SINAMICS GM150, SINAMICS SM150 Medium-Voltage Converters

Catalog D 12 · 2009

SINAMICS Drives

Answers for industry.

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SINAMICS Drives

SINAMICS GM150
SINAMICS SM150
Medium-Voltage Converters

Catalog D 12 · 2009

The products and systems described in this catalog are produced/ distributed in accordance with the requirements of a quality management system which has been certified to DIN EN ISO 9001 (Certificate Registration No. 002241 QM UM). The certificate is recognized in all IQNet countries

Supersedes:
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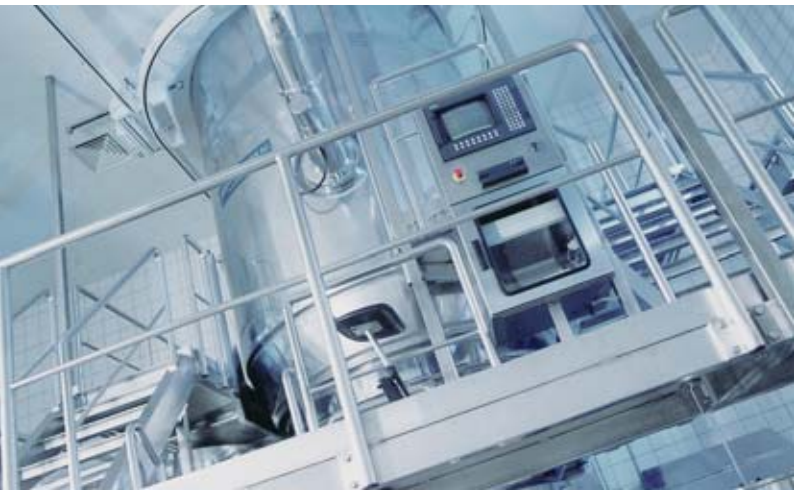
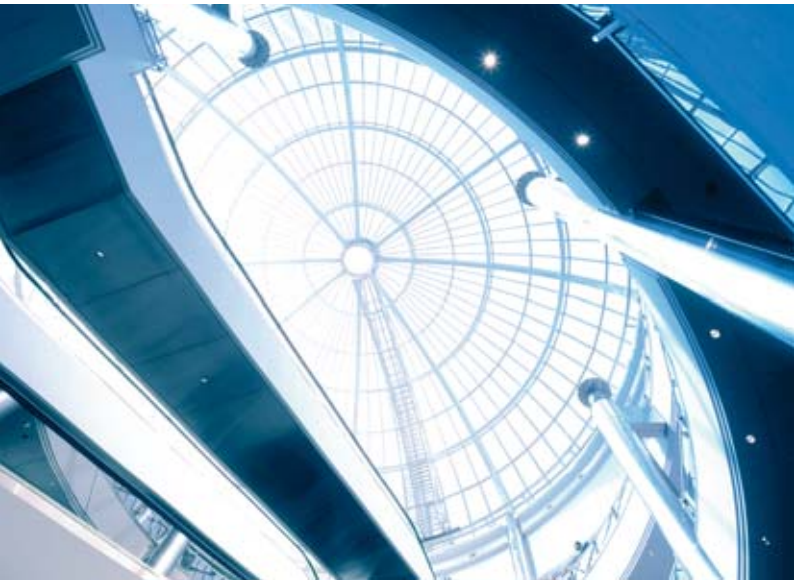
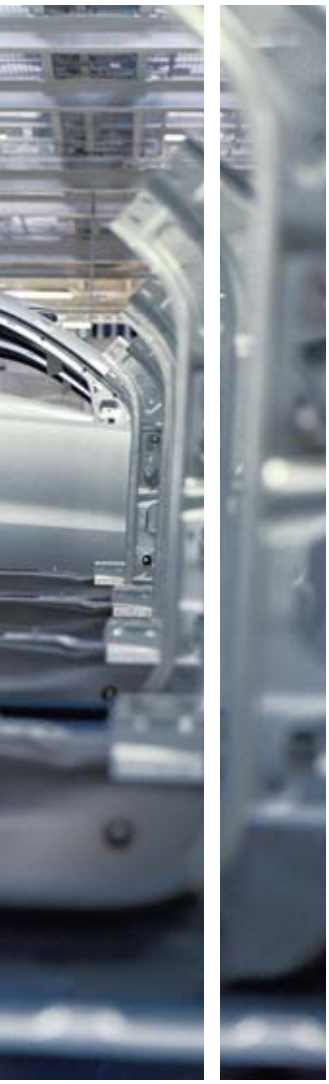






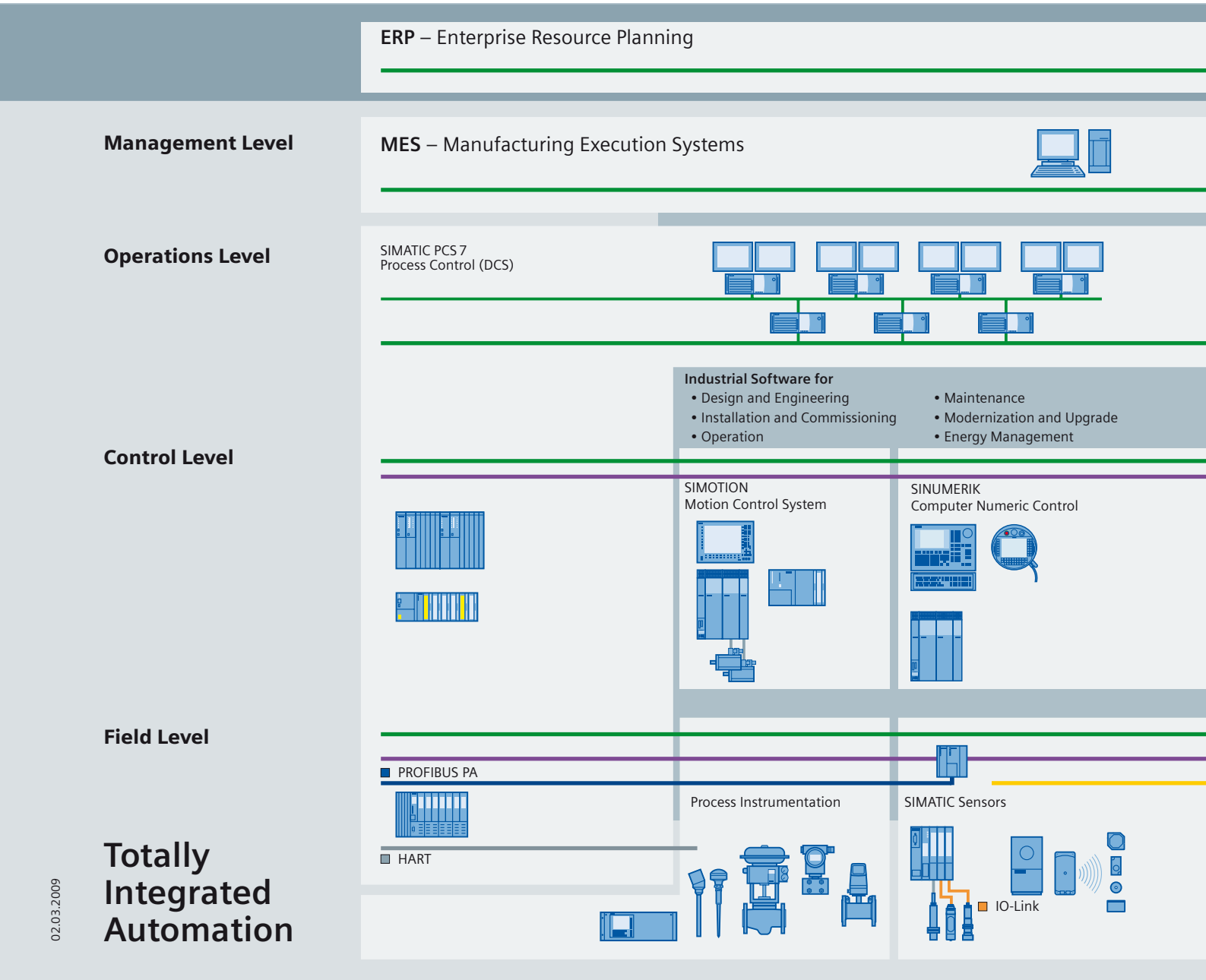
Answers for industry.

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

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

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

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

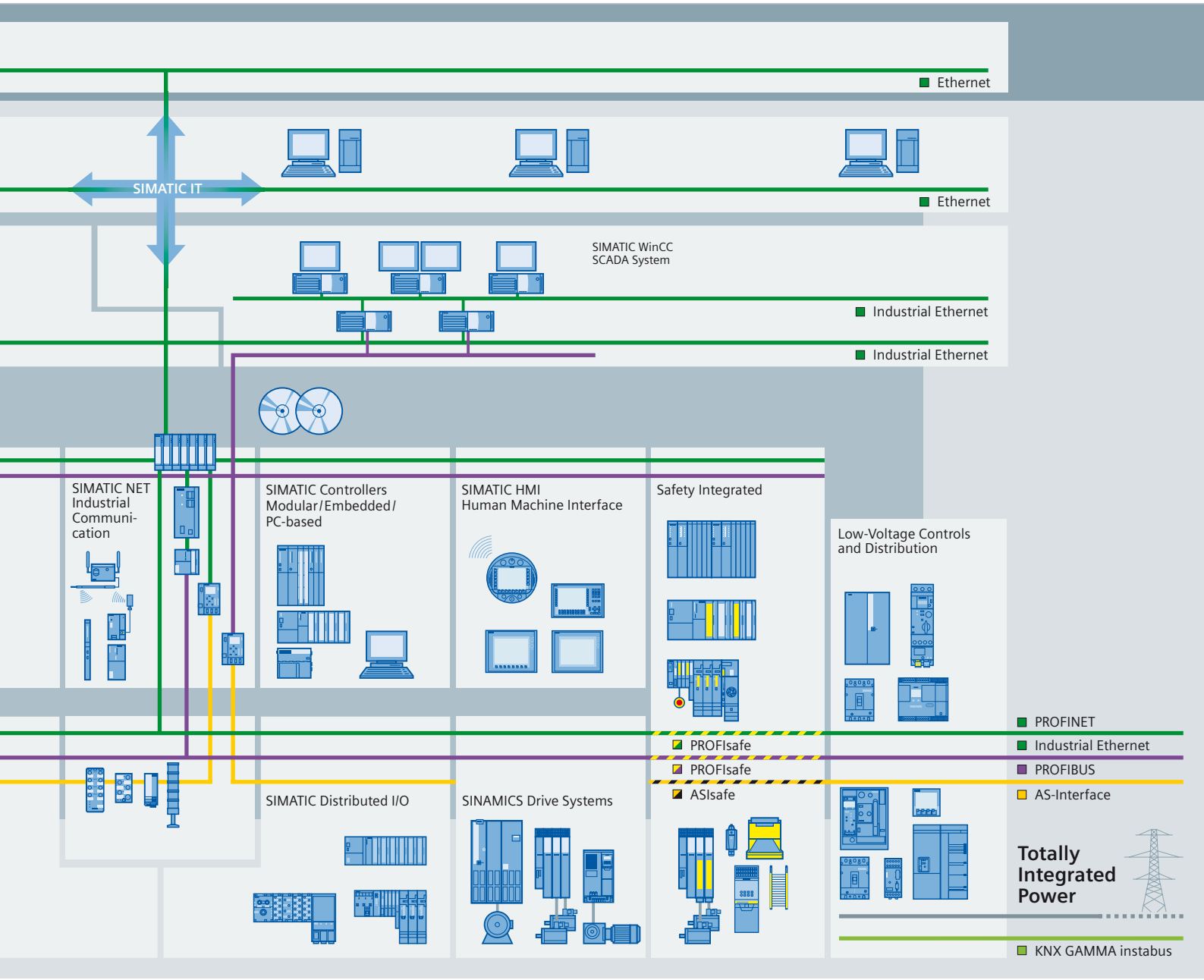


02.03.2009

Setting standards in productivity and competitiveness.

Totally Integrated Automation.

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



TIA is characterized by its unique continuity.

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

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

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

Introduction

The SINAMICS drive family

Applications of the SINAMICS drive family

Applications

SINAMICS is the new drive family from Siemens for industrial machinery and plant construction. SINAMICS offers solutions for all drive tasks:

- Simple pump and fan applications in the process industry
- Complex individual drives in centrifuges, presses, extruders, elevators, as well as conveyor and transport systems
- Drive line-ups in textile, foil and paper machines as well as in rolling mills
- Servo drives with a high dynamic performance for machine tools, as well as packaging and printing machines.

Versions

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

- SINAMICS G is designed for standard applications with induction motors. These applications have less stringent requirements regarding the dynamic performance of the motor speed.
- SINAMICS S handles complex drive tasks with synchronous/ induction motors and fulfills stringent requirements regarding:
  - dynamic performance and accuracy
  - integration of extensive technological functions in the drive control system

Platform concept and Totally Integrated Automation

All SINAMICS versions are based on a platform concept. Common hardware and software components, as well as standardized tools for design, configuration and commissioning tasks, ensure high-level integration across all components. SINAMICS seamlessly handles a wide variety of drive tasks. The different SINAMICS versions can be easily combined with each other.

SINAMICS is a part of the Siemens “Totally Integrated Automation” concept. Integrated SINAMICS systems covering engineering, data management and communication at automation level, ensure low-maintenance solutions with the SIMOTION, SINUMERIK and SIMATIC control systems.

SINAMICS as part of the Siemens modular automation system

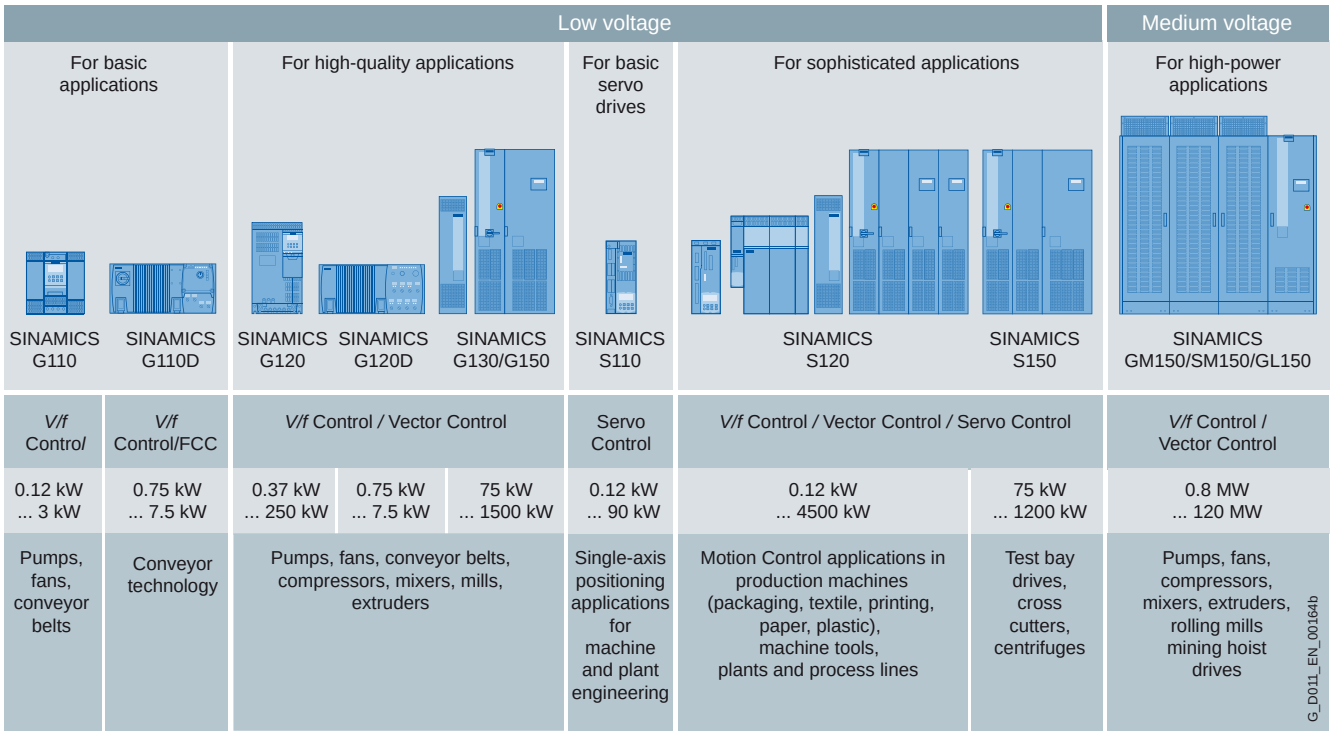
Quality in accordance with DIN EN ISO 9001

SINAMICS fulfills 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 assurance system is certified by an independent authority in accordance with DIN EN ISO 9001.

1

The SINAMICS drive family



Common Engineering Tools

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

Tailored to the respective areas of application, SINAMICS encompasses the family members

Low-voltage converters (line supply < 1000 V)

- **SINAMICS G110** – the versatile drive for low power ratings
- **SINAMICS G120** – the modular single-motor drive for low up to average power ratings
- **SINAMICS G110D** – the distributed, compact single-motor drive in a high degree of protection for basic applications
- **SINAMICS G120D** – the distributed, modular single-motor drive in a high degree of protection for sophisticated applications
- **SINAMICS G130** and **SINAMICS G150** – the universal drive solution for high-performance single-motor drives
- **SINAMICS S110** – the basic positioning drive for single-axis applications
- **SINAMICS S120** – the flexible, modular drive system for demanding drive tasks
- **SINAMICS S150** – the drive solution for demanding single-motor drives with a high power rating

Medium-voltage converters (line supply > 1000 V)

- **SINAMICS GM150** – the universal drive solution for single-motor drives
- **SINAMICS SM150** – the drive solution for demanding single and multi-motor drives
- **SINAMICS GL150** – the drive solution for synchronous motors up to 120 MW

The SINAMICS family is characterized by the following system properties:

- uniform functionality based on platform concept
- standard engineering
- high degree of flexibility and combination
- wide power range
- designed for global use
- SINAMICS Safety Integrated
- increased economy and effectiveness
- wide range of interfaces to higher-level controls
- Totally Integrated Automation

SINAMICS low-voltage converters

SINAMICS G110	SINAMICS G120	SINAMICS G110D	SINAMICS G120D
			
The versatile drive for low power ratings	*The modular single-motor drive for low up to average power ratings*	*The distributed, compact single-motor drive in a high degree of protection for basic applications*	*The distributed, modular single-motor drive in a high degree of protection for sophisticated applications*
Main applications			
• Machines and plants in industrial and commercial environments	• Machines and plants for industrial and commercial applications (machinery construction, automobile, textiles, chemical industry, printing, steel)	• Horizontal conveyor system applications in the industrial environment, main focus on distribution and logistics in airports; generally suitable for basic conveyor-related tasks with local control or connected to a bus via AS-Interface	• Conveyor-related drive applications in the industrial environment, main focus on the automobile industry; also suitable for high-performance applications, including airports and in the food, beverage and tobacco industry (without tensides)
Application examples			
• Pumps and fans • Auxiliary drives • Conveyor systems • Billboards • Door/gate operating mechanisms • Centrifuges	• Pumps and fans • Compressors • Conveyor systems	• Conveyor systems • Airports • Distribution logistics	• Conveyor systems • Electric monorail system in distribution logistics
Highlights			
• Compact • Can be flexibly adapted to different applications • Simple and fast commissioning • Clear terminal layout • Optimum interaction with SIMATIC and LOGO!	• Modular • Can be flexibly expanded • Simple and fast commissioning • Regenerative feedback • Innovative cooling concept • Optimum interaction with SIMOTION and SIMATIC • SINAMICS Safety Integrated	• Low profile design with standard drilling dimensions (standard footprint) in IP65 degree of protection • Simple and fast commissioning • Versions with and without a maintenance switch • Optional key-operated switch • AS-Interface with bus parameterization • Quick stop function • Integrated brake control, 180 V DC • Optimum interaction with SIMATIC and LOGO!	• Low profile design with standard drilling dimensions (standard footprint) in IP65 degree of protection • Modular • Can be flexibly expanded • Simple and fast commissioning • Regenerative feedback • Optimum interaction with SIMOTION and SIMATIC • SINAMICS Safety Integrated
Catalog D 11.1	**Catalog D 11.1**	**Catalog D 11.1**	**Catalog D 11.1**

The members of the SINAMICS drive family

SINAMICS low-voltage converters

SINAMICS G130, SINAMICS G150	SINAMICS S110	SINAMICS S120	SINAMICS S150
			
The universal drive solution for high performance single-motor drives	*The basic positioning drive for single-axis applications*	*The flexible, modular drive system for demanding drive tasks*	*The drive solution for demanding single-motor drives with a high power rating*
Main applications			
• Machines and plants in the process and production industry, water/waste, power stations, oil and gas, petrochemicals, chemical raw materials, paper, cement, stone, steel	• Machine and plants in the industrial environment, where machine axes should be quickly and precisely positioned in the simplest possible way.	• Machines and plants for industrial applications (packaging, plastics, textile, printing, wood, glass, ceramics, presses, paper, lifting equipment, semiconductors, automated assembly and testing equipment, handling, machine tools)	• Machines and plants in the process and production industry, food, beverage and tobacco, automotive and steel industry, mining/open-cast mining, shipbuilding, lifting equipment, conveyors
Application examples			
• Pumps and fans • Compressors • Extruders and mixers • Crushers	• Handling equipment • Feed and withdrawal devices • Stacking units • Automatic assembly machines • Laboratory automation • Metalworking • Woodworking, glass and ceramic industries • Printing machines • Plastics processing machines	• Motion Control applications (positioning, synchronous operation) • Numerical control, interpolating motion control • Converting • Technological applications	• Test stand drives • Centrifuges • Elevators and cranes • Cross cutters and shears • Conveyor belts • Presses • Cable winches
Highlights			
• Space-saving • Low-noise • Simple and fast commissioning • SINAMICS G130: modular components • SINAMICS G150: Ready-to-connect cabinet unit • Optimum interaction with SIMATIC	• Can be universally used • Flexible and modular • Scalable in terms of power, functionality, number of axes, performance • Simple and fast commissioning, auto-configuration • Innovative, system architecture fit for the future • (Graded infeed/regenerative feedback concepts) • Wide range of motors • (Optimum interaction with SIMOTION, SIMATIC and SINUMERIK) • SINAMICS Safety Integrated	• Can be universally used • Flexible and modular • Scalable in terms of power, functionality, number of axes, performance • Simple and fast commissioning, auto-configuration • Innovative, system architecture fit for the future • Graded infeed/regenerative feedback concepts • Wide range of motors • Optimum interaction with SIMOTION, SIMATIC and SINUMERIK • SINAMICS Safety Integrated	• Four-quadrant operation as standard • High control accuracy and dynamic response • Almost no line harmonics, the harmonics are far lower than the THD specified in IEEE 519 • Tolerant to line voltage fluctuations • Reactive power compensation option • Simple and fast commissioning • Ready-to-connect cabinet unit • Optimum interaction with SIMATIC
Catalog D 11	**Catalog PM 22**	**Catalogs PM 21 and D 21.3**	**Catalog D 21.3**

SINAMICS medium-voltage converters		
SINAMICS GM150	**SINAMICS SM150**	**SINAMICS GL150**
		
The universal drive solution for single-motor drives	*The drive solution for demanding single and multi-motor drives*	*The drive solution for synchronous motors up to 120 MW*
Main applications		
• Machines and plants in the process industry	• Machines and plants, e.g. in the steel and mining industry	• Machines and plants in the process industry, especially in the oil, gas and petrochemicals sectors
Application examples		
• Pumps and fans • Compressors • Extruders and mixers • Crushers • Marine drives	• Rolling mills • Mine hoists • Test stand drives • Conveyor belts	• Compressors • Pumps and fans • Extruders and kneaders • Marine drives • Blast furnace blowers
Highlights		
• Space-saving • Simple and fast commissioning • Ready-to-connect cabinet unit • Optimum interaction with SIMATIC	• Four-quadrant operation as standard • High degree of efficiency and operation that reduces the stress on the motor • High control accuracy and dynamic response • Almost no line harmonics • Reactive power compensation option • Simple and fast commissioning • Ready-to-connect cabinet unit • Optimum interaction with SIMATIC	• Compact design and high power density • Simple operator control and monitoring • Extremely reliable in operation and almost maintenance-free • Fully-digital transvector closed-loop control • Two directions of rotation by reversing the rotating field • Can be seamlessly integrated into higher level automation systems
Catalog D 12	**Catalog D 12**	**–**

SINAMICS GM150/SINAMICS SM150 Medium-Voltage Converters

Overview

The SINAMICS GM150 and SINAMICS SM150 converters are the expansion of the SINAMICS drive family in the medium voltage range. They are supplied as ready-to-connect cabinet units.

SINAMICS GM150

SINAMICS GM150 converters are designed as single-motor drives for applications with square-law and constant load characteristics without regenerative feedback.

Typical applications:

- Pumps and fans
- Compressors
- Extruders and mixers
- Crushers
- Marine drives

The motor-side inverters (Motor Modules) use IGBT power semiconductors in the lower power range up to 10 MVA and IGCT power semiconductors in the upper power range from 10 MVA up to 28 MVA.

SINAMICS SM150

SINAMICS SM150 converters are designed for demanding single-motor and multi-motor applications and meet the following requirements:

- High dynamic performance
- High power rating at low frequencies
- Line power factor = 1.0 (can be freely selected)
- Four-quadrant operation

Typical applications:

- Rolling mill drives (cold, hot)
- Mine hoist drives
- Test stands
- Conveyor belts

Both the line-side infeed/regenerative feedback units (Active Line Modules) and the motor-side inverters are equipped with IGCT power semiconductors.

	SINAMICS GM150 IGBT	SINAMICS GM150 IGCT	SINAMICS SM150 IGCT
Line Module (line-side rectifier)			
• Basic Line Module, 12-pulse (two-quadrant operation)	Standard	Standard	–
• Basic Line Module, 24-pulse (two-quadrant operation)	Option Standard for parallel circuit configuration	Option	–
• Active Line Module (four-quadrant operation)	–	–	Standard
Motor Module (motor-side inverter)			
Voltage range	2.3 kV to 4.16 kV	3.3 kV	3.3 kV
Power range (typ.)	1.0 MVA to 10 MVA	10 MVA to 21 MVA	5 MVA to 31.5 MVA
Cooling method			
• Air cooling	Standard	–	–
• Water cooling	Standard	Standard	Standard
Control modes			
• Induction motor	Standard	Standard	Standard
• Synchronous motor, separately excited	Option	Option	Option
• Synchronous motor, permanently excited	–	Option	Option
Sine-wave filter	Option	–	–
DC bus configuration with several Motor Modules on one common DC bus	–	–	Standard

Benefits

- Low-cost: across the board from planning through to service
- Simple and uncomplicated in every regard: engineering, integration, operation and diagnostics
- High availability: robust and reliable components, easy installation, high service-friendliness

SINAMICS GM150
IGBT version

2

IGBT version

Overview

SINAMICS GM150 in IGBT version (air-cooled)

The SINAMICS GM150 converter in IGBT version can be optimally combined with converter motors from Siemens. In this case, a sine-wave filter is not required. This results in an especially favorably-priced, compact and efficient drive solution.

For operating standard motors (motors designed to be connected to the line supply), the converter offers the best prerequisites available in the market when used together with the optional sine-wave filter. They are the optimum choice when retrofitting existing plants and systems from fixed-speed drives to variable-speed drives.

SINAMICS GM150 converters in IGBT version offer economic drive solutions that can be matched to customers' specific requirements by choosing from the wide range of available components and options.

IGBT converters are available for the following voltages and power ranges.

Rated output voltage	Type rating for air cooling	for water cooling
kV	MVA	MVA
2.3	1.0 to 2.4	2.0 to 3.2
3.3	1.0 to 6.3	2.0 to 8.0
4.16	1.3 to 7.9	2.0 to 10.1

Global use

SINAMICS GM150 converters in IGBT version are manufactured to international standards and regulations, making them ideally suited for global use. These converters are available in a UL-listed version as well as in a marine version (meeting the requirements of all of major ship's classification societies).

Benefits

- Compact design and highly flexible configuration ensures easy plant integration
- Simple operator control and monitoring from the user-friendly operator panel
- Simple and reliable operation through integrated maintenance functions: The converter signals early on and automatically if maintenance is required or components need to be replaced
- High degree of ruggedness and reliability by using HV-IGBT technology and a fuseless design combined with intelligent response to external disturbances
- Can be easily integrated into automation solutions as the PROFIBUS interface is supplied as standard along with various analog and digital interfaces
- High level of service-friendliness through innovative power section design with plug-in Powercards and easy access to all components

Design

SINAMICS GM150 converters in IGBT version are available with a 12-pulse or 24-pulse Basic Line Module.

The 12-pulse version is standard for the lower output power ratings at voltages 2.3 kV, 3.3 kV and 4.16 kV.

For higher output power ratings, two Basic Line Modules and two Motor Modules are connected in parallel with a common DC link or two line modules in series (24-pulse Basic Line Modules).

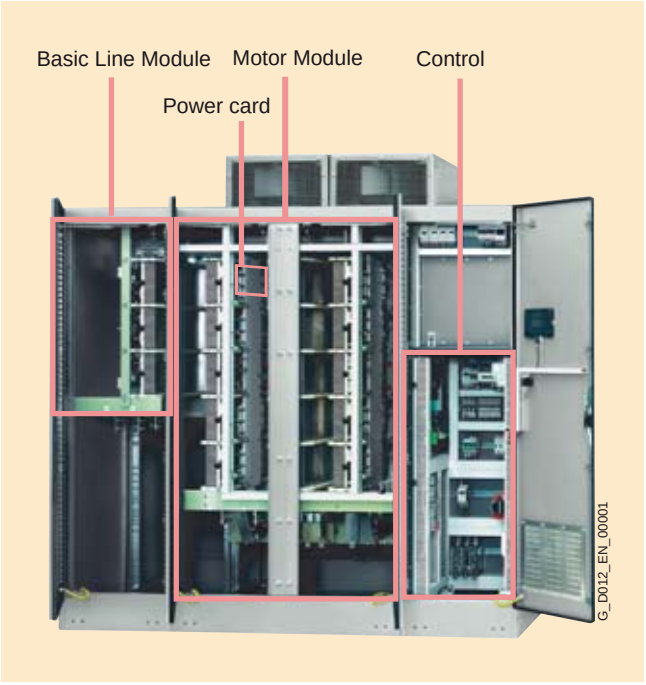
Note: Converters with voltages >4.16 kV are available on request.

For the lower output power ratings at voltages 2.3 kV, 3.3 kV and 4.16 kV, the 24-pulse Basic Line Module is optionally available.

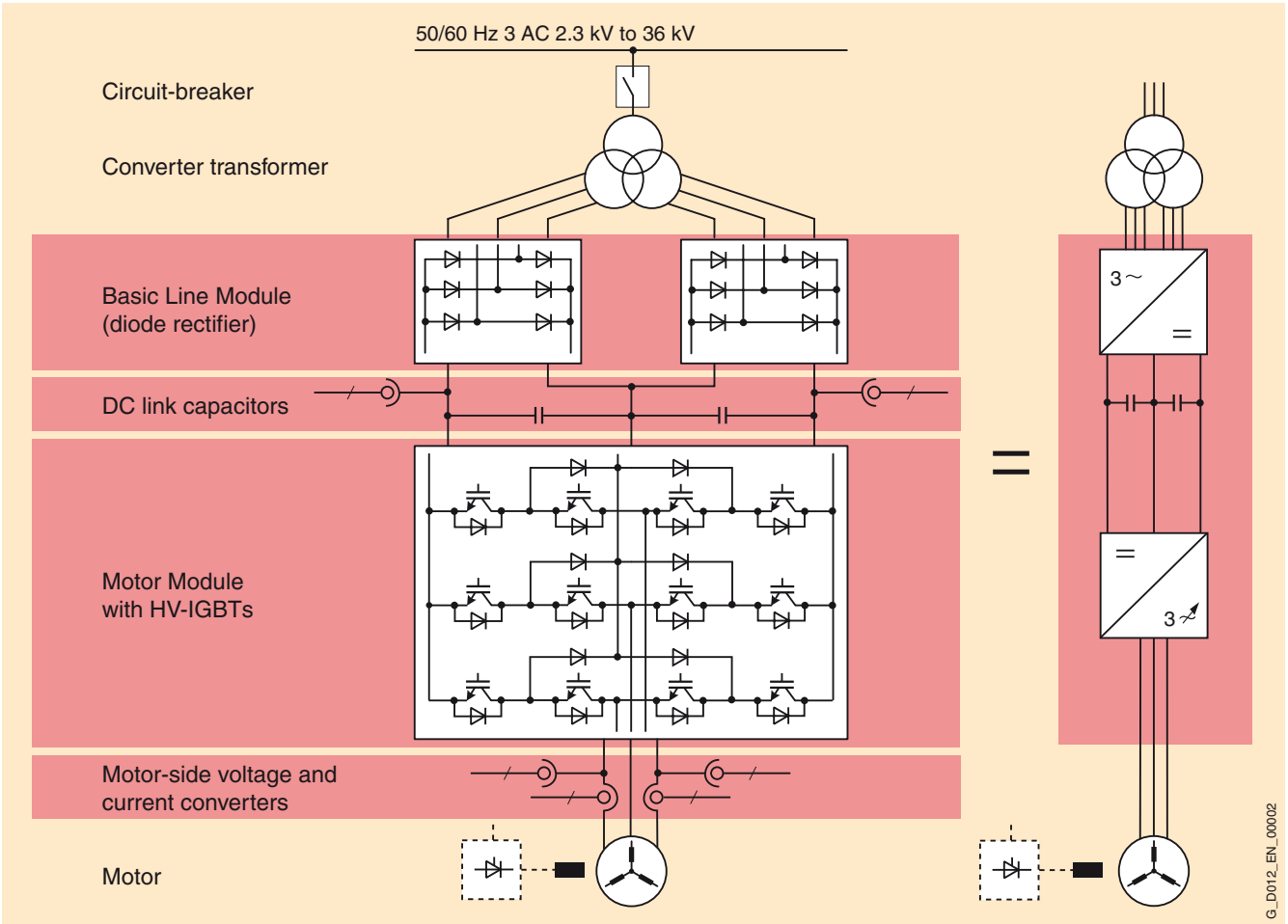
HV-IGBT power semiconductors are used in Motor Modules – they are mounted on plug-in Powercards that are simple to replace.

The line supply and motor can either be connected from the top or from the bottom.

The converter cabinet comprises a section for the Basic Line Module, a section for the Motor Module, as well as the control section.



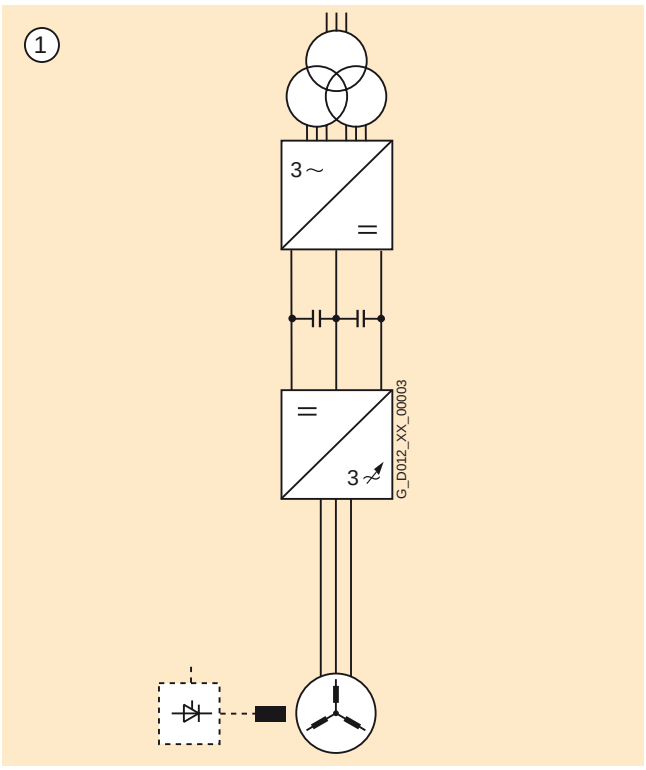
SINAMICS GM150 in air-cooled IGBT version, internal design



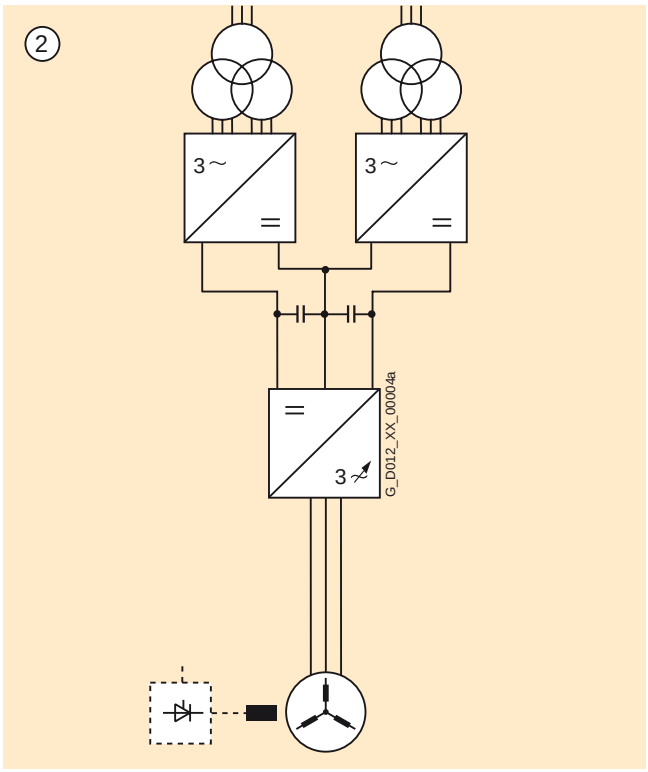
Block diagram

Design (continued)

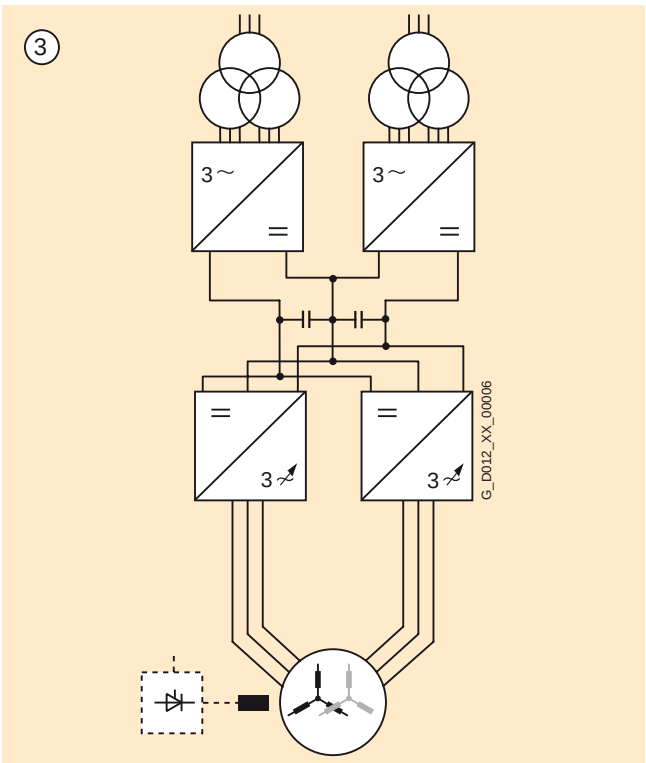
The following circuit designs are available for SINAMICS GM150 in IGBT version.



