: $R_{SC} \geq 20$).

SINAMICS G120P Cabinet with integrated Line Harmonics Filter is available for power ratings up to 400 kW in all available degrees of protection up to IP54 (see options M21 to M54).

Notice:

If there is no 230 V AC power supply in the customer installation, it is essential to select option **K74** in order to ensure proper functioning of option **L01**.

Notice:

For option **L01** the line supply voltage is limited from 380 to 400 V AC ±10 %.

The table below specifies the widths and weights of supplementary cabinets for the Clean Power version of SINAMICS G120P Cabinet units (Option **L01**).

Article No. Z = +L01	Rated power kW	Width of supplementary cabinet mm	Weight of supplementary cabinet kg
6SL3710-1PE32-1AA0-Z	110	400	460
6SL3710-1PE32-5AA0-Z	132	400	460
6SL3710-1PE33-0AA0-Z	160	400	460
6SL3710-1PE33-7AA0-Z	200	400	460
6SL3710-1PE34-6AA0-Z	250	400	460
6SL3710-1PE35-8AA0-Z	315	600	600
6SL3710-1PE36-6AA0-Z	355	600	600
6SL3710-1PE37-4AA0-Z	400	600	750

To allow the power cable shield to be connected in conformance with EMC requirements, an additional EMC shield bus (**M70** option) is installed in the cabinet. A separate order is not required in this case.

L07
dv/dt filter compact plus VPL

dv/dt filters compact plus VPL (**V**oltage **P**eak **L**imiter) limit the voltage rate-of-rise dv/dt to values of <1600 V/µs and the typical voltage peaks to the following values according to the limit value curve A to IEC 60034-25: 2007:

- < 1150 V at U_{line} < 575 V

The dv/dt filter compact plus VPL functionally consists of two components that are supplied as a compact mechanical unit, the dv/dt reactor and the voltage limiting network (VPL), which limits voltage peaks and feeds back the energy to the DC link. Its dimensions are so compact that it can be completely integrated in the cabinet – even for high power ratings. A supplementary cabinet is not required.

By using a dv/dt filter compact plus VPL, standard motors with a standard insulation and without insulated bearings can be used for converter operation.

dv/dt filters compact plus VPL are designed for the following maximum motor cable lengths:

- Shielded cables 100 m (e.g. Protodur NYCWY)
- Non-shielded cables 150 m (e.g. Protodur NYY)

For longer cable lengths (>100 m shielded, >150 m unshielded), the dv/dt filter plus VPL (option **L10**) should be used.

Notice:

Operation with output frequencies <10 Hz is permissible for max. 5 min.

Note:

Option **L07** cannot be combined with the following options:

- **L08** (motor reactor)
- **L10** (dv/dt filter plus VPL)

L08
Motor reactor

Motor reactors reduce the voltage load on the motor windings by reducing the voltage gradients at the motor terminals that occur during converter operation. At the same time, the capacitive charge/discharge currents that occur at the converter output when long motor cables are used are reduced. For this reason, the maximum possible motor cable length can be increased through installation of motor reactors.

Max. connectable motor cable lengths:

- Shielded cables 300 m (e.g. Protodur NYCWY)
- Non-shielded cables 450 m (e.g. Protodur NYY)

These values are guide values only; the actual values depend on the cable type and routing.

Note:

Option **L08** cannot be combined with the following options:

- **L07** (dv/dt filter compact plus VPL)
- **L10** (dv/dt filter plus VPL)

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[1)] Applies to shielded motor cable lengths ≤100 m.

Options (continued)

L10
dv/dt filter plus Voltage Peak Limiter

dv/dt filters plus VPL (Voltage Peak Limiter) limit the voltage rate-of-rise dv/dt to values of <500 V/µs and the typical voltage peaks to the following values according to the limit value curve to IEC/TS 60034-17: 2006:

- <1000 V at U_{line} <575 V

The dv/dt filter plus VPL functionally consists of two components, the dv/dt reactor and the voltage limiting network (VPL), which limits voltage peaks and feeds the energy back to the DC link.

By using a dv/dt filter plus VPL, standard motors with a standard insulation and without insulated bearings can be used for converter operation.

The dv/dt filter plus VPL are designed for the following maximum motor cable lengths:

- Shielded cables 300 m (e.g. Protodur NYCWY)
- Non-shielded cables 450 m (e.g. Protodur NYY)

For cable lengths <100 m shielded or <150 m unshielded, the dv/dt filter compact plus VPL (option **L07**) can be advantageously used.

Note:

Option **L10** cannot be combined with the following options:

- **L07** (dv/dt filter compact plus VPL)
- **L08** (motor reactor)

The table below specifies the widths and weights of supplementary cabinets for SINAMICS G120P Cabinet units with dv/dt filter plus Voltage Peak Limiter (option **L10**), rated output 315 kW and above.

Article No. Z = +L10	Rated power kW (hp)	Width of supplementary cabinet mm (in)	Weight of supplementary cabinet kg (lb)
6SL3710-1PE35-8AA0-Z	315	400	300
6SL3710-1PE36-6AA0-Z	355	400	300
6SL3710-1PE37-4AA0-Z	400	400	300

L13
Main contactor

The SINAMICS G120P Cabinet converter units are provided as standard without a line contactor. Option **L13** is needed if a switching element is required for disconnecting the cabinet from the supply (required for EMERGENCY OFF). The contactor is controlled internally in the converter.

Notice:

If there is no 230 V AC power supply in the customer installation, it is essential to select option **K74** in order to ensure proper functioning of option **L13**.

L19
Connection for external auxiliary equipment

This is an outgoing, controlled feeder fused with max. 10 A for external auxiliary equipment (for example, separately driven motor fan).

The voltage is tapped at the converter input upstream of the main contactor and, therefore, has the same level as the supply voltage.

The outgoing feeder can be controlled internally by the converter or externally.

Notice:

If there is no 230 V AC power supply in the customer installation, it is essential to select option **K74** in order to ensure proper functioning of option **L19**.

Terminal -X155:	Significance	Range
1	L1	380 ... 480 V AC
2	L2	380 ... 480 V AC
3	L3	380 ... 480 V AC
11	Contactor control	230 V AC
12	Contactor control	230 V AC
13	NO: Checkback motor circuit breaker	230 V AC/0.5 A; 24 V DC/2 A
14	NO: Checkback motor circuit breaker	230 V AC/0.5 A; 24 V DC/2 A
15	NO: Contactor feedback signal	230 V AC/6 A
16	NO: Contactor feedback signal	230 V AC/6 A
PE	PE	PE

L26
Main switch incl. fuses

A switch disconnector with fuses is available as main switch.

L45
EMERGENCY OFF pushbutton, installed in the cabinet door

The EMERGENCY OFF button with protective collar is installed in the converter cabinet door and its contacts are connected to the terminal block. The EMERGENCY OFF functions of category 0 or 1 can be activated in conjunction with options **L57** and **L60**.

Notice:

By pressing the EMERGENCY OFF pushbutton, in compliance with EN 60204-1, the motor is stopped – either uncontrolled or controlled depending on the selected Category 0 or 1 – and the converter isolated from the line supply. Auxiliary voltages, such as the cabinet-internal 230 V AC auxiliary power supply (option **K74**), may still be present. Certain areas within the converter also remain live, e.g. the control or auxiliaries. If complete disconnection of all voltages is required, the EMERGENCY OFF button must be incorporated into a protective system to be implemented by the customer. For this purpose, an NC contact is provided at terminal –X120.

The EMERGENCY OFF button is preconfigured at the factory only when one of the options **L57** or **L60** is selected simultaneously. Other circuit arrangements must be implemented in the customer installation.

Options (continued)

L50
Cabinet lighting with service socket

One handheld lamp and one service socket are installed for each cabinet section.

The power supply (at terminal block –X390) for the cabinet lighting and the socket must be provided externally via a 230 V AC power supply and fused with max. 10 A. The cabinet lighting is switched on manually using a switch.

Terminal –X390:	Significance
1	L1 (230 V AC)
2	N
3	PE

L55
Anti-condensation heating for cabinet

The anti-condensation heating is recommended at low ambient temperatures and high levels of humidity to prevent condensation. A 100 W electrical cabinet heater is installed for each cabinet section (two heaters are installed for each section for cabinet section widths from 800 mm to 1200 mm).

The power supply for the anti-condensation heating (110 V to 230 V AC, at terminal block –X240) must be provided externally from a 230 V AC power supply and fused with max. 16 A.

Terminal –X240:	Significance
1	L1 (110 ... 230 V AC)
2	N
3	PE

L57
EMERGENCY OFF category 0, 24 V DC

EMERGENCY OFF Category 0 for uncontrolled stopping in accordance with EN 60204-1.

The function includes interrupting the power feed for the converter via the line contactor and bypassing the microprocessor controller using a safety combination according to EN 60204-1. The motor then coasts down.

Notice:

If there is no 230 V AC power supply in the customer installation, it is essential to select option **K74** in order to ensure proper functioning of option **L57**.

Notice:

Option **L57** always requires the electrical separation from the line supply, i.e. option **L13**.

Terminal –X120:	Significance
3	Looping in of the EMERGENCY STOP button from the customer installation; remove jumper 3-6!
6	Looping in of the EMERGENCY STOP button from the customer installation; remove jumper 3-6!
15	"On" for monitored start; remove jumper 15-16!
16	"On" for monitored start; remove jumper 15-16!

L60
EMERGENCY STOP Category 1, 24 V DC

EMERGENCY STOP Category 1 for controlled stopping in accordance with EN 60204-1.

The function stops the drive using a fast stop along a down ramp that is parameterized by the user. The power feed to the converter is then interrupted as described for EMERGENCY OFF Category 0.

Notice:

If there is no 230 V AC power supply in the customer installation, it is essential to select option **K74** in order to ensure proper functioning of option **L60**.

In order to maintain the specified stopping times, it may be necessary to use a braking unit (option **L62**).

Notice:

Option **L60** always requires the electrical separation from the line supply, i.e. option **L13**.

Terminal –X120:	Significance
3	Looping in of the EMERGENCY STOP button from the customer installation; remove jumper 3-6!
6	Looping in of the EMERGENCY STOP button from the customer installation; remove jumper 3-6!
15	"On" for manual start; remove jumper 15-16!
16	"On" for manual start; remove jumper 15-16!

L62
Braking unit

A braking unit must be installed for applications which require controlled braking or shutdown of the drive. This typically applies in the case of large fans which are caused to rotate by air flow. In such instances, it is important to consider operating states which could result in speeds in excess of the desired maximum speed but also the possibility of reversal of rotational direction during restart from standstill. A braking unit is also necessary when the fan must reach standstill in a specified time, as is normally required for EMERGENCY STOP Category 1 (option **L60**).

The braking unit comprises two components:

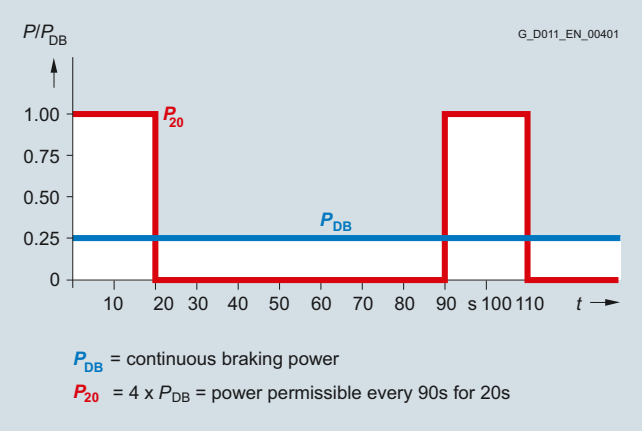
- A Braking Module that is installed in the converter cabinet
- A braking resistor to be mounted externally (IP20 degree of protection)

The braking unit functions as an autonomous unit, and does not require an external power supply. The braking energy is converted into heat in the braking resistor that must be mounted externally.