Basic circuit, 12-pulse infeed, diode rectifier in the Basic Line Module connected in series



24-pulse infeed by connecting two Basic Line Modules in parallel (option **N15**), diode rectifier connected in parallel in the Basic Line Module



The power can be increased by connecting Basic Line Modules and Motor Modules in parallel on a common DC bus for 3.3 kV and 4.16 kV (24-pulse infeed as standard), diode rectifier connected in parallel in the Basic Line Module

Design (continued)

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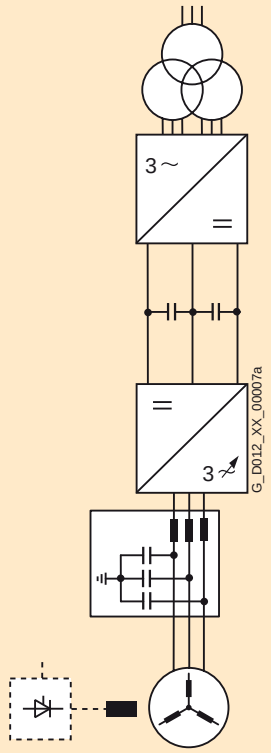

Basic circuit with sine-wave filter for operating standard line motors (option **Y15**), diode rectifier connected in series in the Basic Line Module

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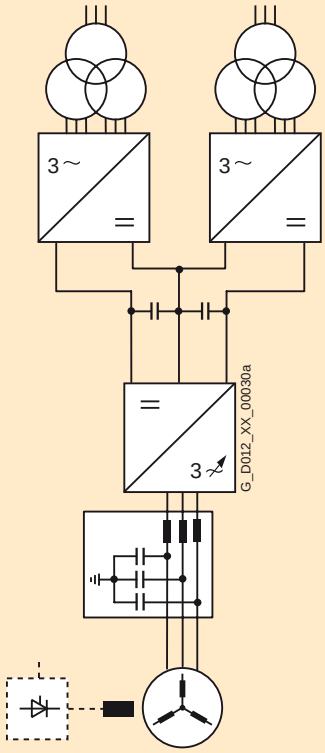

24-pulse infeed by connecting two Basic Line Modules in parallel (option **N15**), diode rectifier connected in parallel in the Basic Line Module, here with sine-wave filter for operating standard line motors (option **Y15**)

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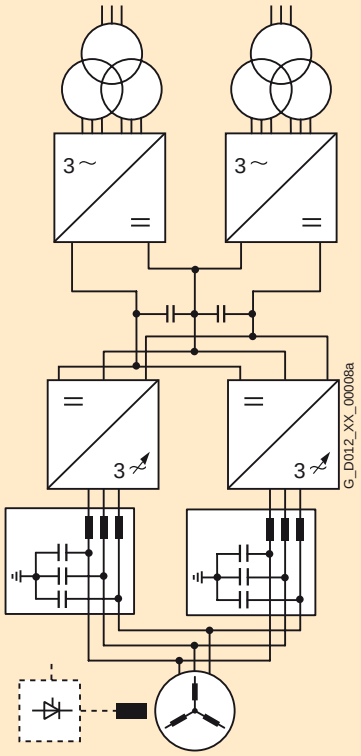


Parallel circuit configuration with sine-wave filter for operating standard line motors for 3.3 kV and 4.16 kV (option **Y15**), diode rectifier connected in parallel in the Basic Line Module

Note: The motor cables are brought out together in the motor terminal box.

Function

Characteristic features

SINAMICS GM150 in IGBT version	
Line Module (line-side rectifier)	
• Basic Line Module, 12-pulse (two-quadrant operation)	Standard
• Basic Line Module, 24-pulse (two-quadrant operation)	Option for 2.3 kV to 4.16 kV Standard for parallel circuit configuration
Motor Module (motor-side inverter)	
Voltage range	2.3 kV to 4.16 kV
Power range (typ.)	0.8 MVA to 10 MVA
Cooling method	
• Air cooling	Standard
• Water cooling	Standard
Control modes	
• Induction motor	Standard
• Synchronous motor, separately excited	Option
Sine-wave filter	Option

Software and protection functions

SINAMICS GM150 in IGBT version	Description
Closed-loop control	The motor-side closed-loop control is realized as a field-oriented closed-loop vector control that can be operated as a speed or torque control as required. The closed-loop vector control achieves the dynamic performance of a DC drive. This is made possible by the fact that the current components forming the torque and flux can be controlled precisely and independently of each other. This means that specified torques can be precisely maintained and limited. In the speed range from 1:10, the field-oriented closed-loop control does not require a speed encoder. A speed encoder is required in the following cases: • High requirements placed on the dynamic performance • Torque control/constant torque drives with control range > 1:10 • Very low speeds • Extremely high speed accuracy
Setpoint input	The setpoint can be defined internally or externally; internally as a fixed, motorized potentiometer or jog setpoint, externally via the PROFIBUS interface or an analog input of the customer's terminal strip. The internal fixed setpoint and the motorized potentiometer setpoint can be switched over or adjusted using control commands via all of the interfaces.
Ramp-function generator	A user-friendly ramp-function generator with separately adjustable ramp-up and ramp-down times, together with adjustable rounding times in the lower and upper speed ranges, improves the control response and therefore prevents mechanical overloading of the drive train. The down ramps can be parameterized separately for a fast stop.
$V_{dc\ max}$ controller	The $V_{dc\ max}$ controller automatically prevents overvoltages in the DC link for example when the selected down ramp is too short. This can also extend the selected ramp-down time.
Kinetic buffering (KIP)	The line voltage failures are buffered to the extent permitted by the kinetic energy of the drive train. The speed decreases depending on the moment of inertia and the load torque. The actual speed setpoint is resumed when the line voltage returns.
Automatic restart (option L32)	The automatic restart switches the drive on again when the power is restored after a power failure or a general fault, and ramps up to the actual speed setpoint.
Flying restart	The flying restart function permits bumpless connection of the converter to a rotating motor.
Diagnostic functions	• Self-diagnostics of the control hardware • Non-volatile memory for reliable diagnostics when the power supply fails • Monitoring HV-IGBTs with individual messages for each mounting location • User-friendly local operator panel with plain text messages
Operating hours and switching cycle counter	The operating hours of the fans are detected and logged so that preventive maintenance can be performed or equipment replaced. The switching cycles of the circuit-breaker are detected and summed to form the basis of preventive maintenance work.
Detecting the motor actual speed (option)	The SMC30 encoder module can be used to detect the actual motor speed. The signals received from the rotary pulse encoder are converted here and made available via the DRIVE-CLiQ interface of the closed-loop control for evaluation purposes.
Personnel protection	The cabinet doors of the power units are fitted with electromagnetic locks. These prevent the cabinet doors from being opened while hazardous voltages are present inside the cabinet.

Function (continued)

Software and protection functions

SINAMICS GM150 in IGBT version	Description
EMERGENCY OFF button	The converters are equipped as standard with an EMERGENCY OFF button with protective collar which is fitted in the cabinet door. The contacts of the pushbutton are connected in parallel to the terminal strip so they can be integrated in a protection concept on the plant side. EMERGENCY OFF stop category 0 is set as standard for uncontrolled shutdown (DIN EN 60204-1/VDE 0113-1 (IEC 60204-1)). The function includes disconnecting the voltage at the converter output through the circuit-breaker. The motor then coasts down. EMERGENCY STOP category 1 is optionally available for a controlled shutdown (option **L60**).
Insulation monitoring	The converters feature insulation monitoring of the complete electrical network from the secondary side of the transformer to the stator windings of the motor.
I/O monitoring	An extensive package of options for I/O monitoring (from the transformer and the motor through to the auxiliaries) is available.
Thermal overload protection	An alarm message is issued first when the overtemperature threshold is reached. If the temperature continues to rise, the converter is either shutdown or the output current is automatically influenced so that the thermal load is reduced. The original operating values are automatically resumed once the cause of the fault has been removed (e.g. improving the cooling). For instance, for air-cooled converters and when filter elements are used, the amount of pollution of the filter elements is monitored by measuring the differential pressure which is then signaled. In the case of water-cooled converters, the water temperature and flow rate are detected at several points in the cooling circuit and evaluated. Extensive self-diagnostic functions signal faults and therefore protect the converter.
Make-proof grounding switch (option)	If grounding on the line or motor side is required for safety and protection reasons, a motor-operated make-proof grounding switch can be ordered. For safety reasons, the converter control interlocks these make-proof grounding switches so that they cannot be closed as long as voltage is still present. The control is integrated into the protection and monitoring circuit of the converter. The make-proof grounding switches are closed automatically when the standard make-proof grounding switch of the DC link is closed.
Capacitor tripping unit	For applications in which the circuit-breaker has no undervoltage coil and this cannot be retrofitted, capacitor tripping devices are available for 110 V up to 120 V DC and for 220 V DC. The capacitor tripping device ensures that the circuit-breaker on the plant side can still be safely opened even if there is a power failure or the normal OFF command is not effective, e.g. because of wire breakage.

AOP30 operator panel

The AOP30 operator panel is fitted into the cabinet door of the SINAMICS GM150 for operation, monitoring and commissioning.

It has the following features and characteristics:

- Graphical LCD display with backlighting for plain-text display and a bar-type display for process variables
- LEDs for displaying the operational status
- Help function describing the causes of faults and alarms and the appropriate counter-measures
- Membrane keypad for operational control of a drive
- Local/remote switchover to select the operator control location (priority assigned to operator panel or customer's terminal strip/PROFIBUS)
- Numerical keypad to enter setpoints or parameter values
- Function keys for prompted navigation in the menu
- Two-stage safety strategy to protect against accidental or unauthorized changes to settings. Operation of the drive from the operator panel can be disabled by a password, ensuring that only parameter values and process variables can be displayed on the panel. A password can be used to prevent the unauthorized modification of converter parameters.

The operator panel languages – English, German, Spanish and Chinese – are stored on the CompactFlash card of the Control Unit.

IGBT version
Air cooling, without sine-wave filter

IGBT version
Air cooling, with sine-wave filter

Selection and ordering data

Type rating	Shaft output		Rated output current	**SINAMICS GM150 in IGBT version, air cooling, without sine-wave filter**	Circuit version (Page 2/4)
kVA	kW	hp	A	Order No.	Fig. No.
Output voltage 2.3 kV					
1000	820	1000	250	**6SL3810-2LM32-5AA0**	①
1200	1000	1250	300	**6SL3810-2LM33-0AA0**	①
1400	1150	1500	350	**6SL3810-2LM33-5AA0**	①
1600	1300	1750	400	**6SL3810-2LM34-0AA0**	①
1800	1500	2000	460	**6SL3810-2LM34-6AA1**	①
2100	1750	2400	530	**6SL3810-2LM35-3AA1**	①
2400	2000	2750	600	**6SL3810-2LM36-0AA0**	①
2700	2250	3100	700	**6SL3810-2LM37-0AA1**	①
3200	2650	3600	800	**6SL3810-2LM38-0AA1**	①
Output voltage 3.3 kV					
1000	850	1000	180	**6SL3810-2LN31-8AA0**	①
1300	1050	1250	220	**6SL3810-2LN32-2AA0**	①
1500	1250	1500	260	**6SL3810-2LN32-6AA0**	①
1700	1400	2000	300	**6SL3810-2LN33-0AA0**	①
2000	1650	2250	350	**6SL3810-2LN33-5AA0**	①
2300	1900	2500	400	**6SL3810-2LN34-0AA0**	①
2600	2150	3000	460	**6SL3810-2LN34-6AA1**	①
3000	2500	3380	530	**6SL3810-2LN35-3AA1**	①
3400	2850	3750	600	**6SL3810-2LN36-0AA0**	①
3900	3550	4350	700	**6SL3810-2LN37-0AA1**	①
4600	4100	5000	800	**6SL3810-2LN38-0AA1**	①
5300	4450	6200	2 × 465	**6SL3810-2LN38-8AA1**	③
6300	5300	7000	2 × 550	**6SL3810-2LN41-1AA0**	③
7100	6000	8000	2 x 625	**6SL3810-2LN41-2AA1**	③
8000	6700	9500	2 x 700	**6SL3810-2LN41-4AA1**	③
Output voltage 4.16 kV					
1300	1000	1500	180	**6SL3810-2LP31-8AA0**	①
1600	1300	1750	220	**6SL3810-2LP32-2AA0**	①
1900	1550	2000	260	**6SL3810-2LP32-6AA0**	①
2200	1800	2500	300	**6SL3810-2LP33-0AA0**	①
2500	2100	3000	350	**6SL3810-2LP33-5AA0**	①
2900	2400	3250	400	**6SL3810-2LP34-0AA0**	①
3300	2800	3800	460	**6SL3810-2LP34-6AA1**	①
3800	3100	4100	530	**6SL3810-2LP35-3AA1**	①
4300	3600	5000	600	**6SL3810-2LP36-0AA0**	①
5000	4150	5650	690	**6SL3810-2LP37-0AA1**	①
5800	4800	6600	800	**6SL3810-2LP38-0AA1**	①
6700	5650	7600	2 × 465	**6SL3810-2LP38-8AA1**	③
7900	6600	9000	2 × 550	**6SL3810-2LP41-1AA0**	③
9000	7600	10250	2 x 625	**6SL3810-2LP41-2AA1**	③
10100	8500	11500	2 x 700	**6SL3810-2LP41-4AA1**	③

Type rating	Shaft output		Rated output current	**SINAMICS GM150 in IGBT version, air cooling, with sine-wave filter**	Circuit design (Page 2/5)
kVA	kW	hp	A	Order No.	Fig. No.
Output voltage 2.3 kV					
850	700	900	210	**6SL3810-2LM32-5AA0-Z Y15**	④
1000	800	1000	250	**6SL3810-2LM33-0AA0-Z Y15**	④
1150	950	1250	290	**6SL3810-2LM33-5AA0-Z Y15**	④
1300	1100	1500	330	**6SL3810-2LM34-0AA0-Z Y15**	④
1450	1200	1600	390	**6SL3810-2LM34-6AA1-Z Y15**	④
1650	1350	1850	420	**6SL3810-2LM35-3AA1-Z Y15**	④
2000	1650	2250	500	**6SL3810-2LM36-0AA0-Z Y15**	④
–	–	–	–	**–**	
–	–	–	–	**–**	
Output voltage 3.3 kV					
850	700	900	150	**6SL3810-2LN31-8AA0-Z Y15**	④
1100	900	1000	190	**6SL3810-2LN32-2AA0-Z Y15**	④
1250	1050	1250	220	**6SL3810-2LN32-6AA0-Z Y15**	④
1450	1200	1500	250	**6SL3810-2LN33-0AA0-Z Y15**	④
1700	1400	1750	300	**6SL3810-2LN33-5AA0-Z Y15**	④
1950	1600	2000	340	**6SL3810-2LN34-0AA0-Z Y15**	④
2350	1850	2500	410	**6SL3810-2LN34-6AA1-Z Y15**	④
2600	2100	2850	440	**6SL3810-2LN35-3AA1-Z Y15**	④
2900	2450	3250	510	**6SL3810-2LN36-0AA0-Z Y15**	④
–	–	–	–	**–**	
–	–	–	–	**–**	
4750	3650	5100	830	**6SL3810-2LN38-8AA1-Z Y15**	⑥
5350	4500	6000	940	**6SL3810-2LN41-1AA0-Z Y15**	⑥
–	–	–	–	**–**	
–	–	–	–	**–**	
Output voltage 4.16 kV					
1100	900	1250	150	**6SL3810-2LP31-8AA0-Z Y15**	④
1350	1150	1500	190	**6SL3810-2LP32-2AA0-Z Y15**	④
1600	1300	1750	220	**6SL3810-2LP32-6AA0-Z Y15**	④
1850	1550	2000	260	**6SL3810-2LP33-0AA0-Z Y15**	④
2100	1750	2250	290	**6SL3810-2LP33-5AA0-Z Y15**	④
2450	2000	2750	340	**6SL3810-2LP34-0AA0-Z Y15**	④
2950	2400	3250	410	**6SL3810-2LP34-6AA1-Z Y15**	④
3250	2600	3600	480	**6SL3810-2LP35-3AA1-Z Y15**	④
3600	3000	4000	500	**6SL3810-2LP36-0AA0-Z Y15**	④
–	–	–	–	**–**	
–	–	–	–	**–**	
6000	5100	6800	830	**6SL3810-2LP38-8AA1-Z Y15**	⑥
6650	5500	7500	920	**6SL3810-2LP41-1AA0-Z Y15**	⑥
–	–	–	–	**–**	
–	–	–	–	**–**	

Special version **"-Z"**

The code **Y15** (sine-wave filter) must be additionally specified and requires plain text
(see Description of options, Page 5/34).

IGBT version
Water cooling, without sine-wave filter

IGBT version
Water cooling, with sine-wave filter

Selection and ordering data (continued)

Type rating	Shaft output		Rated output current	SINAMICS GM150 in IGBT version, water cooling, without sine-wave filter	Circuit version (Page 2/4)
kVA	kW	hp	A	Order No.	Fig. No.
Output voltage 2.3 kV					
2000	1650	2250	500	**6SL3815-2LM35-0AA0**	①
2200	1800	2500	550	**6SL3815-2LM35-5AA0**	①
2400	2000	2750	610	**6SL3815-2LM36-1AA0**	①
2700	2250	3000	675	**6SL3815-2LM36-7AA0**	①
2900	2450	3250	740	**6SL3815-2LM37-4AA0**	①
3200	2650	3500	800	**6SL3815-2LM38-0AA0**	①
Output voltage 3.3 kV					
2000	1650	2250	350	**6SL3815-2LN33-5AA0**	①
2300	1900	2500	400	**6SL3815-2LN34-0AA0**	①
2600	2150	3000	450	**6SL3815-2LN34-5AA0**	①
2900	2400	3250	500	**6SL3815-2LN35-0AA0**	①
3100	2650	3500	550	**6SL3815-2LN35-5AA0**	①
3500	2900	4000	610	**6SL3815-2LN36-1AA0**	①
3900	3200	4250	675	**6SL3815-2LN36-7AA0**	①
4200	3500	4500	740	**6SL3815-2LN37-4AA0**	①
4600	3800	5000	800	**6SL3815-2LN38-0AA0**	①
5100	4250	6000	2 × 445	**6SL3815-2LN38-8AA0**	③
5700	4750	6500	2 × 495	**6SL3815-2LN41-0AA0**	③
6300	5300	7000	2 × 550	**6SL3815-2LN41-1AA0**	③
6900	5700	7500	2 × 600	**6SL3815-2LN41-2AA0**	③
7400	6200	8000	2 × 650	**6SL3815-2LN41-3AA0**	③
8000	6700	9000	2 × 700	**6SL3815-2LN41-4AA0**	③
Output voltage 4.16 kV					
2000	1700	2250	280	**6SL3815-2LP32-8AA0**	①
2200	1850	2500	310	**6SL3815-2LP33-1AA0**	①
2500	2100	2750	350	**6SL3815-2LP33-5AA0**	①
2900	2400	3000	400	**6SL3815-2LP34-0AA0**	①
3200	2700	3500	450	**6SL3815-2LP34-5AA0**	①
3600	3000	4000	500	**6SL3815-2LP35-0AA0**	①
4000	3300	4500	550	**6SL3815-2LP35-5AA0**	①
4400	3700	5000	610	**6SL3815-2LP36-1AA0**	①
4900	4100	5500	675	**6SL3815-2LP36-7AA0**	①
5300	4500	6000	740	**6SL3815-2LP37-4AA0**	①
5800	4800	6500	800	**6SL3815-2LP38-0AA0**	①
6400	5400	7000	2 × 445	**6SL3815-2LP38-8AA0**	③
7100	6000	8000	2 × 495	**6SL3815-2LP41-0AA0**	③
7900	6600	9000	2 × 550	**6SL3815-2LP41-1AA0**	③
8600	7300	9500	2 × 600	**6SL3815-2LP41-2AA0**	③
9400	7900	10000	2 × 650	**6SL3815-2LP41-3AA0**	③
10100	8500	11000	2 × 700	**6SL3815-2LP41-4AA0**	③

Type rating	Shaft output		Rated output current	SINAMICS GM150 in IGBT version, water cooling, with sine-wave filter	Circuit design (Page 2/5)
kVA	kW	hp	A	Order No.	Fig. No.
Output voltage 2.3 kV					
1500	1250	1500	380	**6SL3815-2LM35-0AA0-Z Y15**	④
1650	1350	1750	410	**6SL3815-2LM35-5AA0-Z Y15**	④
1800	1500	2000	450	**6SL3815-2LM36-1AA0–Z Y15**	④
2050	1700	2250	510	**6SL3815-2LM36-7AA0–Z Y15**	④
2200	1850	2500	550	**6SL3815-2LM37-4AA0-Z Y15**	④
2400	2000	2750	600	**6SL3815-2LM38-0AA0-Z Y15**	④
Output voltage 3.3 kV					
1550	1300	1750	270	**6SL3815-2LN33-5AA0-Z Y15**	④
1750	1450	2000	310	**6SL3815-2LN34-0AA0-Z Y15**	④
2000	1650	2250	350	**6SL3815-2LN34-5AA0-Z Y15**	④
2150	1800	2500	380	**6SL3815-2LN35-0AA0-Z Y15**	④
2350	1950	2750	410	**6SL3815-2LN35-5AA0-Z Y15**	④
2700	2250	3000	470	**6SL3815-2LN36-1AA0–Z Y15**	④
2950	2500	3250	520	**6SL3815-2LN36-7AA0–Z Y15**	④
3200	2700	3500	560	**6SL3815-2LN37-4AA0-Z Y15**	④
3500	2900	4000	610	**6SL3815-2LN38-0AA0-Z Y15**	④
3900	3250	4500	680	**6SL3815-2LN38-8AA0–Z Y15**	⑥
4350	3650	5000	760	**6SL3815-2LN41-0AA0–Z Y15**	⑥
4800	4000	5500	840	**6SL3815-2LN41-1AA0–Z Y15**	⑥
5250	4400	6000	920	**6SL3815-2LN41-2AA0–Z Y15**	⑥
5600	4700	6250	980	**6SL3815-2LN41-3AA0-Z Y15**	⑥
6050	5100	6500	1060	**6SL3815-2LN41-4AA0-Z Y15**	⑥
Output voltage 4.16 kV					
1600	1300	1750	220	**6SL3815-2LP32-8AA0-Z Y15**	④
1750	1450	2000	240	**6SL3815-2LP33-1AA0-Z Y15**	④
1950	1600	2250	270	**6SL3815-2LP33-5AA0-Z Y15**	④
2250	1850	2500	310	**6SL3815-2LP34-0AA0-Z Y15**	④
2500	2100	2750	350	**6SL3815-2LP34-5AA0-Z Y15**	④
2800	2350	3000	390	**6SL3815-2LP35-0AA0-Z Y15**	④
3100	2600	3500	430	**6SL3815-2LP35-5AA0-Z Y15**	④
3450	2900	4000	480	**6SL3815-2LP36-1AA0–Z Y15**	④
3800	3200	4250	530	**6SL3815-2LP36-7AA0–Z Y15**	④
4100	3450	4500	570	**6SL3815-2LP37-4AA0-Z Y15**	④
4500	3800	5000	625	**6SL3815-2LP38-0AA0-Z Y15**	④
4950	4200	5500	690	**6SL3815-2LP38-8AA0–Z Y15**	⑥
5550	4600	6000	770	**6SL3815-2LP41-0AA0–Z Y15**	⑥
6150	5100	7000	850	**6SL3815-2LP41-1AA0–Z Y15**	⑥
6700	5600	7500	930	**6SL3815-2LP41-2AA0–Z Y15**	⑥
7350	6200	8000	1020	**6SL3815-2LP41-3AA0-Z Y15**	⑥
7950	6600	9000	1100	**6SL3815-2LP41-4AA0-Z Y15**	⑥

Special version **"-Z"**

The code **Y15** (sine-wave filter) must be additionally specified and requires plain text
(see Description of options, Page 5/34).

2

Options

When ordering a drive converter with options, add the suffix **"-Z"** after the order number and then state the order code(s) for the desired option(s) after the suffix.

Example:

6SL3810-2LM32-5AA0-Z
+N15+L60+...

In the following tables, related options are arranged in groups. Whether the options can be combined or are mutually exclusive is indicated within these groups. A detailed description of the options can be found in the Chapter, Description of options.

Input-side options		**N15**	**N20**	**N21**	**N13**
24-pulse Basic Line Module	**N15**		✓	✓	–
Capacitor tripping device 110 V to 120 V DC [1]	**N20**	✓		–	✓
Capacitor tripping device 230 V DC [1]	**N21**	✓	–		✓
Circuit-breaker at the converter input [2] (for 24-pulse Basic Line Module on request)	**N13**	–	✓	✓	

[1] The options **N20** and **N21** cannot be combined with option **U01** (converter version for NAFTA with UL listing).

[2] Option **N13** can only be inquired in conjunction with option **U01**.

Output-side options		**L08**	**Y15**	**L29**	**L52**	**L72**	**Y73**
Output reactor	**L08**		–	✓	✓	✓	✓
Sine-wave filter (plain text required)	**Y15**	–		✓	✓	✓	✓
Bidirectional synchronized bypass operation	**L29**	✓	✓		✓	✓	✓
Circuit-breaker at the converter output [1]	**L52**	✓	✓	✓		✓	✓
Braking Module	**L72**	✓	✓	✓	✓		✓
Braking resistor	**Y73**	✓	✓	✓	✓	✓	

[1] Option **L52** cannot be combined with option **L51** (disconnector at the converter output).

Protective functions		**L80**	**L48**	**L49**	**L51**	**L60**	**M10**
Control of "Safe Torque Off" function (on request)	**K80**		✓	✓	✓	✓	✓
Make-proof grounding switch at the converter input [1] (motor driven)	**L48**	✓		✓	✓	✓	✓
Make-proof grounding switch at the converter output [1] (motor driven)	**L49**	✓	✓		✓	✓	✓
Disconnector at the converter output [2]	**L51**	✓	✓	✓		✓	✓
EMERGENCY STOP, Stop Category 1 for controlled stopping	**L60**	✓	✓	✓	✓		✓
Safety locking system	**M10**	✓	✓	✓	✓	✓	

[1] An inquiry is necessary for options **L48** and **L49** in conjunction with option **U01** (converter version for NAFTA with UL listing).

[2] Option **L51** cannot be combined with option **L52** (circuit-breaker at the converter output).

✓	Options can be combined
–	Options mutually exclude each other

Options (continued)

Temperature detection and evaluation (standard: 3 PT100 inputs)		L80	L81	L82	L90	L91	L93	L95
2 thermistor protection relays for alarm and fault [1]	L80		–	–	✓	✓	✓	✓
2 x 2 thermistor protection relays for alarm and fault [1]	L81	–		–	✓	✓	✓	✓
3 x 2 thermistor protection relays for alarm and fault [1]	L82	–	–		✓	✓	✓	✓
PT100 evaluation unit with 3 inputs [1]	L90	✓	✓	✓		–	–	–
2 PT100 evaluation units with 3 inputs each [1]	L91	✓	✓	✓	–		–	–
PT100 evaluation unit with 6 inputs, 2 analog outputs (outputs fed to the control for display) [1]	L93	✓	✓	✓	–	–		–
PT100 evaluation unit with 6 inputs for explosion-protected motors and 2 analog outputs (outputs fed to the control for display) [1] [2]	L95	✓	✓	✓	–	–	–	

[1] Options **L..** cannot be combined with option **G61** (additional TM31 Terminal Module).

[2] Option **L95** cannot be combined with option **U01** (converter version for NAFTA with UL listing).

Increased degree of protection of the electrical cabinets in the air-cooled version (standard: IP22)		M11	M42
Dust protection	M11		✓
Degree of protection IP42	M42	✓	

Increased degree of protection of the electrical cabinets in the water-cooled version (standard: IP43)	
IP54 degree of protection	M54

Controlled motor feeder for auxiliaries [1]		N30	N31	N32	N33
Controlled motor feeder for auxiliaries 3 AC 440/480 V, max. 4/4.8 kW	N30		–	–	–
Controlled motor feeder for auxiliaries 3 AC 440/480 V, max. 7/8 kW	N31	–		–	–
Controlled motor feeder for auxiliaries 3 AC 440/480 V, max. 11/12.7 kW	N32	–	–		–
Controlled motor feeder for auxiliaries 3 AC 440/480 V, max. 15/17.5 kW	N33	–	–	–	

Controlled outgoing feeder for auxiliaries [2]		N35	N36	N37	N38
Controlled outgoing feeder for auxiliaries 1 AC 230/120 V, max. 1.2/1 kW	N35		–	–	–
Controlled outgoing feeder for auxiliaries 1 AC 230/120 V, max. 2.2/1.5 kW	N36	–		–	–
Controlled outgoing feeder for auxiliaries 1 AC 230/120 V, max. 3.5/2.1 kW	N37	–	–		–
Controlled outgoing feeder for auxiliaries 1 AC 230/120 V, max. 4.5/2.8 kW	N38	–	–	–	

[1] The contactor is **closed** with the ON command at the converter and **opened** with the OFF command (example: external fan on the motor). The supply voltage for the auxiliaries to be powered must be provided externally.

[2] The contactor is **opened** with the ON command at the converter and **closed** with the OFF command (example: heater). The supply voltage for the auxiliaries to be powered must be provided externally.

✓	Options can be combined
–	Options mutually exclude each other

Options (continued)

Design for air cooling		M61	M64
Redundant fan in the power unit	M61		–
Converter prepared for connection to an external air discharge system, with internal cabinet fans	M64	–	

Connection of power and signal cables (standard: Power cables are connected from the bottom, signal cables are directly connected at terminals of the Terminal Module)		M13	M78	M32	M33	M34
Power cable connected at the converter input from the top	M13		✓	✓	✓	✓
Power cable connected at the converter output from the top	M78	✓		✓	✓	✓
Customer's terminal strip with spring-loaded terminals for signal cables up to 2.5 mm^2	M32	✓	✓		–	✓
Customer's terminal strip with screw terminals for signal cables up to 2.5 mm^2	M33	✓	✓	–		✓
Auxiliary voltage and signal cables connected from the top	M34	✓	✓	✓	✓	

Control and display instruments in the door of the control cabinet		K20	K21	K22
Indicator lights in the cabinet door	K20		–	–
Display instruments in the cabinet door for voltage, current, speed and power as well as indicator lights	K21	–		–
Display instruments in the cabinet door for current, speed, power and winding temperature as well as indicator lights	K22	–	–	

Interface modules for connection to external bus systems (standard: PROFIBUS (Slave))		G20	G21	G22	G23	G24	G25	G35
CAN bus interface (CANopen, on request)	G20		–	–	–	–	–	–
Modbus Plus interface (on request)	G21	–		–	–	–	–	–
Modbus RTU slave interface (on request)	G22	–	–		–	–	–	–
DeviceNet interface (on request)	G23	–	–	–		–	–	–
PROFINET interface (via CBE20) (on request)	G24	–	–	–	–		–	–
TeleService connection, TS Adapter II, analog modem	G25	–	–	–	–	–		–
TeleService connection, TS Adapter II, ISDN modem	G35	–	–	–	–	–	–	

Interface modules for additional customer connections and speed encoders		G61	G62	G63	K50
Additional TM31 Terminal Module [1]	G61		✓	✓	✓
Second additional TM31 Terminal Module [1]	G62	✓		✓	✓
Additional TM15 Terminal Module	G63	✓	✓		✓
Sensor Module Cabinet-Mounted SMC30	K50	✓	✓	✓	

[1] For exclusion of options **G61** and **G62**, see Description of options.

✓	Options can be combined
–	Options mutually exclude each other

Options (continued)

Other interface modules		G70	G71
Pulse distributor for transferring the speed encoder signal (on request) [1]	G70		✓
Optical bus terminal (OBT) for PROFIBUS (on request) [2]	G71	✓	

[1] Option **G70** can only be ordered in combination with option **K50** (Sensor Module Cabinet-Mounted SMC30).

[2] Option **G71** cannot be combined with options **G20** to **G24** and **G34** (access to other bus systems), as well as **G25** and **G35** (teleservice).

Additional analog inputs/outputs (isolated)		E86	E87
Additional analog inputs (isolated) [1]	E86		✓
Additional analog outputs (isolated) [1]	E87	✓	

[1] Options **E86** and **E87** cannot be combined with option **G62** (second additional TM31 Terminal Module).

Sector-specific options		B00	M66
NAMUR terminal strip	B00		✓
Suitable for marine applications [1]	M66	✓	
The following option is included as standard in option **M66**:			
Cabinet anti-condensation heating	L55	✓	✓
The following option cannot be combined with option **M66** :			
UPS for the power supply of the open-loop and closed-loop control	L53	✓	–
The following options are required for safety-relevant drives in addition to option **M66**:			
Individual certification of the converter by the particular certification society [1]	E11 to E71	✓	✓

[1] An inquiry is required for options **M66** and **E11** up to **E71** in combination with options **Y15** (sine-wave filter) or **C30** to **C49** (an auxiliary voltage other than 3 AC/N/400 V).

Individual certification of the converters for use on ships (includes option M66) [1]		E11	E21	E31	E51	E61	E71
Suitable for marine applications with individual certificate from Germanischer Lloyd (GL)	E11		–	–	–	–	–
Suitable for marine applications with individual certificate from Lloyds Register (LR)	E21	–		–	–	–	–
Suitable for marine applications with individual certificate from Bureau Veritas (BV)	E31	–	–		–	–	–
Suitable for marine applications with individual certificate from Det Norske Veritas (DNV)	E51	–	–	–		–	–
Suitable for marine applications with individual certificate from the American Bureau of Shipping (ABS)	E61	–	–	–	–		–
Suitable for marine applications with individual certificate from the Chinese Classification Society (CCS)	E71	–	–	–	–	–	

[1] An inquiry is required for options **M66** and **E11** up to **E71** in combination with options **Y15** (sine-wave filter) or **C30** to **C49** (an auxiliary voltage other than 3 AC/N/400 V).

✓	Options can be combined
–	Options mutually exclude each other

Options (continued)

Functional options		E01	E02	E03	L32
Closed-loop control for separately excited synchronous motors with slip-ring excitation [1]	E01		–	–	✓
Closed-loop control for separately excited synchronous motors with brushless reverse field excitation [1]	E02	–		–	✓
Closed-loop control for permanently excited synchronous motors (on request) [2]	E03	–	–		✓
Automatic restart	L32	✓	✓	✓	

[1] An inquiry is necessary for options **E01** and **E02** in conjunction with option **U01** (converter version for NAFTA with UL listing).

[2] Option **E03** can only be ordered in combination with option **L52** (circuit-breaker at the converter output).

Documentation (standard: PDF format in English on CD-ROM)		B43	B44	B45	D02	D15	Y10
Production flowchart: Generated once	B43		–	–	✓	✓	✓
Production flowchart: Updated every two weeks	B44	–		–	✓	✓	✓
Production flowchart: Updated every month	B45	–	–		✓	✓	✓
Circuit diagrams, terminal diagrams and dimension drawings in the DXF format [1]	D02	✓	✓	✓		✓	✓
One set of printed documentation (multiple orders possible)	D15	✓	✓	✓	✓		✓
Circuit diagrams with customer-specific text field (plain text is required) [1]	Y10	✓	✓	✓	✓	✓	

[1] The equipment-specific documents (circuit diagrams etc.) are only available in English/German.

Documentation in languages (standard: PDF format in English on CD-ROM)		D00	D55	D56	D72	D76	D77	D78	D79	D84	D92
Documentation in German	D00		–	–	–	✓	–	–	–	–	–
Documentation in Polish	D55	–		–	–	✓	–	–	–	–	–
Documentation in Russian (on request)	D56	–	–		–	✓	–	–	–	–	–
Documentation in Italian (on request)	D72	–	–	–		✓	–	–	–	–	–
Documentation in English	D76	✓	✓	✓	✓		✓	✓	✓	✓	✓
Documentation in French (on request)	D77	–	–	–	–	✓		–	–	–	–
Documentation in Spanish	D78	–	–	–	–	✓	–		–	–	–
Documentation in Portuguese	D79	–	–	–	–	✓	–	–		–	–
Documentation in Chinese	D84	–	–	–	–	✓	–	–	–		–
Documentation in Japanese (on request)	D92	–	–	–	–	✓	–	–	–	–	

✓ Options can be combined

– Options mutually exclude each other

Options (continued)

Rating plate language (standard: English/German)		T58	T60	T80	T82	T85	T86	T90	T91
Rating plate in English/French	T58		–	–	–	–	–	–	–
Rating plate in English/Spanish	T60	–		–	–	–	–	–	–
Rating plate in English/Italian	T80	–	–		–	–	–	–	–
Rating plate in English/Portuguese (on request)	T82	–	–	–		–	–	–	–
Rating plate in English/Russian (on request)	T85	–	–	–	–		–	–	–
Rating plate in English/Polish (on request)	T86	–	–	–	–	–		–	–
Rating plate in English/Japanese (on request)	T90	–	–	–	–	–	–		–
Rating plate in English/Chinese (on request)	T91	–	–	–	–	–	–	–	

Auxiliary power supply	
Auxiliary voltage other than 3 AC/N/400 V	C30 to C49

NAFTA version (SINAMICS GM150 in an air-cooled IGBT version; 2.3 kV, 3.3 kV, 4.16 kV)		U01
Converter version for NAFTA with UL listing	U01	
The following options are included as standard in option **U01**:		
Safety interlocking system	M10	
Dust protection	M11	
Rating plate language English/French	T58	
The following options cannot be combined with option **U01**:		
Capacitor tripping devices	N20 and N21	–
PT100 evaluation unit with 6 inputs for explosion-protected motors, 2 analog outputs (outputs fed to the control for display)	L95	–
The following options are available in conjunction with option **U01** on special request:		
Circuit-breaker at the converter input	N13	
Make-proof grounding switch	L48 and L49	
Closed-loop control for separately excited synchronous motors	E01 and E02	
UPS for the power supply of the open-loop and closed-loop control	L53	

✓	Options can be combined
–	Options mutually exclude each other

Options (continued)

Converter acceptance tests with the customer present		F03	F73	F77	F97
Visual acceptance of converter	F03		–	–	–
Functional acceptance of converter with inductive load	F73	–		✓	–
Insulation acceptance test of the converter [1]	F77	–	✓		–
Customer-specific system acceptance test (on request)	F97	–	–	–	

[1] Option **F77** can only be ordered in connection with option **F73**.

Cooling unit (water-cooled converters, standard: Cooling unit with redundant pumps and a stainless steel plate-type heat exchanger)		W02	W11	W12	W14	W20	Y40
Cooling unit with redundant stainless steel plate-type heat exchangers	W02		–	–	–	✓	–
Cooling unit with titanium plate-type heat exchanger	W11	–		–	–	✓	–
Cooling unit with redundant titanium plate-type heat exchangers	W12	–	–		–	✓	–
Converter without cooling unit (provided on the plant side)	W14	–	–	–		–	–
Raw water connection from the bottom	W20	✓	✓	✓	–		✓
Raw water data that deviates from the technical data (on request) [1]	Y40	–	–	–	–	✓	

[1] Option **Y40** includes a cooling system which is adapted to the raw water data according to the customer's specifications.

Warranty extension		W80	W81	W82	W83	W84	W85	W86
Warranty extension of 6 months to 24 months (2 years) after delivery	W80		–	–	–	–	–	–
Warranty extension of 12 months to 30 months (2½ years) after delivery	W81	–		–	–	–	–	–
Warranty extension of 18 months to 36 months (3 years) after delivery	W82	–	–		–	–	–	–
Warranty extension of 24 months to 42 months (3½ years) after delivery	W83	–	–	–		–	–	–
Warranty extension by 30 months to 48 months (4 years) after delivery	W84	–	–	–	–		–	–
Warranty extension by 42 months to 60 months (5 years) after delivery	W85	–	–	–	–	–		–
Warranty extension by 54 months to 72 months (6 years) after delivery	W86	–	–	–	–	–	–	

Other options		L50	L53	L55	Y09
Cabinet lighting and service socket outlet in the closed-loop control section	L50		✓	✓	✓
UPS for the power supply of the open-loop and closed-loop control [1]	L53	✓		✓	✓
Anti-condensation heating for the cabinet	L55	✓	✓		✓
Special paint finish acc. to RAL .... (in a color other than RAL 7035; plain text required)	Y09	✓	✓	✓	

[1] Option **L53** is available on request in conjunction with option **U01** (converter version for NAFTA with UL listing).

✓	Options can be combined
–	Options mutually exclude each other

Technical data

General technical data	
Power components	Diodes, 3.3 kV IGBTs
Line-side converter	
• Standard	- Lower power ratings at 2.3 kV to 4.16 kV: 12-pulse diode rectifier (Basic Line Module) - Higher power ratings for 2.3 kV to 4.16 kV: 24-pulse diode rectifier (Basic Line Module)
• Option	- Lower power ratings at 2.3 kV to 4.16 kV: 24-pulse diode rectifier (Basic Line Module)
Motor-side converter	Inverter (Motor Module)
Closed-loop control	Closed-loop vector control
Drive quadrants	2 (2 directions of rotation, driving)
Electrical isolation, power unit/ open-loop and closed-loop control	Fiber-optic cable, insulating transformer
Auxiliary power supply (for fans, coolant pumps, precharging the DC link capacitors, open-loop and closed-loop control)	• 1 AC 230 V ±10 %, 50/60 Hz ±3 % and • 3 AC 400 V ±10 %, 50/60 Hz ±3 % or another auxiliary voltage (options **C30** to **C49**)
Installation altitude	≤1000 m above sea level: Load capability 100 % >1000 m to 4000 m above sea level: Current derating required >2000 m to 4000 m above sea level: Voltage derating additionally required
Insulation	in accordance with DIN EN 50178/VDE 0160 (IEC 62103): Degree of pollution 2 (without conductive pollution), condensation not permitted
Degree of protection	in accordance with DIN EN 60529/VDE 0470 T1 (IEC 60529):
• Standard	IP22 (air cooling), IP43 (water cooling)
• Option	IP42 (air cooling), IP54 (water cooling)
Protection class	in accordance with DIN EN 61140/VDE 0140 T1 (IEC 61140): 1
Shock protection	BGV A 3
Interference emission	This drive unit is part of a PDS, Category C4 acc. to DIN EN 61800-3/VDE 0160 T103 (IEC 61800-3). It has not been designed to be connected to the public line supply. EMC disturbances can occur when connected to these line supplies. The essential requirements placed on EMC protection for the drive system should be secured using an EMC plan.
Paint finish/color	Indoor requirements/light gray RAL 7035
Compliance with standards	
• Standards	- DIN EN 61800-3/VDE 0160 T103 (IEC 61800-3) - DIN EN 61800-4/VDE 0160 T104 (IEC 61800-4) - DIN EN 61800-5-1/VDE 0160 T105 (IEC 61800-5-1) - DIN EN 60146-1-1/VDE 0558 T11 (IEC 60146-1-1) - DIN EN 50178/VDE 0160 T103 (IEC 62103) - DIN EN 60204-11/VDE 0113 T11 (IEC 60204-11)
• EU Directives	- 98/37/EC + amendments (Machinery Directive) - 2004/108/EC + amendments (Electromagnetic Compatibility)
Air cooling	Forced air cooling with integrated fans
Water cooling	Water-water cooling unit, internal circuit, deionized water
Permitted coolant temperature (raw water)	
• Inlet	+5 °C to +35 °C
• Discharge	max. +40 °C

Rated data			
Output voltage	**2.3 kV**	**3.3 kV**	**4.16 kV**
Input voltage	2 x 1.2 kV	2 x 1.7 kV	2 x 2.2 kV
Tolerance of input voltage	±10 %	±10 %	±10 %
Line frequency	50/60 Hz ±3 %	50/60 Hz ±3 %	50/60 Hz ±3 %
Line power factor fundamental component	>0.96	>0.96	>0.96

Technical data (continued)

	Operation of induction motors				Operation of separately excited synchronous motors	
	without speed encoder		with speed encoder		with speed encoder	
	without sine-wave filter	with sine-wave filter	without sine-wave filter	with sine-wave filter	without sine-wave filter	with sine-wave filter
Closed-loop control properties						
Operating range						
• Lower limit of speed control range (% of rated motor speed)	5 %	5 %	0 %	0 %	0 %	0 %
• Max. permissible output frequency	250 Hz	66 Hz	250 Hz	66 Hz	90 Hz	66 Hz
• Field weakening range	1:3	1:1.1	1:3	1:1.1	1:4	1:1.1
Steady-state operation						
• Speed accuracy (% of rated motor speed)	±0.2 % (from 5 % rated speed)	±0.2 % (from 5 % rated speed)	±0.01 %	±0.01 %	±0.01 %	±0.01 %
• Torque accuracy (% of rated torque)	±5 % (from 5 % rated speed)	±5 % (from 5 % rated speed)	±5 %	±5 %	±2 %	±5 %
Dynamic operation						
• Torque rise time	5 ms	20 ms	5 ms	20 ms	5 ms	20 ms

	Storage	Transport	Operation
Climatic ambient conditions			
Ambient temperature	–25 °C to +70 °C	–25 °C to +70 °C	+5 °C to +40 °C
Relative air humidity	5 % to 95 % (only slight condensation permitted; converter must be completely dry before commissioning)	5 % to 75 %	5 % to 85 % (condensation not permitted)
Other climatic conditions in accordance with Class	1K3 acc. to DIN EN 60721-3-1 (IEC 60721-3-1) (formation of ice not permitted)	2K2 acc. to DIN EN 60721-3-2 (IEC 60721-3-2)	3K3 ac. to DIN EN 60721-3-3 (IEC 60721-3-3)
Degree of pollution	2 without conductive pollution acc. to DIN EN 50178/VDE 0160 (IEC 62103)	2 without conductive pollution acc. to DIN EN 50178/VDE 0160 (IEC 62103)	2 without conductive pollution acc. to DIN EN 50178/VDE 0160 (IEC 62103)
Mechanical ambient conditions			
Vibratory load			
• Displacement	1.5 mm at 2 Hz to 9 Hz	3.5 mm at 2 Hz to 9 Hz	0.3 mm at 2 Hz to 9 Hz
• Acceleration	5 m/s^2 at 9 Hz to 200 Hz	10 m/s^2 at 9 Hz to 200 Hz 15 m/s^2 at 200 Hz to 500 Hz	1 m/s^2 at 9 Hz to 200 Hz
Other mechanical conditions in accordance with Class (increased strength for marine applications)	1M2 acc. to DIN EN 60721-3-1 (IEC 60721-3-1)	2M2 acc. to DIN EN 60721-3-2 (IEC 60721-3-2)	3M1 acc. to DIN EN 60721-3-3 (IEC 60721-3-3)
Other ambient conditions			
Biological ambient conditions in accordance with Class	1B1 acc. to DIN EN 60721-3-1 (IEC 60721-3-1)	2B1 acc. to DIN EN 60721-3-2 (IEC 60721-3-2)	3B2 acc. to DIN EN 60721-3-3 (IEC 60721-3-3) (without harmful flora)
Chemically active substances in accordance with Class	1C1 acc. to DIN EN 60721-3-1 (IEC 60721-3-1)	2C1 acc. to DIN EN 60721-3-2 (IEC 60721-3-2)	3C2 acc. to DIN EN 60721-3-3 (IEC 60721-3-3) (no occurrence of salt mist)
Mechanically active substances in accordance with Class	1S1 acc. to DIN EN 60721-3-1 (IEC 60721-3-1)	2S1 acc. to DIN EN 60721-3-2 (IEC 60721-3-2)	3S1 acc. to DIN EN 60721-3-3 (IEC 60721-3-3) (3S3 for water cooling and degree of protection IP54)

Note: The values specified under storage and transport apply to suitably packed converters.

Technical data (continued)

Derating for special installation conditions

Current derating

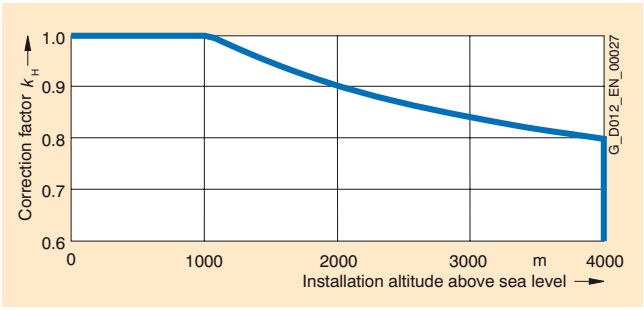
If the converters are operated at installation altitudes above 1000 m above sea level or for ambient and coolant temperatures >40 °C for air cooling or >35 °C for water cooling, derating factors k_T or k_H must be taken into account for the rated output current (DIN 43671). For the permissible continuous current I the following applies:

$I \leq I_{rated} \times k_H \times k_T$

I: permissible continuous current
I_{rated}: rated current

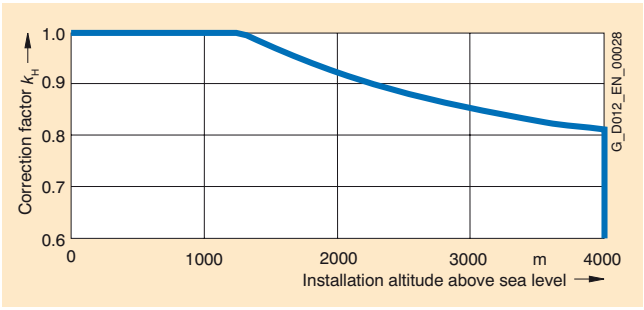
For water-cooled versions, the following applies: When determining the current derating required ($k_H \times k_T$) in addition to the raw water intake temperature, the ambient temperature and air pressure also have to be taken into consideration as e.g. the DC link busbars are air-cooled. For this purpose, factor k_T should be determined from the diagram for the ambient temperature and from the diagram for the raw water intake temperature. The lower of the two values should be used to calculate the current derating.

Current derating as a function of the installation altitude (air cooling)



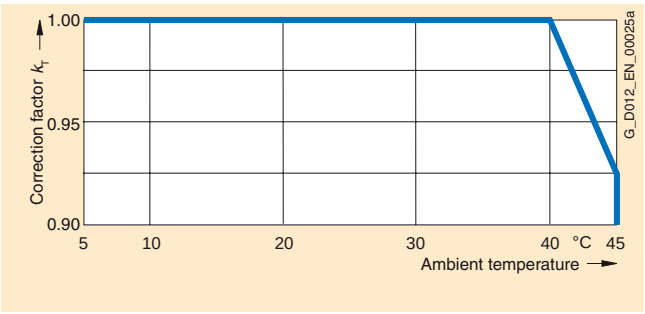
Derating factor k_H for air cooling

Current derating as a function of the installation altitude (water cooling)



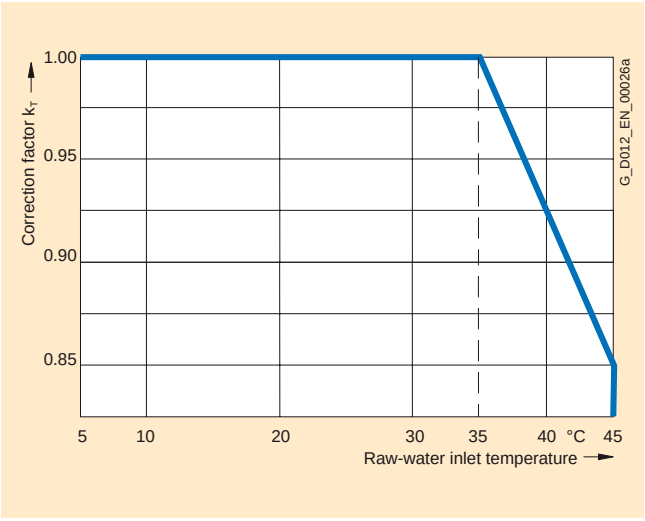
Derating factor k_H for water cooling

Current derating as a function of the ambient temperature



Derating factor k_T (ambient temperature)

Current derating as a function of the raw water intake temperature

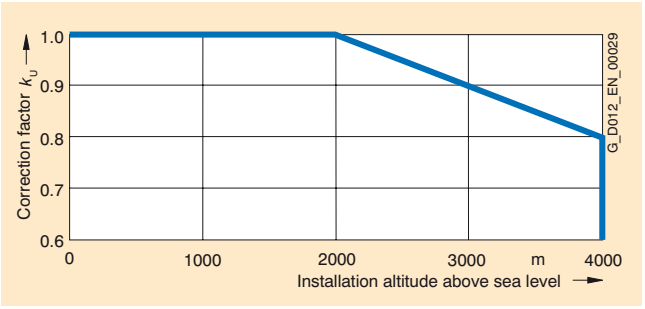


Derating factor k_T (raw water intake temperature)

Voltage derating

At installation altitudes >2000 m, a voltage derating must be made in addition to a current derating DIN EN 60664-1/ VDE 0110 (IEC 60664-1). This depends on the air and creepage distances in the unit.

Voltage derating as a function of the installation altitude



Derating factor k_U

Technical data (continued)

Example 1 (air-cooled converter)

Derating data SINAMICS GM150 in IGBT version

Drive unit	6SL3810-2LP33-1AA0
Output voltage	4.16 kV
Input voltage	2 x 2.2 kV
Type rating	2200 kVA, 300 A
Installation altitude	3000 m
Maximum ambient temperature	30 °C
k_H (air cooling)	0.84
k_T (ambient temperature)	1.0
k_U	0.9

For the current, the following applies:

$I \leq I_{rated} \times 0.84 \times 1.0 = I_{rated} \times 0.84$

A current derating of 16 % and a voltage derating of 10 % are required. The converter may still be connected to a line supply voltage of 3 AC 2 x 1.98 kV. The maximum available output current is 252 A.

Example 2 (water-cooled converter)

Derating data SINAMICS GM150 in IGBT version

Drive unit	6SL3815-2LN33-5AA0
Output voltage	3.3 kV
Input voltage	2 x 1.7 kV
Type rating	2000 kVA, 350 A
Installation altitude	2000 m
Maximum ambient temperature	40 °C
Raw water intake temperature	40 °C
k_H (water cooling)	0.925
k_T (ambient temperature)	1.0
k_T (raw water intake temperature)	0.925
k_U	1.0

The lower value for k_T is obtained here from the diagram for the raw water intake temperature.

$I \leq I_{rated} \times 0.925 \times 0.925 = I_{rated} \times 0.856$

A current derating of 14.4 % is required. The max. available output current of the converter is 299 A.

Example 3 (water-cooled converter)

Derating data SINAMICS GM150 in IGBT version

Drive unit	6SL3815-2LN33-5AA0
Output voltage	3.3 kV
Input voltage	2 x 1.7 kV
Type rating	2000 kVA, 350 A
Installation altitude	2000 m
Maximum ambient temperature	43 °C
Raw water intake temperature	30 °C
k_H (water cooling)	0.925
k_T (ambient temperature)	0.955
k_T (raw water intake temperature)	1.0
k_U	1.0

The lower value for k_T is obtained here from the diagram for the ambient temperature.

$I \leq I_{rated} \times 0.925 \times 0.955 = I_{rated} \times 0.883$

A current derating of 11.7 % is required. The max. available output current of the converter is 309 A.

Technical data (continued)

SINAMICS GM150 in IGBT version Air cooling, without sine-wave filter		6SL3810-2LM32-5AA0	6SL3810-2LM33-0AA0	6SL3810-2LM33-5AA0	6SL3810-2LM34-0AA0	6SL3810-2LM34-6AA1
Output voltage 2.3 kV						
Type rating	kVA	1000	1200	1400	1600	1800
Shaft output [1]	kW	820	1000	1150	1300	1500
	hp	1000	1250	1500	1750	2000
Rated output current	A	250	300	350	400	460
Input voltage	kV	2 × 1.2	2 × 1.2	2 × 1.2	2 × 1.2	2 × 1.2
Rated input current [1]	A	2 × 220	2 × 264	2 × 308	2 × 351	2 × 404
Power loss [2]	kW	15	18	21	24	27
Efficiency [2]	%	98.3	98.3	98.3	98.3	98.4
Max. current demand of the auxiliary supply 1 AC 50/60 Hz 230 V	A	10	10	10	10	10
Max. current demand of the auxiliary supply 3 AC 50/60 Hz 400 V [3]	A	27	27	27	27	27
Cooling air flow rate	m^3/s	1.6	1.6	1.6	1.6	1.6
Sound pressure level L_{pA} (1 m)	dB	78	80	80	80	80
Measuring surface level L_s (1 m)	dB	18	18	18	18	18
Cable cross-sections, line-side, max. connectable per phase [4] [5]	mm^2 (DIN VDE)	3 × 240	3 × 240	3 × 240	3 × 240	3 × 240
	AWG/MCM (NEC, CEC)	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM
Cable cross-sections, motor-side, max. connectable per phase [4] [5]	mm^2 (DIN VDE)	3 × 240	3 × 240	3 × 240	3 × 240	3 × 240
	AWG/MCM (NEC, CEC)	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM
PE connection, max. connection cross-section at enclosure with M12 screw [4]	mm^2 (DIN VDE)	3 × 240	3 × 240	3 × 240	3 × 240	3 × 240
	AWG/MCM (NEC, CEC)	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM
Degree of protection		IP22	IP22	IP22	IP22	IP22
Dimensions (with doors and panels)						
• Width	mm	2420	2420	2420	2420	2420
• Height	mm	2570	2570	2570	2570	2570
• Depth	mm	1275	1275	1275	1275	1275
Circuit design (Page 2/4)		①	①	①	①	①
Weight	kg	1750	1750	1750	1750	1750

[1] The specifications for the rated input current and the power data in hp and kW are approximate values only; these have been calculated for operation with induction motors and for a typical power factor cos phi and motor efficiency.
The hp specifications are based on the NEC and CEC guidelines for the North American market. The kW values are specified in multiples of 50. Both approximate values need to be adapted to the motor which is actually used.

[2] Without cooling system.

[3] In addition, 20 A pre-charging current for 25 s.

[4] Figures refer to a subsystem; see “Circuit designs” for the number of subsystems to be connected on the line and motor side.

[5] The maximum permissible cable lengths must be observed (see Power cables in Section 7).

Technical data (continued)

SINAMICS GM150 in IGBT version Air cooling, without sine-wave filter		6SL3810- 2LM35-3AA1	6SL3810- 2LM36-0AA0	6SL3810- 2LM37-0AA1	6SL3810- 2LM38-0AA1
Output voltage 2.3 kV					
Type rating	kVA	2100	2400	2700	3200
Shaft output [1]	kW	1750	2000	2250	2650
	hp	2400	2750	3100	3600
Rated output current	A	530	600	700	800
Input voltage	kV	2 × 1.2	2 × 1.2	2 × 1.2	2 × 1.2
Rated input current [1]	A	2 × 465	2 × 539	2 × 614	2 × 702
Power loss [2]	kW	29	34	41	45
Efficiency [2]	%	98.6	98.4	98.6	98.6
Max. current demand of the auxiliary supply 1 AC 50/60 Hz 230 V	A	10	10	10	10
Max. current demand of the auxiliary supply 3 AC 50/60 Hz 400 V [3]	A	27	27	27	27
Cooling air flow rate	m^3/s	1.6	1.6	1.6	1.6
Sound pressure level L_{pA} (1 m)	dB	80	80	80	80
Measuring surface level L_s (1 m)	dB	18	18	18	18
Cable cross-sections, line-side, max. connectable per phase [4] [5]	mm^2 (DIN VDE)	3 × 240	3 × 240	3 × 240	3 × 240
	AWG/MCM (NEC, CEC)	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM
Cable cross-sections, motor-side, max. connectable per phase [4] [5]	mm^2 (DIN VDE)	3 × 240	3 × 240	3 × 240	3 × 240
	AWG/MCM (NEC, CEC)	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM
PE connection, max. connection cross-section at enclosure with M12 screw [4]	mm^2 (DIN VDE)	3 × 240	3 × 240	3 × 240	3 × 240
	AWG/MCM (NEC, CEC)	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM
Degree of protection		IP22	IP22	IP22	IP22
Dimensions (with doors and panels)					
• Width	mm	2420	2420	2420	2420
• Height	mm	2570	2570	2570	2570
• Depth	mm	1275	1275	1275	1275
Circuit design (Page 2/4)		①	①	①	①
Weight	kg	1800	1800	1800	1800

[1] The specifications for the rated input current and the power data in hp and kW are approximate values only; these have been calculated for operation with induction motors and for a typical power factor cos phi and motor efficiency.
The hp specifications are based on the NEC and CEC guidelines for the North American market. The kW values are specified in multiples of 50. Both approximate values need to be adapted to the motor which is actually used.

[2] Without cooling system.

[3] In addition, 20 A pre-charging current for 25 s.

[4] Figures refer to a subsystem; see "Circuit designs" for the number of subsystems to be connected on the line and motor side.

[5] The maximum permissible cable lengths must be observed (see Power cables in Section 7).

Technical data (continued)

SINAMICS GM150 in IGBT version Air cooling, without sine-wave filter		6SL3810-2LN31-8AA0	6SL3810-2LN32-2AA0	6SL3810-2LN32-6AA0	6SL3810-2LN33-0AA0	6SL3810-2LN33-5AA0
Output voltage 3.3 kV						
Type rating	kVA	1000	1300	1500	1700	2000
Shaft output [1]	kW	850	1050	1250	1400	1650
	hp	1000	1250	1500	2000	2250
Rated output current	A	180	220	260	300	350
Input voltage	kV	2 × 1.7	2 × 1.7	2 × 1.7	2 × 1.7	2 × 1.7
Rated input current [1]	A	2 × 153	2 × 199	2 × 230	2 × 260	2 × 309
Power loss [2]	kW	15	20	23	26	28
Efficiency [2]	%	98.3	98.2	98.2	98.3	98.4
Max. current demand of the auxiliary supply 1 AC 50/60 Hz 230 V	A	10	10	10	10	10
Max. current demand of the auxiliary supply 3 AC 50/60 Hz 400 V [3]	A	27	27	27	27	27
Cooling air flow rate	m^3/s	2.4	2.4	2.4	2.4	2.4
Sound pressure level L_{pA} (1 m)	dB	78	78	78	80	80
Measuring surface level L_s (1 m)	dB	18	18	18	18	18
Cable cross-sections, line-side, max. connectable per phase [4] [5]	mm^2 (DIN VDE)	3 × 240	3 × 240	3 × 240	3 × 240	3 × 240
	AWG/MCM (NEC, CEC)	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM
Cable cross-sections, motor-side, max. connectable per phase [4] [5]	mm^2 (DIN VDE)	3 × 240	3 × 240	3 × 240	3 × 240	3 × 240
	AWG/MCM (NEC, CEC)	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM
PE connection, max. connection cross-section at enclosure with M12 screw [4]	mm^2 (DIN VDE)	3 × 240	3 × 240	3 × 240	3 × 240	3 × 240
	AWG/MCM (NEC, CEC)	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM
Degree of protection		IP22	IP22	IP22	IP22	IP22
Dimensions (with doors and panels)						
• Width	mm	2420	2420	2420	2420	2420
• Height	mm	2570	2570	2570	2570	2570
• Depth	mm	1275	1275	1275	1275	1275
Circuit design (Page 2/4)		①	①	①	①	①
Weight	kg	1900	1900	1900	1900	1900

[1] The specifications for the rated input current and the power data in hp and kW are approximate values only; these have been calculated for operation with induction motors and for a typical power factor cos phi and motor efficiency.
The hp specifications are based on the NEC and CEC guidelines for the North American market. The kW values are specified in multiples of 50. Both approximate values need to be adapted to the motor which is actually used.

[2] Without cooling system.

[3] In addition, 20 A pre-charging current for 25 s.

[4] Figures refer to a subsystem; see “Circuit designs” for the number of subsystems to be connected on the line and motor side.

[5] The maximum permissible cable lengths must be observed (see Power cables in Section 7).

Technical data (continued)

SINAMICS GM150 in IGBT version Air cooling, without sine-wave filter		6SL3810-2LN34-0AA0	6SL3810-2LN34-6AA1	6SL3810-2LN35-3AA1	6SL3810-2LN36-0AA0	6SL3810-2LN37-0AA1
Output voltage 3.3 kV						
Type rating	kVA	2300	2600	3000	3400	3900
Shaft output [1]	kW	1900	2150	2500	2850	3550
	hp	2500	3000	3380	3750	4350
Rated output current	A	400	460	530	600	700
Input voltage	kV	2 × 1.7	2 × 1.7	2 × 1.7	2 × 1.7	2 × 1.7
Rated input current [1]	A	2 × 360	2 × 406	2 × 465	2 × 531	2 × 606
Power loss [2]	kW	32	34	39	44	48
Efficiency [2]	%	98.4	98.5	98.5	98.6	98.8
Max. current demand of the auxiliary supply 1 AC 50/60 Hz 230 V	A	10	10	10	10	10
Max. current demand of the auxiliary supply 3 AC 50/60 Hz 400 V [3]	A	27	27	27	27	27
Cooling air flow rate	m^3/s	2.4	2.4	2.4	2.4	2.4
Sound pressure level L_{pA} (1 m)	dB	80	80	80	80	80
Measuring surface level L_s (1 m)	dB	18	18	18	18	18
Cable cross-sections, line-side, max. connectable per phase [4] [5]	mm^2 (DIN VDE)	3 × 240	3 × 240	3 × 240	3 × 240	3 × 240
	AWG/MCM (NEC, CEC)	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM
Cable cross-sections, motor-side, max. connectable per phase [4] [5]	mm^2 (DIN VDE)	3 × 240	3 × 240	3 × 240	3 × 240	3 × 240
	AWG/MCM (NEC, CEC)	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM
PE connection, max. connection cross-section at enclosure with M12 screw [4]	mm^2 (DIN VDE)	3 × 240	3 × 240	3 × 240	3 × 240	3 × 240
	AWG/MCM (NEC, CEC)	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM
Degree of protection		IP22	IP22	IP22	IP22	IP22
Dimensions (with doors and panels)						
• Width	mm	2420	2420	2420	2420	2420
• Height	mm	2570	2570	2570	2570	2570
• Depth	mm	1275	1275	1275	1275	1275
Circuit design (Page 2/4)		①	①	①	①	①
Weight	kg	1950	1950	1950	2000	2000

[1] The specifications for the rated input current and the power data in hp and kW are approximate values only; these have been calculated for operation with induction motors and for a typical power factor cos phi and motor efficiency.
The hp specifications are based on the NEC and CEC guidelines for the North American market. The kW values are specified in multiples of 50. Both approximate values need to be adapted to the motor which is actually used.

[2] Without cooling system.

[3] In addition, 20 A pre-charging current for 25 s.

[4] Figures refer to a subsystem; see "Circuit designs" for the number of subsystems to be connected on the line and motor side.

[5] The maximum permissible cable lengths must be observed (see Power cables in Section 7).

Technical data (continued)

SINAMICS GM150 in IGBT version Air cooling, without sine-wave filter		6SL3810-2LN38-0AA1	6SL3810-2LN38-8AA1	6SL3810-2LN41-1AA0	6SL3810-2LN41-2AA1	6SL3810-2LN41-4AA1
Output voltage 3.3 kV						
Type rating	kVA	4600	5300	6300	7100	8000
Shaft output [1]	kW	4100	4450	5300	6000	6700
	hp	5000	6200	7000	8000	9500
Rated output current	A	800	2 × 465	2 × 550	2 × 625	2 × 700
Input voltage	kV	2 × 1.7	2 × 1.7	2 × (2 × 1.7)	2 × 1.7	2 × 1.7
Rated input current [1]	A	2 × 700	2 × (2 × 405)	2 × (2 × 492)	2 × (2 × 546)	2 × (2 × 611)
Power loss [2]	kW	53	70	82	89	96
Efficiency [2]	%	98.8	98.5	98.5	98.5	98.5
Max. current demand of the auxiliary supply 1 AC 50/60 Hz 230 V	A	10	10	10	10	10
Max. current demand of the auxiliary supply 3 AC 50/60 Hz 400 V [3]	A	27	54	54	54	54
Cooling air flow rate	m^3/s	2.4	4.7	4.7	4.7	4.7
Sound pressure level L_{pA} (1 m)	dB	80	85	85	85	85
Measuring surface level L_s (1 m)	dB	18	18	19	18	18
Cable cross-sections, line-side, max. connectable per phase [4] [5]	mm^2 (DIN VDE)	3 × 240	3 × 240	3 × 240	3 × 240	3 × 240
	AWG/MCM (NEC, CEC)	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM
Cable cross-sections, motor-side, max. connectable per phase [4] [5]	mm^2 (DIN VDE)	3 × 240	3 × 240	3 × 240	3 × 240	3 × 240
	AWG/MCM (NEC, CEC)	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM
PE connection, max. connection cross-section at enclosure with M12 screw [4]	mm^2 (DIN VDE)	3 × 240	3 × 240	3 × 240	3 × 240	3 × 240
	AWG/MCM (NEC, CEC)	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM
Degree of protection		IP22	IP22	IP22	IP22	IP22
Dimensions (with doors and panels)						
• Width	mm	2420	4220	4220	4220	4220
• Height	mm	2570	2570	2570	2570	2570
• Depth	mm	1275	1275	1275	1275	1275
Circuit design (Page 2/4)		①	③	③	③	③
Weight	kg	2000	3700	3700	3700	3700

[1] The specifications for the rated input current and the power data in hp and kW are approximate values only; these have been calculated for operation with induction motors and for a typical power factor cos phi and motor efficiency.
The hp specifications are based on the NEC and CEC guidelines for the North American market. The kW values are specified in multiples of 50. Both approximate values need to be adapted to the motor which is actually used.

[2] Without cooling system.

[3] In addition, 20 A pre-charging current for 25 s.

[4] Figures refer to a subsystem; see "Circuit designs" for the number of subsystems to be connected on the line and motor side.

[5] The maximum permissible cable lengths must be observed (see Power cables in Section 7).

Technical data (continued)

SINAMICS GM150 in IGBT version Air cooling, without sine-wave filter		6SL3810-2LP31-8AA0	6SL3810-2LP32-2AA0	6SL3810-2LP32-6AA0	6SL3810-2LP33-0AA0	6SL3810-2LP33-5AA0
Output voltage 4.16 kV						
Type rating	kVA	1300	1600	1900	2200	2500
Shaft output [1]	kW	1000	1300	1550	1800	2100
	hp	1500	1750	2000	2500	3000
Rated output current	A	180	220	260	300	350
Input voltage	kV	2 × 2.2	2 × 2.2	2 × 2.2	2 × 2.2	2 × 2.2
Rated input current [1]	A	2 × 158	2 × 194	2 × 233	2 × 273	2 × 310
Power loss [2]	kW	20	24	27	31	33
Efficiency [2]	%	98.2	98.3	98.4	98.4	98.5
Max. current demand of the auxiliary supply 1 AC 50/60 Hz 230 V	A	10	10	10	10	10
Max. current demand of the auxiliary supply 3 AC 50/60 Hz 400 V [3]	A	27	27	27	27	27
Cooling air flow rate	m^3/s	2.4	2.4	2.4	2.4	2.4
Sound pressure level L_{pA} (1 m)	dB	78	78	78	80	80
Measuring surface level L_s (1 m)	dB	18	18	18	18	18
Cable cross-sections, line-side, max. connectable per phase [4] [5]	mm^2 (DIN VDE)	3 × 240	3 × 240	3 × 240	3 × 240	3 × 240
	AWG/MCM (NEC, CEC)	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM
Cable cross-sections, motor-side, max. connectable per phase [4] [5]	mm^2 (DIN VDE)	3 × 240	3 × 240	3 × 240	3 × 240	3 × 240
	AWG/MCM (NEC, CEC)	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM
PE connection, max. connection cross-section at enclosure with M12 screw [4]	mm^2 (DIN VDE)	3 × 240	3 × 240	3 × 240	3 × 240	3 × 240
	AWG/MCM (NEC, CEC)	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM
Degree of protection		IP22	IP22	IP22	IP22	IP22
Dimensions (with doors and panels)						
• Width	mm	2420	2420	2420	2420	2420
• Height	mm	2570	2570	2570	2570	2570
• Depth	mm	1275	1275	1275	1275	1275
Circuit design (Page 2/4)		①	①	①	①	①
Weight	kg	1900	1900	1900	1950	1950

[1] The specifications for the rated input current and the power data in hp and kW are approximate values only; these have been calculated for operation with induction motors and for a typical power factor cos phi and motor efficiency.
The hp specifications are based on the NEC and CEC guidelines for the North American market. The kW values are specified in multiples of 50.
Both approximate values need to be adapted to the motor which is actually used.

[2] Without cooling system.

[3] In addition, 20 A pre-charging current for 25 s.

[4] Figures refer to a subsystem; see "Circuit designs" for the number of subsystems to be connected on the line and motor side.

[5] The maximum permissible cable lengths must be observed (see Power cables in Section 7).

Technical data (continued)

SINAMICS GM150 in IGBT version Air cooling, without sine-wave filter		6SL3810-2LP34-0AA0	6SL3810-2LP34-6AA1	6SL3810-2LP35-3AA1	6SL3810-2LP36-0AA0	6SL3810-2LP37-0AA1
Output voltage 4.16 kV						
Type rating	kVA	2900	3300	3800	4300	5000
Shaft output [1]	kW	2400	2800	3100	3600	4150
	hp	3250	3800	4100	5000	5650
Rated output current	A	400	460	530	600	690
Input voltage	kV	2 × 2.2	2 × 2.2	2 × 2.2	2 × 2.2	2 × 2.2
Rated input current [1]	A	2 × 359	2 × 397	2 × 465	2 × 533	2 × 600
Power loss [2]	kW	38	43	48	56	54
Efficiency [2]	%	98.5	98.5	98.6	98.5	98.7
Max. current demand of the auxiliary supply 1 AC 50/60 Hz 230 V	A	10	10	10	10	10
Max. current demand of the auxiliary supply 3 AC 50/60 Hz 400 V [3]	A	27	27	27	27	27
Cooling air flow rate	m^3/s	2.4	2.4	2.4	2.4	2.4
Sound pressure level L_{pA} (1 m)	dB	80	80	80	80	80
Measuring surface level L_s (1 m)	dB	18	18	18	18	18
Cable cross-sections, line-side, max. connectable per phase [4] [5]	mm^2 (DIN VDE)	3 × 240	3 × 240	3 × 240	3 × 240	3 × 240
	AWG/MCM (NEC, CEC)	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM
Cable cross-sections, motor-side, max. connectable per phase [4] [5]	mm^2 (DIN VDE)	3 × 240	3 × 240	3 × 240	3 × 240	3 × 240
	AWG/MCM (NEC, CEC)	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM
PE connection, max. connection cross-section at enclosure with M12 screw [4]	mm^2 (DIN VDE)	3 × 240	3 × 240	3 × 240	3 × 240	3 × 240
	AWG/MCM (NEC, CEC)	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM
Degree of protection		IP22	IP22	IP22	IP22	IP22
Dimensions (with doors and panels)						
• Width	mm	2420	2420	2420	2420	2420
• Height	mm	2570	2570	2570	2570	2570
• Depth	mm	1275	1275	1275	1275	1275
Circuit design (Page 2/4)		①	①	①	①	①
Weight	kg	1950	2000	2000	2000	2000

[1] The specifications for the rated input current and the power data in hp and kW are approximate values only; these have been calculated for operation with induction motors and for a typical power factor cos phi and motor efficiency.
The hp specifications are based on the NEC and CEC guidelines for the North American market. The kW values are specified in multiples of 50. Both approximate values need to be adapted to the motor which is actually used.

[2] Without cooling system.

[3] In addition, 20 A pre-charging current for 25 s.

[4] Figures refer to a subsystem; see “Circuit designs” for the number of subsystems to be connected on the line and motor side.

[5] The maximum permissible cable lengths must be observed (see Power cables in Section 7).