A max. cable length of 100 m is permissible between the Braking Module and the braking resistor. This allows the braking resistor to be mounted externally so that heat losses can be dissipated outside the converter enclosure.

Options (continued)

Characteristic curves



Load diagram for Braking Module and braking resistor

The following braking units are available for SINAMICS G120P Cabinet:

Order code	SINAMICS G120P Cabinet, converter cabinet units	**Braking Module**		**Braking resistor**
Option	Rated power	P_{DB}	P_{20}	R_B
	kW (hp)	kW (hp)	kW (hp)	Ω
380 ... 480 V 3 AC				
L62	110 ... 400	50	200	3.1 ±8 %

P_{DB}: Rated power (continuous braking power).

P_{20}: 20 s power referred to a braking interval of 90 s.

L83
Thermistor motor protection unit (alarm)

Thermistor motor protection device for PTC temperature thermistors (PTC resistors, type A) for alarm.

The thermistor motor protection unit is supplied with power and evaluated internally in the converter.

Notice:

If there is no 230 V AC power supply in the customer installation, it is essential to select option **K74** in order to ensure proper functioning of option **L83**.

L84
Thermistor motor protection unit (trip)

Thermistor motor protection device for PTC temperature sensors (PTC resistors, type A) for trip.

The thermistor motor protection unit is supplied with power and evaluated internally in the converter.

Notice:

If there is no 230 V AC power supply in the customer installation, it is essential to select option **K74** in order to ensure proper functioning of option **L84**.

L86
PT100 evaluation unit

The PT100 evaluation unit can monitor up to 6 sensors.

The sensors can be connected in a two- or three-wire system. The limit values can be freely programmed for each channel. In the factory setting, the measuring channels are subdivided into two groups, each with 3 channels. For motors, for example, this means that three PT100s in the stator windings and two PT100s in the motor bearings can be monitored. Unused channels can be suppressed via parameters.

The output relays are integrated into the internal fault and shutdown sequence of the converter.

Notice:

If there is no 230 V AC power supply in the customer installation, it is essential to select option **K74** in order to ensure proper functioning of option **L86**.

M06
Base 100 mm high, RAL 7035

The additional cabinet base allows larger bending radii for cables (cable entry from below) and enables them to be routed within the cabinet base. It is delivered completely assembled with the cabinet. The mounting height of the operator panel changes accordingly.

Note:

The cabinet base is coated as standard in RAL 7035. It is also available with a special paint coating.

M07
Cable compartment 200 mm high, RAL 7035

The cable compartment is made of strong sheet steel and allows cables to be connected more flexibly (entry from below). It also allows routing of cables within the compartment. It is delivered completely assembled with the cabinet. The mounting height of the operator panel changes accordingly.

Note:

The cable compartment is coated as standard in RAL 7035. It is also available with a special paint coating.

Options (continued)

M21
IP21 degree of protection

Cabinet version in IP20, but with additional top or drip protection cover. This increases the cabinet height by 300 mm.

For transport reasons, the top or drip protection covers are delivered separately and must be fitted on site.

Note:

The top or drip protection covers are painted in RAL 7035 as standard.

Notice:

If there is no 230 V AC power supply in the customer installation for version A frame size HX, it is essential to select option **K74** in order to provide a power supply to the fan.

M23, M43, M54
Degrees of protection IP23, IP43, IP54

When **M23, M43** or **M54** is selected, the converter is equipped with a hood. This increases the cabinet height by 400 mm.

For transport reasons, the hoods are delivered separately and must be fitted by the customer.

Note:

The roof sections are colored RAL 7035 as standard. The molded plastic parts (e.g. ventilation grilles) have color RAL 7035 and cannot be coated.

Notice:

If there is no 230 V AC power supply in the customer installation for version A, it is essential to select option **K74** in order to provide a power supply to the fan.

M70
EMC shielding busbar with PE busbar

The EMC shielding busbar is used to connect line and motor shielded supply cables.

The PE busbar is used to connect and secure PE cables.

Note:

The EMC shield busbar with PE busbar is already contained as standard in option **L00** (use in the first environment).

Q80 to Q85
Extension of the liability for defects

It is possible to extend the liability for defect periods beyond the standard liability for defects period. The standard liability for defects period as listed in the standard conditions for the supply of services and products is 12 months.

The following extension periods are available:

Extension of the liability for defects period for converters	
Article No. supplement -Z with order code	Additional text
Q80	Extension of the liability for defects period by 12 months to a total of 24 months (2 years) from delivery
Q81	Extension of the liability for defects period by 18 months to a total of 30 months (2½ years) from delivery
Q82	Extension of the liability for defects period by 24 months to a total of 36 months (3 years) from delivery
Q83	Extension of the liability for defects period by 30 months to a total of 42 months (3½ years) from delivery
Q84	Extension of the liability for defects period by 36 months to a total of 48 months (4 years) from delivery
Q85	Extension of the liability for defects period by 48 months to a total of 60 months (5 years) from delivery

The currently valid conditions for extending the period of liability for defects can be found at
http://support.automation.siemens.com/WW/view/en/56715113

T58, T60, T80
Rating plate data

As standard, the rating plate is in English/German.

A rating plate in another language can be selected using the following order code for the option.

Order code	Rating plate language
T58	English/French
T60	English/Spanish
T80	English/Italian

Technical specifications

The most important directives and standards are listed below. These are used as basis for the SINAMICS G120P Cabinet, converter cabinet units and they must be carefully observed to achieve an EMC-compliant configuration that is safe both functionally and in operation.

European directives	
2006/95/EC	Low-voltage directive: Directive of the European Parliament and Council of December 12, 2006, on the approximation of the laws of the member states relating to electrical equipment designed for use within certain voltage limits
2004/108/EC	EMC directive: Directive of the European Parliament and Council of December 15, 2004, which repeals directive 89/336/EEC, on the approximation of laws of the member states relating to electromagnetic compatibility
2006/42/EC	Machinery directive: The directive of the European Parliament and Council of May 17, 2006 on machinery and for changing Directive 95/16/EC (amendment)
European Standards	
EN 60146-1-1	Semiconductor converters – General requirements and line-commutated converters Part 1-1: Specification of basic requirements
EN 60204-1	Electrical equipment of machines Part 1: General requirements
EN 60529	Degrees of protection provided by enclosures (IP code)
EN 61800-2	Adjustable speed electrical power drive systems Part 2: General requirements – Rating specifications for low-voltage adjustable frequency a.c. power drive systems
EN 61800-3	Adjustable speed electrical power drive systems 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
Electrical specifications	
Line voltages	380 ... 480 V 3 AC, ±10 % (-15 % <1 min)[1)]
Output ranges	110 ... 400 kW
Line system configurations	Grounded TN/TT systems and non-grounded IT systems
Power frequency	47 ... 63 Hz
Output frequency	0 ... 100 Hz
Offset factor cos φ	0.96
Power factor λ	0.75 ... 0.93
Efficiency	>98 %
Overvoltage category	III to EN 61800-5-1
Closed-loop control modes	Vector control without sensor or U/f control
Fixed speeds	15 fixed speeds plus 1 minimum speed, parameterizable (in the default setting, 3 fixed setpoints plus 1 minimum speed are selectable using terminal block/fieldbus system)
Skipped speed ranges	4, parameterizable
Setpoint resolution of the Control Unit	0.01 Hz 12 bit analog
Braking operation	DC braking, dynamic braking with optional Braking Module
Mechanical specifications	
Degree of protection	IP20 (higher degrees of protection up to IP54 optional)
Safety class	I acc. to EN 61800-5-1
Touch protection	According to EN 50274 and BGV A3 when used as intended
Cabinet system	Schäfer IS-1, doors with double-barb lock, base plates with cable entry possibilities, crane transport aid
Paint finish	RAL 7035 (indoor requirements)
Type of cooling	Forced air cooling AF to EN 60146

[1)] With option **L01** the line supply voltage is limited from 380 to 400 V ±10%.

Technical specifications (continued)

Ambient conditions	Bearings	Transport	Operation
Ambient temperature	-25 ... +55 °C	-25 ... +70 °C above -40 °C for 24 hours	0 ... 40 °C up to 50 °C see derating data
Relative humidity (condensation not permissible)	5 ... 95 % Class 1K4 acc. to EN 60721-3-1	5 ... 95 % Class 2K3 acc. to EN 60721-3-2	5 ... 95 % Class 3K3 acc. to EN 60721-3-3
Environmental class/harmful chemical substances	Class 1C2 acc. to EN 60721-3-1	Class 2C2 acc. to EN 60721-3-2	Class 3C2 acc. to EN 60721-3-3
Organic/biological influences	Class 1B1 acc. to EN 60721-3-1	Class 2B1 acc. to EN 60721-3-2	Class 3B1 according to EN 60721-3-3 Restriction: No conductive dust particles permitted
Pollution degree	2 acc. to EN 61800-5-1		
Installation altitude	Up to 1000 m (3281 ft) above sea level without derating > 1000 m (3281 ft) see derating data		

Mechanical strength	Bearings	Transport [1]	Operation
Vibratory load • Deflection • Acceleration	Class 1M2 acc. to EN 60721-3-1 1.5 mm at 5 ... 9 Hz 5 m/s^2 at > 9 ... 200 Hz	Class 2M2 acc. to EN 60721-3-2 3.5 mm at 2 ... 9 Hz 10 m/s^2 at > 9 ... 200 Hz	Class 3M2 acc. to EN 60721-3-3 0.075 mm at 10 ... 58 Hz 10 m/s^2 at > 58 ... 200 Hz
Shock load • Acceleration	Class 1M2 acc. to EN 60721-3-1 40 m/s^2 at 22 ms	Class 2M2 acc. to EN 60721-3-2 150 m/s^2 at 11 ms	Class 3M2 acc. to EN 60721-3-3 50 m/s^2 (5 × *g*)/30 ms 150 m/s^2 (15 × *g*)/11 ms

Standards	
Compliance with standards	CE, C-Tick, GOST-R (EAC), KC
CE marking	According to EMC Directive No. 2004/108/EC, Low Voltage Directive No. 2006/95/EC, Machinery Directive No. 2006/42/EC
Radio interference suppression	The SINAMICS G120P Cabinet converter systems are not designed for connection to the public power network ("first environment"). Radio interference suppression is compliant with the EMC product standard for variable-speed drives EN 61800-3 "Second environment" (industrial line supplies). The equipment can cause electromagnetic interference when it is connected to the public network. However, if supplementary measures are taken (e.g. line filter, see option **L00**) operation in the "first environment" is possible.

Deviations from the specified classes are underlined.

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[1] In transport packaging.