2

Technical data (continued)

SINAMICS GM150 in IGBT version Air cooling, without sine-wave filter		6SL3810-2LP38-0AA1	6SL3810-2LP38-8AA1	6SL3810-2LP41-1AA0	6SL3810-2LP41-2AA1	6SL3810-2LP41-4AA1
Output voltage 4.16 kV						
Type rating	kVA	5800	6700	7900	9000	10100
Shaft output [1]	kW	4800	5650	6600	7600	8500
	hp	6600	7600	9000	10250	11500
Rated output current	A	800	2 × 465	2 × 550	2 × 625	2 × 700
Input voltage	kV	2 × 2.2	2 × (2 × 2.2)	2 × (2 × 2.2)	2 × (2 × 2.2)	2 × (2 × 2.2)
Rated input current [1]	A	2 × 700	2 × (2 × 405)	2 × (2 × 490)	2 × (2 × 543)	2 × (2 × 608)
Power loss [2]	kW	56	83	103	112	125
Efficiency [2]	%	98.8	98.5	98.5	98.5	98.5
Max. current demand of the auxiliary supply 1 AC 50/60 Hz 230 V	A	10	10	10	10	10
Max. current demand of the auxiliary supply 3 AC 50/60 Hz 400 V [3]	A	27	54	54	54	54
Cooling air flow rate	m^3/s	2.4	4.7	4.7	4.7	4.7
Sound pressure level L_{pA} (1 m)	dB	80	85	85	85	85
Measuring surface level L_s (1 m)	dB	18	19	19	19	19
Cable cross-sections, line-side, max. connectable per phase [4] [5]	mm^2 (DIN VDE)	3 × 240	3 × 240	3 × 240	3 × 240	3 × 240
	AWG/MCM (NEC, CEC)	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM
Cable cross-sections, motor-side, max. connectable per phase [4] [5]	mm^2 (DIN VDE)	3 × 240	3 × 240	3 × 240	3 × 240	3 × 240
	AWG/MCM (NEC, CEC)	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM
PE connection, max. connection cross-section at enclosure with M12 screw [4]	mm^2 (DIN VDE)	3 × 240	3 × 240	3 × 240	3 × 240	3 × 240
	AWG/MCM (NEC, CEC)	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM
Degree of protection		IP22	IP22	IP22	IP22	IP22
Dimensions (with doors and panels)						
• Width	mm	2420	4220	4220	4220	4220
• Height	mm	2570	2570	2570	2570	2570
• Depth	mm	1275	1275	1275	1275	1275
Circuit design (Page 2/4)		①	③	③	③	③
Weight	kg	2000	3700	3700	3700	3700

[1] The specifications for the rated input current and the power data in hp and kW are approximate values only; these have been calculated for operation with induction motors and for a typical power factor cos phi and motor efficiency.
The hp specifications are based on the NEC and CEC guidelines for the North American market. The kW values are specified in multiples of 50. Both approximate values need to be adapted to the motor which is actually used.

[2] Without cooling system.

[3] In addition, 20 A pre-charging current for 25 s.

[4] Figures refer to a subsystem; see "Circuit designs" for the number of subsystems to be connected on the line and motor side.

[5] The maximum permissible cable lengths must be observed (see Power cables in Section 7).

Technical data (continued)

SINAMICS GM150 in IGBT version Air cooling, with sine-wave filter (option Y15)		6SL3810-2LM32-5AA0	6SL3810-2LM33-0AA0	6SL3810-2LM33-5AA0	6SL3810-2LM34-0AA0
Output voltage 2.3 kV					
Type rating	kVA	850	1000	1150	1300
Shaft output [1]	kW	700	800	950	1100
	hp	900	1000	1250	1500
Rated output current	A	210	250	290	330
Input voltage	kV	2 × 1.2	2 × 1.2	2 × 1.2	2 × 1.2
Rated input current [1]	A	2 × 182	2 × 221	2 × 257	2 × 293
Power loss [2]	kW	18	22	24	26
Efficiency [2]	%	97.5	97.5	97.5	97.5
Max. current demand of the auxiliary supply 1 AC 50/60 Hz 230 V	A	10	10	10	10
Max. current demand of the auxiliary supply 3 AC 50/60 Hz 400 V [3]	A	33	33	33	33
Cooling air flow rate	m^3/s	2.2	2.2	2.2	2.2
Sound pressure level L_{pA} (1 m)	dB	78	81	81	81
Measuring surface level L_s (1 m)	dB	18	18	18	18
Cable cross-sections, line-side, max. connectable per phase [4] [5]	mm^2 (DIN VDE)	3 × 240	3 × 240	3 × 240	3 × 240
	AWG/MCM (NEC, CEC)	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM
Cable cross-sections, motor-side, max. connectable per phase [4] [5]	mm^2 (DIN VDE)	3 × 240	3 × 240	3 × 240	3 × 240
	AWG/MCM (NEC, CEC)	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM
PE connection, max. connection cross-section at enclosure with M12 screw [4]	mm^2 (DIN VDE)	3 × 240	3 × 240	3 × 240	3 × 240
	AWG/MCM (NEC, CEC)	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM
Degree of protection		IP22	IP22	IP22	IP22
Dimensions (with doors and panels)					
• Width	mm	3340	3340	3340	3340
• Height	mm	2570	2570	2570	2570
• Depth	mm	1275	1275	1275	1275
Circuit design (Page 2/5)		④	④	④	④
Weight	kg	2800	2800	2800	2850

[1] The specifications for the rated input current and the power data in hp and kW are approximate values only; these have been calculated for operation with induction motors and for a typical power factor cos phi and motor efficiency.
The hp specifications are based on the NEC and CEC guidelines for the North American market. The kW values are specified in multiples of 50. Both approximate values need to be adapted to the motor which is actually used.

[2] Without cooling system.

[3] In addition, 20 A pre-charging current for 25 s.

[4] Figures refer to a subsystem; see "Circuit designs" for the number of subsystems to be connected on the line and motor side.

[5] The maximum permissible cable lengths must be observed (see Power cables in Section 7).

Technical data (continued)

SINAMICS GM150 in IGBT version Air cooling, with sine-wave filter (option Y15)		6SL3810-2LM34-6AA1	6SL3810-2LM35-3AA1	6SL3810-2LM36-0AA0
Output voltage 2.3 kV				
Type rating	kVA	1450	1650	2000
Shaft output [1]	kW	1200	1350	1650
	hp	1600	1850	2250
Rated output current	A	390	420	500
Input voltage	kV	2 × 1.2	2 × 1.2	2 × 1.2
Rated input current [1]	A	2 × 337	2 × 365	2 × 444
Power loss [2]	kW	28	31	36
Efficiency [2]	%	97.9	98.1	98.0
Max. current demand of the auxiliary supply 1 AC 50/60 Hz 230 V	A	10	10	10
Max. current demand of the auxiliary supply 3 AC 50/60 Hz 400 V [3]	A	33	33	33
Cooling air flow rate	m^3/s	2.2	2.2	2.2
Sound pressure level L_{pA} (1 m)	dB	81	81	81
Measuring surface level L_s (1 m)	dB	18	18	18
Cable cross-sections, line-side, max. connectable per phase [4] [5]	mm^2 (DIN VDE)	3 × 240	3 × 240	3 × 240
	AWG/MCM (NEC, CEC)	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM
Cable cross-sections, motor-side, max. connectable per phase [4] [5]	mm^2 (DIN VDE)	3 × 240	3 × 240	3 × 240
	AWG/MCM (NEC, CEC)	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM
PE connection, max. connection cross-section at enclosure with M12 screw [4]	mm^2 (DIN VDE)	3 × 240	3 × 240	3 × 240
	AWG/MCM (NEC, CEC)	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM
Degree of protection		IP22	IP22	IP22
Dimensions (with doors and panels)				
• Width	mm	3340	3340	3340
• Height	mm	2570	2570	2570
• Depth	mm	1275	1275	1275
Circuit design (Page 2/5)		④	④	④
Weight	kg	2900	2950	2950

[1] The specifications for the rated input current and the power data in hp and kW are approximate values only; these have been calculated for operation with induction motors and for a typical power factor cos phi and motor efficiency.
The hp specifications are based on the NEC and CEC guidelines for the North American market. The kW values are specified in multiples of 50. Both approximate values need to be adapted to the motor which is actually used.

[2] Without cooling system.

[3] In addition, 20 A pre-charging current for 25 s.

[4] Figures refer to a subsystem; see "Circuit designs" for the number of subsystems to be connected on the line and motor side.

[5] The maximum permissible cable lengths must be observed (see Power cables in Section 7).

Technical data (continued)

SINAMICS GM150 in IGBT version Air cooling, with sine-wave filter (option Y15)		6SL3810-2LN31-8AA0	6SL3810-2LN32-2AA0	6SL3810-2LN32-6AA0	6SL3810-2LN33-0AA0	6SL3810-2LN33-5AA0	6SL3810-2LN34-0AA0
Output voltage 3.3 kV							
Type rating	kVA	850	1100	1250	1450	1700	1950
Shaft output [1]	kW	700	900	1050	1200	1400	1600
	hp	900	1000	1250	1500	1750	2000
Rated output current	A	150	190	220	250	300	340
Input voltage	kV	2 × 1.2	2 × 1.7	2 × 1.7	2 × 1.7	2 × 1.7	2 × 1.7
Rated input current [1]	A	2 × 130	2 × 171	2 × 197	2 × 223	2 × 261	2 × 304
Power loss [2]	kW	19	22	24	28	31	35
Efficiency [2]	%	97.4	97.5	97.9	97.8	97.9	98.0
Max. current demand of the auxiliary supply 1 AC 50/60 Hz 230 V	A	10	10	10	10	10	10
Max. current demand of the auxiliary supply 3 AC 50/60 Hz 400 V [3]	A	33	33	33	33	33	33
Cooling air flow rate	m^3/s	3	3	3	3	3	3
Sound pressure level L_{pA} (1 m)	dB	79	79	79	81	81	81
Measuring surface level L_s (1 m)	dB	18	18	18	18	18	18
Cable cross-sections, line-side, max. connectable per phase [4] [5]	mm^2 (DIN VDE)	3 × 240	3 × 240	3 × 240	3 × 240	3 × 240	3 × 240
	AWG/MCM (NEC, CEC)	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM
Cable cross-sections, motor-side, max. connectable per phase [4] [5]	mm^2 (DIN VDE)	3 × 240	3 × 240	3 × 240	3 × 240	3 × 240	3 × 240
	AWG/MCM (NEC, CEC)	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM
PE connection, max. connection cross-section at enclosure with M12 screw [4]	mm^2 (DIN VDE)	3 × 240	3 × 240	3 × 240	3 × 240	3 × 240	3 × 240
	AWG/MCM (NEC, CEC)	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM
Degree of protection		IP22	IP22	IP22	IP22	IP22	IP22
Dimensions (with doors and panels)							
• Width	mm	3340	3340	3340	3340	3340	3640
• Height	mm	2570	2570	2570	2570	2570	2570
• Depth	mm	1275	1275	1275	1275	1275	1275
Circuit design (Page 2/5)		④	④	④	④	④	④
Weight	kg	3050	3050	3100	3100	3100	3300

[1] The specifications for the rated input current and the power data in hp and kW are approximate values only; these have been calculated for operation with induction motors and for a typical power factor cos phi and motor efficiency.
The hp specifications are based on the NEC and CEC guidelines for the North American market. The kW values are specified in multiples of 50. Both approximate values need to be adapted to the motor which is actually used.

[2] Without cooling system.

[3] In addition, 20 A pre-charging current for 25 s.

[4] Figures refer to a subsystem; see “Circuit designs” for the number of subsystems to be connected on the line and motor side.

[5] The maximum permissible cable lengths must be observed (see Power cables in Section 7).

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Technical data (continued)

SINAMICS GM150 in IGBT version Air cooling, with sine-wave filter (option Y15)		6SL3810-2LN34-6AA1	6SL3810-2LN35-3AA1	6SL3810-2LN36-0AA0	6SL3810-2LN38-8AA1	6SL3810-2LN41-1AA0
Output voltage 3.3 kV						
Type rating	kVA	2350	2600	2900	4750	5350
Shaft output [1]	kW	1850	2100	2450	3650	4500
	hp	2500	2850	3250	5100	6000
Rated output current	A	410	440	510	830	940
Input voltage	kV	2 × 1.7	2 × 1.7	2 × 1.7	2 × (2 × 1.7)	2 × (2 × 1.7)
Rated input current [1]	A	2 × 347	2 × 417	2 × 453	2 × (2 × 360)	2 × (2 × 420)
Power loss [2]	kW	40	42	49	73	86
Efficiency [2]	%	98.1	98.1	98.1	98.2	98.2
Max. current demand of the auxiliary supply 1 AC 50/60 Hz 230 V	A	10	10	10	10	10
Max. current demand of the auxiliary supply 3 AC 50/60 Hz 400 V [3]	A	33	33	33	66	66
Cooling air flow rate	m^3/s	3	3	3	5.8	5.8
Sound pressure level L_{pA} (1 m)	dB	81	81	81	87	87
Measuring surface level L_s (1 m)	dB	18	18	18	19	19
Cable cross-sections, line-side, max. connectable per phase [4] [5]	mm^2 (DIN VDE)	3 × 240	3 × 240	3 × 240	3 × 240	3 × 240
	AWG/MCM (NEC, CEC)	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM
Cable cross-sections, motor-side, max. connectable per phase [4] [5]	mm^2 (DIN VDE)	3 × 240	3 × 240	3 × 240	3 × 240	3 × 240
	AWG/MCM (NEC, CEC)	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM
PE connection, max. connection cross-section at enclosure with M12 screw [4]	mm^2 (DIN VDE)	3 × 240	3 × 240	3 × 240	3 × 240	3 × 240
	AWG/MCM (NEC, CEC)	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM
Degree of protection		IP22	IP22	IP22	IP22	IP22
Dimensions (with doors and panels)						
• Width	mm	3640	3640	3640	6660	6660
• Height	mm	2570	2570	2570	2570	2570
• Depth	mm	1275	1275	1275	1275	1275
Circuit design (Page 2/5)		④	④	④	⑥	⑥
Weight	kg	3350	3350	3500	6500	6500

[1] The specifications for the rated input current and the power data in hp and kW are approximate values only; these have been calculated for operation with induction motors and for a typical power factor cos phi and motor efficiency.
The hp specifications are based on the NEC and CEC guidelines for the North American market. The kW values are specified in multiples of 50. Both approximate values need to be adapted to the motor which is actually used.

[2] Without cooling system.

[3] In addition, 20 A pre-charging current for 25 s.

[4] Figures refer to a subsystem; see "Circuit designs" for the number of subsystems to be connected on the line and motor side.

[5] The maximum permissible cable lengths must be observed (see Power cables in Section 7).

Technical data (continued)

SINAMICS GM150 in IGBT version Air cooling, with sine-wave filter (option Y15)		6SL3810-2LP31-8AA0	6SL3810-2LP32-2AA0	6SL3810-2LP32-6AA0	6SL3810-2LP33-0AA0	6SL3810-2LP33-5AA0	6SL3810-2LP34-0AA0
Output voltage 4.16 kV							
Type rating	kVA	1100	1350	1600	1850	2100	2450
Shaft output [1]	kW	900	1150	1300	1550	1750	2000
	hp	1250	1500	1750	2000	2250	2750
Rated output current	A	150	190	220	260	290	340
Input voltage	kV	2 × 2.2	2 × 2.2	2 × 2.2	2 × 2.2	2 × 2.2	2 × 2.2
Rated input current [1]	A	2 × 133	2 × 163	2 × 195	2 × 225	2 × 262	2 × 304
Power loss [2]	kW	24	25	29	33	38	41
Efficiency [2]	%	97.5	97.9	97.9	98.0	98.0	98.1
Max. current demand of the auxiliary supply 1 AC 50/60 Hz 230 V	A	10	10	10	10	10	10
Max. current demand of the auxiliary supply 3 AC 50/60 Hz 400 V [3]	A	33	33	33	33	33	33
Cooling air flow rate	m^3/s	3	3	3	3	3	3
Sound pressure level L_{pA} (1 m)	dB	79	79	79	81	81	81
Measuring surface level L_s (1 m)	dB	18	18	18	18	18	18
Cable cross-sections, line-side, max. connectable per phase [4] [5]	mm^2 (DIN VDE)	3 × 240	3 × 240	3 × 240	3 × 240	3 × 240	3 × 240
	AWG/MCM (NEC, CEC)	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM
Cable cross-sections, motor-side, max. connectable per phase [4] [5]	mm^2 (DIN VDE)	3 × 240	3 × 240	3 × 240	3 × 240	3 × 240	3 × 240
	AWG/MCM (NEC, CEC)	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM
PE connection, max. connection cross-section at enclosure with M12 screw [4]	mm^2 (DIN VDE)	3 × 240	3 × 240	3 × 240	3 × 240	3 × 240	3 × 240
	AWG/MCM (NEC, CEC)	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM
Degree of protection		IP22	IP22	IP22	IP22	IP22	IP22
Dimensions (with doors and panels)							
• Width	mm	3640	3640	3640	3640	3640	3640
• Height	mm	2570	2570	2570	2570	2570	2570
• Depth	mm	1275	1275	1275	1275	1275	1275
Circuit design (Page 2/5)		④	④	④	④	④	④
Weight	kg	3300	3300	3300	3350	3350	3350

[1] The specifications for the rated input current and the power data in hp and kW are approximate values only; these have been calculated for operation with induction motors and for a typical power factor cos phi and motor efficiency.
The hp specifications are based on the NEC and CEC guidelines for the North American market. The kW values are specified in multiples of 50. Both approximate values need to be adapted to the motor which is actually used.

[2] Without cooling system.

[3] In addition, 20 A pre-charging current for 25 s.

[4] Figures refer to a subsystem; see "Circuit designs" for the number of subsystems to be connected on the line and motor side.

[5] The maximum permissible cable lengths must be observed (see Power cables in Section 7).

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Technical data (continued)

SINAMICS GM150 in IGBT version Air cooling, with sine-wave filter (option Y15)		6SL3810-2LP34-6AA1	6SL3810-2LP35-3AA1	6SL3810-2LP36-0AA0	6SL3810-2LP38-8AA1	6SL3810-2LP41-1AA0
Output voltage 4.16 kV						
Type rating	kVA	2950	3250	3600	6000	6650
Shaft output [1]	kW	2400	2600	3000	5100	5500
	hp	3250	3600	4000	6800	7500
Rated output current	A	410	480	500	830	920
Input voltage	kV	2 × 2.2	2 × 2.2	2 × 2.2	2 × (2 × 2.2)	2 × (2 × 2.2)
Rated input current [1]	A	2 × 355	2 × 417	2 × 449	2 × (2 × 360)	2 × (2 × 413)
Power loss [2]	kW	47	52	61	85	106
Efficiency [2]	%	98.1	98.2	98.1	98.3	98.2
Max. current demand of the auxiliary supply 1 AC 50/60 Hz 230 V	A	10	10	10	10	10
Max. current demand of the auxiliary supply 3 AC 50/60 Hz 400 V [3]	A	33	33	33	66	66
Cooling air flow rate	m^3/s	3	3	3	5.8	5.8
Sound pressure level L_{pA} (1 m)	dB	81	81	81	87	87
Measuring surface level L_s (1 m)	dB	18	18	18	19	19
Cable cross-sections, line-side, max. connectable per phase [4] [5]	mm^2 (DIN VDE)	3 × 240	3 × 240	3 × 240	3 × 240	3 × 240
	AWG/MCM (NEC, CEC)	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM
Cable cross-sections, motor-side, max. connectable per phase [4] [5]	mm^2 (DIN VDE)	3 × 240	3 × 240	3 × 240	3 × 240	3 × 240
	AWG/MCM (NEC, CEC)	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM
PE connection, max. connection cross-section at enclosure with M12 screw [4]	mm^2 (DIN VDE)	3 × 240	3 × 240	3 × 240	3 × 240	3 × 240
	AWG/MCM (NEC, CEC)	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM
Degree of protection		IP22	IP22	IP22	IP22	IP22
Dimensions (with doors and panels)						
• Width	mm	3640	3640	3640	6660	6660
• Height	mm	2570	2570	2570	2570	2570
• Depth	mm	1275	1275	1275	1275	1275
Circuit design (Page 2/5)		④	④	④	⑥	⑥
Weight	kg	3450	3450	3450	6500	6600

[1] The specifications for the rated input current and the power data in hp and kW are approximate values only; these have been calculated for operation with induction motors and for a typical power factor cos phi and motor efficiency.
The hp specifications are based on the NEC and CEC guidelines for the North American market. The kW values are specified in multiples of 50.
Both approximate values need to be adapted to the motor which is actually used.

[2] Without cooling system.

[3] In addition, 20 A pre-charging current for 25 s.

[4] Figures refer to a subsystem; see "Circuit designs" for the number of subsystems to be connected on the line and motor side.

[5] The maximum permissible cable lengths must be observed (see Power cables in Section 7).

Technical data (continued)

SINAMICS GM150 in IGBT version Water cooling, without sine-wave filter		6SL3815-2LM35-0AA0	6SL3815-2LM35-5AA0	6SL3815-2LM36-1AA0	6SL3815-2LM36-7AA0	6SL3815-2LM37-4AA0	6SL3815-2LM38-0AA0
Output voltage 2.3 kV							
Type rating	kVA	2000	2200	2400	2700	2900	3200
Shaft output [1]	kW	1650	1800	2000	2250	2450	2650
	hp	2250	2500	2750	3000	3250	3500
Rated output current	A	500	550	610	675	740	800
Input voltage	kV	2 × 1.2	2 × 1.2	2 × 1.2	2 × 1.2	2 × 1.2	2 × 1.2
Rated input current [1]	A	2 × 444	2 × 494	2 × 539	2 × 605	2 × 650	2 × 717
Power loss [2] [3]	kW	28	31	34	35	38	42
Efficiency [3]	%	98.4	98.4	98.4	98.5	98.5	98.5
Max. current demand of the auxiliary supply 1 AC 50/60 Hz 230 V	A	10	10	10	10	10	10
Max. current demand of the auxiliary supply 3 AC 50/60 Hz 400 V [4]	A	25	25	25	25	25	25
Cooling water flow rate (raw water/deionized water)	l/min	72	72	72	72	72	72
Sound pressure level L_{pA} (1 m)	dB	73	73	73	73	73	73
Measuring surface level L_s (1 m)	dB	18	18	18	18	18	18
Cable cross-sections, line-side, max. connectable per phase [5] [6]	mm^2 (DIN VDE)	3 × 240	3 × 240	2 × 240	2 × 240	3 × 240	3 × 240
	AWG/MCM (NEC, CEC)	3 × 500 MCM	3 × 500 MCM	2 × 500 MCM	2 × 500 MCM	3 × 500 MCM	3 × 500 MCM
Cable cross-sections, motor-side, max. connectable per phase [5] [6]	mm^2 (DIN VDE)	3 × 240	3 × 240	2 × 240	2 × 240	3 × 240	3 × 240
	AWG/MCM (NEC, CEC)	3 × 500 MCM	3 × 500 MCM	2 × 500 MCM	2 × 500 MCM	3 × 500 MCM	3 × 500 MCM
PE connection, max. connection cross-section at enclosure with M12 screw [5]	mm^2 (DIN VDE)	3 × 240	3 × 240	2 × 240	2 × 240	3 × 240	3 × 240
	AWG/MCM (NEC, CEC)	3 × 500 MCM	3 × 500 MCM	2 × 500 MCM	2 × 500 MCM	3 × 500 MCM	3 × 500 MCM
Degree of protection		IP43	IP43	IP43	IP43	IP43	IP43
Dimensions (with doors and panels)							
• Width	mm	3620	3620	3620	3620	3620	3620
• Height	mm	2280	2280	2280	2280	2280	2280
• Depth	mm	1275	1275	1275	1275	1275	1275
Circuit design (Page 2/4)		①	①	①	①	①	①
Weight	kg	2600	2650	2650	2650	2700	2700

[1] The specifications for the rated input current and the power data in hp and kW are approximate values only; these have been calculated for operation with induction motors and for a typical power factor cos phi and motor efficiency.
The hp specifications are based on the NEC and CEC guidelines for the North American market. The kW values are specified in multiples of 50. Both approximate values have to be adapted to the motor that is actually used.

[2] Approx. 5 % of the power loss is dissipated into the atmosphere.

[3] Without cooling system.

[4] In addition, 20 A pre-charging current for 25 s.

[5] Figures refer to a subsystem; see “Circuit designs” for the number of subsystems to be connected on the line and motor side.

[6] The maximum permissible cable lengths must be observed (see Power cables in Section 7).

Technical data (continued)

SINAMICS GM150 in IGBT version Water cooling, without sine-wave filter		6SL3815-2LN33-5AA0	6SL3815-2LN34-0AA0	6SL3815-2LN34-5AA0	6SL3815-2LN35-0AA0	6SL3815-2LN35-5AA0
Output voltage 3.3 kV						
Type rating	kVA	2000	2300	2600	2900	3100
Shaft output [1]	kW	1650	1900	2150	2400	2650
	hp	2250	2500	3000	3250	3500
Rated output current	A	350	400	450	500	550
Input voltage	kV	2 × 1.7	2 × 1.7	2 × 1.7	2 × 1.7	2 × 1.7
Rated input current [1]	A	2 × 309	2 × 360	2 × 406	2 × 453	2 × 484
Power loss [2] [3]	kW	28	32	34	38	40
Efficiency [3]	%	98.4	98.4	98.5	98.5	98.6
Max. current demand of the auxiliary supply 1 AC 50/60 Hz 230 V	A	10	10	10	10	10
Max. current demand of the auxiliary supply 3 AC 50/60 Hz 400 V [4]	A	14	14	14	14	14
Cooling water flow rate (raw water/deionized water)	l/min	108	108	108	108	108
Sound pressure level L_{pA} (1 m)	dB	73	73	73	73	73
Measuring surface level L_s (1 m)	dB	18	18	18	18	18
Cable cross-sections, line-side, max. connectable per phase [5] [6]	mm^2 (DIN VDE)	3 × 240	3 × 240	3 × 240	3 × 240	3 × 240
	AWG/MCM (NEC, CEC)	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM
Cable cross-sections, motor-side, max. connectable per phase [5] [6]	mm^2 (DIN VDE)	3 × 240	3 × 240	3 × 240	3 × 240	3 × 240
	AWG/MCM (NEC, CEC)	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM
PE connection, max. connection cross-section at enclosure with M12 screw [5]	mm^2 (DIN VDE)	3 × 240	3 × 240	3 × 240	3 × 240	3 × 240
	AWG/MCM (NEC, CEC)	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM
Degree of protection		IP43	IP43	IP43	IP43	IP43
Dimensions (with doors and panels)						
• Width	mm	3620	3620	3620	3620	3620
• Height	mm	2280	2280	2280	2280	2280
• Depth	mm	1275	1275	1275	1275	1275
Circuit design (Page 2/4)		①	①	①	①	①
Weight	kg	2750	2800	2800	2800	2850

[1] The specifications for the rated input current and the power data in hp and kW are approximate values only; these have been calculated for operation with induction motors and for a typical power factor cos phi and motor efficiency.
The hp specifications are based on the NEC and CEC guidelines for the North American market. The kW values are specified in multiples of 50. Both approximate values have to be adapted to the motor that is actually used.

[2] Approx. 5 % of the power loss is dissipated into the atmosphere.

[3] Without cooling system.

[4] In addition, 20 A pre-charging current for 25 s.

[5] Figures refer to a subsystem; see “Circuit designs” for the number of subsystems to be connected on the line and motor side.

[6] The maximum permissible cable lengths must be observed (see Power cables in Section 7).

Technical data (continued)

SINAMICS GM150 in IGBT version Water cooling, without sine-wave filter		6SL3815-2LN36-1AA0	6SL3815-2LN36-7AA0	6SL3815-2LN37-4AA0	6SL3815-2LN38-0AA0	6SL3815-2LN38-8AA0
Output voltage 3.3 kV						
Type rating	kVA	3500	3900	4200	4600	5100
Shaft output [1]	kW	2900	3200	3500	3800	4250
	hp	4000	4250	4500	5000	6000
Rated output current	A	610	675	740	800	2 × 445
Input voltage	kV	2 × 1.7	2 × 1.7	2 × 1.7	2 × 1.7	2 × (2 × 1.7)
Rated input current [1]	A	2 × 547	2 × 609	2 × 656	2 × 719	2 × (2 × 399)
Power loss [2] [3]	kW	46	51	55	60	66
Efficiency [3]	%	98.5	98.5	98.5	98.5	98.6
Max. current demand of the auxiliary supply 1 AC 50/60 Hz 230 V	A	10	10	10	10	10
Max. current demand of the auxiliary supply 3 AC 50/60 Hz 400 V [4]	A	25	25	25	25	31
Cooling water flow rate (raw water/deionized water)	l/min	108	108	108	108	216
Sound pressure level L_{pA} (1 m)	dB	73	73	73	73	76
Measuring surface level L_s (1 m)	dB	18	18	18	18	19
Cable cross-sections, line-side, max. connectable per phase [5] [6]	mm^2 (DIN VDE)	2 × 240	2 × 240	3 × 240	3 × 240	2 × 240
	AWG/MCM (NEC, CEC)	2 × 500 MCM	2 × 500 MCM	3 × 500 MCM	3 × 500 MCM	2 × 500 MCM
Cable cross-sections, motor-side, max. connectable per phase [5] [6]	mm^2 (DIN VDE)	2 × 240	2 × 240	3 × 240	3 × 240	2 × 240
	AWG/MCM (NEC, CEC)	2 × 500 MCM	2 × 500 MCM	3 × 500 MCM	3 × 500 MCM	2 × 500 MCM
PE connection, max. connection cross-section at enclosure with M12 screw [5]	mm^2 (DIN VDE)	2 × 240	2 × 240	3 × 240	3 × 240	2 × 240
	AWG/MCM (NEC, CEC)	2 × 500 MCM	2 × 500 MCM	3 × 500 MCM	3 × 500 MCM	2 × 500 MCM
Degree of protection		IP43	IP43	IP43	IP43	IP43
Dimensions (with doors and panels)						
• Width	mm	3620	3620	3620	3620	5420
• Height	mm	2280	2280	2280	2280	2280
• Depth	mm	1275	1275	1275	1275	1275
Circuit design (Page 2/4)		①	①	①	①	③
Weight	kg	2850	2850	2850	2850	4100

[1] The specifications for the rated input current and the power data in hp and kW are approximate values only; these have been calculated for operation with induction motors and for a typical power factor cos phi and motor efficiency.
The hp specifications are based on the NEC and CEC guidelines for the North American market. The kW values are specified in multiples of 50. Both approximate values have to be adapted to the motor that is actually used.

[2] Approx. 5 % of the power loss is dissipated into the atmosphere.

[3] Without cooling system.

[4] In addition, 20 A pre-charging current for 25 s.

[5] Figures refer to a subsystem; see “Circuit designs” for the number of subsystems to be connected on the line and motor side.

[6] The maximum permissible cable lengths must be observed (see Power cables in Section 7).

Technical data (continued)

SINAMICS GM150 in IGBT version Water cooling, without sine-wave filter		6SL3815-2LN41-0AA0	6SL3815-2LN41-1AA0	6SL3815-2LN41-2AA0	6SL3815-2LN41-3AA0	6SL3815-2LN41-4AA0
Output voltage 3.3 kV						
Type rating	kVA	5700	6300	6900	7400	8000
Shaft output [1]	kW	4750	5300	5700	6200	6700
	hp	6500	7000	7500	8000	9000
Rated output current	A	2 × 495	2 × 550	2 × 600	2 × 650	2 × 700
Input voltage	kV	2 × (2 × 1.7)	2 × (2 × 1.7)	2 × (2 × 1.7)	2 × (2 × 1.7)	2 × (2 × 1.7)
Rated input current [1]	A	2 × (2 × 446)	2 × (2 × 492)	2 × (2 × 539)	2 × (2 × 578)	2 × (2 × 625)
Power loss [2] [3]	kW	74	82	90	96	104
Efficiency [3]	%	98.5	98.5	98.5	98.5	98.5
Max. current demand of the auxiliary supply 1 AC 50/60 Hz 230 V	A	10	10	10	10	10
Max. current demand of the auxiliary supply 3 AC 50/60 Hz 400 V [4]	A	31	31	31	31	31
Cooling water flow rate (raw water/deionized water)	l/min	216	216	216	216	216
Sound pressure level L_{pA} (1 m)	dB	76	76	76	76	76
Measuring surface level L_s (1 m)	dB	19	19	19	19	19
Cable cross-sections, line-side, max. connectable per phase [5] [6]	mm^2 (DIN VDE)	2 × 240	2 × 240	2 × 240	3 × 240	3 × 240
	AWG/MCM (NEC, CEC)	2 × 500 MCM	2 × 500 MCM	2 × 500 MCM	3 × 500 MCM	3 × 500 MCM
Cable cross-sections, motor-side, max. connectable per phase [5] [6]	mm^2 (DIN VDE)	2 × 240	2 × 240	2 × 240	3 × 240	3 × 240
	AWG/MCM (NEC, CEC)	2 × 500 MCM	2 × 500 MCM	2 × 500 MCM	3 × 500 MCM	3 × 500 MCM
PE connection, max. connection cross-section at enclosure with M12 screw [5]	mm^2 (DIN VDE)	2 × 240	2 × 240	2 × 240	3 × 240	3 × 240
	AWG/MCM (NEC, CEC)	2 × 500 MCM	2 × 500 MCM	2 × 500 MCM	3 × 500 MCM	3 × 500 MCM
Degree of protection		IP43	IP43	IP43	IP43	IP43
Dimensions (with doors and panels)						
• Width	mm	5420	5420	5420	5420	5420
• Height	mm	2280	2280	2280	2280	2280
• Depth	mm	1275	1275	1275	1275	1275
Circuit design (Page 2/4)		③	③	③	③	③
Weight	kg	4200	4200	4200	4200	4200

[1] The specifications for the rated input current and the power data in hp and kW are approximate values only; these have been calculated for operation with induction motors and for a typical power factor cos phi and motor efficiency.
The hp specifications are based on the NEC and CEC guidelines for the North American market. The kW values are specified in multiples of 50. Both approximate values have to be adapted to the motor that is actually used.

[2] Approx. 5 % of the power loss is dissipated into the atmosphere.

[3] Without cooling system.

[4] In addition, 20 A pre-charging current for 25 s.

[5] Figures refer to a subsystem; see “Circuit designs” for the number of subsystems to be connected on the line and motor side.

[6] The maximum permissible cable lengths must be observed (see Power cables in Section 7).

Technical data (continued)

SINAMICS GM150 in IGBT version Water cooling, without sine-wave filter		6SL3815-2LP32-8AA0	6SL3815-2LP33-1AA0	6SL3815-2LP33-5AA0	6SL3815-2LP34-0AA0	6SL3815-2LP34-5AA0	6SL3815-2LP35-0AA0
Output voltage 4.16 kV							
Type rating	kVA	2000	2200	2500	2900	3200	3600
Shaft output [1]	kW	1700	1850	2100	2400	2700	3000
	hp	2250	2500	2750	3000	3500	4000
Rated output current	A	280	310	350	400	450	500
Input voltage	kV	2 × 2.2	2 × 2.2	2 × 2.2	2 × 2.2	2 × 2.2	2 × 2.2
Rated input current [1]	A	2 × 245	2 × 273	2 × 310	2 × 359	2 × 397	2 × 446
Power loss [2] [3]	kW	28	31	33	38	42	47
Efficiency [3]	%	98.4	98.4	98.5	98.5	98.5	98.5
Max. current demand of the auxiliary supply 1 AC 50/60 Hz 230 V	A	10	10	10	10	10	10
Max. current demand of the auxiliary supply 3 AC 50/60 Hz 400 V [4]	A	25	25	25	25	25	25
Cooling water flow rate (raw water/deionized water)	l/min	108	108	108	108	108	108
Sound pressure level L_{pA} (1 m)	dB	73	73	73	73	73	73
Measuring surface level L_s (1 m)	dB	18	18	18	18	18	18
Cable cross-sections, line-side, max. connectable per phase [5] [6]	mm^2 (DIN VDE)	3 × 240	3 × 240	3 × 240	3 × 240	3 × 240	3 × 240
	AWG/MCM (NEC, CEC)	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM
Cable cross-sections, motor-side, max. connectable per phase [5] [6]	mm^2 (DIN VDE)	3 × 240	3 × 240	3 × 240	3 × 240	3 × 240	3 × 240
	AWG/MCM (NEC, CEC)	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM
PE connection, max. connection cross-section at enclosure with M12 screw [5]	mm^2 (DIN VDE)	3 × 240	3 × 240	3 × 240	3 × 240	3 × 240	3 × 240
	AWG/MCM (NEC, CEC)	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM
Degree of protection		IP43	IP43	IP43	IP43	IP43	IP43
Dimensions (with doors and panels)							
• Width	mm	3620	3620	3620	3620	3620	3620
• Height	mm	2280	2280	2280	2280	2280	2280
• Depth	mm	1275	1275	1275	1275	1275	1275
Circuit design (Page 2/4)		①	①	①	①	①	①
Weight	kg	2750	2800	2800	2800	2850	2850

[1] The specifications for the rated input current and the power data in hp and kW are approximate values only; these have been calculated for operation with induction motors and for a typical power factor cos phi and motor efficiency.
The hp specifications are based on the NEC and CEC guidelines for the North American market. The kW values are specified in multiples of 50. Both approximate values have to be adapted to the motor that is actually used.

[2] Approx. 5 % of the power loss is dissipated into the atmosphere.

[3] Without cooling system.

[4] In addition, 20 A pre-charging current for 25 s.

[5] Figures refer to a subsystem; see “Circuit designs” for the number of subsystems to be connected on the line and motor side.

[6] The maximum permissible cable lengths must be observed (see Power cables in Section 7).

Technical data (continued)

SINAMICS GM150 in IGBT version Water cooling, without sine-wave filter		6SL3815-2LP35-5AA0	6SL3815-2LP36-1AA0	6SL3815-2LP36-7AA0	6SL3815-2LP37-4AA0	6SL3815-2LP38-0AA0	6SL3815-2LP38-8AA0
Output voltage 4.16 kV							
Type rating	kVA	4000	4400	4900	5300	5800	6400
Shaft output [1]	kW	3300	3700	4100	4500	4800	5400
	hp	4500	5000	5500	6000	6500	7000
Rated output current	A	550	610	675	740	800	2 × 445
Input voltage	kV	2 × 2.2	2 × 2.2	2 × 2.2	2 × 2.2	2 × 2.2	2 × (2 × 2.2)
Rated input current [1]	A	2 × 496	2 × 545	2 × 607	2 × 657	2 × 719	2 × (2 × 397)
Power loss [2] [3]	kW	52	57	64	69	75	83
Efficiency [3]	%	98.5	98.5	98.5	98.5	98.6	98.5
Max. current demand of the auxiliary supply 1 AC 50/60 Hz 230 V	A	10	10	10	10	10	10
Max. current demand of the auxiliary supply 3 AC 50/60 Hz 400 V [4]	A	25	25	25	25	25	31
Cooling water flow rate (raw water/deionized water)	l/min	108	108	108	108	108	216
Sound pressure level L_{pA} (1 m)	dB	73	73	73	73	73	76
Measuring surface level L_s (1 m)	dB	18	18	18	18	18	19
Cable cross-sections, line-side, max. connectable per phase [5] [6]	mm^2 (DIN VDE)	3 × 240	2 × 240	2 × 240	3 × 240	3 × 240	2 × 240
	AWG/MCM (NEC, CEC)	3 × 500 MCM	2 × 500 MCM	2 × 500 MCM	3 × 500 MCM	3 × 500 MCM	2 × 500 MCM
Cable cross-sections, motor-side, max. connectable per phase [5] [6]	mm^2 (DIN VDE)	3 × 240	2 × 240	2 × 240	3 × 240	3 × 240	2 × 240
	AWG/MCM (NEC, CEC)	3 × 500 MCM	2 × 500 MCM	2 × 500 MCM	3 × 500 MCM	3 × 500 MCM	2 × 500 MCM
PE connection, max. connection cross-section at enclosure with M12 screw [5]	mm^2 (DIN VDE)	3 × 240	2 × 240	2 × 240	3 × 240	3 × 240	2 × 240
	AWG/MCM (NEC, CEC)	3 × 500 MCM	2 × 500 MCM	2 × 500 MCM	3 × 500 MCM	3 × 500 MCM	2 × 500 MCM
Degree of protection		IP43	IP43	IP43	IP43	IP43	IP43
Dimensions (with doors and panels)							
• Width	mm	3620	3620	3620	3620	3620	5420
• Height	mm	2280	2280	2280	2280	2280	2280
• Depth	mm	1275	1275	1275	1275	1275	1275
Circuit design (Page 2/4)		①	①	①	①	①	③
Weight	kg	2850	2850	2850	2850	2850	4200

[1] The specifications for the rated input current and the power data in hp and kW are approximate values only; these have been calculated for operation with induction motors and for a typical power factor cos phi and motor efficiency.
The hp specifications are based on the NEC and CEC guidelines for the North American market. The kW values are specified in multiples of 50. Both approximate values have to be adapted to the motor that is actually used.

[2] Approx. 5 % of the power loss is dissipated into the atmosphere.

[3] Without cooling system.

[4] In addition, 20 A pre-charging current for 25 s.

[5] Figures refer to a subsystem; see “Circuit designs” for the number of subsystems to be connected on the line and motor side.

[6] The maximum permissible cable lengths must be observed (see Power cables in Section 7).

Technical data (continued)

SINAMICS GM150 in IGBT version Water cooling, without sine-wave filter		6SL3815-2LP41-0AA0	6SL3815-2LP41-1AA0	6SL3815-2LP41-2AA0	6SL3815-2LP41-3AA0	6SL3815-2LP41-4AA0
Output voltage 4.16 kV						
Type rating	kVA	7100	7900	8600	9400	10100
Shaft output [1]	kW	6000	6600	7300	7900	8500
	hp	8000	9000	9500	10000	11000
Rated output current	A	2 × 495	2 × 550	2 × 600	2 × 650	2 × 700
Input voltage	kV	2 × (2 × 2.2)	2 × (2 × 2.2)	2 × (2 × 2.2)	2 × (2 × 2.2)	2 × (2 × 2.2)
Rated input current [1]	A	2 × (2 × 440)	2 × (2 × 490)	2 × (2 × 533)	2 × (2 × 583)	2 × (2 × 627)
Power loss [2] [3]	kW	92	103	112	122	131
Efficiency [3]	%	98.5	98.5	98.5	98.5	98.5
Max. current demand of the auxiliary supply 1 AC 50/60 Hz 230 V	A	10	10	10	10	10
Max. current demand of the auxiliary supply 3 AC 50/60 Hz 400 V [4]	A	31	31	31	31	31
Cooling water flow rate (raw water/deionized water)	l/min	216	216	216	216	216
Sound pressure level L_{pA} (1 m)	dB	76	76	76	76	76
Measuring surface level L_s (1 m)	dB	19	19	19	19	19
Cable cross-sections, line-side, max. connectable per phase [5] [6]	mm^2 (DIN VDE)	2 × 240	2 × 240	2 × 240	3 × 240	3 × 240
	AWG/MCM (NEC, CEC)	2 × 500 MCM	2 × 500 MCM	2 × 500 MCM	3 × 500 MCM	3 × 500 MCM
Cable cross-sections, motor-side, max. connectable per phase [5] [6]	mm^2 (DIN VDE)	2 × 240	2 × 240	2 × 240	3 × 240	3 × 240
	AWG/MCM (NEC, CEC)	2 × 500 MCM	2 × 500 MCM	2 × 500 MCM	3 × 500 MCM	3 × 500 MCM
PE connection, max. connection cross-section at enclosure with M12 screw [5]	mm^2 (DIN VDE)	2 × 240	2 × 240	2 × 240	3 × 240	3 × 240
	AWG/MCM (NEC, CEC)	2 × 500 MCM	2 × 500 MCM	2 × 500 MCM	3 × 500 MCM	3 × 500 MCM
Degree of protection		IP43	IP43	IP43	IP43	IP43
Dimensions (with doors and panels)						
• Width	mm	5420	5420	5420	5420	5420
• Height	mm	2280	2280	2280	2280	2280
• Depth	mm	1275	1275	1275	1275	1275
Circuit design (Page 2/4)		③	③	③	③	③
Weight	kg	4200	4200	4200	4200	4200

[1] The specifications for the rated input current and the power data in hp and kW are approximate values only; these have been calculated for operation with induction motors and for a typical power factor cos phi and motor efficiency.
The hp specifications are based on the NEC and CEC guidelines for the North American market. The kW values are specified in multiples of 50. Both approximate values have to be adapted to the motor that is actually used.

[2] Approx. 5 % of the power loss is dissipated into the atmosphere.

[3] Without cooling system.

[4] In addition, 20 A pre-charging current for 25 s.

[5] Figures refer to a subsystem; see “Circuit designs” for the number of subsystems to be connected on the line and motor side.

[6] The maximum permissible cable lengths must be observed (see Power cables in Section 7).

Technical data (continued)

SINAMICS GM150 in IGBT version Water cooling, with sine-wave filter (option Y15)		6SL3815-2LM35-0AA0	6SL3815-2LM35-5AA0	6SL3815-2LM36-1AA0	6SL3815-2LM36-7AA0	6SL3815-2LM37-4AA0	6SL3815-2LM38-0AA0
Output voltage 2.3 kV							
Type rating	kVA	1500	1650	1800	2050	2200	2400
Shaft output [1]	kW	1250	1350	1500	1700	1850	2000
	hp	1500	1750	2000	2250	2500	2750
Rated output current	A	380	410	450	510	550	600
Input voltage	kV	2 × 1.2	2 × 1.2	2 × 1.2	2 × 1.2	2 × 1.2	2 × 1.2
Rated input current [1]	A	2 × 331	2 × 364	2 × 397	2 × 453	2 × 491	2 × 540
Power loss [2] [3]	kW	29	30	32	37	39	41
Efficiency [3]	%	97.8	97.9	98.0	97.9	98.0	98.1
Max. current demand of the auxiliary supply 1 AC 50/60 Hz 230 V	A	10	10	10	10	10	10
Max. current demand of the auxiliary supply 3 AC 50/60 Hz 400 V [4]	A	31	31	31	31	31	31
Cooling water flow rate (raw water/deionized water)	l/min	112	112	112	112	112	112
Sound pressure level L_{pA} (1 m)	dB	74	74	74	74	74	74
Measuring surface level L_s (1 m)	dB	18	18	18	18	18	18
Cable cross-sections, line-side, max. connectable per phase [5] [6]	mm^2 (DIN VDE)	3 × 240	3 × 240	2 × 240	2 × 240	3 × 240	3 × 240
	AWG/MCM (NEC, CEC)	3 × 500 MCM	3 × 500 MCM	2 × 500 MCM	2 × 500 MCM	3 × 500 MCM	3 × 500 MCM
Cable cross-sections, motor-side, max. connectable per phase [5] [6]	mm^2 (DIN VDE)	3 × 240	3 × 240	2 × 240	2 × 240	3 × 240	3 × 240
	AWG/MCM (NEC, CEC)	3 × 500 MCM	3 × 500 MCM	2 × 500 MCM	2 × 500 MCM	3 × 500 MCM	3 × 500 MCM
PE connection, max. connection cross-section at enclosure with M12 screw [5]	mm^2 (DIN VDE)	3 × 240	3 × 240	2 × 240	2 × 240	3 × 240	3 × 240
	AWG/MCM (NEC, CEC)	3 × 500 MCM	3 × 500 MCM	2 × 500 MCM	2 × 500 MCM	3 × 500 MCM	3 × 500 MCM
Degree of protection		IP43	IP43	IP43	IP43	IP43	IP43
Dimensions (with doors and panels)							
• Width	mm	4540	4540	4540	4540	4540	4540
• Height	mm	2280	2280	2280	2280	2280	2280
• Depth	mm	1275	1275	1275	1275	1275	1275
Circuit design (Page 2/5)		④	④	④	④	④	④
Weight	kg	3750	3850	3850	3900	3950	3950

[1] The specifications for the rated input current and the power data in hp and kW are approximate values only; these have been calculated for operation with induction motors and for a typical power factor cos phi and motor efficiency.
The hp specifications are based on the NEC and CEC guidelines for the North American market. The kW values are specified in multiples of 50. Both approximate values have to be adapted to the motor that is actually used.

[2] Approx. 5 % of the power loss is dissipated into the atmosphere.

[3] Without cooling system.

[4] In addition, 20 A pre-charging current for 25 s.

[5] Figures refer to a subsystem; see “Circuit designs” for the number of subsystems to be connected on the line and motor side.

[6] The maximum permissible cable lengths must be observed (see Power cables in Section 7).

Technical data (continued)

SINAMICS GM150 in IGBT version Water cooling, with sine-wave filter (option Y15)		6SL3815-2LN33-5AA0	6SL3815-2LN34-0AA0	6SL3815-2LN34-5AA0	6SL3815-2LN35-0AA0	6SL3815-2LN35-5AA0
Output voltage 3.3 kV						
Type rating	kVA	1550	1750	2000	2150	2350
Shaft output [1]	kW	1300	1450	1650	1800	1950
	hp	1750	2000	2250	2500	2750
Rated output current	A	270	310	350	380	410
Input voltage	kV	2 × 1.7	2 × 1.7	2 × 1.7	2 × 1.7	2 × 1.7
Rated input current [1]	A	2 × 234	2 × 269	2 × 308	2 × 346	2 × 370
Power loss [2] [3]	kW	29	32	36	40	42
Efficiency [3]	%	97.8	97.9	98.0	98.0	98.1
Max. current demand of the auxiliary supply 1 AC 50/60 Hz 230 V	A	10	10	10	10	10
Max. current demand of the auxiliary supply 3 AC 50/60 Hz 400 V [4]	A	31	31	31	31	31
Cooling water flow rate (raw water/deionized water)	l/min	148	148	148	148	148
Sound pressure level L_{pA} (1 m)	dB	74	74	74	74	74
Measuring surface level L_S (1 m)	dB	18	18	18	18	18
Cable cross-sections, line-side, max. connectable per phase [5] [6]	mm^2 (DIN VDE)	3 × 240	3 × 240	3 × 240	3 × 240	3 × 240
	AWG/MCM (NEC, CEC)	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM
Cable cross-sections, motor-side, max. connectable per phase [5] [6]	mm^2 (DIN VDE)	3 × 240	3 × 240	3 × 240	3 × 240	3 × 240
	AWG/MCM (NEC, CEC)	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM
PE connection, max. connection cross-section at enclosure with M12 screw [5]	mm^2 (DIN VDE)	3 × 240	3 × 240	3 × 240	3 × 240	3 × 240
	AWG/MCM (NEC, CEC)	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM
Degree of protection		IP43	IP43	IP43	IP43	IP43
Dimensions (with doors and panels)						
• Width	mm	4540	4840	4840	4840	4840
• Height	mm	2280	2280	2280	2280	2280
• Depth	mm	1275	1275	1275	1275	1275
Circuit design (Page 2/5)		④	④	④	④	④
Weight	kg	4000	4200	4200	4200	4300

[1] The specifications for the rated input current and the power data in hp and kW are approximate values only; these have been calculated for operation with induction motors and for a typical power factor cos phi and motor efficiency.
The hp specifications are based on the NEC and CEC guidelines for the North American market. The kW values are specified in multiples of 50. Both approximate values have to be adapted to the motor that is actually used.

[2] Approx. 5 % of the power loss is dissipated into the atmosphere.

[3] Without cooling system.

[4] In addition, 20 A pre-charging current for 25 s.

[5] Figures refer to a subsystem; see “Circuit designs” for the number of subsystems to be connected on the line and motor side.

[6] The maximum permissible cable lengths must be observed (see Power cables in Section 7).

2

Technical data (continued)

SINAMICS GM150 in IGBT version Water cooling, with sine-wave filter (option Y15)		6SL3815-2LN36-1AA0	6SL3815-2LN36-7AA0	6SL3815-2LN37-4AA0	6SL3815-2LN38-0AA0	6SL3815-2LN38-8AA0
Output voltage 3.3 kV						
Type rating	kVA	2700	2950	3200	3500	3900
Shaft output [1]	kW	2250	2500	2700	2900	3250
	hp	3000	3250	3500	4000	4500
Rated output current	A	470	520	560	610	680
Input voltage	kV	2 × 1.7	2 × 1.7	2 × 1.7	2 × 1.7	2 × (2 × 1.7)
Rated input current [1]	A	2 × 417	2 × 465	2 × 501	2 × 549	2 × (2 × 304)
Power loss [2] [3]	kW	45	50	54	60	62
Efficiency [3]	%	98.1	98.1	98.1	98.1	98.2
Max. current demand of the auxiliary supply 1 AC 50/60 Hz 230 V	A	10	10	10	10	10
Max. current demand of the auxiliary supply 3 AC 50/60 Hz 400 V [4]	A	31	31	31	31	43
Cooling water flow rate (raw water/deionized water)	l/min	148	148	148	148	296
Sound pressure level L_{pA} (1 m)	dB	74	74	74	74	78
Measuring surface level L_S (1 m)	dB	18	18	18	18	19
Cable cross-sections, line-side, max. connectable per phase [5] [6]	mm^2 (DIN VDE)	2 × 240	2 × 240	3 × 240	3 × 240	2 × 240
	AWG/MCM (NEC, CEC)	2 × 500 MCM	2 × 500 MCM	3 × 500 MCM	3 × 500 MCM	2 × 500 MCM
Cable cross-sections, motor-side, max. connectable per phase [5] [6]	mm^2 (DIN VDE)	2 × 240	2 × 240	3 × 240	3 × 240	2 × 240
	AWG/MCM (NEC, CEC)	2 × 500 MCM	2 × 500 MCM	3 × 500 MCM	3 × 500 MCM	2 × 500 MCM
PE connection, max. connection cross-section at enclosure with M12 screw [5]	mm^2 (DIN VDE)	2 × 240	2 × 240	3 × 240	3 × 240	2 × 240
	AWG/MCM (NEC, CEC)	2 × 500 MCM	2 × 500 MCM	3 × 500 MCM	3 × 500 MCM	2 × 500 MCM
Degree of protection		IP43	IP43	IP43	IP43	IP43
Dimensions (with doors and panels)						
• Width	mm	4840	4840	4840	4840	7260
• Height	mm	2280	2280	2280	2280	2280
• Depth	mm	1275	1275	1275	1275	1275
Circuit design (Page 2/5)		④	④	④	④	⑥
Weight	kg	4300	4400	4400	4400	6900

[1] The specifications for the rated input current and the power data in hp and kW are approximate values only; these have been calculated for operation with induction motors and for a typical power factor cos phi and motor efficiency.
The hp specifications are based on the NEC and CEC guidelines for the North American market. The kW values are specified in multiples of 50. Both approximate values have to be adapted to the motor that is actually used.

[2] Approx. 5 % of the power loss is dissipated into the atmosphere.

[3] Without cooling system.

[4] In addition, 20 A pre-charging current for 25 s.

[5] Figures refer to a subsystem; see "Circuit designs" for the number of subsystems to be connected on the line and motor side.

[6] The maximum permissible cable lengths must be observed (see Power cables in Section 7).

Technical data (continued)

SINAMICS GM150 in IGBT version Water cooling, with sine-wave filter (option Y15)		6SL3815-2LN41-0AA0	6SL3815-2LN41-1AA0	6SL3815-2LN41-2AA0	6SL3815-2LN41-3AA0	6SL3815-2LN41-4AA0
Output voltage 3.3 kV						
Type rating	kVA	4350	4800	5250	5600	6050
Shaft output [1]	kW	3650	4000	4400	4700	5100
	hp	5000	5500	6000	6250	6500
Rated output current	A	760	840	920	980	1060
Input voltage	kV	2 × (2 × 1.7)	2 × (2 × 1.7)	2 × (2 × 1.7)	2 × (2 × 1.7)	2 × (2 × 1.7)
Rated input current [1]	A	2 × (2 × 340)	2 × (2 × 376)	2 × (2 × 411)	2 × (2 × 441)	2 × (2 × 477)
Power loss [2] [3]	kW	69	77	84	90	97
Efficiency [3]	%	98.2	98.2	98.2	98.2	98.2
Max. current demand of the auxiliary supply 1 AC 50/60 Hz 230 V	A	10	10	10	10	10
Max. current demand of the auxiliary supply 3 AC 50/60 Hz 400 V [4]	A	43	43	43	43	43
Cooling water flow rate (raw water/deionized water)	l/min	296	296	296	296	296
Sound pressure level L_{pA} (1 m)	dB	78	78	78	78	78
Measuring surface level L_S (1 m)	dB	19	19	19	19	19
Cable cross-sections, line-side, max. connectable per phase [5] [6]	mm^2 (DIN VDE)	2 × 240	2 × 240	2 × 240	3 × 240	3 × 240
	AWG/MCM (NEC, CEC)	2 × 500 MCM	2 × 500 MCM	2 × 500 MCM	3 × 500 MCM	3 × 500 MCM
Cable cross-sections, motor-side, max. connectable per phase [5] [6]	mm^2 (DIN VDE)	2 × 240	2 × 240	2 × 240	3 × 240	3 × 240
	AWG/MCM (NEC, CEC)	2 × 500 MCM	2 × 500 MCM	2 × 500 MCM	3 × 500 MCM	3 × 500 MCM
PE connection, max. connection cross-section at enclosure with M12 screw [5]	mm^2 (DIN VDE)	2 × 240	2 × 240	2 × 240	3 × 240	3 × 240
	AWG/MCM (NEC, CEC)	2 × 500 MCM	2 × 500 MCM	2 × 500 MCM	3 × 500 MCM	3 × 500 MCM
Degree of protection		IP43	IP43	IP43	IP43	IP43
Dimensions (with doors and panels)						
• Width	mm	7260	7860	7860	7860	7860
• Height	mm	2280	2280	2280	2280	2280
• Depth	mm	1275	1275	1275	1275	1275
Circuit design (Page 2/5)		⑥	⑥	⑥	⑥	⑥
Weight	kg	7000	7100	7100	7100	7300

[1] The specifications for the rated input current and the power data in hp and kW are approximate values only; these have been calculated for operation with induction motors and for a typical power factor cos phi and motor efficiency.
The hp specifications are based on the NEC and CEC guidelines for the North American market. The kW values are specified in multiples of 50. Both approximate values have to be adapted to the motor that is actually used.

[2] Approx. 5 % of the power loss is dissipated into the atmosphere.

[3] Without cooling system.

[4] In addition, 20 A pre-charging current for 25 s.

[5] Figures refer to a subsystem; see “Circuit designs” for the number of subsystems to be connected on the line and motor side.

[6] The maximum permissible cable lengths must be observed (see Power cables in Section 7).

2

Technical data (continued)

SINAMICS GM150 in IGBT version Water cooling, with sine-wave filter (option Y15)		6SL3815-2LP32-8AA0	6SL3815-2LP33-1AA0	6SL3815-2LP33-5AA0	6SL3815-2LP34-0AA0	6SL3815-2LP34-5AA0	6SL3815-2LP35-0AA0
Output voltage 4.16 kV							
Type rating	kVA	1600	1750	1950	2250	2500	2800
Shaft output [1]	kW	1300	1450	1600	1850	2100	2350
	hp	1750	2000	2250	2500	2750	3000
Rated output current	A	220	240	270	310	350	390
Input voltage	kV	2 × 2.2	2 × 2.2	2 × 2.2	2 × 2.2	2 × 2.2	2 × 2.2
Rated input current [1]	A	2 × 190	2 × 210	2 × 240	2 × 282	2 × 311	2 × 350
Power loss [2] [3]	kW	30	31	35	41	43	48
Efficiency [3]	%	97.8	97.9	98.0	98.0	98.1	98.1
Max. current demand of the auxiliary supply 1 AC 50/60 Hz 230 V	A	10	10	10	10	10	10
Max. current demand of the auxiliary supply 3 AC 50/60 Hz 400 V [4]	A	31	31	31	31	31	31
Cooling water flow rate (raw water/deionized water)	l/min	148	148	148	148	148	148
Sound pressure level L_{pA} (1 m)	dB	74	74	74	74	74	74
Measuring surface level L_s (1 m)	dB	18	18	18	18	18	18
Cable cross-sections, line-side, max. connectable per phase [5] [6]	mm^2 (DIN VDE)	3 × 240	3 × 240	3 × 240	3 × 240	3 × 240	3 × 240
	AWG/MCM (NEC, CEC)	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM
Cable cross-sections, motor-side, max. connectable per phase [5] [6]	mm^2 (DIN VDE)	3 × 240	3 × 240	3 × 240	3 × 240	3 × 240	3 × 240
	AWG/MCM (NEC, CEC)	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM
PE connection, max. connection cross-section at enclosure with M12 screw [5]	mm^2 (DIN VDE)	3 × 240	3 × 240	3 × 240	3 × 240	3 × 240	3 × 240
	AWG/MCM (NEC, CEC)	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM	3 × 500 MCM
Degree of protection		IP43	IP43	IP43	IP43	IP43	IP43
Dimensions (with doors and panels)							
• Width	mm	4840	4840	4840	4840	4840	4840
• Height	mm	2280	2280	2280	2280	2280	2280
• Depth	mm	1275	1275	1275	1275	1275	1275
Circuit design (Page 2/5)		④	④	④	④	④	④
Weight	kg	4200	4250	4250	4250	4300	4300

[1] The specifications for the rated input current and the power data in hp and kW are approximate values only; these have been calculated for operation with induction motors and for a typical power factor cos phi and motor efficiency.
The hp specifications are based on the NEC and CEC guidelines for the North American market. The kW values are specified in multiples of 50. Both approximate values have to be adapted to the motor that is actually used.

[2] Approx. 5 % of the power loss is dissipated into the atmosphere.

[3] Without cooling system.

[4] In addition, 20 A pre-charging current for 25 s.

[5] Figures refer to a subsystem; see “Circuit designs” for the number of subsystems to be connected on the line and motor side.

[6] The maximum permissible cable lengths must be observed (see Power cables in Section 7).

Technical data (continued)

SINAMICS GM150 in IGBT version Water cooling, with sine-wave filter (option Y15)		6SL3815-2LP35-5AA0	6SL3815-2LP36-1AA0	6SL3815-2LP36-7AA0	6SL3815-2LP37-4AA0	6SL3815-2LP38-0AA0	6SL3815-2LP38-8AA0
Output voltage 4.16 kV							
Type rating	kVA	3100	3450	3800	4100	4500	4950
Shaft output [1]	kW	2600	2900	3200	3450	3800	4200
	hp	3500	4000	4250	4500	5000	5500
Rated output current	A	430	480	530	570	625	690
Input voltage	kV	2 × 2.2	2 × 2.2	2 × 2.2	2 × 2.2	2 × 2.2	2 × (2 × 2.2)
Rated input current [1]	A	2 × 388	2 × 427	2 × 475	2 × 514	2 × 562	2 × (2 × 311)
Power loss [2] [3]	kW	53	58	61	66	72	80
Efficiency [3]	%	98.1	98.1	98.2	98.2	98.2	98.2
Max. current demand of the auxiliary supply 1 AC 50/60 Hz 230 V	A	10	10	10	10	10	10
Max. current demand of the auxiliary supply 3 AC 50/60 Hz 400 V [4]	A	31	31	31	31	31	43
Cooling water flow rate (raw water/deionized water)	l/min	148	148	148	148	148	296
Sound pressure level L_{pA} (1 m)	dB	74	74	74	74	74	78
Measuring surface level L_s (1 m)	dB	18	18	18	18	18	19
Cable cross-sections, line-side, max. connectable per phase [5] [6]	mm^2 (DIN VDE)	3 × 240	2 × 240	2 × 240	3 × 240	3 × 240	2 × 240
	AWG/MCM (NEC, CEC)	3 × 500 MCM	2 × 500 MCM	2 × 500 MCM	3 × 500 MCM	3 × 500 MCM	2 × 500 MCM
Cable cross-sections, motor-side, max. connectable per phase [5] [6]	mm^2 (DIN VDE)	3 × 240	2 × 240	2 × 240	3 × 240	3 × 240	2 × 240
	AWG/MCM (NEC, CEC)	3 × 500 MCM	2 × 500 MCM	2 × 500 MCM	3 × 500 MCM	3 × 500 MCM	2 × 500 MCM
PE connection, max. connection cross-section at enclosure with M12 screw [5]	mm^2 (DIN VDE)	3 × 240	2 × 240	2 × 240	3 × 240	3 × 240	2 × 240
	AWG/MCM (NEC, CEC)	3 × 500 MCM	2 × 500 MCM	2 × 500 MCM	3 × 500 MCM	3 × 500 MCM	2 × 500 MCM
Degree of protection		IP43	IP43	IP43	IP43	IP43	IP43
Dimensions (with doors and panels)							
• Width	mm	4840	4840	4840	4840	4840	7860
• Height	mm	2280	2280	2280	2280	2280	2280
• Depth	mm	1275	1275	1275	1275	1275	1275
Circuit design (Page 2/5)		④	④	④	④	④	⑥
Weight	kg	4350	4350	4850	4850	4850	7100

[1] The specifications for the rated input current and the power data in hp and kW are approximate values only; these have been calculated for operation with induction motors and for a typical power factor cos phi and motor efficiency.
The hp specifications are based on the NEC and CEC guidelines for the North American market. The kW values are specified in multiples of 50. Both approximate values have to be adapted to the motor that is actually used.

[2] Approx. 5 % of the power loss is dissipated into the atmosphere.

[3] Without cooling system.

[4] In addition, 20 A pre-charging current for 25 s.

[5] Figures refer to a subsystem; see “Circuit designs” for the number of subsystems to be connected on the line and motor side.

[6] The maximum permissible cable lengths must be observed (see Power cables in Section 7).

2

Technical data (continued)

SINAMICS GM150 in IGBT version Water cooling, with sine-wave filter (option Y15)		6SL3815-2LP41-0AA0	6SL3815-2LP41-1AA0	6SL3815-2LP41-2AA0	6SL3815-2LP41-3AA0	6SL3815-2LP41-4AA0
Output voltage 4.16 kV						
Type rating	kVA	5550	6150	6700	7350	7950
Shaft output [1]	kW	4600	5100	5600	6200	6600
	hp	6000	7000	7500	8000	9000
Rated output current	A	770	850	930	1020	1100
Input voltage	kV	2 × (2 × 2.2)	2 × (2 × 2.2)	2 × (2 × 2.2)	2 × (2 × 2.2)	2 × (2 × 2.2)
Rated input current [1]	A	2 × (2 × 345)	2 × (2 × 383)	2 × (2 × 417)	2 × (2 × 456)	2 × (2 × 491)
Power loss [2] [3]	kW	89	99	107	117	126
Efficiency [3]	%	98.2	98.2	98.2	98.2	98.2
Max. current demand of the auxiliary supply 1 AC 50/60 Hz 230 V	A	10	10	10	10	10
Max. current demand of the auxiliary supply 3 AC 50/60 Hz 400 V [4]	A	43	43	43	43	43
Cooling water flow rate (raw water/deionized water)	l/min	296	296	296	296	296
Sound pressure level L_{pA} (1 m)	dB	78	78	78	78	78
Measuring surface level L_s (1 m)	dB	19	19	19	19	19
Cable cross-sections, line-side, max. connectable per phase [5] [6]	mm^2 (DIN VDE)	2 × 240	2 × 240	2 × 240	3 × 240	3 × 240
	AWG/MCM (NEC, CEC)	2 × 500 MCM	2 × 500 MCM	2 × 500 MCM	3 × 500 MCM	3 × 500 MCM
Cable cross-sections, motor-side, max. connectable per phase [5] [6]	mm^2 (DIN VDE)	2 × 240	2 × 240	2 × 240	3 × 240	3 × 240
	AWG/MCM (NEC, CEC)	2 × 500 MCM	2 × 500 MCM	2 × 500 MCM	3 × 500 MCM	3 × 500 MCM
PE connection, max. connection cross-section at enclosure with M12 screw [5]	mm^2 (DIN VDE)	2 × 240	2 × 240	2 × 240	3 × 240	3 × 240
	AWG/MCM (NEC, CEC)	2 × 500 MCM	2 × 500 MCM	2 × 500 MCM	3 × 500 MCM	3 × 500 MCM
Degree of protection		IP43	IP43	IP43	IP43	IP43
Dimensions (with doors and panels)						
• Width	mm	7860	7860	7860	7860	7860
• Height	mm	2280	2280	2280	2280	2280
• Depth	mm	1275	1275	1275	1275	1275
Circuit design (Page 2/5)		⑥	⑥	⑥	⑥	⑥
Weight	kg	7100	7200	7200	8200	8200

[1] The specifications for the rated input current and the power data in hp and kW are approximate values only; these have been calculated for operation with induction motors and for a typical power factor cos phi and motor efficiency.
The hp specifications are based on the NEC and CEC guidelines for the North American market. The kW values are specified in multiples of 50. Both approximate values have to be adapted to the motor that is actually used.

[2] Approx. 5 % of the power loss is dissipated into the atmosphere.

[3] Without cooling system.

[4] In addition, 20 A pre-charging current for 25 s.

[5] Figures refer to a subsystem; see "Circuit designs" for the number of subsystems to be connected on the line and motor side.

[6] The maximum permissible cable lengths must be observed (see Power cables in Section 7).

SINAMICS GM150
IGCT version

3

IGCT version

Overview

SINAMICS GM150 in the IGCT version

The water-cooled SINAMICS GM150 converters in the IGCT version with IGCT Motor Modules are an addition to the SINAMICS GM150 converters as IGBT version in the upper power range up to 21 MVA.

SINAMICS GM150 converters in the IGCT version are optimally matched to Siemens motors.

SINAMICS GM150 converters in the IGCT version offer economic drive solutions that can be matched to customers' specific requirements by choosing from the wide range of available components and options.

IGCT converters are available for the following voltage and power ranges:

Rated output voltage	Type rating
3.3 kV	10 MVA to 21 MVA

Global use

SINAMICS GM150 converters in the IGCT version are manufactured to international standards and regulations, making them ideally suited for global use. These converters are also available in a marine version (meeting the requirements of all of major ship's classification societies).

Benefits

- Compact design and highly flexible configuration ensures easy plant integration
- Simple operator control and monitoring from the user-friendly operator panel
- Simple and reliable operation through integrated maintenance functions: The converter signals early on and automatically if maintenance is required or components need to be replaced
- High degree of ruggedness and reliability due to the use of IGCT power semiconductors in the high power range and fuseless design combined with an intelligent response to external disturbances
- Can be easily integrated into automation solutions as the PROFIBUS interface is supplied as standard along with various analog and digital interfaces
- High level of service-friendliness through innovative power unit design with compact phase modules and easy access to all components

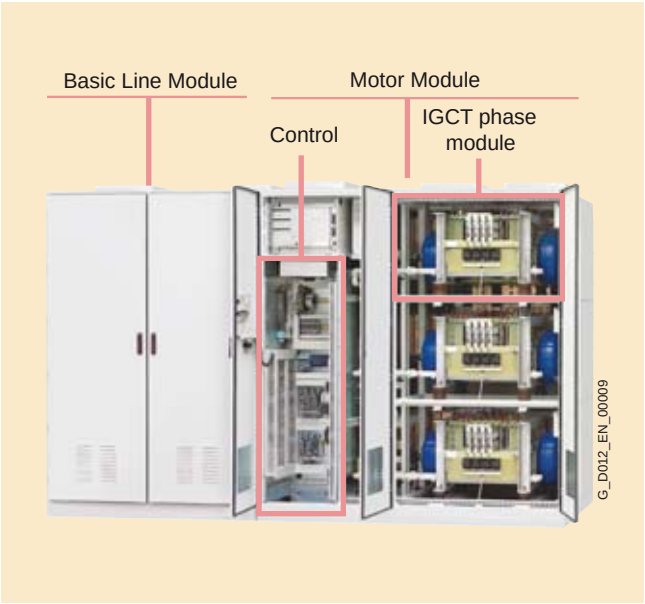
Design

SINAMICS GM150 converters in the IGCT version are available in the basic circuit with a 12-pulse or 24-pulse Basic Line Module (option).

For higher output ratings, two or three complete converter units with isolated DC links are operated in parallel.

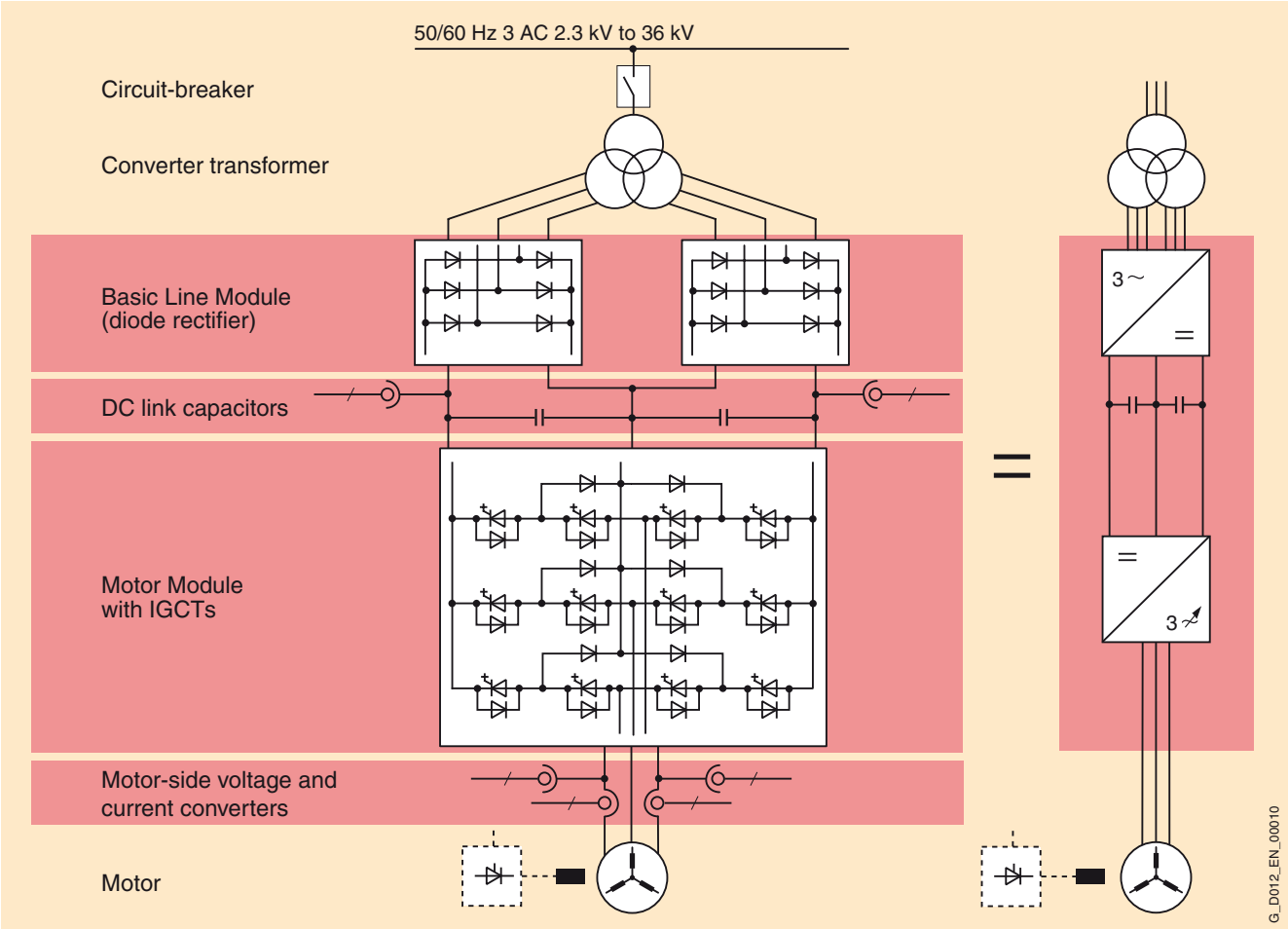
Phase modules in which IGCTs, diodes etc. are grouped together in a tensioned stack are used in the Motor Modules.

The converter consists of cabinet units for the Basic Line Module and for the Motor Module. One of three phase modules and the control section in the Motor Module cabinet are highlighted in the diagram.