Technical specifications (continued)

Line voltage 380 ... 480 V 3 AC		SINAMICS G120P Cabinet, converter cabinet units				
		6SL3710-1PE32-1.A0-Z	6SL3710-1PE32-5.A0-Z	6SL3710-1PE33-0.A0-Z	6SL3710-1PE33-7.A0-Z	6SL3710-1PE34-6.A0-Z
Rated power						
• At I_L 400 V/50 Hz [1]	kW (hp)	**110**	**132**	**160**	**200**	**250**
• At I_L 460 V/60 Hz [2]	hp	125	150	200	250	300
• At I_H 400 V/50 Hz [1]	kW (hp)	90	110	132	160	200
• At I_H 460 V/60 Hz [2]	hp	100	100	150	200	200
Output current						
• Rated current I_{rated} (400 V ±10 %)	A	205	245	300	370	460
• Rated current I_{rated} (480 V ±10 %)	A	160	184	245	308	369
• Base-load current I_L (400 V ±10 %) [3]	A	200	240	290	360	450
• Base-load current I_L (480 V ±10 %) [3]	A	156	180	240	302	361
• Base-load current I_H (400 V ±10 %) [4]	A	164	196	240	296	368
• Base-load current I_H (480 V ±10 %) [4]	A	128	147	196	247	295
• Output current, max.	A	270	324	392	486	608
Input current						
• Rated current (400 V ±10 %) [5]	A	218	262	317	375	469
• Rated current (480 V ±10 %) [5]	A	171	197	262	314	376
• Base-load current I_L (400 V ±10 %) [3]	A	213	257	307	365	459
• Base-load current I_L (480 V ±10 %) [3]	A	167	193	257	308	368
• Base-load current I_H (400 V ±10 %) [4]	A	175	210	254	300	375
• Base-load current I_H (480 V ±10 %) [4]	A	137	157	210	251	301
• Input current, max.	A	288	347	415	493	620
Current requirement, 24 V DC auxiliary power supply [6]						
• Version A	A	1	1	1	1	1
• Version C	A	0.5	0.5	0.5	0.5	0.5
Short-circuit current rating per IEC in conjunction with the specified fuses	kA	65	65	65	65	65
Minimum short-circuit current [7]						
• For 3NE1 fuses	A	3000	3600	4400	5200	6300
• For 3NA3 fuses	A	5800	7300	9500	14000	20000
Power loss, max. at I_{rated} (400 V/40 °C)						
• Version A	kW (hp)	3.377 (4.53)	3.939 (5.28)	4.543 (6.09)	5.681 (7.62)	6.376 (8.55)
• Version C	kW (hp)	2.831 (3.80)	3.255 (4.36)	3.901 (5.23)	4.777 (6.41)	5.482 (7.35)
Coolant		of air	of air	of air	of air	of air
Coolant requirements	m^3/s (ft^3/s)	0.21 (7.4)	0.21 (7.4)	0.21 (7.4)	0.21 (7.4)	0.21 (7.4)
Sound pressure level L_{pA}(1 m) at 50/60 Hz						
• Version A	dB	66/66	66/66	66/66	66/66	66/66
• Version C	dB	63/63	63/63	63/63	63/63	63/63

Note:

If the minimum short-circuit current is not reached, the activation time of the fuses is increased, which can lead to damage.

Note:

The power data in hp units are based on the NEC/CEC standards for the North American market.

Information on the line connection, motor connection and cabinet grounding can be found in section Cable cross-sections and connections.

[1] Rated power of a typ. 4-pole standard induction motor based on base-load current I_L or I_H at 400 V 3 AC/50 Hz.

[2] Rated power of a typ. 4-pole standard induction motor based on base-load current I_L or I_H at 460 V 3 AC/60 Hz.

[3] The base-load current I_L is based on a duty cycle of 110 % for 60 s or 135 % for 3 s with a duty cycle duration of 300 s (see overload capability characteristics).

[4] The base-load current I_H is based on a duty cycle of 150 % for 60 s with a duty cycle duration of 300 s (see overload capability characteristics).

[5] The current values given here are based on the rated output current.

[6] If the drive closed-loop control is still to remain active when the main line supply fails, then the equipment must be provided with an external 24 V DC supply.

[7] 10 ms value from current-time characteristic for reliable tripping of installed protection devices.

Technical specifications (continued)

Line voltage 380 ... 480 V 3 AC		SINAMICS G120P Cabinet, converter cabinet units				
		6SL3710-1PE32-1.A0-Z	6SL3710-1PE32-5.A0-Z	6SL3710-1PE33-0.A0-Z	6SL3710-1PE33-7.A0-Z	6SL3710-1PE34-6.A0-Z
Cable length, max. between Power Module and motor						
• When compliant with Categories C2 and C3 according to EN 61800-3 shielded	m (ft)	100 (328.10)	100 (328.10)	100 (328.10)	100 (328.10)	100 (328.10)
• When non-compliant with the limit values for RI suppression and without output reactor or dv/dt filter unshielded	m (ft)	200 (656.20)	200 (656.20)	200 (656.20)	200 (656.20)	200 (656.20)
• When non-compliant with the limit values for RI suppression with output reactor or dv/dt filter shielded/unshielded	m (ft)	300/450 (984.40/1476.45)	300/450 (984.40/1476.45)	300/450 (984.40/1476.45)	300/450 (984.40/1476.45)	300/450 (984.40/1476.45)
Dimensions						
• Width for version A/C	mm (in)	1000/600 (39.37/23.62)	1000/600 (39.37/23.62)	1000/600 (39.37/23.62)	1000/600 (39.37/23.62)	1000/600 (39.37/23.62)
• Height[1)]	mm (in)	2000 (78.74)	2000 (78.74)	2000 (78.74)	2000 (78.74)	2000 (78.74)
• Depth	mm (in)	600 (23.26)	600 (23.26)	600 (23.26)	600 (23.26)	600 (23.26)
Frame size		GX	GX	GX	GX	GX
Weight Versions A/C (degree of protection IP20, without options)	kg (lb)	360/290 (793.80/639.45)	360/290 (793.80/639.45)	370/290 (815.85/639.45)	380/300 (837.90/661.50)	400/300 (882.00/661.50)

Note:

If the minimum short-circuit current is not reached, the activation time of the fuses is increased, which can lead to damage.

Note:

The power data in hp units are based on the NEC/CEC standards for the North American market.

Information on the line connection, motor connection and cabinet grounding can be found in section Cable cross-sections and connections.

1) Version A: The cabinet height increases by 300 mm with IP20 and IP21 degrees of protection, and by 400 mm with IP23, IP43 and IP54 degrees of protection.
Version C: The cabinet height increases by 300 mm for IP21 degree of protection, and by 400 mm for IP23, IP43 and IP54 degrees of protection.

Technical specifications (continued)

Line voltage 380 ... 480 V 3 AC		SINAMICS G120P Cabinet, converter cabinet units		
		6SL3710-1PE35-8.A0-Z	6SL3710-1PE36-6.A0-Z	6SL3710-1PE37-4.A0-Z
Rated power				
• At I_L 400 V/50 Hz [1]	kW	**315**	**355**	**400**
• At I_L 460 V/60 Hz [2]	hp	400	450	500
• At I_H 400 V/50 Hz [1]	kW	250	250	315
• At I_H 460 V/60 Hz [2]	hp	300	300	350
Output current				
• Rated current I_{rated} (400 V ±10 %)	A	585	655	735
• Rated current I_{rated} (480 V ±10 %)	A	487	526	602
• Base-load current I_L (400 V ±10 %) [3]	A	570	640	720
• Base-load current I_L (480 V ±10 %) [3]	A	477	515	590
• Base-load current I_H (400 V ±10 %) [4]	A	468	491	551
• Base-load current I_H (480 V ±10 %) [4]	A	390	394	452
• Output current, max.	A	770	864	972
Input current				
• Rated current (400 V ±10 %) [5]	A	597	668	750
• Rated current (480 V ±10 %) [5]	A	497	536	614
• Base-load current I_L (400 V ±10 %) [3]	A	585	654	735
• Base-load current I_L (480 V ±10 %) [3]	A	486	525	602
• Base-load current I_H (400 V ±10 %) [4]	A	477	501	562
• Base-load current I_H (480 V ±10 %) [4]	A	397	402	461
• Input current, max.	A	785	881	992
Current requirement, 24 V DC auxiliary power supply [6]				
• Version A	A	1	1	1
• Version C	A	0.5	0.5	0.5
Short-circuit current rating per IEC in conjunction with the specified fuses	kA	65	65	65
Minimum short-circuit current [7]				
• For 3NE1 fuses	A	9000	10000	12000
• For 3NA3 fuses	A	20000	30000	30000
Power loss, max. at I_{rated} (400 V/40 °C)				
• Version A	kW (hp)	8.478 (11.37)	9.443 (12.66)	9.907 (13.29)
• Version C	kW (hp)	7.143 (9.58)	8.026 (10.76)	8.824 (11.83)
Coolant		of air	of air	of air
Coolant requirements	m^3/s (ft^3/s)	0.6 (21.2)	0.6 (21.2)	0.6 (21.2)
Sound pressure level L_{pA}(1 m) at 50/60 Hz				
• Version A	dB	69/69	69/69	69/69
• Version C	dB	66/66	66/66	66/66

Note:

If the minimum short-circuit current is not reached, the activation time of the fuses is increased, which can lead to damage.

Note:

The power data in hp units are based on the NEC/CEC standards for the North American market.

Information on the line connection, motor connection and cabinet grounding can be found in section Cable cross-sections and connections.

[1] Rated power of a typ. 4-pole standard induction motor based on base-load current I_L or I_H at 400 V 3 AC/50 Hz.

[2] Rated power of a typ. 4-pole standard induction motor based on base-load current I_L or I_H at 460 V 3 AC/60 Hz.

[3] The base-load current I_L is based on a duty cycle of 110 % for 60 s or 135 % for 3 s with a duty cycle duration of 300 s (see overload capability characteristics).

[4] The base-load current I_H is based on a duty cycle of 150 % for 60 s with a duty cycle duration of 300 s (see overload capability characteristics).

[5] The current values given here are based on the rated output current.

[6] If the drive closed-loop control is still to remain active when the main line supply fails, then the equipment must be provided with an external 24 V DC supply.

[7] 10 ms value from current-time characteristic for reliable tripping of installed protection devices.

Technical specifications (continued)

Line voltage 380 ... 480 V 3 AC		SINAMICS G120P Cabinet, converter cabinet units		
		6SL3710-1PE35-8.A0-Z	6SL3710-1PE36-6.A0-Z	6SL3710-1PE37-4.A0-Z
Cable length, max. between Power Module and motor				
• When compliant with Categories C2 and C3 according to EN 61800-3 shielded	m (ft)	100 (328.10)	100 (328.10)	100 (328.10)
• When non-compliant with the limit values for RI suppression and without output reactor or dv/dt filter unshielded	m (ft)	200 (656.20)	200 (656.20)	200 (656.20)
• When non-compliant with the limit values for RI suppression with output reactor or dv/dt filter shielded/unshielded	m (ft)	300/450 (984.30/1476.45)	300/450 (984.30/1476.45)	300/450 (984.30/1476.45)
Dimensions				
• Width for version A/C	mm (in)	1200 [2]/800 (47.24 [2]/31.50)	1200 [2]/800 (47.24 [2]/31.50)	1200 [2]/800 (47.24 [2]/31.50)
• Height [1]	mm (in)	2000 (78.74)	2000 (78.74)	2000 (78.74)
• Depth	mm (in)	600 (23.26)	600 (23.26)	600 (23.26)
Frame size		HX	HX	HX
Weight Versions A/C (degree of protection IP20, without options)	kg (lb)	500/430 (1102.50/948.15)	500/440 (1102.50/970.20)	530/440 (1168.65/970.20)

Note:

If the minimum short-circuit current is not reached, the activation time of the fuses is increased, which can lead to damage.