SINAMICS GM150 in the IGCT version, internal arrangement (without cooling unit)

Design (continued)

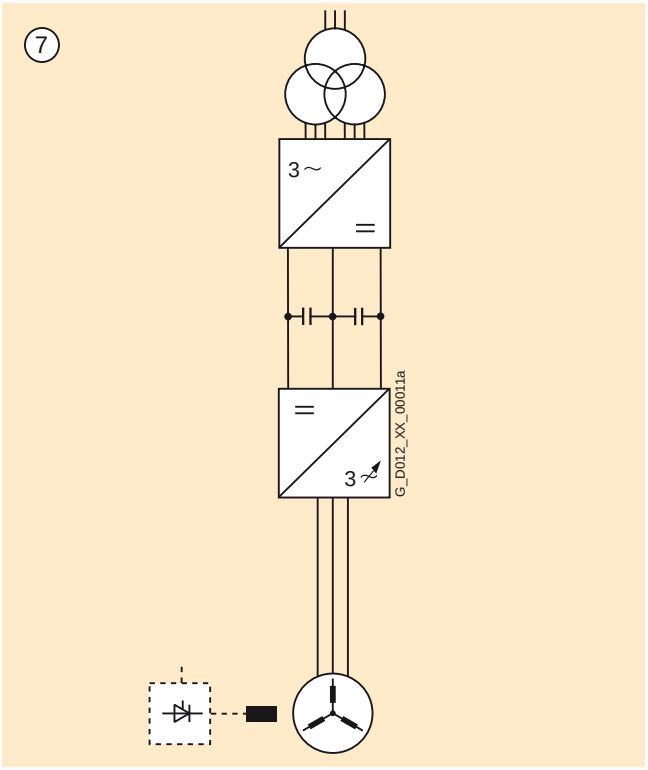


Block diagram

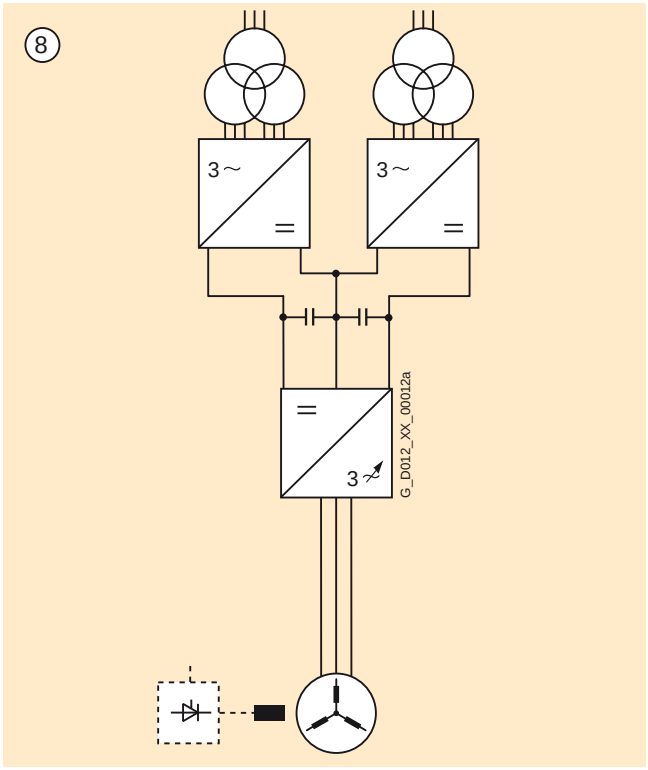
3

Design (continued)

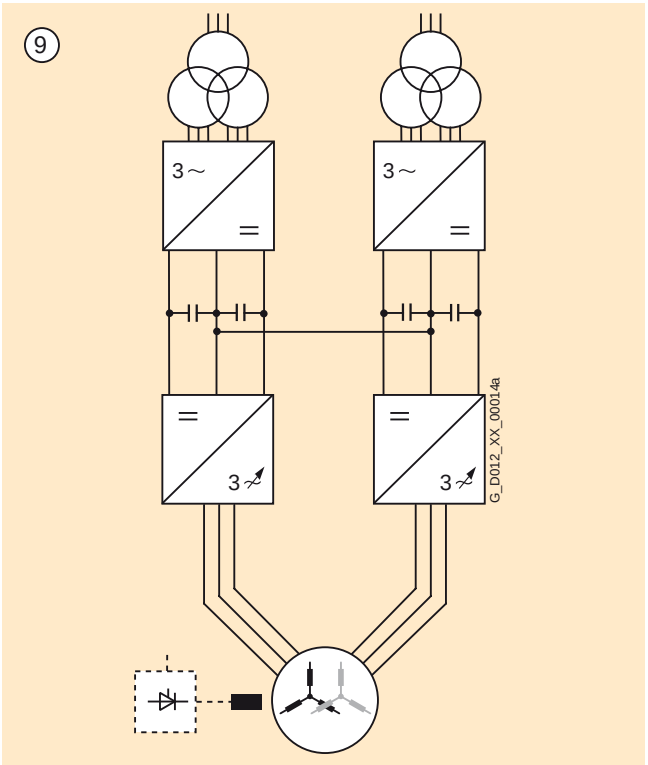
The following circuit designs are available for SINAMICS GM150 in the IGCT version.



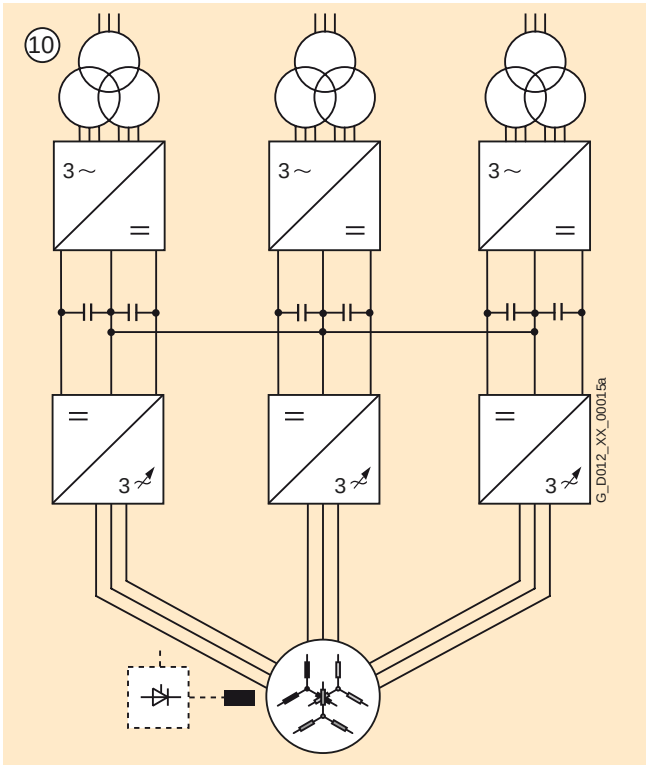
Basic circuit
12-pulse infeed



24-pulse infeed by connecting two
Basic Line Modules in series: option **N15**



The power can be increased by operating two converter units in parallel [1], 24-pulse infeed possible



The power can be increased by operating three converter units in parallel [1], 36-pulse infeed possible

[1] Requires a motor with separate winding systems.

Function

Characteristic features

SINAMICS GM150 in IGCT version	
Line Module (line-side rectifier)	
• Basic Line Module, 12-pulse (two-quadrant operation)	Standard
• Basic Line Module, 24-pulse (two-quadrant operation)	Option
Motor Module (motor-side inverter)	
Voltage range	3.3 kV
Power range (typ.)	10 MVA to 21 MVA
Cooling method	
• Water cooling	Standard
Control modes	
• Induction motor	Standard
• Synchronous motor, separately excited	Option
• Synchronous motor, permanently excited	Option

Software and protection functions

SINAMICS GM150 in IGCT version	Description
Closed-loop control	The motor-side closed-loop control is realized as a field-oriented closed-loop vector control that can be operated as a speed or torque control as required. The closed-loop vector control achieves the dynamic performance of a DC drive. This is made possible by the fact that the current components forming the torque and flux can be controlled precisely and independently of each other. This means that specified torques can be precisely maintained and limited. In the speed range from 1:10, the field-oriented closed-loop control does not require a speed encoder. A speed encoder is required in the following cases: • High requirements placed on the dynamic performance • Torque control/constant torque drives with control range > 1:10 • Very low speeds • Extremely high speed accuracy
Setpoint input	The setpoint can be defined internally or externally; internally as a fixed, motorized potentiometer or jog setpoint, externally via the PROFIBUS interface or an analog input of the customer's terminal strip. The internal fixed setpoint and the motorized potentiometer setpoint can be switched over or adjusted using control commands via all of the interfaces.
Ramp-function generator	A user-friendly ramp-function generator with separately adjustable ramp-up and ramp-down times, together with adjustable rounding times in the lower and upper speed ranges, improves the control response and therefore prevents mechanical overloading of the drive train. The down ramps can be parameterized separately for a fast stop.
$V_{dc\ max}$ controller	The $V_{dc\ max}$ controller automatically prevents overvoltages in the DC link for example when the selected down ramp is too short. This can also extend the selected ramp-down time.
Kinetic buffering (KIP)	The line voltage failures are buffered to the extent permitted by the kinetic energy of the drive train. The speed decreases depending on the moment of inertia and the load torque. The actual speed setpoint is resumed when the line voltage returns.
Automatic restart (option)	The automatic restart powers up the drive again when the power is restored after a power failure or a general fault, and ramps up the drive to the actual speed setpoint.
Flying restart	The flying restart function permits bumpless connection of the converter to a rotating motor.
Diagnostic functions	• Self-diagnostics of the control hardware • Non-volatile memory for reliable diagnostics when the power supply fails • Monitoring the IGCTs with individual messages for each mounting location • User-friendly local operator panel with plain text messages
Operating hours and switching cycle counter	The operating hours of the fans are detected and logged so that preventive maintenance can be performed or equipment replaced. The switching cycles of the circuit-breaker are detected and summed to form the basis of preventive maintenance work.
Detecting the motor actual speed (option)	The SMC30 encoder module can be used to detect the actual motor speed. The signals received from the rotary pulse encoder are converted here and made available via the DRIVE-CLiQ interface of the closed-loop control for evaluation purposes.
Personnel protection	The cabinet doors of the power units are fitted with electromagnetic locks. These prevent the cabinet doors from being opened while hazardous voltages are present inside the cabinet.

Function (continued)

Software and protection functions

SINAMICS GM150 in IGCT version	Description
EMERGENCY OFF button	The converters are equipped as standard with an EMERGENCY OFF button with protective collar which is fitted in the cabinet door. The contacts of the pushbutton are connected in parallel to the terminal strip so they can be integrated in a protection concept on the plant side. EMERGENCY OFF stop category 0 is set as standard for uncontrolled shutdown (DIN EN 60204-1/VDE 0113-1 (IEC 60204-1)). The function includes disconnecting the voltage at the converter output through the circuit-breaker. The motor then coasts down. EMERGENCY STOP category 1 is optionally available for a controlled shutdown (option **L60**).
Insulation monitoring	The converters feature insulation monitoring of the complete electrical network from the secondary side of the transformer to the stator windings of the motor.
I/O monitoring	An extensive package of options for I/O monitoring (from the transformer and the motor through to the auxiliaries) is available. In addition it is possible to monitor the temperature with thermocouples or PT100 resistors.
Thermal overload protection	An alarm message is issued first when the overtemperature threshold is reached. If the temperature continues to rise, the converter is either shutdown or the output current is automatically influenced so that the thermal load is reduced. The original operating values are automatically resumed once the cause of the fault has been removed (e.g. improving the cooling). In the case of water-cooled converters, the water temperature and flow rate are detected at several points in the cooling circuit and evaluated. Extensive self-diagnostic functions protect the converter and signal faults.
Make-proof grounding switch (option)	If grounding on the line or motor side is required for safety and protection reasons, a motor-operated make-proof grounding switch can be ordered. For safety reasons, the converter control interlocks these make-proof grounding switches so that they cannot be closed as long as voltage is still present. The control is integrated into the protection and monitoring circuit of the converter. The make-proof grounding switches are closed automatically when the standard make-proof grounding switch of the DC link is closed.

AOP30 operator panel

The AOP30 operator panel is fitted into the cabinet door of the SINAMICS GM150 for operation, monitoring and commissioning.

It has the following features and characteristics:

- Graphical LCD display with backlighting for plain-text display and a bar-type display for process variables
- LEDs for displaying the operational status
- Help function describing the causes of faults and alarms and the appropriate counter-measures
- Membrane keypad for operational control of a drive
- Local/remote switchover to select the operator control location (priority assigned to operator panel or customer's terminal strip/PROFIBUS)
- Numerical keypad to enter setpoints or parameter values
- Function keys for prompted navigation in the menu
- Two-stage safety strategy to protect against accidental or unauthorized changes to settings. Operation of the drive from the operator panel can be disabled by a password, ensuring that only parameter values and process variables can be displayed on the panel. A password can be used to prevent the unauthorized modification of converter parameters.

The operator panel languages – English, German, Spanish and Chinese – are stored on the CompactFlash card of the Control Unit.

Selection and ordering data

Type rating	Shaft output		Rated output current	**SINAMICS GM150 in IGCT version**	Circuit design (Page 3/4)
kVA	kW	hp	A	Order No.	Fig. No.
Output voltage 3.3 kV					
10000	9000	12000	1750	**6SL3835-2LN41-8AA0**	⑦
15500	12500	18000	2 × 1360	**6SL3835-2LN42-8AA0**	⑨
18000	16000	22000	2 × 1570	**6SL3835-2LN43-6AA0**	⑨
21000	17500	24000	3 × 1220	**6SL3835-2LN44-2AA0**	⑩

Options

When ordering a drive converter with options, add the suffix **"-Z"** after the order number and then state the order code(s) for the desired option(s) after the suffix.

Example:

6SL3835-2LN41-8AA0-Z
+N15+L60+...

In the following tables, related options are arranged in groups. Whether the options can be combined or are mutually exclusive is indicated within these groups. A detailed description of the options can be found in the Chapter, Description of options.

Input-side options		**N15**	**N13**
24-pulse Basic Line Module [1]	**N15**		–
Circuit-breaker at the converter input (for 24-pulse Basic Line Module on request)	**N13**	–	

[1] Option **N15** cannot be combined with option **L72** (Braking Module).

Output-side options		**L08**	**L52**	**L72**	**Y73**
Output reactor	**L08**		✓	✓	✓
Circuit-breaker at the converter output [1]	**L52**	✓		✓	✓
Braking Module [2]	**L72**	✓	✓		✓
Braking resistor	**Y73**	✓	✓	✓	

[1] Option **L52** cannot be combined with option **L51** (disconnector at the converter output).

[2] Option **L72** cannot be combined with option **N15** (24-pulse Basic Line Module).

Protective functions		**K80**	**L48**	**L49**	**L51**	**L60**	**M10**
Control of "Safe Torque Off" function (on request)	**K80**		✓	✓	✓	✓	✓
Make-proof grounding switch at the converter input (motor driven)	**L48**	✓		✓	✓	✓	✓
Make-proof grounding switch at the converter output (motor driven)	**L49**	✓	✓		✓	✓	✓
Disconnector at the converter output [1]	**L51**	✓	✓	✓		✓	✓
EMERGENCY STOP, Stop Category 1 for controlled stopping	**L60**	✓	✓	✓	✓		✓
Safety locking system	**M10**	✓	✓	✓	✓	✓	

Option **L51** cannot be combined with option **L52** (circuit-breaker at the converter output).

✓	Options can be combined
–	Options mutually exclude each other

3

Options (continued)

Temperature detection and evaluation (standard: 3 PT100 inputs)		L80	L81	L82	L90	L91	L92	L93	L94	L95	L96
2 thermistor protection relays for alarm and fault [1]	L80		–	–	✓	✓	✓	✓	✓	✓	✓
2 × 2 thermistor protection relays for alarm and fault [1]	L81	–		–	✓	✓	✓	✓	✓	✓	✓
3 × 2 thermistor protection relays for alarm and fault [1]	L82	–	–		✓	✓	✓	✓	✓	✓	✓
PT100 evaluation unit with 3 inputs [1]	L90	✓	✓	✓		–	–	–	–	–	–
2 PT100 evaluation units with 3 inputs each [1]	L91	✓	✓	✓	–		–	–	–	–	–
3 PT100 evaluation units with 3 inputs each [1]	L92	✓	✓	✓	–	–		–	–	–	–
PT100 evaluation unit with 6 inputs, 2 analog outputs (outputs fed to the control for display) [1]	L93	✓	✓	✓	–	–	–		–	–	–
2 PT100 evaluation units each with 6 inputs and 2 analog outputs (outputs fed to the control for display) [2]	L94	✓	✓	✓	–	–	–	–		–	–
PT100 evaluation unit with 6 inputs for explosion-protected motors and 2 analog outputs (outputs fed to the control for display) [1]	L95	✓	✓	✓	–	–	–	–	–		–
2 PT100 evaluation units each with 6 inputs for explosion-protected motors and 2 analog outputs (outputs fed to the control for display) [2]	L96	✓	✓	✓	–	–	–	–	–	–	

[1] Options **L..** cannot be combined with option **G61** (additional TM31 Terminal Module).

[2] Options **L94** and **L96** cannot be combined with options **G61** and **G62** (additional TM31 Terminal Modules) and with option **E86** (additional analog inputs).

Increased degree of protection of the electrical cabinets in the water-cooled version (standard: IP43)	
IP54 degree of protection	M54

Controlled motor feeder for auxiliaries [1]		N30	N31	N32	N33
Controlled motor feeder for auxiliaries 3 AC 440/480 V, max. 4/4.8 kW	N30		–	–	–
Controlled motor feeder for auxiliaries 3 AC 440/480 V, max. 7/8 kW	N31	–		–	–
Controlled motor feeder for auxiliaries 3 AC 440/480 V, max. 11/12.7 kW	N32	–	–		–
Controlled motor feeder for auxiliaries 3 AC 440/480 V, max. 15/17.5 kW	N33	–	–	–	

Controlled outgoing feeder for auxiliaries [2]		N35	N36	N37	N38
Controlled outgoing feeder for auxiliaries 1 AC 230/120 V, max. 1.2/1 kW	N35		–	–	–
Controlled outgoing feeder for auxiliaries 1 AC 230/120 V, max. 2.2/1.5 kW	N36	–		–	–
Controlled outgoing feeder for auxiliaries 1 AC 230/120 V, max. 3.5/2.1 kW	N37	–	–		–
Controlled outgoing feeder for auxiliaries 1 AC 230/120 V, max. 4.5/2.8 kW	N38	–	–	–	

[1] The contactor is **closed** with the ON command at the converter and **opened** with the OFF command (example: external fan on the motor). The supply voltage for the auxiliaries to be powered must be provided externally.

[2] The contactor is **opened** with the ON command at the converter and **closed** with the OFF command (example: heater). The supply voltage for the auxiliaries to be powered must be provided externally.

✓	Options can be combined
–	Options mutually exclude each other

Options (continued)

Connection of signal cables (standard: Signal cables are directly connected at the terminals of the Terminal Module)		M32	M33
Customer's terminal strip with spring-loaded terminals for signal cables up to 2.5 mm^2	M32		–
Customer's terminal strip with screw terminals for signal cables up to 2.5 mm^2	M33	–	

Control and display instruments in the door of the control cabinet		K20	K21	K22
Indicator lights in the cabinet door	K20		–	–
Display instruments in the cabinet door for voltage, current, speed and power as well as indicator lights	K21	–		–
Display instruments in the cabinet door for current, speed, power and winding temperature as well as indicator lights	K22	–	–	

Interface modules for connection to external bus systems (standard: PROFIBUS (Slave))		G20	G21	G22	G23	G24
CAN bus interface (CANopen, on request)	G20		–	–	–	–
Modbus Plus interface (on request)	G21	–		–	–	–
Modbus RTU slave interface (on request)	G22	–	–		–	–
DeviceNet interface (on request)	G23	–	–	–		–
PROFINET interface (via CBE20) (on request)	G24	–	–	–	–	

Interface modules for additional customer connections and speed encoders		G61	G62	G63	K50
Additional TM31 Terminal Module [1]	G61		✓	✓	✓
Second additional TM31 Terminal Module [1]	G62	✓		✓	✓
Additional TM15 Terminal Module	G63	✓	✓		✓
Sensor Module Cabinet-Mounted SMC30	K50	✓	✓	✓	

[1] For exclusion of options **G61** and **G62**, see Description of options.

Additional analog inputs/outputs (isolated)		E86	E87
Additional analog inputs (isolated) [1]	E86		✓
Additional analog outputs (isolated) [2]	E87	✓	

[1] Option **E86** cannot be combined with option **G62** (second additional TM31 Terminal Module) and with options **L94** and **L96** (2 PT100 evaluation units).

[2] Option **E87** cannot be combined with option **G62** (second additional TM31 Terminal Module).

✓	Options can be combined
–	Options mutually exclude each other

Options (continued)

Other interface modules		G66	G70	G71
PADU8 diagnostics module (8 analog and 8 digital signals)	G66		✓	✓
Pulse distributor for transferring the speed encoder signal (on request) [1]	G70	✓		✓
Optical bus terminal (OBT) for PROFIBUS (on request) [2]	G71	✓	✓	

[1] Option **G70** can only be ordered in combination with option **K50** (Sensor Module Cabinet-Mounted SMC30).
[2] Option **G71** cannot be combined with options **G20** to **G24** and **G34** (access to other bus systems).

Sector-specific options		B00	M66
NAMUR terminal strip	B00		✓
Suitable for marine applications [1]	M66	✓	
The following option is included as standard in option **M66**:			
Cabinet anti-condensation heating	L55	✓	✓
The following option cannot be combined with option **M66** :			
UPS for the power supply of the open-loop and closed-loop control	L53	✓	–
The following options are required for safety-relevant drives in addition to option **M66**:			
Individual certification of the converter by the particular certification society [1]	E11 to E71	✓	✓

[1] An inquiry is required for options **M66** and **E11** up to **E71** in combination with options **C30** to **C49** (an auxiliary voltage other than 3 AC/N/400 V).

Individual certification of the converters for use on ships (on request, contains option M66) [1]		E11	E21	E31	E51	E61	E71
Suitable for marine applications with individual certificate from Germanischer Lloyd (GL)	E11		–	–	–	–	–
Suitable for marine applications with individual certificate from Lloyds Register (LR)	E21	–		–	–	–	–
Suitable for marine applications with individual certificate from Bureau Veritas (BV)	E31	–	–		–	–	–
Suitable for marine applications with individual certificate from Det Norske Veritas (DNV)	E51	–	–	–		–	–
Suitable for marine applications with individual certificate from the American Bureau of Shipping (ABS)	E61	–	–	–	–		–
Suitable for marine applications with individual certificate from the Chinese Classification Society (CCS)	E71	–	–	–	–	–	

[1] An inquiry is required for options **M66** and **E11** up to **E71** in combination with options **C30** to **C49** (an auxiliary voltage other than 3 AC/N/400 V).

Functional options		E01	E02	E03	L32
Closed-loop control for separately excited synchronous motors with slip-ring excitation	E01		–	–	✓
Closed-loop control for separately excited synchronous motors with brushless reverse field excitation	E02	–		–	✓
Closed-loop control for permanently excited synchronous motors [1]	E03	–	–		✓
Automatic restart	L32	✓	✓	✓	

[1] Option **E03** can only be ordered in combination with option **L52** (circuit-breaker at the converter output).

✓	Options can be combined
–	Options mutually exclude each other

Options (continued)

Documentation (standard: PDF format in English on CD-ROM)		B43	B44	B45	D02	D15	Y10
Production flowchart: Generated once	B43		–	–	✓	✓	✓
Production flowchart: Updated every two weeks	B44	–		–	✓	✓	✓
Production flowchart: Updated every month	B45	–	–		✓	✓	✓
Circuit diagrams, terminal diagrams and dimension drawings in the DXF format [1]	D02	✓	✓	✓		✓	✓
One set of printed documentation (multiple orders possible)	D15	✓	✓	✓	✓		✓
Circuit diagrams with customer-specific text field (plain text is required) [1]	Y10	✓	✓	✓	✓	✓	

[1] The equipment-specific documents (circuit diagrams etc.) are only available in English/German.

Documentation in languages (standard: PDF format in English on CD-ROM)		D00	D55	D56	D72	D76	D77	D78	D79	D84	D92
Documentation in German	D00		–	–	–	✓	–	–	–	–	–
Documentation in Polish	D55	–		–	–	✓	–	–	–	–	–
Documentation in Russian (on request)	D56	–	–		–	✓	–	–	–	–	–
Documentation in Italian (on request)	D72	–	–	–		✓	–	–	–	–	–
Documentation in English (additional CD-ROM in English, independent of the selected language)	D76	✓	✓	✓	✓		✓	✓	✓	✓	✓
Documentation in French (on request)	D77	–	–	–	–	✓		–	–	–	–
Documentation in Spanish	D78	–	–	–	–	✓	–		–	–	–
Documentation in Portuguese	D79	–	–	–	–	✓	–	–		–	–
Documentation in Chinese	D84	–	–	–	–	✓	–	–	–		–
Documentation in Japanese (on request)	D92	–	–	–	–	✓	–	–	–	–	

Rating plate language (standard: English/German)		T58	T60	T80	T82	T85	T86	T90	T91
Rating plate in English/French	T58		–	–	–	–	–	–	–
Rating plate in English/Spanish	T60	–		–	–	–	–	–	–
Rating plate in English/Italian	T80	–	–		–	–	–	–	–
Rating plate in English/Portuguese (on request)	T82	–	–	–		–	–	–	–
Rating plate in English/Russian (on request)	T85	–	–	–	–		–	–	–
Rating plate in English/Polish (on request)	T86	–	–	–	–	–		–	–
Rating plate in English/Japanese (on request)	T90	–	–	–	–	–	–		–
Rating plate in English/Chinese (on request)	T91	–	–	–	–	–	–	–	

✓ Options can be combined
– Options mutually exclude each other

3

Options (continued)

Auxiliary power supply	
Auxiliary voltage other than 3 AC/N/400 V	**C30 to C49**

Converter acceptance tests with the customer present		F03	F73	F77	F97
Visual acceptance of converter	**F03**		–	–	–
Functional acceptance of converter with inductive load	**F73**	–		✓	–
Insulation acceptance test of the converter [1]	**F77**	–	✓		–
Customer-specific system acceptance test (on request)	**F97**	–	–	–	

[1] Option **F77** can only be ordered in connection with option **F73**.

Cooling unit (standard: Cooling unit with redundant pumps and a stainless steel plate-type heat exchanger)		W02	W11	W12	W14	Y40
Cooling unit with redundant stainless steel plate-type heat exchangers	**W02**		–	–	–	–
Cooling unit with titanium plate-type heat exchanger	**W11**	–		–	–	–
Cooling unit with redundant titanium plate-type heat exchangers	**W12**	–	–		–	–
Converter without cooling unit (provided on the plant side)	**W14**	–	–	–		–
Raw water data that deviates from the technical data (on request) [1]	**Y40**	–	–	–	–	

[1] Option **Y40** includes a cooling system which is adapted to the raw water data according to the customer's specifications.

Warranty extension		W80	W81	W82	W83	W84	W85	W86
Warranty extension of 6 months to 24 months (2 years) after delivery	**W80**		–	–	–	–	–	–
Warranty extension of 12 months to 30 months (2½ years) after delivery	**W81**	–		–	–	–	–	–
Warranty extension of 18 months to 36 months (3 years) after delivery	**W82**	–	–		–	–	–	–
Warranty extension of 24 months to 42 months (3½ years) after delivery	**W83**	–	–	–		–	–	–
Warranty extension by 30 months to 48 months (4 years) after delivery	**W84**	–	–	–	–		–	–
Warranty extension by 42 months to 60 months (5 years) after delivery	**W85**	–	–	–	–	–		–
Warranty extension by 54 months to 72 months (6 years) after delivery	**W86**	–	–	–	–	–	–	

Other options		L50	L53	L55	Y09
Cabinet lighting and service socket outlet in the closed-loop control section	**L50**		✓	✓	✓
UPS for the power supply of the open-loop and closed-loop control	**L53**	✓		✓	✓
Anti-condensation heating for the cabinet	**L55**	✓	✓		✓
Special paint finish acc. to RAL .... (in a color other than RAL 7035; plain text required)	**Y09**	✓	✓	✓	

✓	Options can be combined
–	Options mutually exclude each other

Technical data

General technical data	
Power components	Diodes/IGCTs
Line-side converter	
• Standard	12-pulse diode rectifier (Basic Line Module)
• Option	24-pulse diode rectifier (Basic Line Module)
Motor-side converter	Inverter (Motor Module)
Closed-loop control	Closed-loop vector control
Drive quadrants	2 (2 directions of rotation, driving)
Isolation of power unit/ open-loop and closed-loop control	Fiber-optic cable, insulating transformer
Auxiliary power supply (for fans, coolant pumps, precharging the DC link capacitors, open-loop and closed-loop control)	• 1 AC 230 V ±10 %, 50/60 Hz ±3 % and • 3 AC 400 V ±10 %, 50/60 Hz ±3 % or another auxiliary voltage (options **C30** to **C49**)
Installation altitude	≤1000 m above sea level: Load capability 100 % >1000 m to 4000 m above sea level: Current derating required >2000 m to 4000 m above sea level: Voltage derating additionally required
Insulation	in accordance with DIN EN 50178/VDE 0160 (IEC 62103): Degree of pollution 2 (without conductive pollution), condensation not permitted
Degree of protection	in accordance with DIN EN 60529/VDE 0470 T1 (IEC 60529): IP43
Protection class	in accordance with DIN EN 61140/VDE 0140 T1 (IEC 61140): 1
Shock protection	BGV A 3
Interference emission	This drive unit is part of a PDS, Category C4 acc. to DIN EN 61800-3/VDE 0160 T103 (IEC 61800-3). It has not been designed to be connected to the public line supply. EMC disturbances can occur when connected to these line supplies. The essential requirements placed on EMC protection for the drive system should be secured using an EMC plan.
Paint finish/color	Indoor requirements/light gray RAL 7035
Compliance with standards	
• Standards	- DIN EN 61800-3/VDE 0160 T103 (IEC 61800-3) - DIN EN 61800-4/VDE 0160 T104 (IEC 61800-4) - DIN EN 60146-1-1/VDE 0558 T11 (IEC 60146-1-1) - DIN EN 50178/VDE 0160 T103 (IEC 62103) - DIN EN 60204-11/VDE 0113 T11 (IEC 60204-11)
• EU Directives	- 98/37/EC + amendments (Machinery Directive) - 2004/108/EC + amendments (Electromagnetic Compatibility)
Water cooling	Water-water cooling unit, internal circuit, deionized water
Permissible coolant temperature (raw water)	
• Inlet	+5 °C to +35 °C
• Discharge	max. +40 °C

Rated data	
Output voltage	**3.3 kV**
Input voltage	2 × 1.7 kV
Tolerance of input voltage	±10 %
Line frequency	50/60 Hz ±3 %
Line power factor fundamental component	>0.96

Technical data (continued)

	Operation of induction motors		Operation of separately excited synchronous motors
	without speed encoder	with speed encoder	with speed encoder
Closed-loop control properties			
Operating range			
• Lower limit of speed control range (% of rated motor speed)	5 %	0 %	0 %
• Max. permissible output frequency	250 Hz	250 Hz	90 Hz
• Field weakening range	1:3	1:3	1:4
Steady-state operation			
• Speed accuracy (% of rated motor speed)	±0.2 % (from 5 % rated speed)	±0.01 %	±0.01 %
• Torque accuracy (% of rated torque)	±5 % (from 5 % rated speed)	±5 %	±2 %
Dynamic operation			
• Torque rise time	5 ms	5 ms	5 ms

	Storage	Transport	Operation
Climatic ambient conditions			
Ambient temperature	-25 °C to +70 °C	-25 °C to +70 °C	+5 °C to +40 °C
Relative air humidity	5 % to 95 % (only slight condensation permitted; converter must be completely dry before commissioning)	5 % to 75 %	5 % to 85 % (condensation not permitted)
Other climatic conditions in accordance with Class	1K3 acc. to DIN EN 60721-3-1 (IEC 60721-3-1) (formation of ice not permitted)	2K2 acc. to DIN EN 60721-3-2 (IEC 60721-3-2)	3K3 ac. to DIN EN 60721-3-3 (IEC 60721-3-3)
Degree of pollution	2 without conductive pollution acc. to DIN EN 50178/VDE 0160 (IEC 62103)	2 without conductive pollution acc. to DIN EN 50178/VDE 0160 (IEC 62103)	2 without conductive pollution acc. to DIN EN 50178/VDE 0160 (IEC 62103)
Mechanical ambient conditions			
Vibratory load			
• Displacement	1.5 mm at 2 Hz to 9 Hz	3.5 mm at 2 Hz to 9 Hz	0.3 mm at 2 Hz to 9 Hz
• Acceleration	5 m/s^2 at 9 Hz to 200 Hz	10 m/s^2 at 9 Hz to 200 Hz 15 m/s^2 at 200 Hz to 500 Hz	1 m/s^2 at 9 Hz to 200 Hz
Other mechanical conditions in accordance with Class (increased strength for marine applications)	1M2 acc. to DIN EN 60721-3-1 (IEC 60721-3-1)	2M2 acc. to DIN EN 60721-3-2 (IEC 60721-3-2)	3M1 acc. to DIN EN 60721-3-3 (IEC 60721-3-3)
Other ambient conditions			
Biological ambient conditions in accordance with Class	1B1 acc. to DIN EN 60721-3-1 (IEC 60721-3-1)	2B1 acc. to DIN EN 60721-3-2 (IEC 60721-3-2)	3B2 acc. to DIN EN 60721-3-3 (IEC 60721-3-3) (without harmful flora)
Chemically active substances in accordance with Class	1C1 acc. to DIN EN 60721-3-1 (IEC 60721-3-1)	2C1 acc. to DIN EN 60721-3-2 (IEC 60721-3-2)	3C2 acc. to DIN EN 60721-3-3 (IEC 60721-3-3) (no occurrence of salt mist)
Mechanically active substances in accordance with Class	1S1 acc. to DIN EN 60721-3-1 (IEC 60721-3-1)	2S1 acc. to DIN EN 60721-3-2 (IEC 60721-3-2)	3S1 acc. to DIN EN 60721-3-3 (IEC 60721-3-3)

Note: The values specified under storage and transport apply to suitably packed converters.

Technical data (continued)

Derating for special installation conditions

Current derating

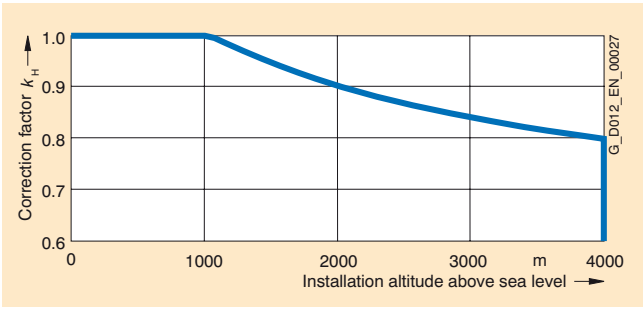
If the converters are operated at installation altitudes above 1000 m above sea level or for ambient and coolant temperatures >40 °C for air cooling or >35 °C for water cooling, derating factors k_T or k_H must be taken into account for the rated output current (DIN 43671). For the permissible continuous current I the following applies:

$I \leq I_{rated} \times k_H \times k_T$

I: permissible continuous current
I_{rated}: rated current

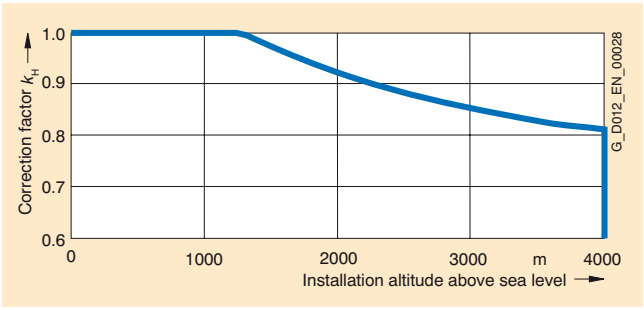
For water-cooled versions, the following applies: When determining the current derating required ($k_H \times k_T$) in addition to the raw water intake temperature, the ambient temperature and air pressure also have to be taken into consideration as e.g. the DC link busbars are air-cooled. For this purpose, factor k_T should be determined from the diagram for the ambient temperature and from the diagram for the raw water intake temperature. The lower of the two values should be used to calculate the current derating.

Current derating as a function of the installation altitude (air cooling)



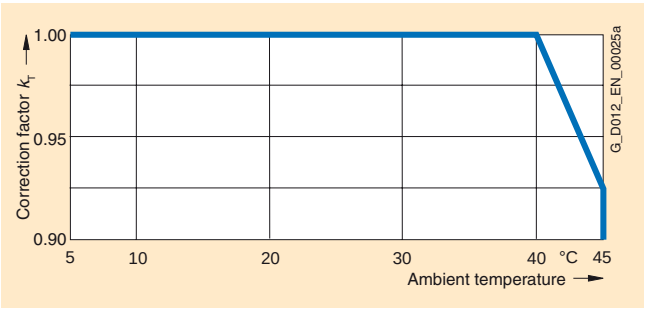
Derating factor k_H for air cooling

Current derating as a function of the installation altitude (water cooling)



Derating factor k_H for water cooling

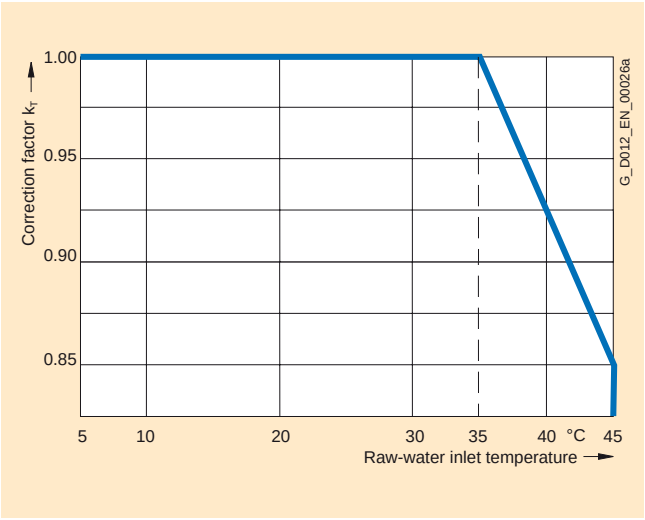
Current derating as a function of the ambient temperature



Derating factor k_T (ambient temperature)

The specified current derating as a function of the ambient temperature is only relevant for continuous operation (rated data); the possible overload current remains unaffected.

Current derating as a function of the raw water intake temperature

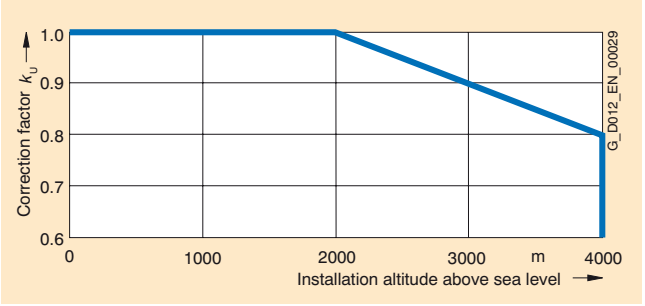


Derating factor k_T (raw water intake temperature)

Voltage derating

At installation altitudes >2000 m, a voltage derating must be made in addition to a current derating DIN EN 60664-1/ VDE 0110 (IEC 60664-1). This depends on the air and creepage distances in the unit.

Voltage derating as a function of the installation altitude



Derating factor k_U

Technical data (continued)

Example 1

Derating data SINAMICS GM150 in IGCT version

Drive unit	6SL3835-2LN43-6AA0
Output voltage	3.3 kV
Input voltage	2 x (2 x 1.7) kV
Type rating	20000 kVA, 2 x 1750 A
Installation altitude	2000 m
Maximum ambient temperature	35 °C
Raw water intake temperature	40 °C
k_H (water cooling)	0.925
k_T (ambient temperature)	1.0
k_T (raw water intake temperature)	0.925
k_U	1.0

The lower value for k_T is obtained here from the diagram for the raw water intake temperature.

$I \leq I_{rated} \times 0.925 \times 0.925 = I_{rated} \times 0.856$

A current derating of 14.4 % is required. The max. available output current of the converter is 1498 A per subsystem.

Example 2

Derating data SINAMICS GM150 in IGCT version

Drive unit	6SL3835-2LN43-6AA0
Output voltage	3.3 kV
Input voltage	2 x (2 x 1.7) kV
Type rating	20000 kVA, 2 x 1750 A
Installation altitude	1000 m
Maximum ambient temperature	45 °C
Raw water intake temperature	38 °C
k_H (water cooling)	1.0
k_T (ambient temperature)	0.925
k_T (raw water intake temperature)	0.955
k_U	1.0

The lower value for k_T is obtained here from the diagram for the ambient temperature.

$I \leq I_{rated} \times 1.0 \times 0.925 = I_{rated} \times 0.925$

A current derating of 7.5 % is required.

The max. available output current of the converter is 1619 A per subsystem.

Technical data

SINAMICS GM150 in IGCT version Water cooling		6SL3835-2LN41-8AA0	6SL3835-2LN42-8AA0	6SL3835-2LN43-6AA0	6SL3835-2LN44-2AA0
Output voltage 3.3 kV					
Type rating	kVA	10000	15500	18000	21000
Shaft output [1]	kW	9000	12500	16000	17500
	hp	12000	18000	22000	24000
Rated output current	A	1750	2 × 1360	2 × 1570	3 × 1220
Input voltage	kV	2 × 1.7	2 × (2 × 1.7)	2 × (2 × 1.7)	3 × (2 × 1.7)
Rated input current [1]	A	2 × 1550	2 × (2 × 1240)	2 × (2 × 1550)	3 × (2 × 1240)
Power loss [2] [3]	kW	80	128	160	192
Efficiency [3]	%	99.1	99.1	99.1	99.1
Max. current demand of the auxiliary supply 1 AC 50/60 Hz 230 V	A	3	6	6	9
Max. current demand of the auxiliary supply 3 AC 50/60 Hz 400 V	A	17	20	20	23
Precharging current requirement, briefly for approx. 25 s	A	20	40	40	60
Cooling water flow rate (raw water/deionized water)	l/min	205	410	410	615
Sound pressure level L_{pA} (1 m)	dB	75	77	77	79
Measuring surface level L_s (1 m)	dB	22	23	23	24
Cable cross-sections, line-side, max. connectable per phase [4] [5]	mm^2 (DIN VDE)	6 × 240	6 × 240	6 × 240	6 × 240
	AWG/MCM (NEC, CEC)	6 × 500 MCM	6 × 500 MCM	6 × 500 MCM	6 × 500 MCM
Cable cross-sections, motor-side, max. connectable per phase [4] [5]	mm^2 (DIN VDE)	6 × 240	6 × 240	6 × 240	6 × 240
	AWG/MCM (NEC, CEC)	6 × 500 MCM	6 × 500 MCM	6 × 500 MCM	6 × 500 MCM
PE connection, max. connection cross-section at enclosure with M12 screw [4]	mm^2 (DIN VDE)	2 × 120	6 × 120	2 × 120	6 × 120
	AWG/MCM (NEC, CEC)	2 × 250 MCM	6 × 250 MCM	2 × 250 MCM	6 × 250 MCM
Degree of protection		IP43	IP43	IP43	IP43
Dimensions (with doors and panels)					
• Width	mm	5300	9400	9400	14300
• Height	mm	2540	2540	2540	2540
• Depth	mm	1600	1600	1600	1600
Circuit design (Page 3/4)		⑦	⑨	⑨	⑩
Weight	kg	5400	9800	9800	15000

[1] The specifications for the rated input current and the power data in hp and kW are approximate values only; these have been calculated for operation with induction motors and for a typical power factor cos phi and motor efficiency.
The hp specifications are based on the NEC and CEC guidelines for the North American market.
The kW values are specified in multiples of 500. Both approximate values need to be adapted to the motor which is actually used.

[2] Approx. 5 % of the power loss is dissipated into the atmosphere.

[3] Without cooling system.

[4] Figures refer to a subsystem; see “Circuit designs” for the number of subsystems to be connected on the line and motor side.

[5] The maximum permissible cable lengths must be observed (see Power cables in Section 7).

Notes

SINAMICS SM150

4

SINAMICS SM150

Overview

SINAMICS SM150

Water-cooled regenerative SINAMICS SM150 converters are available as single or multi-motor drives with the well-proven medium voltage IGCT power semiconductors. For multi-motor drives, a common DC bus enables energy to be directly exchanged between generating and motoring drives.

IGCT converters are available for the following voltage and power ranges:

Rated output voltage	Max. type ratings
3.3 kV	10.5 MVA, 21 MVA, 31.5 MVA (for a single circuit configuration, parallel circuit configurations with either two or three units)

The rated power in the concrete application will depend on the necessary load cycle.

Note: For other technical requirements that have to be taken into consideration (surge loads, operation at low frequencies, possibly necessary derating for parallel circuit configurations) please contact your partner in sales and let him have the specifications.

Global use

SINAMICS SM150 converters are manufactured to international standards and regulations, making them ideally suited for global use. These converters are also available in a marine version (meeting the requirements of all of major ship's classification societies).

Benefits

- Compact design and highly flexible configuration ensures easy plant integration
- Simple operator control and monitoring from the user-friendly operator panel
- Simple and reliable operation through integrated maintenance functions: The converter signals early on and automatically if maintenance is required or components need to be replaced
- High degree of ruggedness and reliability due to the use of IGCT power semiconductors in the high power range and fuseless design combined with an intelligent response to external disturbances
- Can be easily integrated into automation solutions as the PROFIBUS interface is supplied as standard along with various analog and digital interfaces
- High level of service-friendliness through innovative power unit design with compact phase modules and easy access to all components
- By appropriately engineering the drive system, reactive power can be made available to other drives therefore helping ensure that the plant or system is cost effective.

Design

For both single-motor drives as well as multi-motor drives, Active Line Modules and Motor Modules have an almost identical structure. Both use phase modules in which IGCTs, diodes etc. are grouped together in one compact tensioned stack.

Single-motor drive

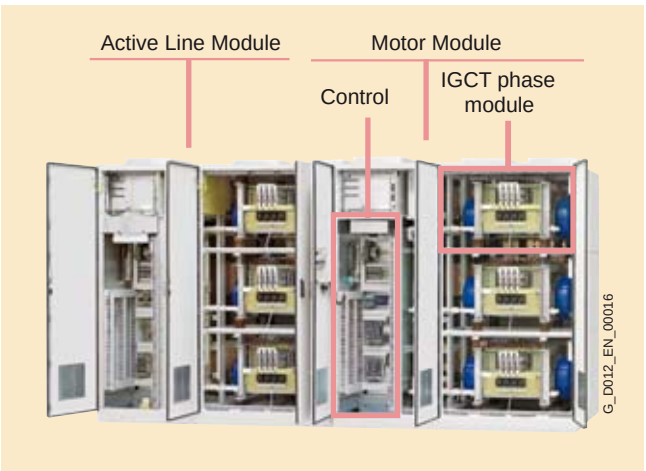
With a single-motor drive, one Active Line Module and one Motor Module are connected “back-to-back” in the basic circuit via a DC link.

For higher output ratings, two or three complete converter units with isolated DC links are operated in parallel.

Multi-motor drive

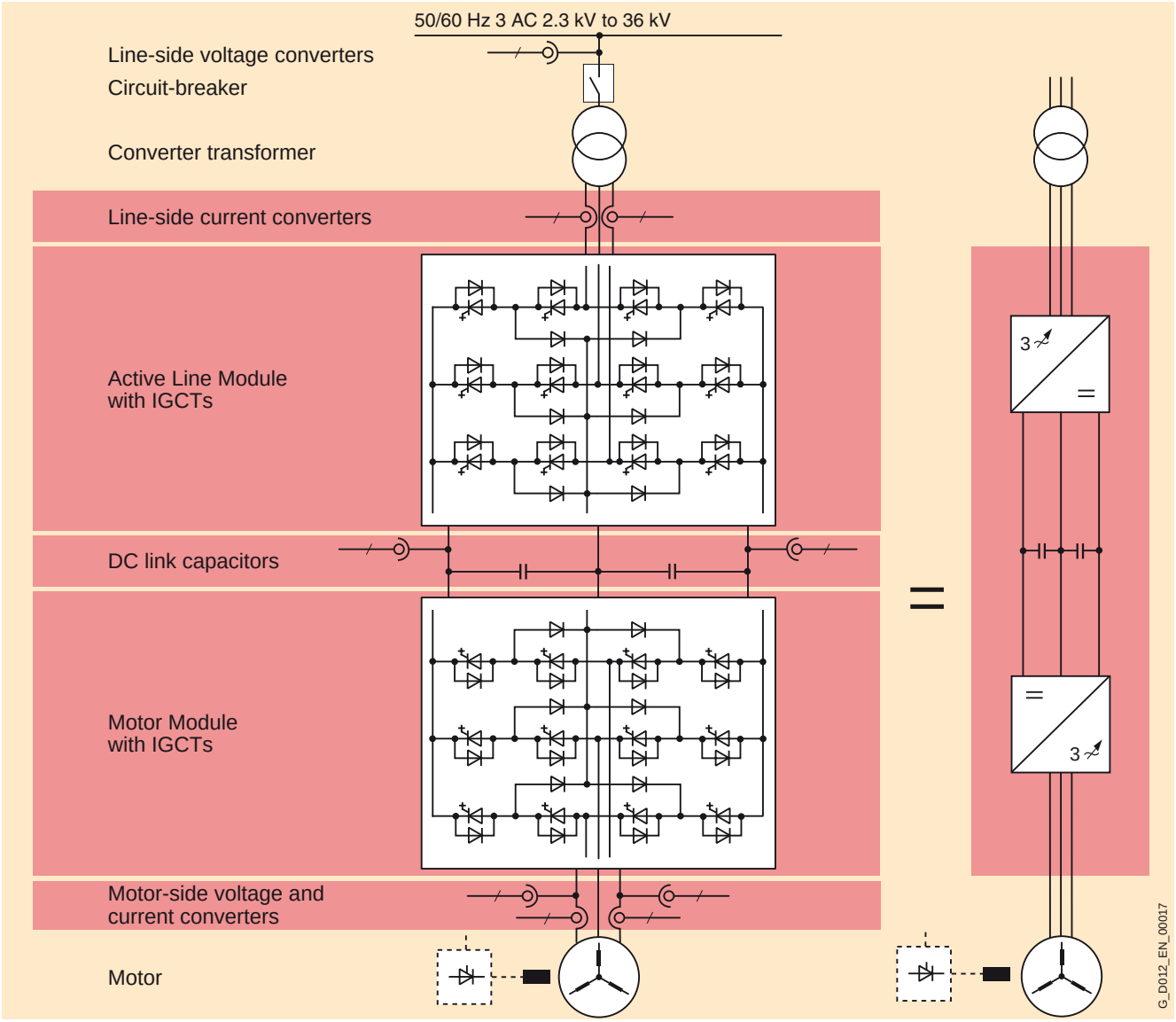
With multi-motor drives, up to four power units are operated on the common DC bus. In addition to the Active Line Module, three Motor Modules with three motors can be operated on the common DC bus where energy can be directly exchanged.

The converter consists of cabinet units for the Active Line Module and for the Motor Module. One of three phase modules and the control section in the Motor Module cabinet are highlighted in the diagram.



SINAMICS SM150, internal arrangement (without cooling unit)

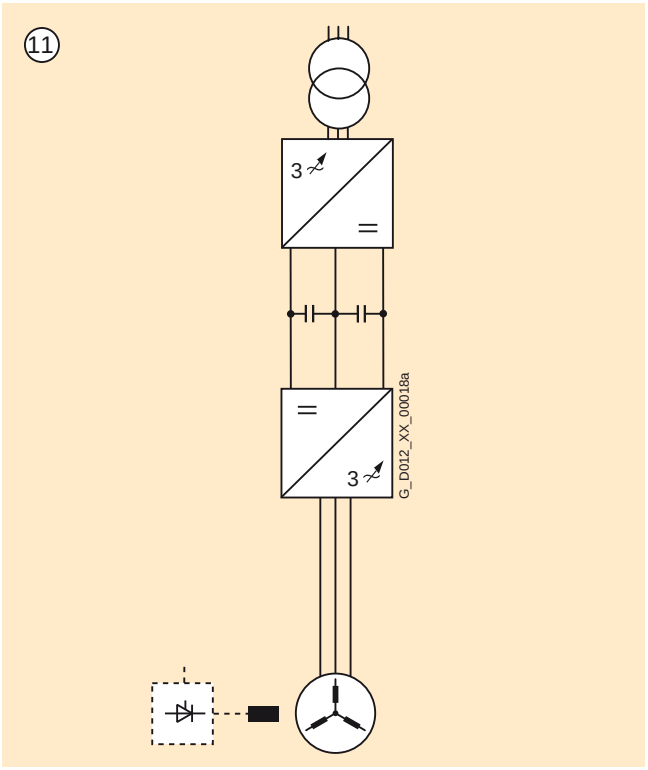
Design (continued)



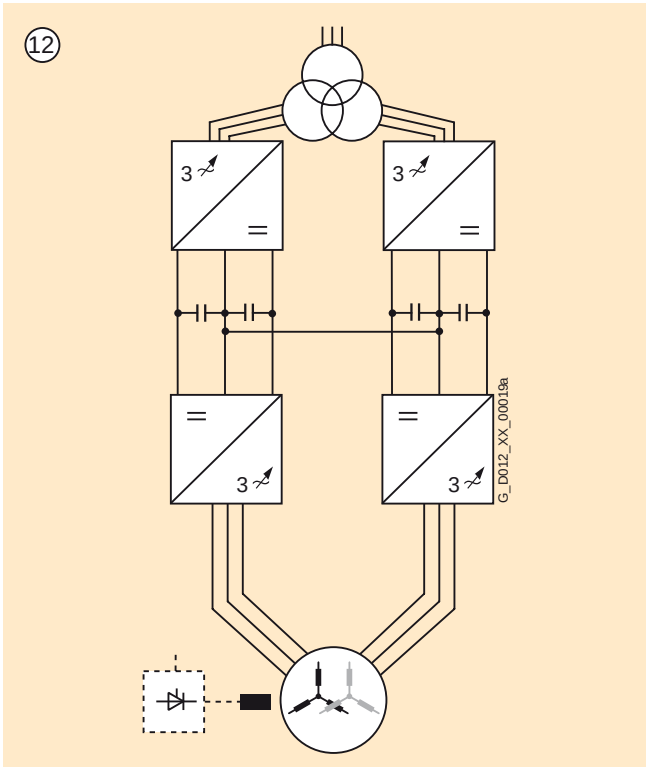
Block diagram

Design (continued)

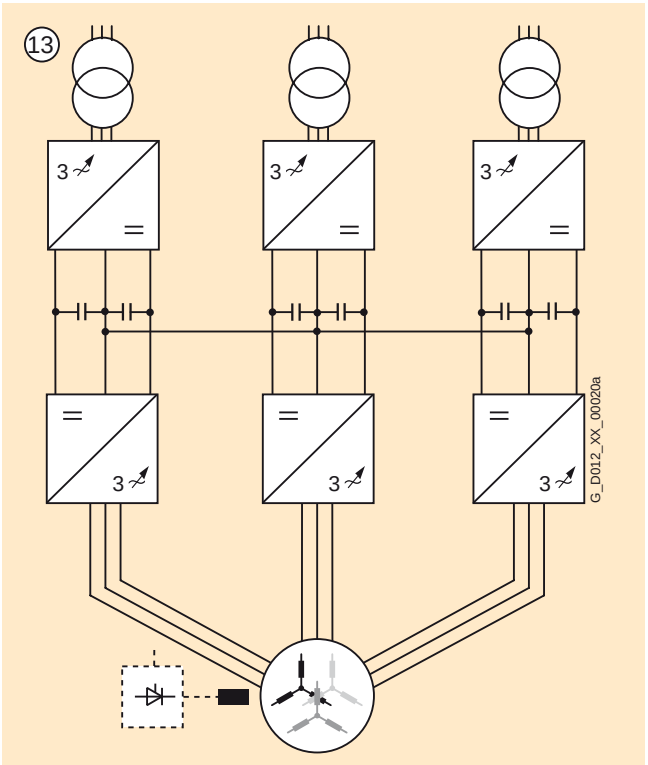
The following circuit designs are available for SINAMICS SM150.



Basic circuit



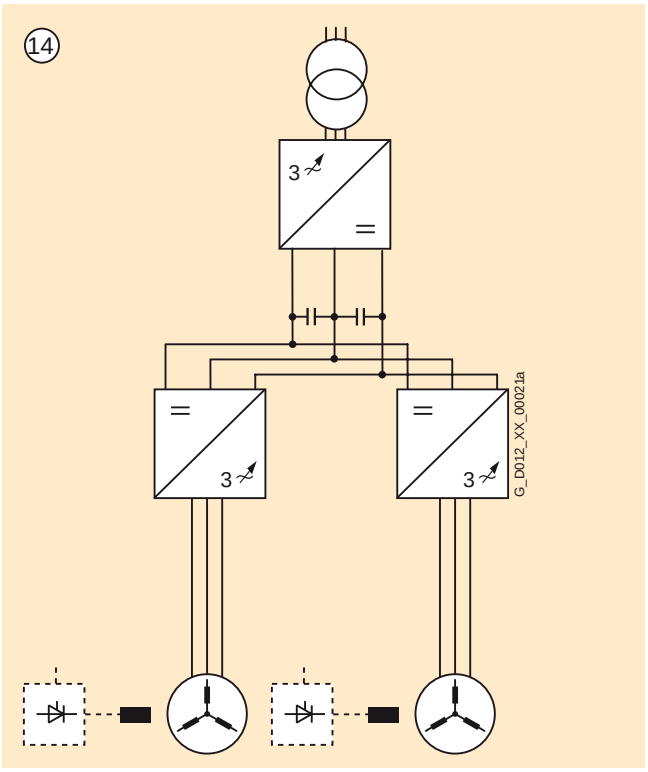
The power can be increased by operating two converter units in parallel (this additionally reduces the harmonics) [1)]



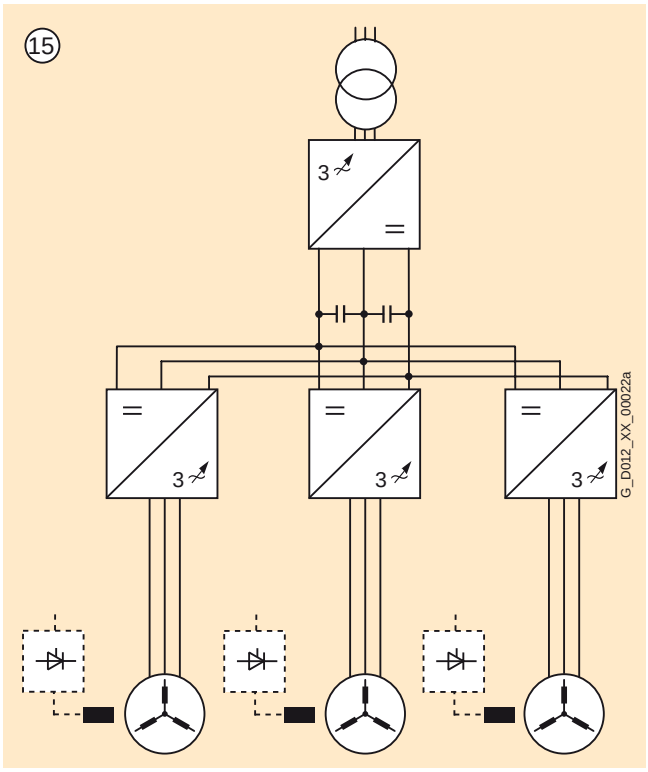
The power can be increased by operating three converter units in parallel (this additionally reduces the line harmonics) [1)]

[1)] Requires a motor with separate winding systems.

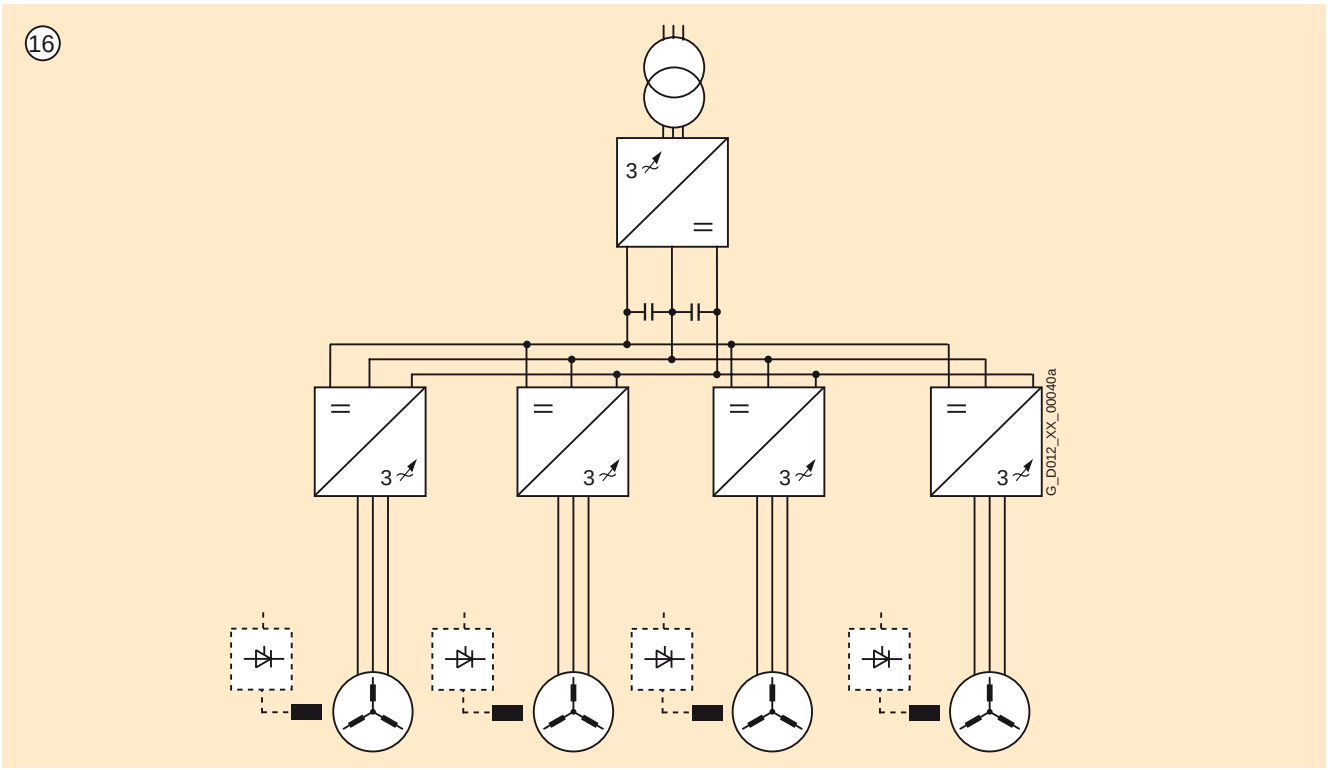
Design (continued)



DC bus configuration with two motors on a common DC link

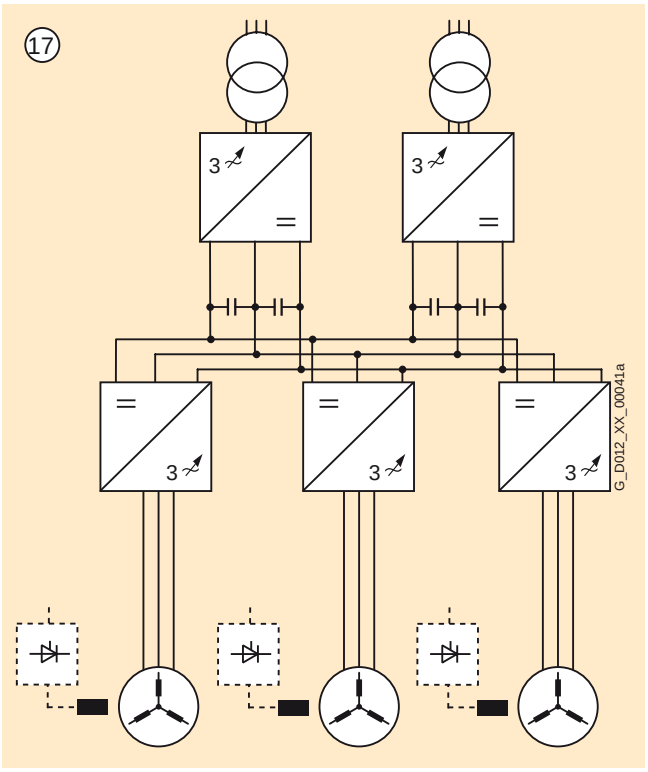


DC bus configuration with three motors on a common DC link

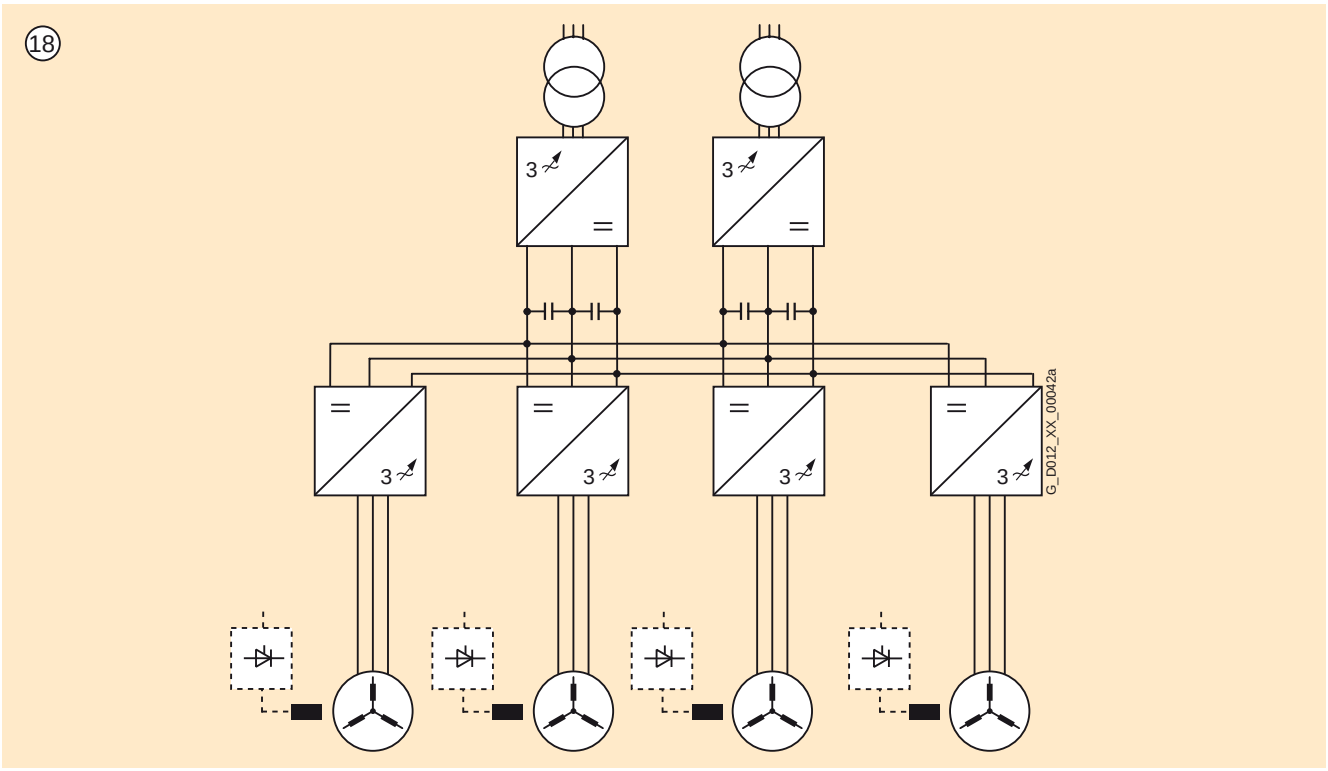


DC bus configuration with four motors on a common DC link

Design (continued)

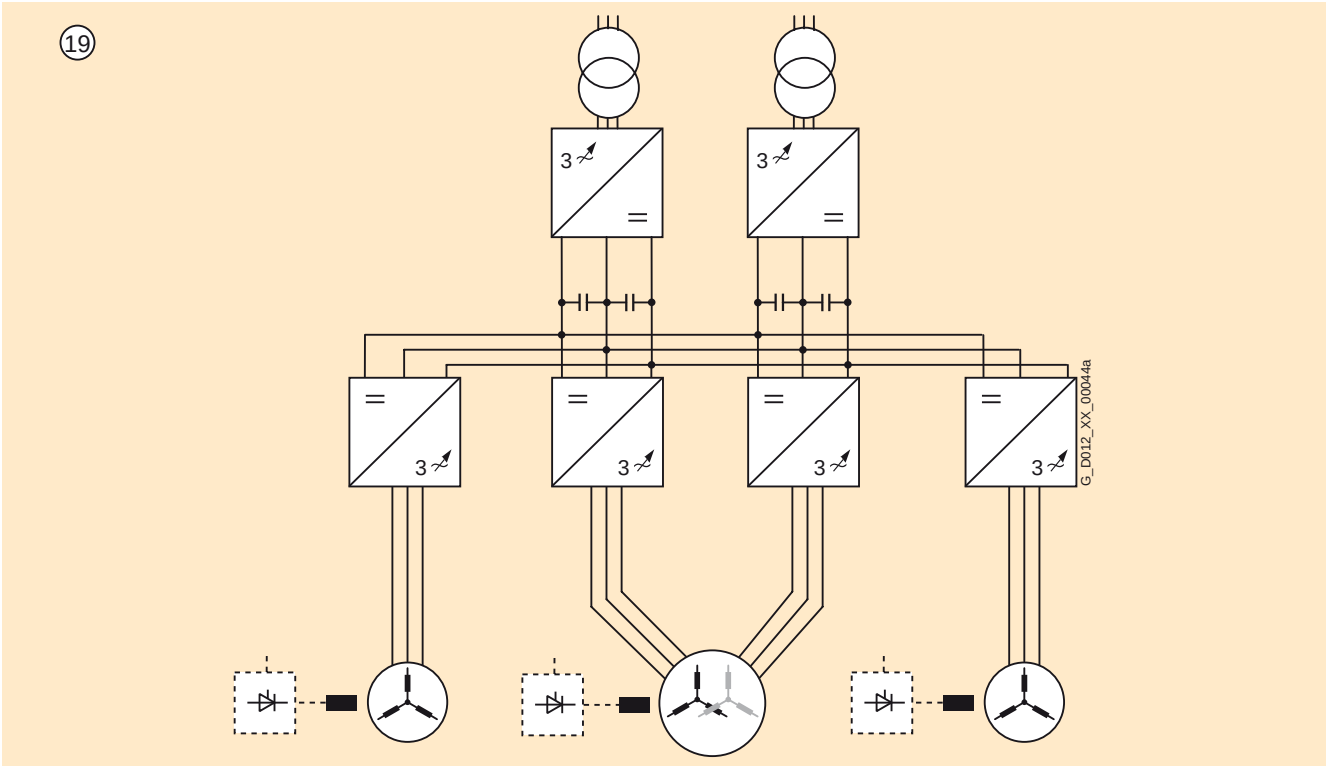


DC bus configuration with two Active Line Modules and three motors on a common DC link



DC bus configuration with two Active Line Modules and four motors on a common DC link

Design (continued)



DC bus configuration with two Active Line Modules and three motors on a common DC link (2 x 10 MVA, 1 x 20 MVA)

For the DC bus configurations with two or more motors, energy can be exchanged along the common DC link between drives that are either motoring or regenerating. This results in savings in the Active Line Module, the transformers and the circuit-breakers. These configurations are mainly used for single-stand cold rolling mills with a coiler and for gear unit test stands.

SINAMICS SM150

Function

Characteristic features

SINAMICS SM150	
Line Module (line-side rectifier)	
Active Line Module (four-quadrant operation)	Standard
Motor Module (motor-side inverter)	
Voltage range	3.3 kV
Power range (typ.)	5 MVA to 31.5 MVA
Cooling method	
• Water cooling	Standard
Control modes	
• Induction motor	Standard
• Synchronous motor, separately excited	Option
• Synchronous motor, permanently excited	Option
DC bus configuration with several Motor Modules on one common DC bus	Standard

Software and protection functions

SINAMICS SM150	Description
Closed-loop control	The motor-side closed-loop control is realized as a field-oriented closed-loop vector control that can be operated as a speed or torque control as required. The closed-loop vector control achieves the dynamic performance of a DC drive. This is made possible by the fact that the current components forming the torque and flux can be controlled precisely and independently of each other. This means that specified torques can be precisely maintained and limited. In the speed range from 1:10, the field-oriented closed-loop control does not require a speed encoder. A speed encoder is required in the following cases: • High requirements placed on the dynamic performance • Torque control/constant torque drives with control range > 1:10 • Very low speeds • Extremely high speed accuracy
Setpoint input	The setpoint can be defined internally or externally; internally as a fixed, motorized potentiometer or jog setpoint, externally via the PROFIBUS interface or an analog input of the customer's terminal strip. The internal fixed setpoint and the motorized potentiometer setpoint can be switched over or adjusted using control commands via all of the interfaces.
Ramp-function generator	A user-friendly ramp-function generator with separately adjustable ramp-up and ramp-down times, together with adjustable rounding times in the lower and upper speed ranges, improves the control response and therefore prevents mechanical overloading of the drive train. The down ramps can be parameterized separately for a fast stop.
$V_{dc\ max}$ controller	The $V_{dc\ max}$ controller automatically prevents overvoltages in the DC link for example when the selected down ramp is too short. This can also extend the selected ramp-down time.
Kinetic buffering (KIP)	The line voltage failures are buffered to the extent permitted by the kinetic energy of the drive train. The speed decreases depending on the moment of inertia and the load torque. The actual speed setpoint is resumed when the line voltage returns.
Automatic restart (option)	The automatic restart powers up the drive again when the power is restored after a power failure or a general fault, and ramps up the drive to the actual speed setpoint.
Flying restart	The flying restart function permits bumpless connection of the converter to a rotating motor.
Diagnostic functions	• Self-diagnostics of the control hardware • Non-volatile memory for reliable diagnostics when the power supply fails • Monitoring the IGCTs with individual messages for each mounting location • User-friendly local operator panel with plain text messages
Operating hours and switching cycle counter	The operating hours of the fans are detected and logged so that preventive maintenance can be performed or equipment replaced. The switching cycles of the circuit-breaker are detected and summed to form the basis of preventive maintenance work.
Personnel protection	The cabinet doors of the power units are fitted with electromagnetic locks. These prevent the cabinet doors from being opened while hazardous voltages are present inside the cabinet.

Function (continued)

Software and protection functions

SINAMICS SM150	Description
EMERGENCY OFF button	The converters are equipped as standard with an EMERGENCY OFF button with protective collar which is fitted in the cabinet door. The contacts of the pushbutton are connected in parallel to the terminal strip so they can be integrated in a protection concept on the plant side. EMERGENCY OFF stop category 0 is set as standard for uncontrolled shutdown (DIN EN 60204-1/VDE 0113-1 (IEC 60204-1)). The function includes disconnecting the voltage at the converter output through the circuit-breaker. The motor then coasts down. The control of the "Safe Torque Off" function is optionally available (option **K80**).
Insulation monitoring	The converters feature insulation monitoring of the complete electrical network from the secondary side of the transformer to the stator windings of the motor.
I/O monitoring	An extensive package of options for I/O monitoring (from the transformer and the motor through to the auxiliaries) is available. In addition it is possible to monitor the temperature with thermocouples or PT100 resistors.
Thermal overload protection	An alarm message is issued first when the overtemperature threshold is reached. If the temperature continues to rise, the converter is either shutdown or the output current is automatically influenced so that the thermal load is reduced. The original operating values are automatically resumed once the cause of the fault has been removed (e.g. improving the cooling). In the case of water-cooled converters, the water temperature and flow rate are detected at several points in the cooling circuit and evaluated. Extensive self-diagnostic functions protect the converter and signal faults.
Make-proof grounding switch (option)	If grounding on the line or motor side is required for safety and protection reasons, a motor-operated make-proof grounding switch can be ordered. For safety reasons, the converter control interlocks these make-proof grounding switches so that they cannot be closed as long as voltage is still present. The control is integrated into the protection and monitoring circuit of the converter. The make-proof grounding switches are closed automatically when the standard make-proof grounding switch of the DC link is closed.

SIMATIC OP 177B operator panel

The SIMATIC OP 177B operator panel is fitted into the cabinet door of the SINAMICS SM150 for operation, monitoring and commissioning.

It has the following features and characteristics:

- 5.7" STN touch display
- Context-dependent operator actions by touch, permanently available functions can be selected using individual keys
- Non-volatile message buffer, no battery

English and German are available as operator panel languages.

SINAMICS SM150

Selection data

Type rating	Shaft output		Rated output current	SINAMICS SM150	Circuit design (Pages 4/4 to 4/7)
kVA	kW	hp	A	Type No.	Fig. No.
Output voltage 3.3 kV					
10000	10000	13000	1750	**6SL3845-7NN4■-■AA0**	⑪
20000	20000	26000	2 × 1750	**6SL3845-7NN4■-■AA0**	⑫
30000	30000	39000	3 × 1750	**6SL3845-7NN4■-■AA0**	⑬
10000 [1]	10000	13000	2 × 1750	**6SL3845-7NN4■-■AB0**	⑭
10000 [1]	10000	13000	3 × 1750	**6SL3845-7NN4■-■AC0**	⑮
10000 [1]	10000	13000	4 × 1750	**6SL3845-7NN4■-■AD0**	⑯
10000 [1]	10000	13000	3 × 1750	**6SL3845-7NN4■-■AF0**	⑰
10000 [1]	10000	13000	4 × 1750	**6SL3845-7NN4■-■AG0**	⑱
20000 [1]	20000	26000	1 × (2 × 1750) +2 × 1750	**6SL3845-7NN4■-■AF0**	⑲
10500	10500	13500	1850	**6SL3845-7NN4■-■AA0**	⑪
21000	21000	27000	2 × 1850	**6SL3845-7NN4■-■AA0**	⑫
31500	31500	40500	3 × 1850	**6SL3845-7NN4■-■AA0**	⑬

Note: For other technical requirements that have to be taken into consideration (surge loads, operation at low frequencies, possibly necessary derating for parallel circuit configurations) please contact your partner in sales and let him have the specifications.

[1] The underlying circuits are based on a drive group in which the drives operate both as motor and generator. The energy is balanced via the DC link. The specified power corresponds to the maximum infeed power. The effective total power of the Motor Modules (taking into account the power flow direction) may not exceed this infeed power.

Options

When ordering a drive converter with options, add the suffix **"-Z"** after the order number and then state the order code(s) for the desired option(s) after the suffix.

In the following tables, related options are arranged in groups. Whether the options can be combined or are mutually exclusive is indicated within these groups. A detailed description of the options can be found in the Chapter, Description of options.

Input-side options	
Circuit-breaker at the converter input (on request)	**N13**

Output-side options		**L08**	**L52**	**L72**	**Y73**
Output reactor	**L08**		✓	✓	✓
Circuit-breaker at the converter output [1]	**L52**	✓		✓	✓
Braking Module (on request)	**L72**	✓	✓		✓
Braking resistor	**Y73**	✓	✓	✓	

[1] Option **L52** cannot be combined with option **L51** (disconnector at the converter output).