Note:

The power data in hp units are based on the NEC/CEC standards for the North American market.

Information on the line connection, motor connection and cabinet grounding can be found in section Cable cross-sections and connections.

[1] The cabinet height increases by 300 mm for IP21 degree of protection, and by 400 mm for IP23, IP43 and IP54 degrees of protection.

[2] The specified cabinet widths increase depending on the options selected. For details, see description of options **L01** and **L10**.

Characteristic curves

Derating data

SINAMICS G120P Cabinet units and the associated system components are rated for an ambient temperature of 40 °C and installation altitudes up to 1000 m above sea level.

At ambient temperatures of > 40 °C, the output current must be reduced. Ambient temperatures above 50 °C are not permissible.

At installation altitudes > 1000 m above sea level, it must be taken into account that the air pressure, and therefore air density, decreases as the height increases. As a consequence, the cooling efficiency and the insulation capacity of the air also decrease.

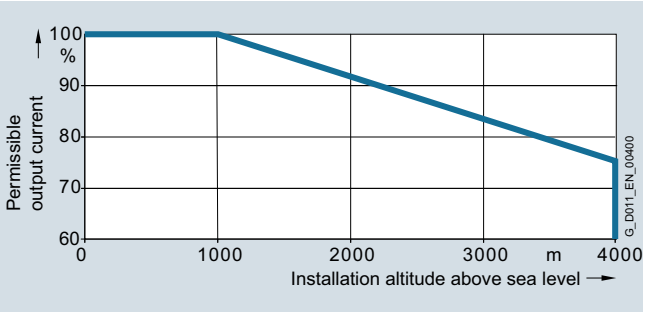
Due to the reduced cooling efficiency, it is necessary, on the one hand, to reduce the ambient temperature, and on the other hand, to lower heat loss in the converter cabinet unit by reducing the output current.

As additional measure for installation altitudes from 2000 m up to 4000 m, an isolating transformer is required in order to reduce transient overvoltages according to EN 60664-1.

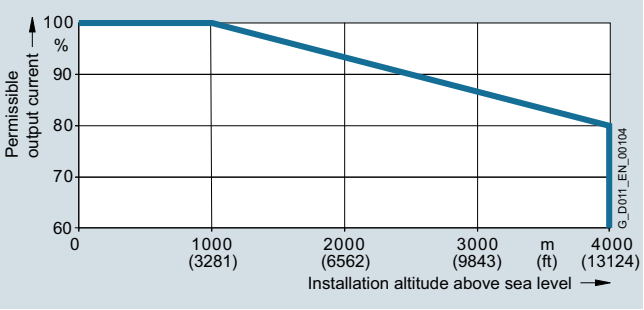
Automatic adjustment of pulse frequency

In the factory setting, the drive starts with a pulse frequency of 4 kHz and reduces the pulse frequency automatically to the associated required frequencies when loaded. When the load decreases, the pulse frequency is increased automatically up to 4 kHz. The values of the rated current apply to a pulse frequency of 2 kHz and an ambient temperature of 40 °C and are reached at any time by the automatic adaptation of the output pulse frequency.

Current derating as a function of installation altitude



Permissible output current as a function of the installation altitude for SINAMICS G120P Cabinet units, frame size GX

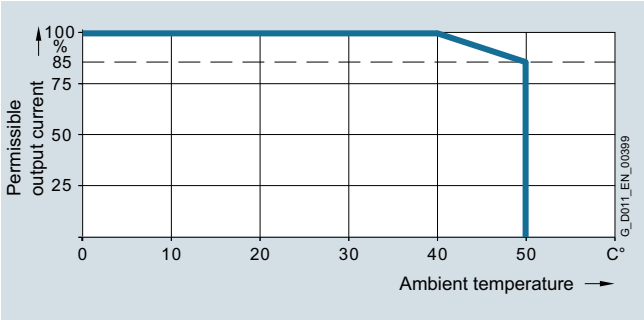


Permissible output current as a function of the installation altitude for SINAMICS G120P Cabinet units, frame size HX

Note:

The connected motors and power elements must be considered separately.

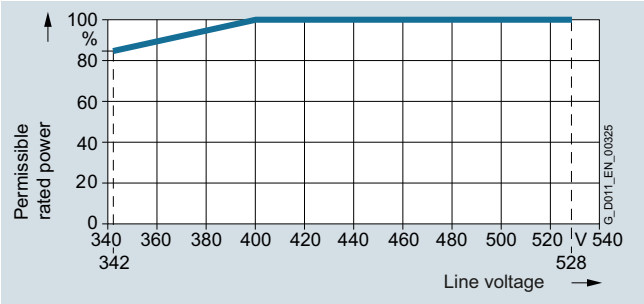
Current derating as a function of ambient temperature



Permissible output current as a function of the ambient temperature

System operating voltage

The PM330 Power Modules supply a constant power over the full permissible range of line voltage.



Rated power as a function of the line voltage

The constant power results in current derating as a function of the line voltage.

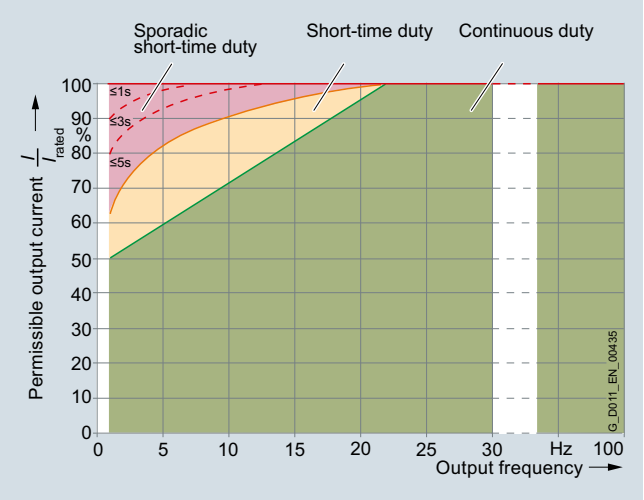
SINAMICS G120P Cabinet	Rated output current I_{rated} at 380 ... 400 V	380 V	400 V	415 V	460 V	480 V
Type 6SL3710-	A	%	%	%	%	%
1PE32-1 . A0-Z	205	100	100	95.9	83.5	78.0
1PE32-5 . A0-Z	245	100	100	95.3	83.1	75.0
1PE33-0 . A0-Z	300	100	100	96.6	86.2	81.6
1PE33-7 . A0-Z	370	100	100	96.9	87.8	83.7
1PE34-6 . A0-Z	460	100	100	96.4	85.4	80.6
1PE35-8 . A0-Z	585	100	100	96.9	87.8	83.7
1PE36-6 . A0-Z	655	100	100	96.4	85.4	80.6
1PE37-4 . A0-Z	735	100	100	96.6	86.6	82.1

Characteristic curves (continued)

Operating ranges

An additional dimensioning aid is available for all converters with a PM330 Power Module. The purpose of this aid is to ensure the constant reliable operation of the converter, in particular with regard to service life expectancy.

The dimensioning aid clearly distinguishes between continuous operating ranges and short-time operating ranges. As a result, due consideration can be given to operating ranges when the plant is configured. For further details, please refer to the diagram below and the explanatory text.



Continuous operation (green area) permissible.

Short-time operation (yellow area) permissible for 2 % of the total operating period without significant reduction in the converter service life; no overload reaction triggered by the thermal monitoring model.

Sporadic short-time operation (red area) permissible for only very short, rare operating states lasting less than 0.1 % of the total operating period without significant reduction in the converter service life; no overload reaction triggered by the thermal monitoring model on condition of compliance with the duty times specified in the diagram.

Overload capability

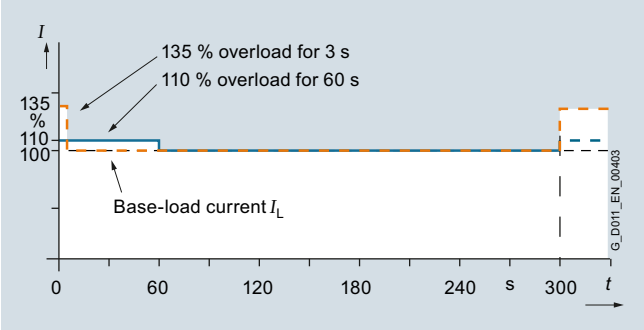
SINAMICS G120P Cabinet, converter cabinet units are equipped with an overload reserve to deal with breakaway torques, for example. If larger surge loads occur, this must be taken into account when configuring. In drives with overload requirements, the appropriate base-load current must, therefore, be used as a basis for the required load.

The unit can operate in two different duty cycles in the permissible continuous operating range shown in the diagram (green area). Depending on how the system is dimensioned, the relevant base-load current is effective as a rated quantity.

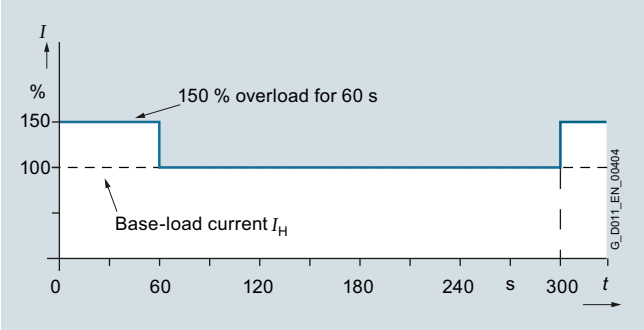
The criterion for overload is that the drive is operated with its base-load current before and after the overload occurs on the basis of a duty cycle duration of 300 s.

The base-load current for a low overload I_L is the basis for a duty cycle of 110 % for 60 s or 135 % for 3 s.

The base-load current I_H for a high overload is based on a duty cycle of 150 % for 60 s.



Overload capability, low overload



Overload capability, high overload

5

Recommended line-side power components

Selection and ordering data

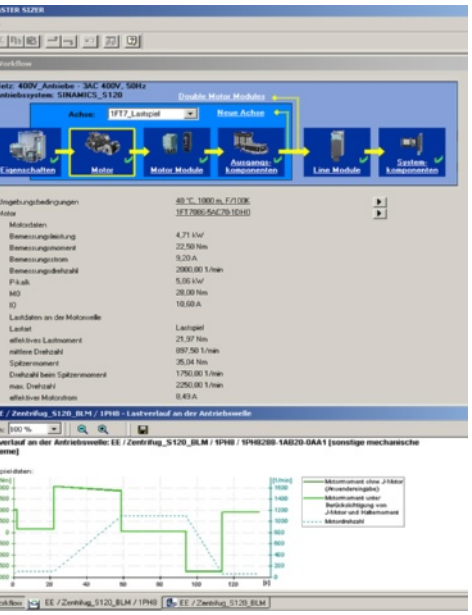
The fuses specified below are the recommended types for protecting the unit on the low-voltage distribution panel. If option **L26** (main switch) has been selected, the converter has integrated semiconductor protection. In this case, a fuse of type 3NA can be used on the low-voltage distribution panel.

Additional information on the fuses is provided in Catalog LV 10.

Rated power		SINAMICS G120P Cabinet converter	**Fuse when fuse switch disconnector (option L26) is installed**			**Fuse (incl. semiconductor protection) without fuse switch disconnector**		
at 400 V, 50 Hz	at 460 V, 60 Hz		Rated current	Frame size acc. to IEC 60269-2		Rated current	Frame size acc. to IEC 60269-2	
kW	hp	6SL3710- ...	A		Article No.	A		Article No.
380 ... 480 V 3 AC								
110	150	1PE32-1 . A0-Z	250	1	**3NA3144**	315	1	**3NE1230-2**
132	200	1PE32-5 . A0-Z	315	2	**3NA3252**	350	2	**3NE1331-2**
160	250	1PE33-0 . A0-Z	400	2	**3NA3260**	450	2	**3NE1333-2**
200	300	1PE33-7 . A0-Z	500	3	**3NA3365**	500	2	**3NE1334-2**
250	350	1PE34-6 . A0-Z	630	3	**3NA3372**	560	3	**3NE1435-2**
315	400	1PE35-8 . A0-Z	630	3	**3NA3372**	710	3	**3NE1437-2**
355	450	1PE36-6 . A0-Z	800	4	**3NA3475**	800	3	**3NE1438-2**
400	500	1PE37-4 . A0-Z	800	4	**3NA3475**	850	3	**3NE1448-2**

Note:

The power data in hp units are based on the NEC/CEC standards for the North American market.



Security information

Siemens provides products and solutions with industrial security functions that support the secure operation of plants, solutions, machines, equipment and/or networks. They are important components in a holistic industrial security concept. With this in mind, Siemens' products and solutions undergo continuous development. Siemens recommends strongly that you regularly check 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 integrate each component into a holistic, state-of-the-art industrial security concept. Third-party products that may be in use should also be considered.

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

Siemens has developed the SINAMICS SELECTOR app as a practical tool for finding Article numbers for your SINAMICS inverters in the output range from 0.12 kW to 250 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 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 by 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-apps

SinaSave energy-saving program

Overview

Payback calculator for energy-efficient drive systems

SinaSave calculates the extent of the potential savings that are possible in a specific drive application, based on the plant characteristics. Potential savings of up to 70% can be achieved. SinaSave also works as a payback calculator, stating how quickly investing in an energy-efficient motor will pay off in mains operation or with a frequency converter for variable-speed operation. The payback period will frequently be just a few months.

For mains operation, SinaSave calculates the cost savings and payback period of Siemens energy-saving motors of efficiency class IE3 (IEC) or Premium Efficiency (NEMA) compared to motors of the standard efficiency classes IE2 and IE1 (IEC) or High Efficiency (NEMA), individually selected or familiar motors as part of a complete plant assessment.

For converter operation, SinaSave takes all necessary plant-specific parameters and values required for the process into account. Other basic data for the program include the number of working days and work shifts, as well as the load curve that decides the extent of the energy-saving effect throughout the day and the year. From the entered plant-specific data, SinaSave first obtains the drive system with the appropriate output and the price of the corresponding frequency converter. In a further step, the program determines the energy requirements of the variable-speed drive system and compares it to the calculated values for all alternative concepts that could be considered.

More information

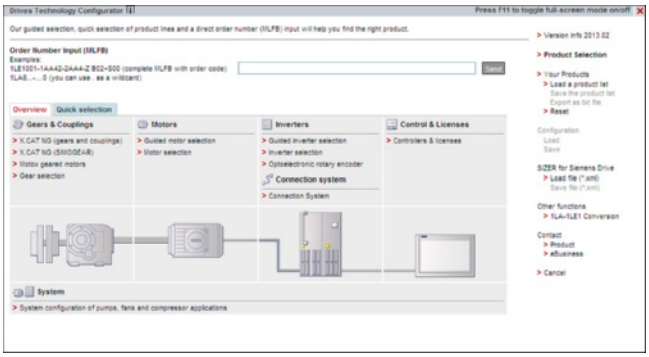
SinaSave is available free on the Internet at
www.siemens.com/sinasave

More information about services for energy saving is available on the Internet at
www.siemens.com/energy-saving

Overview

Configuring drive system products

The Drive Technology Configurator (DT Configurator) helps you to select the optimum products for your application – starting with gear units, motors, inverters and the associated options and components and ending with controllers, software licenses and connection technology. Whether with little or detailed knowledge of products: You can easily, quickly and efficiently configure your particular drive using product group preselectors, targeted navigation through selection menus or by entering article numbers directly to select the products.



In addition to all this, comprehensive documentation comprising technical data sheets, operating instructions, certificates and 2D/3D dimensional drawings can be selected in the DT Configurator. The products that you select can be directly ordered by transferring a parts lists to the shopping cart of the Industry Mall.

DT Configurator – efficient drive configuration:

- Quick and easy configuration of drive components
- Configuration of drive systems for pumps, fans and compressor applications from 1 kW to 2.6 MW
- Selection from a wide range of products
- Comprehensive documentation
- Support for retrofit projects
- Direct ordering through the Industry Mall

System requirements:

- Internet access as well as a standard browser (e.g. Internet Explorer V7.0 and higher, Firefox V5.0 and higher)
- Documentation (data sheets, dimensional drawings, etc.) is output in PDF or RTF format
- Registration is not required to use the DT Configurator.

Selection and ordering data

Description	Article No.
Interactive catalog CA 01 DVD-ROM including DT Configurator, English	**E86060-D4001-A510-D3-7600**

More information

Online access to Drive Technology Configurator

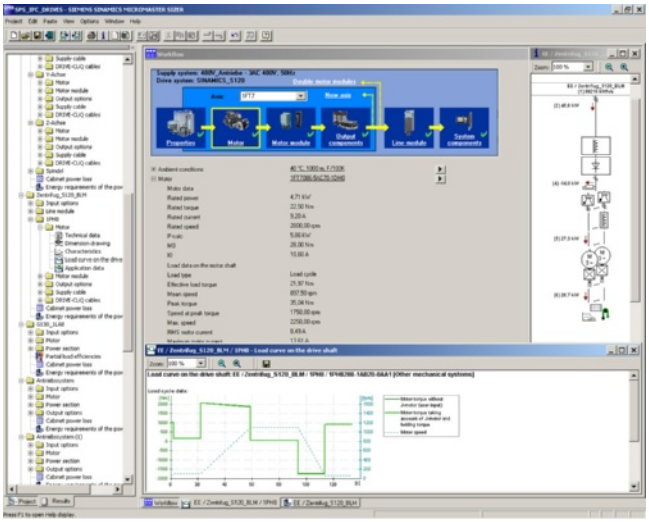
More information about the Drive Technology Configurator is available on the Internet at
www.siemens.com/dtconfigurator

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 - the offline version of the Siemens Industry Mall.
The Interactive Catalog CA 01 can be ordered from the relevant Siemens sales office or via the 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:

- 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 a workflow:

- Configuring the power supply
- Designing the motor and gearbox, including calculation of mechanical transmission elements
- Configuring the drive components
- Compiling the required accessories
- Selecting the line-side and motor-side power options, e.g. cables, filters, and reactors

When SIZER 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 dimensional 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 is available:

- Detailed technical data
- 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 XP Home Edition SP2
  - Windows XP Professional 32 bit SP2
  - Windows XP Professional 64 bit SP2
  - Windows Vista Business
  - Windows 7 Ultimate 32 bit
  - Windows 7 Professional 32 bit
  - Windows 7 Professional 64 bit
- Microsoft Internet Explorer V5.5 SP2

Selection and ordering data

Description	Article No.
SIZER for Siemens Drives engineering tool 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

Drive engineering – flexible, tailored and user-friendly

You can quickly find a solution for your drive task with the web-based tool: menu-prompted workflows navigate you through the technical selection and dimensioning of products and drive systems, including the accessories.

Based on an integrated inquiry functionality, SIZER WEB ENGINEERING also offers you special customized solutions for applications which cannot be addressed using "Standard Products"; i.e. the focus is on flexibility and customized solutions.

The following product groups are presently supported:

- High-voltage motors
- Low-voltage motors
- Medium-voltage converters
- Low-voltage converters
- DC converters

The tool can also be used to design the following drive systems:

- Medium-voltage systems
- Low-voltage systems
  - Basic single-axis applications for pumps, fans, and compressors
  - More complex applications (on condition that SIZER for Siemens Drives is installed)

Comprehensive documentation, such as data sheets, startup calculations, dimension drawings, offer documentation and a lot more are integrated in the tool.

The result: Customized solutions for your drive tasks.

Example of startup calculation

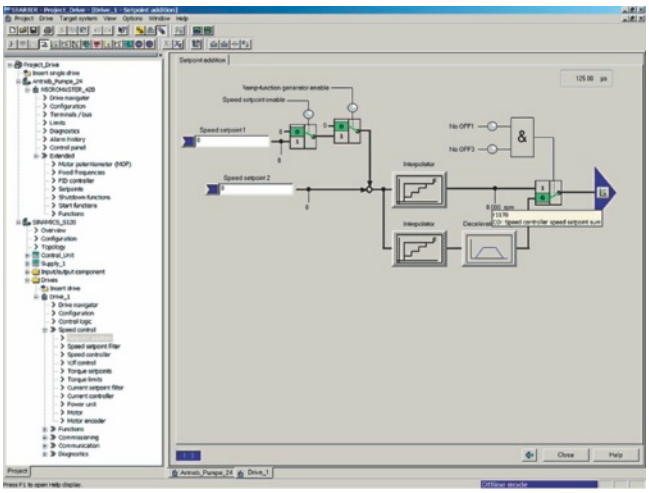
An Internet access as well as a standard browser (e.g. Internet Explorer from V7.0, Firefox from V3.0) are required. After successful registration and release, SIZER WEB ENGINEERING is available 24/7.

More information

Further information on the SIZER WEB ENGINEERING tool is available on the Internet at
www.siemens.com/sizer-we

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 via Drive ES Basic, or it can be integrated into the SCOUT engineering system (for SIMOTION). The basic functions and handling are the same in both cases.

In addition to the SINAMICS drives, the 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 individual settings required are made using graphics-based parameterization screens, which also precisely visualize the principle of operation of the drive.

Examples of individual settings that can be made include:

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

For experts, the expert list can be used to specifically and quickly access individual parameters at any time. An individual compilation of frequently used parameters can be saved in dedicated user lists 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 Server 2008
    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

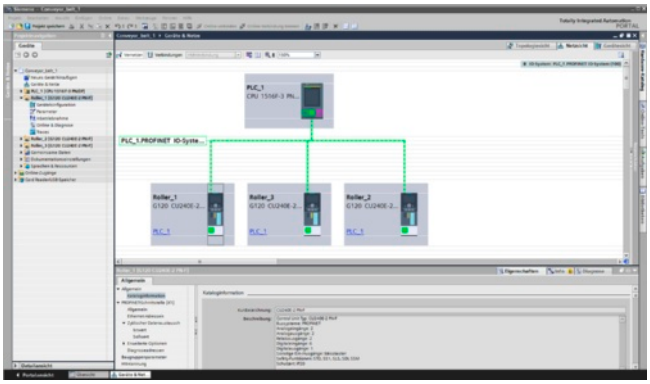
Selection and ordering data

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

More information

Updates for the STARTER commissioning tool are also available on the Internet at
www.siemens.com/starter

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 drives:

- 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 configuration and powerful tools:

- High degree of usability thanks to task-based navigation through the engineering workflow
  - Hardware configuration
  - Parameterization
  - 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 drive from the TIA Portal
- Powerful realtime trace for commissioning and drive diagnostics
- Intuitive and efficient drive diagnostics through automatic display of messages
- Context-sensitive online help, e.g. for drive messages
- Integrated detailed drive 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 drive
  - Without previous creation of an offline project
  - With new SINAMICS firmware (e.g. V4.6), 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 drive 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 drives in your automation solution:

- Reduction in the familiarization overhead thanks to cross-tool uniformity of the operator inputs
- Device configuration and network connection of the drives in the TIA Portal-wide configuration/network editor
- Device access to the drives via the PLC across network boundaries (dataset routing)
- Automatic frame comparison between drives and SIMATIC S7 PLC
- Reduction of standstill times through the integration of drive 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 drives 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 drives, e.g. Undo, Redo
- Block library supplied for easy integration of SINAMICS drives 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 drives

Integration of the SINAMICS drives into the TIA Portal is carried out in steps. The following drives can be configured in SINAMICS Startdrive

- SINAMICS G120
- SINAMICS G120C
- SINAMICS G120D
- SINAMICS G120P

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 can also 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 firmware version 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

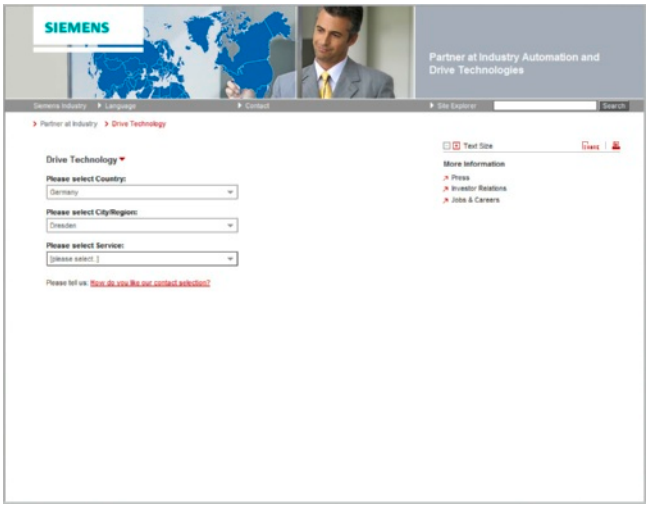
Compatibility with other products

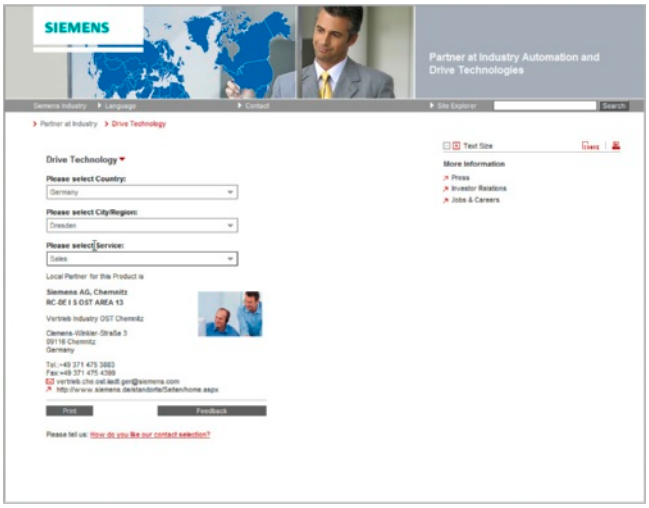
- SINAMICS Startdrive can be installed alongside STARTER
- SINAMICS Startdrive V13 operates with STEP 7 Basic/ Professional V13 and WinCC V13 in a framework
- SINAMICS Startdrive V13 can be installed on the same computer as other versions of Startdrive V12, STEP 7 V12, V5.4 or V5.5, STEP 7 Micro/WIN, 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

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.

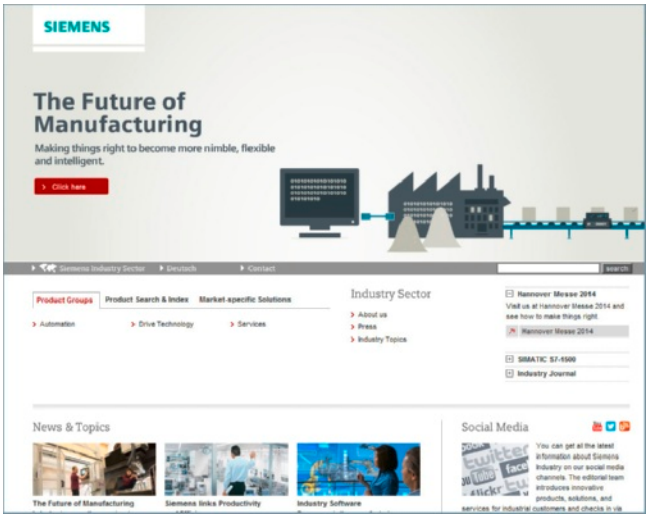
At your service locally, around the globe for consulting, sales, training, service, support, spare parts ... on the entire Industry Automation and Drive Technologies range.

Your personal contact can be found in our Contacts Database at:
www.siemens.com/automation/partner

You start by selecting a

- Product group,
- Country,
- City,
- Service.

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 of Industry

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.

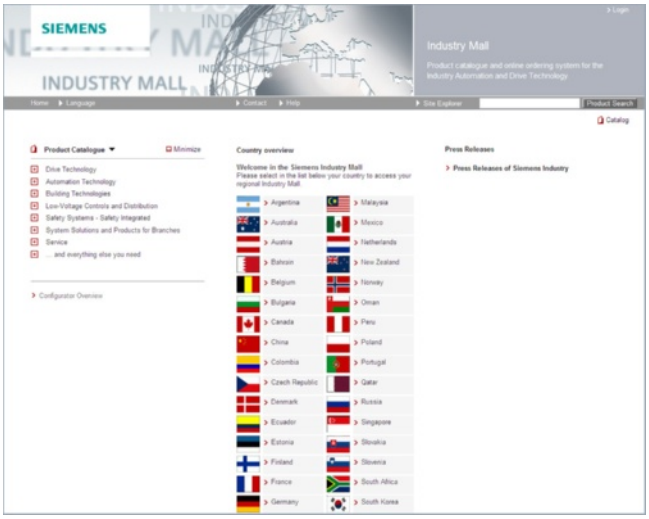
After selecting the product of your choice you can order at the press of a button, by fax or by online link.

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.

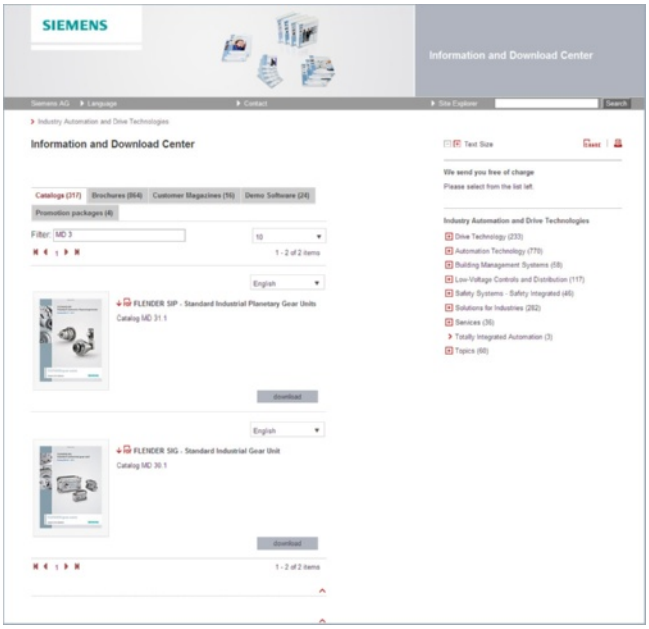
Numerous additional functions are available to support you.

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



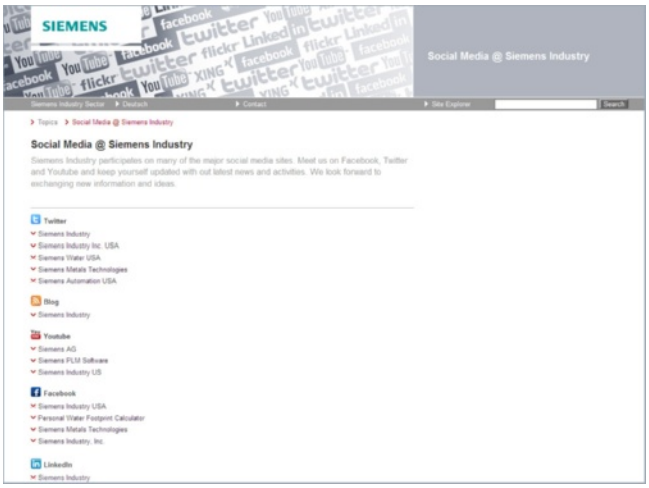
In addition to numerous other useful documents, you can also find the catalogs listed on the back inside cover of this catalog in the Information and Download Center. Without having to register, you can download these catalogs in PDF format or increasingly as digital page-turning e-books.

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

Social Media



Connect with Siemens through social media: visit our social networking sites for a wealth of useful information, demos on products and services, the opportunity to provide feedback, to exchange information and ideas with customers and other Siemens employees, and much, much more. Stay in the know and follow us on the ever-expanding global network of social media.

Connect with Siemens Industry at our central access point:

www.siemens.com/industry/socialmedia

Or via our product pages at:

www.siemens.com/automation

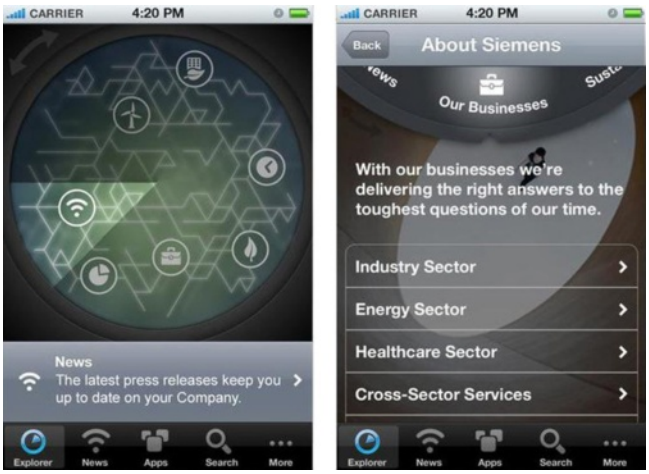
or

www.siemens.com/drives

To find out more about Siemens' current social media activities visit us at:

www.siemens.com/socialmedia

Mobile Media



Discover the world of Siemens.

We are also constantly expanding our offering of cross-platform apps for smartphones and tablets. You will find the current Siemens apps at the app store (iOS) or at Google Play (Android).

The Siemens app, for example, tells you all about the history, latest developments and future plans of the company – with informative pictures, fascinating reports and the most recent press releases.

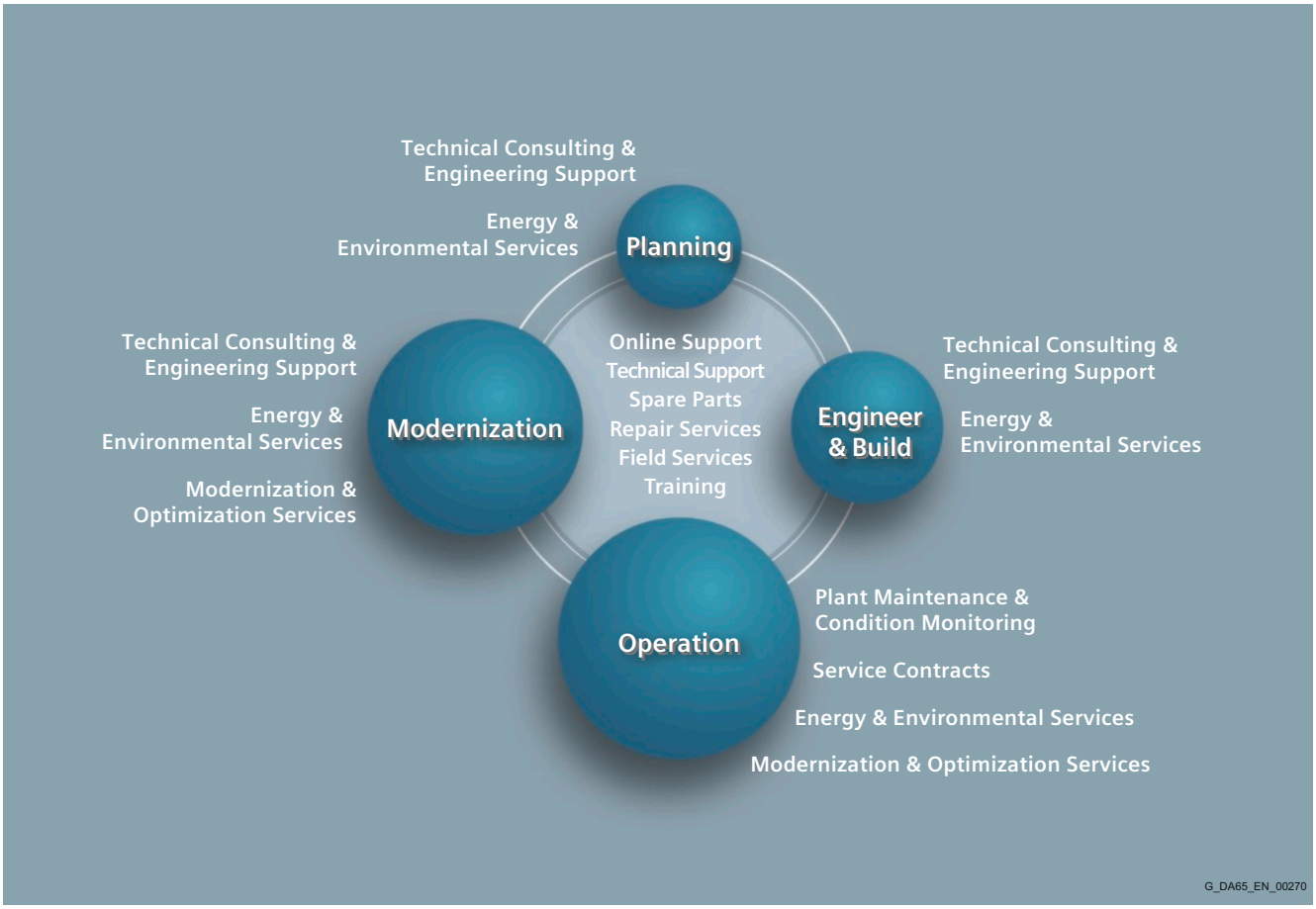
Your machines and plant can do more – with Industry Services.

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).

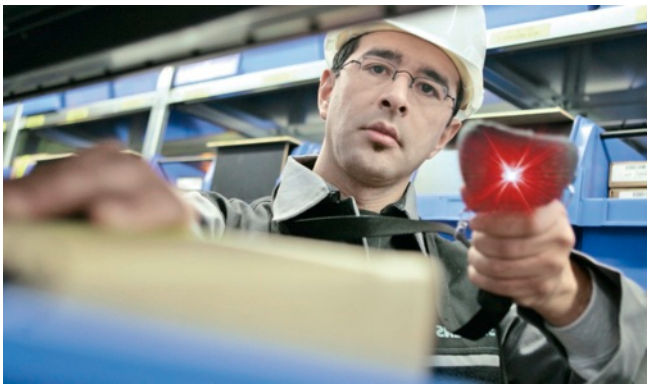
www.siemens.com/industry/onlinesupportapp

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.

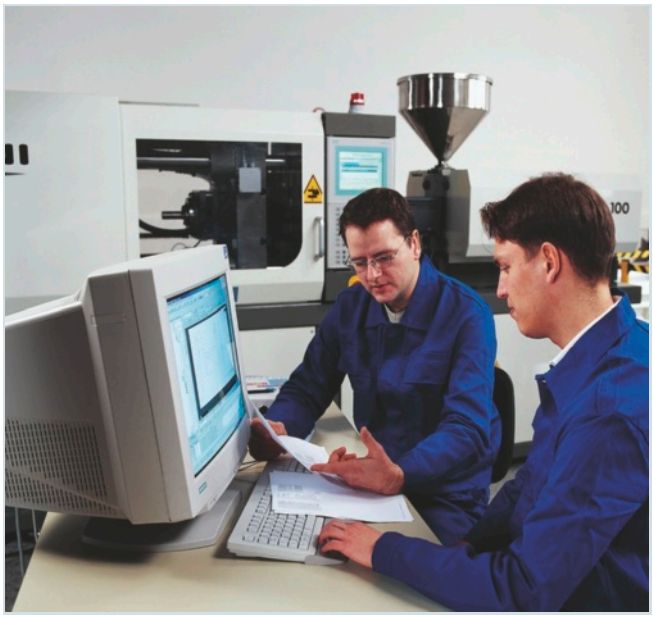
Plant Maintenance & Condition Monitoring

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
- Austria: Vienna
- Brazil: Sao Paulo
- China: Beijing
- Denmark: Ballerup
- France: Paris
- Great Britain: Manchester
- India: Mumbai
- Italy: Bologna, Milan
- Japan: Tokyo, Osaka
- The Netherlands: The Hague
- South Korea: Seoul
- Sweden: Göteborg
- Switzerland: Zurich
- Turkey: Istanbul
- USA: Atlanta

These application centers specialize in the use of SIMOTION/SINAMICS. You therefore can rely on automation and drive specialists for implementing successful applications. By involving your personnel at an early stage in the process, we can provide a solid basis for rapid knowledge transfer, maintenance and further development of your automation solution.

Advice on applications and implementation

We offer a variety of consultation services to help you find the optimum solution for the SIMOTION/SINAMICS application you want to implement:

The quotation phase includes

- clarification of technical questions,
- discussion of machine concepts and customer-specific solutions,
- selection of suitable technology and
- suggestions for implementation.

A technical feasibility study is also performed at the outset. In this way, difficult points of the application can be identified and solved early on. We can also configure and implement your application as a complete solution including control cabinet from a single source.

During the implementation phase a number of proven standards can be applied. This saves engineering costs.

The system can be commissioned by experienced, competent personnel, if required. This saves time and trouble.

If servicing is required, we can support you on site or via teleservice. For further information about servicing, please see 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.

For more information, go to:
www.siemens.com/motioncontrol/apc

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.

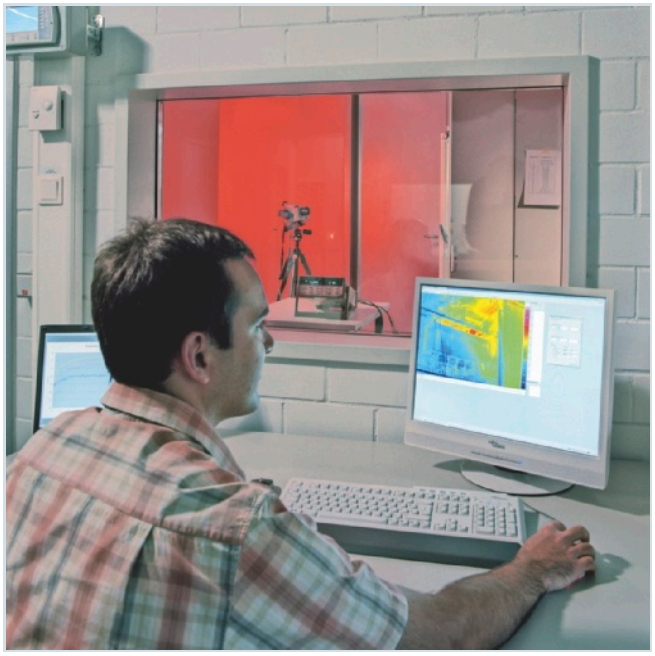
Our engineers configure for you in EPLAN P8 and other commonly used CAD systems, execute projects designed to cost and adapt your documents where necessary to UL or new systems.

Our Technical Competence Center Cabinets in Chemnitz supports you with selecting and optimizing the suitable controlcabinet 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

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
- Just-in-time delivery

Overview (continued)

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 for defects

Of course we accept the same liability for defects for our complete equipment as for our SINUMERIK, SIMODRIVE and SINAMICS products.

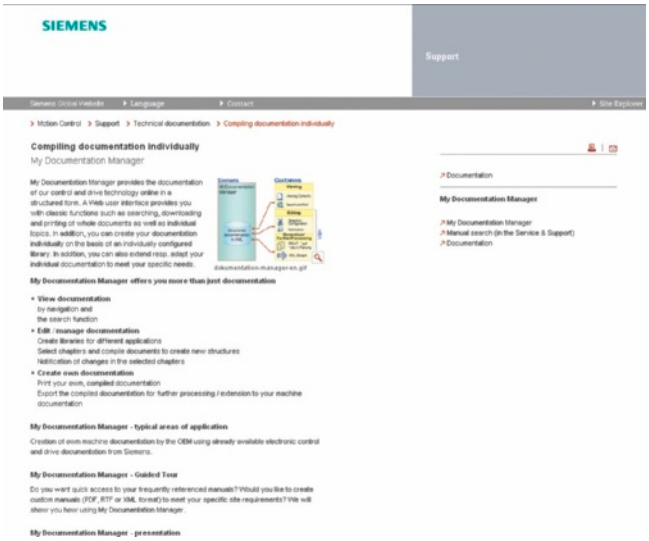
Furthermore, you can use our worldwide repair service anywhere and at any time.

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



My Documentation Manager – Customizing information

My Documentation Manager offers all Motion Control customers an innovation with extended usability: Machine manufacturers and end customers are not only able to assemble their own customized technical documents for a specific product or system, they can also generate complete libraries with individually configured contents. The content that matches your topic can be found from the full range of I IA&DT documentation stored under Service & Support using the operator interface and assembled using drag & drop into application-based libraries, generated and even combined with your own documentation. The self-generated collections can be saved in the commonly used RTF and PDF formats or even in XML format.

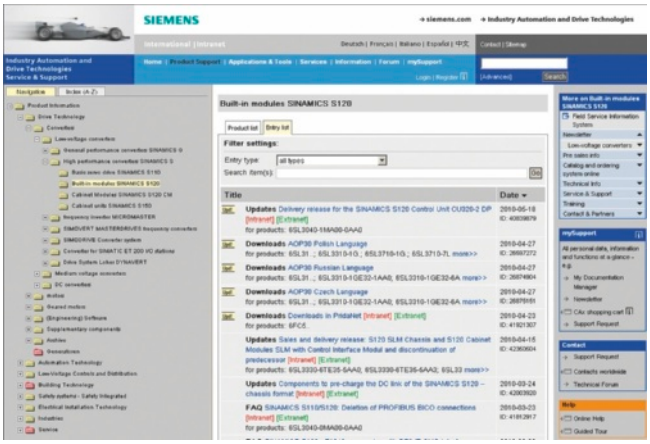
You must register for configuring and generating/managing (the existing login can be used, e.g. Industry Mall www.siemens.com/industrymall)

Benefits

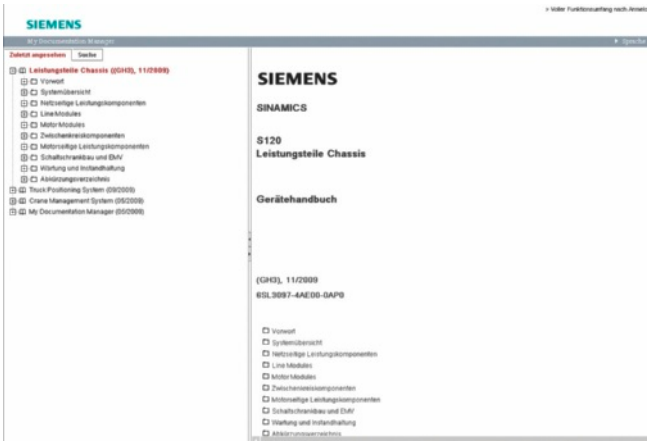
- Display
  View, print or download standard documents or personalized documents
- Configure
  Transfer standard documents or parts of them to personalized documents
- Generate/Manage
  Produce and manage personalized documents in the formats PDF, RTF or XML

Design

My Documentation Manager is the web-based system to generate personalized documentation based on standard documents. It is part of the Service & Support Portal.



Search in the Service & Support portal



Document in My Documentation Manager

Function

Opening My Documentation Manager

My Documentation Manager opens in two ways

- Search in the Service & Support portal
  www.siemens.com/automation/service&support
  The appropriate manuals are designated by "configurable". My Documentation Manager opens by clicking on "Display and configure". The selected document is displayed as the current document.
- Using the direct link from the Service & Support portal
  www.automation.siemens.com/docconf/
  After logon/registration, the online help is displayed as current document.

More information

More information is available on the Internet at

www.siemens.com/mdm

Overview

SINAMICS G120P, built-in and wall-mounted units

A comprehensive range of documentation is available for SINAMICS G120P, built-in and wall-mounted units. These documents include operating instructions and installation manuals, list manuals and a Getting Started guide.

Information is available in the following formats:

- PDF file
- on the SINAMICS Manual Collection (DVD-ROM)
- Configuring documents/documentation available for downloading at: http://support.automation.siemens.com/WW/view/en/38797189/133300 and http://support.automation.siemens.com/WW/view/en/30563173

SINAMICS G120P Cabinet

The documentation is provided as standard in the PDF format on CD-ROM, and comprises the following sections:

- Description
- Installation instructions
- Commissioning instructions
- Description of functions
- Maintenance information
- Lists of spare parts

as well as device-specific documentation, such as circuit diagrams, dimensional drawings, layout diagrams and terminal diagrams.

The documentation is provided in English/German as standard supplied with the device. The scope of delivery also includes a CD-ROM with the STARTER commissioning tool.

If one of the languages subsequently listed is required, when ordering this should be specified using the corresponding option order code (⇒ Description of options):

Language	Order code
English/French	**D58**
English/Spanish	**D60**
English/Italian	**D80**
English/Chinese	**D91**
English/Russian	**D94**

Configuring documents/documentation available for downloading at: http://support.automation.siemens.com/WW/view/en/82139421/133300

Application

Explanations on manuals:

- **Operating Instructions**
  contain all the information needed to install the device and make electrical connections, information about commissioning and a description of the drive 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 drives 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
- **List Manual**
  containing all parameters, function charts, and faults/warnings for the product/system as well as their meanings and setting options. It contains parameter data and fault/warning descriptions with functional correlations.
  Phases of use: Commissioning of components that have already been connected, configuration of system functions, fault cause/diagnosis
- **Getting Started**
  providing information about getting started for the first-time user as well as references to additional information. It contains information about the basic steps to be taken during commissioning. The information in the other documentation should be carefully observed for all of the other work required.
  Phases of use: Commissioning of components that have already been connected
- **Function Manual**
  contains all the relevant information about individual drive functions
  Phases of use: Commissioning of components that have already been connected, configuration of system functions

Selection and ordering data

Description	Article No.
Catalog D 31	
• German	**E86060-K4931-A101-A1**
• English	**E86060-K4931-A101-A1-7600**
• Italian	**E86060-K4931-A101-A1-7200**
• French	**E86060-K4931-A101-A1-7700**
• Spanish	**E86060-K4931-A101-A1-7800**
Catalog D 81.1	
• German	**E86060-K5581-A111-A6**
• English	**E86060-K5581-A111-A6-7600**
Catalog D 81.8	
• German	**E86060-K5581-A181-A3**
• English	**E86060-K5581-A181-A3-7600**
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**
Catalog IK PI	
• German	**E86060-K6710-A101-B8**
• English	**E86060-K6710-A101-B8-7600**
• Italian	**E86060-K6710-A101-B8-7200**
• French	**E86060-K6710-A101-B8-7700**
• Spanish	**E86060-K6710-A101-B8-7800**
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 Design Guidelines	
• 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**

More information

Please send any queries or suggestions to

docu.motioncontrol@siemens.com

Notes

Appendix

Overview

Many of the products in this Catalog comply with UL/CSA and FM requirements and are labeled with the corresponding approval mark.

All of the approvals, certificates, declarations of conformity, test certificates, e.g. CE, UL, Safety Integrated etc. have been performed with the associated system components as they are described in the Catalogs and Configuration Manuals.

The certificates are only valid if the products are used with the described system components, are installed according to the Installation Guidelines and are used for their intended purpose.

In other cases, the vendor of these products is responsible for arranging for new certificates to be issued.

UL: Underwriters Laboratories
Independent testing body in North America

Test symbol:

- **UL** for end products, tested by UL in accordance with the UL standard
- **cUL** for end products, tested by UL in accordance with the CSA standard
- **cULus** for end products, tested by UL in accordance with the UL and CSA standards
- **UR** for mounting parts in end products, tested by UL in accordance with the UL standard
- **cUR** for built-in parts in end products, tested by UL in accordance with the CSA standard
- **cURus** for built-in parts in end products, tested by UL in accordance with the 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 testing body in North America
National recognized testing laboratory (NRTL)

Test symbol:

- **cTUVus** Tested by TUV according to 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 testing body in Canada

Test symbol:

- **CSA** Tested by CSA in accordance with the 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 the 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

Article No. Page

Order code Page

Appendix

Subject index

Page

Page

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.

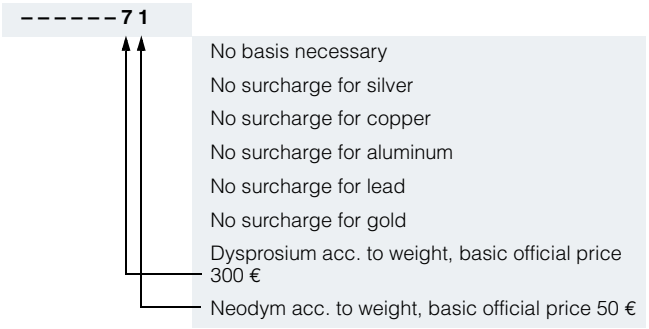
1st digit	List or customer net price using the percentage method
2nd digit	for silver (AG)[1]
3rd digit	for copper (CU)[1]
4th digit	for aluminum (AL)[1]
5th digit	for lead (PB)[1]
6th digit	for gold (AU)[1]
7th digit	for dysprosium (Dy)
8th digit	for neodym (Nd)

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



[1] For a different method of calculation, refer to the separate explanation for these raw materials on the previous page.
[2] 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 Price in €	% surcharge 2nd step Price in €	% surcharge 3rd step Price in €	% surcharge 4th step Price in €	% surcharge per additional step
			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

Appendix

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
120	0000000	4/0
150	–	6/0
185	–	7/0

1) The table shows approximate SWG/AWG sizes nearest to standard metric sizes; the cross-sections do not match exactly.

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Catalog Add-On D 35 AO

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The core elements of a fully integrated drive system are frequency converters, motors, couplings and gear units.

Siemens offers all the required components in top manufacturing quality from a single source, perfectly integrated – operating perfectly together, for all performance classes.

As a standard solution or tailored to individual requirements: no other provider on the market is able to offer a comparable portfolio. All Siemens drive components are optimally tuned to each other so that they interact ideally in every application.

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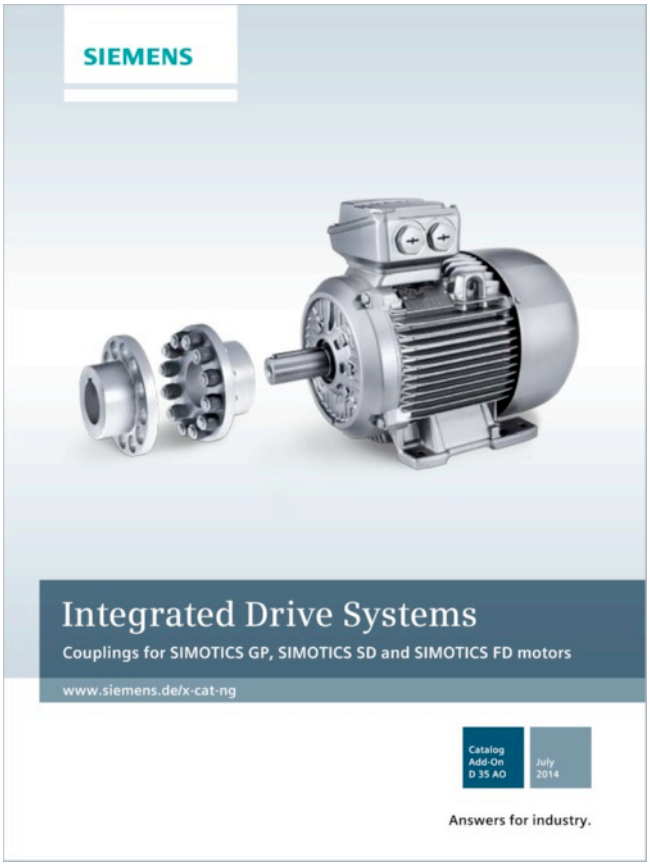
The section "Integrated Drive Systems" on pages 3/16 to 3/28 provide an overview of all SINAMICS G120P and SINAMICS G120P Cabinet converters with associated line-side and load-side components, DC link components and motors and the available Control Units with operator panels.

For the recommended **FLENDER standard couplings** Types N-EUPEX, RUPEX and ARPEX assigned to the motors, refer to **Catalog Add-On D 35 AO** and Catalog MD 10.1.



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GAMMA Building Control	ET G1

Drive Systems	
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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
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