✓	Options can be combined
–	Options mutually exclude each other

Options (continued)

Protective functions		K80	L48	L49	L51	M10
Control of "Safe Torque Off" function (on request)	K80		✓	✓	✓	✓
Make-proof grounding switch at the converter input (motor driven)	L48	✓		✓	✓	✓
Make-proof grounding switch at the converter output (motor driven)	L49	✓	✓		✓	✓
Disconnector at the converter output [1]	L51	✓	✓	✓		✓
Safety locking system	M10	✓	✓	✓	✓	

[1] Option **L51** cannot be combined with option **L52** (circuit-breaker at the converter output).

Temperature detection and evaluation (standard: 3 PT100 inputs)		L80	L81	L82	L90	L91	L92	L93	L94	L95	L96
2 thermistor protection relays for alarm and fault [1]	L80		–	–	✓	✓	✓	✓	✓	✓	✓
2 × 2 thermistor protection relays for alarm and fault [1]	L81	–		–	✓	✓	✓	✓	✓	✓	✓
3 × 2 thermistor protection relays for alarm and fault [1]	L82	–	–		✓	✓	✓	✓	✓	✓	✓
PT100 evaluation unit with 3 inputs [1]	L90	✓	✓	✓		–	–	–	–	–	–
2 PT100 evaluation units with 3 inputs each [1]	L91	✓	✓	✓	–		–	–	–	–	–
3 PT100 evaluation units with 3 inputs each [1]	L92	✓	✓	✓	–	–		–	–	–	–
PT100 evaluation unit with 6 inputs, 2 analog outputs (outputs fed to the control for display) [1]	L93	✓	✓	✓	–	–	–		–	–	–
2 PT100 evaluation units each with 6 inputs and 2 analog outputs (outputs fed to the control for display) [2]	L94	✓	✓	✓	–	–	–	–		–	–
PT100 evaluation unit with 6 inputs for explosion-protected motors and 2 analog outputs (outputs fed to the control for display) [1]	L95	✓	✓	✓	–	–	–	–	–		–
2 PT100 evaluation units each with 6 inputs for explosion-protected motors and each with 2 analog outputs (outputs fed to the control for display) [2]	L96	✓	✓	✓	–	–	–	–	–	–	

[1] Options **L..** cannot be combined with option **G61** (additional TM31 Terminal Module).

[2] Options **L94** and **L96** cannot be combined with options **G61** and **G62** (additional TM31 Terminal Modules) and with option **E86** (additional analog inputs).

Increased degree of protection of the electrical cabinets in the water-cooled version (standard: IP43)	
IP54 degree of protection	M54

✓	Options can be combined
–	Options mutually exclude each other

Options (continued)

Controlled motor feeder for auxiliaries [1]		N30	N31	N32	N33
Controlled motor feeder for auxiliaries 3 AC 440/480 V, max. 4/4.8 kW	N30		–	–	–
Controlled motor feeder for auxiliaries 3 AC 440/480 V, max. 7/8 kW	N31	–		–	–
Controlled motor feeder for auxiliaries 3 AC 440/480 V, max. 11/12.7 kW	N32	–	–		–
Controlled motor feeder for auxiliaries 3 AC 440/480 V, max. 15/17.5 kW	N33	–	–	–	

Controlled outgoing feeder for auxiliaries [2]		N35	N36	N37	N38
Controlled outgoing feeder for auxiliaries 1 AC 230/120 V, max. 1.2/1 kW	N35		–	–	–
Controlled outgoing feeder for auxiliaries 1 AC 230/120 V, max. 2.2/1.5 kW	N36	–		–	–
Controlled outgoing feeder for auxiliaries 1 AC 230/120 V, max. 3.5/2.1 kW	N37	–	–		–
Controlled outgoing feeder for auxiliaries 1 AC 230/120 V, max. 4.5/2.8 kW	N38	–	–	–	

[1] The contactor is **closed** with the ON command at the converter and **opened** with the OFF command (example: external fan on the motor). The supply voltage for the auxiliaries to be powered must be provided externally.

[2] The contactor is **opened** with the ON command at the converter and **closed** with the OFF command (example: heater). The supply voltage for the auxiliaries to be powered must be provided externally.

Connection of signal cables (standard: Signal cables are directly connected at the terminals of the Terminal Module)		M32	M33
Customer's terminal strip with spring-loaded terminals for signal cables up to 2.5 mm^2	M32		–
Customer's terminal strip with screw terminals for signal cables up to 2.5 mm^2	M33	–	

Control and display instruments in the door of the control cabinet		K20	K21	K22
Indicator lights and start/stop button in the cabinet door	K20		–	–
Display instruments in the cabinet door for voltage, current, speed and power as well as indicator lights and start/stop pushbutton	K21	–		–
Display instruments in the cabinet door for current, speed, power and winding temperature as well as indicator lights and start/stop pushbutton	K22	–	–	

Interface modules for connection to external bus systems (standard: PROFIBUS (Slave))	
PROFINET interface (via CBE30)	G34

Interface modules for additional customer connections		G61	G62	G63
Additional TM31 Terminal Module [1]	G61		✓	✓
Second additional TM31 Terminal Module [1]	G62	✓		✓
Additional TM15 Terminal Module	G63	✓	✓	

[1] For exclusion of options **G61** and **G62**, see Description of options.

✓	Options can be combined
–	Options mutually exclude each other

Options (continued)

Additional analog inputs/outputs (isolated)		E86	E87
Additional analog inputs (isolated) [1]	E86		✓
Additional analog outputs (isolated) [2]	E87	✓	

[1] Option **E86** cannot be combined with option **G62** (second additional TM31 Terminal Module) and with options **L94** and **L96** (2 PT100 evaluation units).

[2] Option **E87** cannot be combined with option **G62** (second additional TM31 Terminal Module).

Other interface modules		G66	G70	G71
PADU8 diagnostics module (8 analog and 8 digital signals)	G66		✓	✓
Pulse distributor for transferring the speed encoder signal	G70	✓		✓
Optical bus terminal (OBT) for PROFIBUS	G71	✓	✓	

Sector-specific options	
NAMUR terminal strip	B00

Functional options		E00	E01	E02	E03	L32
Closed-loop control for separately excited synchronous motors (static excitation unit is provided on the plant side)	E00		–	–	–	✓
Closed-loop control for separately excited synchronous motors with slip-ring excitation	E01	–		–	–	✓
Closed-loop control for separately excited synchronous motors with brushless reverse field excitation	E02	–	–		–	✓
Closed-loop control for permanently excited synchronous motors [1]	E03	–	–	–		✓
Automatic restart	L32	✓	✓	✓	✓	

[1] Option **E03** can only be ordered in combination with option **L52** (circuit-breaker at the converter output).

Documentation (standard: PDF format in English on CD-ROM)		B43	B44	B45	D02	D15	Y10
Production flowchart: Generated once	B43		–	–	✓	✓	✓
Production flowchart: Updated every two weeks	B44	–		–	✓	✓	✓
Production flowchart: Updated every month	B45	–	–		✓	✓	✓
Circuit diagrams, terminal diagrams and dimension drawings in the DXF format [1]	D02	✓	✓	✓		✓	✓
One set of printed documentation (multiple orders possible)	D15	✓	✓	✓	✓		✓
Circuit diagrams with customer-specific text field (plain text is required) [1]	Y10	✓	✓	✓	✓	✓	

[1] The equipment-specific documents (circuit diagrams etc.) are only available in English/German.

✓	Options can be combined
–	Options mutually exclude each other

Options (continued)

Documentation in languages (standard: PDF format in English on CD-ROM)		D00	D55	D56	D72	D76	D77	D78	D79	D84	D92
Documentation in German	D00		–	–	–	✓	–	–	–	–	–
Documentation in Polish	D55	–		–	–	✓	–	–	–	–	–
Documentation in Russian (on request)	D56	–	–		–	✓	–	–	–	–	–
Documentation in Italian (on request)	D72	–	–	–		✓	–	–	–	–	–
Documentation in English (additional CD-ROM in English, independent of the selected language)	D76	✓	✓	✓	✓		✓	✓	✓	✓	✓
Documentation in French (on request)	D77	–	–	–	–	✓		–	–	–	–
Documentation in Spanish	D78	–	–	–	–	✓	–		–	–	–
Documentation in Portuguese	D79	–	–	–	–	✓	–	–		–	–
Documentation in Chinese	D84	–	–	–	–	✓	–	–	–		–
Documentation in Japanese (on request)	D92	–	–	–	–	✓	–	–	–	–	

Rating plate language (standard: English/German)		T58	T60	T80	T82	T85	T86	T90	T91
Rating plate in English/French	T58		–	–	–	–	–	–	–
Rating plate in English/Spanish	T60	–		–	–	–	–	–	–
Rating plate in English/Italian	T80	–	–		–	–	–	–	–
Rating plate in English/Portuguese (on request)	T82	–	–	–		–	–	–	–
Rating plate in English/Russian (on request)	T85	–	–	–	–		–	–	–
Rating plate in English/Polish (on request)	T86	–	–	–	–	–		–	–
Rating plate in English/Japanese (on request)	T90	–	–	–	–	–	–		–
Rating plate in English/Chinese (on request)	T91	–	–	–	–	–	–	–	

Converter acceptance tests with the customer present		F03	F73	F77	F97
Visual acceptance of converter	F03		–	–	–
Functional acceptance of converter with inductive load	F73	–		✓	–
Insulation acceptance test of the converter [1]	F77	–	✓		–
Customer-specific system acceptance tests (on request)	F97	–	–	–	

[1] Option **F77** can only be ordered in connection with option **F73**.

✓ Options can be combined
– Options mutually exclude each other

Options (continued)

Cooling unit (standard: Cooling unit with redundant pumps and a stainless steel plate-type heat exchanger)		W02	W11	W12	W14	Y40
Cooling unit with redundant stainless steel plate-type heat exchangers	W02		–	–	–	–
Cooling unit with titanium plate-type heat exchanger	W11	–		–	–	–
Cooling unit with redundant titanium plate-type heat exchangers	W12	–	–		–	–
Converter without cooling unit (provided on the plant side)	W14	–	–	–		–
Raw water data that deviates from the technical data (on request) [1]	Y40	–	–	–	–	

[1] Option **Y40** includes a cooling system which is adapted to the raw water data according to the customer's specifications.

Warranty extension		W80	W81	W82	W83	W84	W85	W86
Warranty extension of 6 months to 24 months (2 years) after delivery	W80		–	–	–	–	–	–
Warranty extension of 12 months to 30 months (2½ years) after delivery	W81	–		–	–	–	–	–
Warranty extension of 18 months to 36 months (3 years) after delivery	W82	–	–		–	–	–	–
Warranty extension of 24 months to 42 months (3½ years) after delivery	W83	–	–	–		–	–	–
Warranty extension by 30 months to 48 months (4 years) after delivery	W84	–	–	–	–		–	–
Warranty extension by 42 months to 60 months (5 years) after delivery	W85	–	–	–	–	–		–
Warranty extension by 54 months to 72 months (6 years) after delivery	W86	–	–	–	–	–	–	

Other options		L50	L55	Y09
Cabinet lighting and service socket outlet in the closed-loop control section	L50		✓	✓
Anti-condensation heating for the cabinet	L55	✓		✓
Special paint finish acc. to RAL .... (in a color other than RAL 7035; plain text required)	Y09	✓	✓	

✓	Options can be combined
–	Options mutually exclude each other

SINAMICS SM150

Technical data

General technical data	
Power components	IGCTs
Line-side converter	Regulated, self-commutated infeed/regenerative feedback unit (Active Line Module)
Motor-side converter	Inverter (Motor Module)
Closed-loop control	Closed-loop vector control
Drive quadrants	4 (driving and braking in both directions of rotation)
Isolation of power unit/ open-loop and closed-loop control	Fiber-optic cable, insulating transformer
Auxiliary power supply (for fans, coolant pumps, precharging the DC link capacitors, open-loop and closed-loop control)	• 1 AC 230 V ±10 %, 50/60 Hz ±3 % and • 3 AC 400 V ±10 %, 50/60 Hz ±3 %
Installation altitude	≤1000 m above sea level: Load capability 100 % >1000 m to 4000 m above sea level: Current derating required >2000 m to 4000 m above sea level: Voltage derating additionally required
Insulation	in accordance with DIN EN 50178/VDE 0160 (IEC 62103): Degree of pollution 2 (without conductive pollution), condensation not permitted
Degree of protection	in accordance with DIN EN 60529/VDE 0470 T1 (IEC 60529): IP43
Protection class	in accordance with DIN EN 61140/VDE 0140 T1 (IEC 61140): 1
Shock protection	BGV A 3
Interference emission	This drive unit is part of a PDS, Category C4 acc. to DIN EN 61800-3/VDE 0160 T103 (IEC 61800-3). It has not been designed to be connected to the public line supply. EMC disturbances can occur when connected to these line supplies. The essential requirements placed on EMC protection for the drive system should be secured using an EMC plan.
Paint finish/color	Indoor requirements/light gray RAL 7035
Compliance with standards	
• Standards	- DIN EN 61800-3/VDE 0160 T103 (IEC 61800-3) - DIN EN 61800-4/VDE 0160 T104 (IEC 61800-4) - DIN EN 60146-1-1/VDE 0558 T11 (IEC 60146-1-1) - DIN EN 50178/VDE 0160 T103 (IEC 62103) - DIN EN 60204-11/VDE 0113 T11 (IEC 60204-11)
• EU Directives	- 98/37/EC + amendments (Machinery Directive) - 2004/108/EC + amendments (Electromagnetic Compatibility)
Water cooling	Water-water cooling unit, internal circuit, deionized water
Permitted coolant temperature (raw water)	
• Inlet	+5 °C to +35 °C
• Discharge	max. +40 °C

Rated data	
Output voltage	**3.3 kV**
Input voltage	3.3 kV
Tolerance of input voltage	±10 %
Line frequency	50/60 Hz ±3 %
Line power factor fundamental component	1

Technical data (continued)

	Operation of induction motors		Operation of separately excited synchronous motors
	without speed encoder	with speed encoder	with speed encoder
Closed-loop control properties			
Operating range			
• Lower limit of speed control range (% of rated motor speed)	5 %	0 %	0 %
• Max. permissible output frequency	250 Hz	250 Hz	90 Hz
• Field weakening range	1:3	1:3	1:4
Steady-state operation			
• Speed accuracy (% of rated motor speed)	±0.2 % (from 5 % rated speed)	±0.01 %	±0.01 %
• Torque accuracy (% of rated torque)	±5 % (from 5 % rated speed)	±5 %	±2 %
Dynamic operation			
• Torque rise time	5 ms	5 ms	5 ms

	Storage	Transport	Operation
Climatic ambient conditions			
Ambient temperature	-25 °C to +70 °C	-25 °C to +70 °C	+5 °C to +40 °C
Relative air humidity	5 % to 95 % (only slight condensation permitted; converter must be completely dry before commissioning)	5 % to 75 %	5 % to 85 % (condensation not permitted)
Other climatic conditions in accordance with Class	1K3 acc. to DIN EN 60721-3-1 (IEC 60721-3-1) (formation of ice not permitted)	2K2 acc. to DIN EN 60721-3-2 (IEC 60721-3-2)	3K3 ac. to DIN EN 60721-3-3 (IEC 60721-3-3)
Degree of pollution	2 without conductive pollution acc. to DIN EN 50178/VDE 0160 (IEC 62103)	2 without conductive pollution acc. to DIN EN 50178/VDE 0160 (IEC 62103)	2 without conductive pollution acc. to DIN EN 50178/VDE 0160 (IEC 62103)
Mechanical ambient conditions			
Vibratory load			
• Displacement	1.5 mm at 2 Hz to 9 Hz	3.5 mm at 2 Hz to 9 Hz	0.3 mm at 2 Hz to 9 Hz
• Acceleration	5 m/s^2 at 9 Hz to 200 Hz	10 m/s^2 at 9 Hz to 200 Hz 15 m/s^2 at 200 Hz to 500 Hz	1 m/s^2 at 9 Hz to 200 Hz
Other mechanical conditions in accordance with Class (increased strength for marine applications)	1M2 acc. to DIN EN 60721-3-1 (IEC 60721-3-1)	2M2 acc. to DIN EN 60721-3-2 (IEC 60721-3-2)	3M1 acc. to DIN EN 60721-3-3 (IEC 60721-3-3)
Other ambient conditions			
Biological ambient conditions in accordance with Class	1B1 acc. to DIN EN 60721-3-1 (IEC 60721-3-1)	2B1 acc. to DIN EN 60721-3-2 (IEC 60721-3-2)	3B2 acc. to DIN EN 60721-3-3 (IEC 60721-3-3) (without harmful flora)
Chemically active substances in accordance with Class	1C1 acc. to DIN EN 60721-3-1 (IEC 60721-3-1)	2C1 acc. to DIN EN 60721-3-2 (IEC 60721-3-2)	3C2 acc. to DIN EN 60721-3-3 (IEC 60721-3-3) (no occurrence of salt mist)
Mechanically active substances in accordance with Class	1S1 acc. to DIN EN 60721-3-1 (IEC 60721-3-1)	2S1 acc. to DIN EN 60721-3-2 (IEC 60721-3-2)	3S1 acc. to DIN EN 60721-3-3 (IEC 60721-3-3)

Note: The values specified under storage and transport apply to suitably packed converters.

Technical data (continued)

Derating for special installation conditions

Current derating

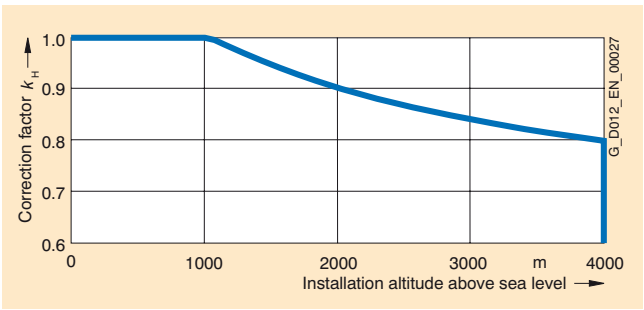
If the converters are operated at installation altitudes above 1000 m above sea level or for ambient and coolant temperatures >40 °C for air cooling or >35 °C for water cooling, derating factors k_T or k_H must be taken into account for the rated output current (DIN 43671). For the permissible continuous current I the following applies:

$I \leq I_{rated} \times k_H \times k_T$

I: permissible continuous current
I_{rated}: rated current

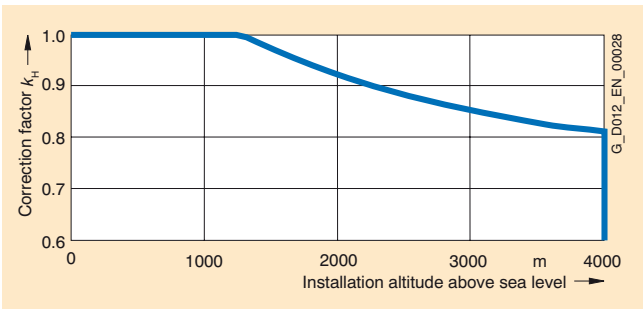
For water-cooled versions, the following applies: When determining the current derating required ($k_H \times k_T$) in addition to the raw water intake temperature, the ambient temperature and air pressure also have to be taken into consideration as e.g. the DC link busbars are air-cooled. For this purpose, factor k_T should be determined from the diagram for the ambient temperature and from the diagram for the raw water intake temperature. The lower of the two values should be used to calculate the current derating.

Current derating as a function of the installation altitude (air cooling)



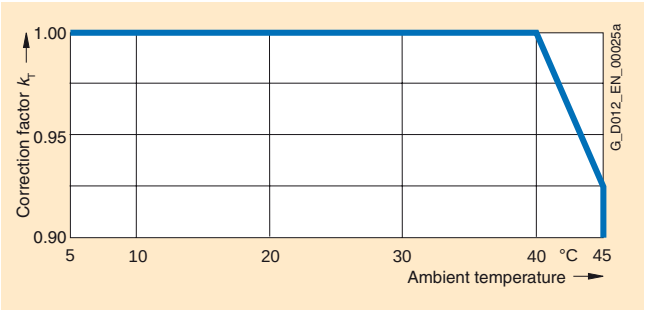
Derating factor k_H for air cooling

Current derating as a function of the installation altitude (water cooling)



Derating factor k_H for water cooling

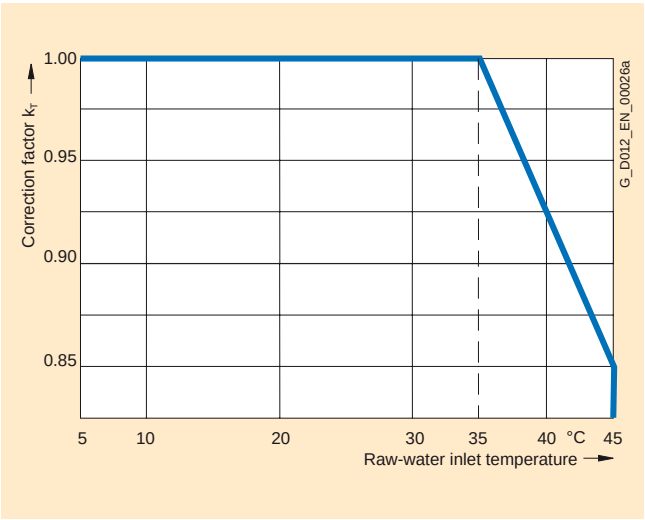
Current derating as a function of the ambient temperature



Derating factor k_T (ambient temperature)

The specified current derating as a function of the ambient temperature is only relevant for continuous operation (rated data); the possible overload current remains unaffected.

Current derating as a function of the raw water intake temperature

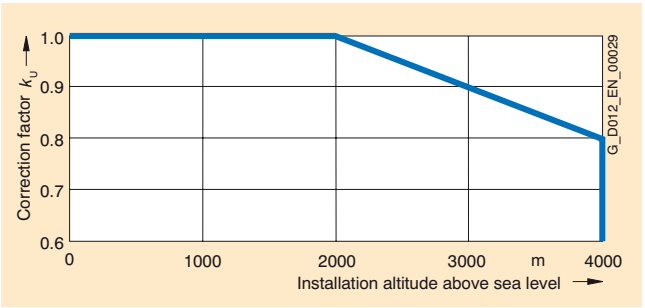


Derating factor k_T (raw water intake temperature)

Voltage derating

At installation altitudes >2000 m, a voltage derating must be made in addition to a current derating DIN EN 60664-1/ VDE 0110 (IEC 60664-1). This depends on the air and creepage distances in the unit.

Voltage derating as a function of the installation altitude



Derating factor k_U

Technical data (continued)

Example 1

Derating data, SINAMICS SM150

Drive unit	6SL3845-7NN41-8AA0
Output voltage	3.3 kV
Input voltage	3.3 kV
Type rating	10000 kVA, 1750 A
Installation altitude	2000 m
Maximum ambient temperature	35 °C
Raw water intake temperature	40 °C
k_H (water cooling)	0.925
k_T (ambient temperature)	1.0
k_T (raw water intake temperature)	0.925
k_U	1.0

The lower value for k_T is obtained here from the diagram for the raw water intake temperature.

$I \leq I_{rated} \times 0.925 \times 0.925 = I_{rated} \times 0.856$

A current derating of 14.4 % is required.

The max. available output current of the converter is 1497 A.

Example 2

Derating data, SINAMICS SM150

Drive unit	6SL3845-7NN41-8AA0
Output voltage	3.3 kV
Input voltage	3.3 kV
Type rating	10000 kVA, 1750 A
Installation altitude	2000 m
Maximum ambient temperature	43 °C
Raw water intake temperature	37 °C
k_H (water cooling)	0.925
k_T (ambient temperature)	0.955
k_T (raw water intake temperature)	0.97
k_U	1.0

The lower value for k_T is obtained here from the diagram for the ambient temperature.

$I \leq I_{rated} \times 0.925 \times 0.955 = I_{rated} \times 0.883$

A current derating of 11.7 % is required.

The max. available output current of the converter is 1545 A.

SINAMICS SM150

Technical data

SINAMICS SM150 Water cooling		6SL3845- 7NN4■-■AA0	6SL3845- 7NN4■-■AA0	6SL3845- 7NN4■-■AA0	6SL3845- 7NN4■-■AB0	6SL3845- 7NN4■-■AC0
Output voltage 3.3 kV						
Type rating	kVA	10000	20000	30000	10000	10000
Shaft output [1]	kW	10000	20000	30000	10000 [2]	10000 [2]
	hp	13000	26000	39000	13000 [2]	13000 [2]
Rated output current	A	1750	2 × 1750	3 × 1750	2 × 1750	3 × 1750
Input voltage	kV	3.3	2 × 3.3	3 × 3.3	3.3	3.3
Rated input current [1]	A	1770	2 × 1680	3 × 1650	1770	1770
Power loss [3] [4]	kW	100	200	300	150	225
Efficiency [4]	%	99.0	99.0	98.9	99.3	99.2
Max. current requirement 50/60 Hz 230 V AC	A	6	12	18	9	12
Max. current demand of the auxiliary supply 3 AC 50/60 Hz 400 V	A	17	20	23	19	20
Precharging current requirement, briefly for approx. 25 s	A	20	40	60	22	24
Cooling water flow rate (raw water/deionized water)	l/min	325	650	975	480	650
Sound pressure level L_{pA} (1 m)	dB	75	77	79	76	77
Measuring surface level L_s (1 m)	dB	22	23	24	22.5	23
Cable cross-sections, line-side, max. connectable per phase [5] [6]	mm^2 (DIN VDE)	6 × 240	6 × 240	6 × 240	6 × 240	6 × 240
	AWG/MCM (NEC, CEC)	6 × 500 MCM	6 × 500 MCM	6 × 500 MCM	6 × 500 MCM	6 × 500 MCM
Cable cross-sections, motor-side, max. connectable per phase [5] [6]	mm^2 (DIN VDE)	6 × 240	6 × 240	6 × 240	6 × 240	6 × 240
	AWG/MCM (NEC, CEC)	6 × 500 MCM	6 × 500 MCM	6 × 500 MCM	6 × 500 MCM	6 × 500 MCM
PE connection, max. connection cross-section at enclosure with M12 screw [5]	mm^2 (DIN VDE)	2 × 120	2 × 120	2 × 120	2 × 120	2 × 120
	AWG/MCM (NEC, CEC)	2 × 250 MCM	2 × 250 MCM	2 × 250 MCM	2 × 250 MCM	2 × 250 MCM
Degree of protection		IP43	IP43	IP43	IP43	IP43
Dimensions (with doors and panels)						
• Width	mm	6100	11200	16300	8900	11700
• Height	mm	2540	2540	2540	2540	2540
• Depth	mm	1600	1600	1600	1600	1600
Circuit designs (Pages 4/4 and 4/5)		⑪	⑫	⑬	⑭	⑮
Weight	kg	6400	11800	17200	9300	12200

Note: For other technical requirements that have to be taken into consideration (surge loads, operation at low frequencies, possibly necessary derating for parallel circuit configurations) please contact your partner in sales and let him have the specifications. Additional DC bus configurations are available on request.

[1] The figures for the rated input current and the power figures in hp and kW are approximate values which were determined for operation with synchronous motors, for the power factor cos phi=1 and taking into account the efficiency of the motor.
The hp specifications are based on the NEC and CEC guidelines for the North American market.
The kW values are specified in multiples of 500. Both approximate values need to be adapted to the motor which is actually used.

[2] The underlying circuits are based on a drive group in which the drives operate both as motor and generator. The energy is balanced via the DC link. The specified power corresponds to the maximum infeed power. The effective total power of the Motor Modules (taking into account the power flow direction) may not exceed this infeed power.

[3] Approx. 5 % of the power loss is dissipated into the atmosphere.

[4] Without cooling system.

[5] Figures refer to a subsystem; see “Circuit designs” for the number of subsystems to be connected on the line and motor side.

[6] The maximum permissible cable lengths must be observed (see Power cables in Section 7).

Technical data (continued)

SINAMICS SM150 Water cooling		6SL3845- 7NN4■-■AD0	6SL3845- 7NN4■-■AF0	6SL3845- 7NN4■-■AG0	6SL3845- 7NN4■-■AF0
Output voltage 3.3 kV					
Type rating	kVA	10000	10000	10000	20000
Shaft output [1]	kW	10000 [2]	10000 [2]	10000 [2]	20000 [2]
	hp	13000 [2]	13000 [2]	13000 [2]	26000 [2]
Rated output current	A	4 x 1750	3 x 1750	4 x 1750	1 x (2 x1750) +2 x 1750
Input voltage	kV	3.3	2 x 3.3	2 x 3.3	2 x 3.3
Rated input current [1]	A	1770	2 x 1770	2 x 1770	2 x 1770
Power loss [3] [4]	kW	250	250	300	300
Efficiency [4]	%	97.5	97.5	97	98.4
Max. current requirement 50/60 Hz 230 V AC	A	15	15	18	18
Max. current demand of the auxiliary supply 3 AC 50/60 Hz 400 V	A	22	22	23	23
Precharging current requirement, briefly for approx. 25 s	A	20	40	40	40
Cooling water flow rate (raw water/deionized water)	l/min	815	815	975	975
Sound pressure level L_{pA} (1 m)	dB	78	78	79	79
Measuring surface level L_s (1 m)	dB	24	24	24	24
Cable cross-sections, line-side, max. connectable per phase [5] [6]	mm^2 (DIN VDE)	6 x 240	6 x 240	6 x 240	6 x 240
	AWG/MCM (NEC, CEC)	6 x 500 MCM	6 x 500 MCM	6 x 500 MCM	6 x 500 MCM
Cable cross-sections, motor-side, max. connectable per phase [5] [6]	mm^2 (DIN VDE)	6 x 240	6 x 240	6 x 240	6 x 240
	AWG/MCM (NEC, CEC)	6 x 500 MCM	6 x 500 MCM	6 x 500 MCM	6 x 500 MCM
PE connection, max. connection cross-section at enclosure with M12 screw [5]	mm^2 (DIN VDE)	2 x 120	2 x 120	2 x 120	2 x 120
	AWG/MCM (NEC, CEC)	2 x 250 MCM	2 x 250 MCM	2 x 250 MCM	2 x 250 MCM
Degree of protection		IP43	IP43	IP43	IP43
Dimensions (with doors and panels)					
• Width	mm	14000	14000	16300	16300
• Height	mm	2540	2540	2540	2540
• Depth	mm	1600	1600	1600	1600
Circuit designs (Pages 4/5 to 4/7)		⑯	⑰	⑱	⑲
Weight	kg	13500	13500	16200	16200

Note: For other technical requirements that have to be taken into consideration (surge loads, operation at low frequencies, possibly necessary derating for parallel circuit configurations) please contact your partner in sales and let him have the specifications. Additional DC bus configurations are available on request.

[1] The figures for the rated input current and the power figures in hp and kW are approximate values which were determined for operation with synchronous motors, for the power factor cos phi=1 and taking into account the efficiency of the motor.
The hp specifications are based on the NEC and CEC guidelines for the North American market.
The kW values are specified in multiples of 500. Both approximate values need to be adapted to the motor which is actually used.

[2] The underlying circuits are based on a drive group in which the drives operate both as motor and generator. The energy is balanced via the DC link. The specified power corresponds to the maximum infeed power. The effective total power of the Motor Modules (taking into account the power flow direction) may not exceed this infeed power.

[3] Approx. 5 % of the power loss is dissipated into the atmosphere.

[4] Without cooling system.

[5] Figures refer to a subsystem; see “Circuit designs” for the number of subsystems to be connected on the line and motor side.

[6] The maximum permissible cable lengths must be observed (see Power cables in Section 7).

Notes

Technical data

SINAMICS SM150 Water cooling		6SL3845- 7NN4■-■AA0	6SL3845- 7NN4■-■AA0	6SL3845- 7NN4■-■AA0
Output voltage 3.3 kV				
Type rating	kVA	10500	21000	31500
Shaft output [1]	kW	10500	21000	31500
	hp	13500	27000	40500
Rated output current	A	1850	2 × 1850	3 × 1850
Input voltage	kV	3.3	2 × 3.3	3 × 3.3
Rated input current [1]	A	1870	2 × 1870	3 × 1870
Power loss [3] [4]	kW	150	300	450
Efficiency [4]	%	98.6	98.6	98.6
Max. current requirement 50/60 Hz 230 V AC	A	6	12	18
Max. current demand of the auxiliary supply 3 AC 50/60 Hz 400 V	A	17	20	23
Precharging current requirement, briefly for approx. 25 s	A	20	40	60
Cooling water flow rate (raw water/deionized water)	l/min	325	650	975
Sound pressure level L_{pA} (1m)	dB	75	77	79
Measuring surface level L_s (1 m)	dB	22	23	24
Cable cross-sections, line-side, max. connectable per phase [5] [6]	mm^2 (DIN VDE)	6 × 240	6 × 240	6 × 240
	AWG/MCM (NEC, CEC)	6 × 500 MCM	6 × 500 MCM	6 × 500 MCM
Cable cross-sections, motor-side, max. connectable per phase [5] [6]	mm^2 (DIN VDE)	6 × 240	6 × 240	6 × 240
	AWG/MCM (NEC, CEC)	6 × 500 MCM	6 × 500 MCM	6 × 500 MCM
PE connection, max. connection cross-section at enclosure with M12 screw [5]	mm^2 (DIN VDE)	2 × 120	2 × 120	2 × 120
	AWG/MCM (NEC, CEC)	2 × 250 MCM	2 × 250 MCM	2 × 250 MCM
Degree of protection		IP43	IP43	IP43
Dimensions (with doors and panels)				
• Width	mm	6100	11200	16300
• Height	mm	2540	2540	2540
• Depth	mm	1600	1600	1600
Circuit designs (Page 4/4)		⑪	⑫	⑬
Weight	kg	7000	12300	18000

Note: For other technical requirements that have to be taken into consideration (surge loads, operation at low frequencies, possibly necessary derating for parallel circuit configurations) please contact your partner in sales and let him have the specifications. Additional DC bus configurations are available on request.

[1] The figures for the rated input current and the power figures in hp and kW are approximate values which were determined for operation with synchronous motors, for the power factor cos phi=1 and taking into account the efficiency of the motor.
The hp specifications are based on the NEC and CEC guidelines for the North American market.
The kW values are specified in multiples of 500. Both approximate values need to be adapted to the motor which is actually used.

[2] The underlying circuits are based on a drive group in which the drives operate both as motor and generator. The energy is balanced via the DC link. The specified power corresponds to the maximum infeed power. The effective total power of the Motor Modules (taking into account the power flow direction) may not exceed this infeed power.

[3] Approx. 5 % of the power loss is dissipated into the atmosphere.

[4] Without cooling system.

[5] Figures refer to a subsystem; see “Circuit designs” for the number of subsystems to be connected on the line and motor side.

[6] The maximum permissible cable lengths must be observed (see Power cables in Section 7).

Description of options

5

Description of options

Overview

The following tables list a complete overview of the availability of options for the three converter versions SINAMICS GM150 in IGBT version, SINAMICS GM150 in IGCT version and SINAMICS SM150.

Information on the possibility of combining various options can be taken from the matrices in catalog sections 2, 3 and 4.

Order code	Option	SINAMICS GM150 IGBT version	SINAMICS GM150 IGCT version	SINAMICS SM150 IGCT version
B00	NAMUR terminal strip	✓	✓	✓
B43	Documentation, production flowchart: Generated once	✓	✓	✓
B44	Documentation, production flowchart: Updated every two weeks	✓	✓	✓
B45	Documentation, production flowchart: Updated every month	✓	✓	✓
C30	Auxiliary voltage 3 AC 50 Hz 200 V	✓	✓	–
C33	Auxiliary voltage 3 AC 60 Hz 220 V	✓	✓	–
C34	Auxiliary voltage 3 AC 60 Hz 230 V	✓	✓	–
C35	Auxiliary voltage 3 AC 60 Hz 240 V	✓	✓	–
C36	Auxiliary voltage 3 AC 50 Hz 380 V	✓	✓	–
C37	Auxiliary voltage 3 AC 60 Hz 380 V	✓	✓	–
C38	Auxiliary voltage 3 AC 50 Hz 400 V	✓	✓	–
C39	Auxiliary voltage 3 AC 50 Hz 415 V	✓	✓	–
C40	Auxiliary voltage 3 AC 60 Hz 440 V	✓	✓	–
C41	Auxiliary voltage 3 AC 60 Hz 460 V	✓	✓	–
C42	Auxiliary voltage 3 AC 60 Hz 480 V	✓	✓	–
C43	Auxiliary voltage 3 AC 50 Hz 500 V	✓	✓	–
C44	Auxiliary voltage 3 AC 50 Hz 550 V	✓	✓	–
C46	Auxiliary voltage 3 AC 60 Hz 575 V	✓	✓	–
C48	Auxiliary voltage 3 AC 50 Hz 690 V	✓	✓	–
C49	Auxiliary voltage 3 AC 60 Hz 690 V	✓	✓	–
D00	Documentation in German	✓	✓	✓
D02	Circuit diagrams, terminal diagrams and dimension drawings in DXF format	✓	✓	✓
D15	One set of printed documentation	✓	✓	✓
D55	Documentation in Polish	on request	on request	on request
D56	Documentation in Russian	on request	on request	on request
D72	Documentation in Italian	on request	on request	on request

✓	Options that can be ordered
–	Options that cannot be ordered

Overview (continued)

Order code	Option	SINAMICS GM150 IGBT version	SINAMICS GM150 IGCT version	SINAMICS SM150 IGCT version
D76	Documentation in English	✓	✓	✓
D77	Documentation in French	on request	on request	on request
D78	Documentation in Spanish	✓	✓	✓
D79	Documentation in Portuguese	on request	on request	on request
D84	Documentation in Chinese	✓	✓	✓
D92	Documentation in Japanese	on request	on request	on request
E00	Closed-loop control for separately excited synchronous motors	✓	✓	✓
E01	Closed-loop control for separately excited synchronous motors with slip-ring excitation	✓	✓	✓
E02	Closed-loop control for separately excited synchronous motors with brushless reverse field excitation	✓	✓	✓
E03	Closed-loop control for permanently excited synchronous motors	on request	✓	✓
E11	Suitable for marine applications with individual certificate from Germanischer Lloyd (GL)	only for water cooling	✓	–
E21	Suitable for marine applications with individual certificate from Lloyds Register (LR)	only for water cooling	✓	–
E31	Suitable for marine applications with individual certificate from Bureau Veritas (BV)	only for water cooling	✓	–
E51	Suitable for marine applications with individual certificate from Det Norske Veritas (DNV)	only for water cooling	✓	–
E61	Suitable for marine applications with individual certificate from the American Bureau of Shipping (ABS)	only for water cooling	✓	–
E71	Suitable for marine applications with individual certificate from the Chinese Classification Society (CCS)	only for water cooling	✓	–
E86	Additional analog inputs	✓	✓	✓
E87	Additional analog outputs	✓	✓	✓
F03	Visual acceptance	✓	✓	✓
F73	Functional acceptance of converter with inductive load	✓	on request	on request
F77	Acceptance of insulation test of the converter	✓	on request	on request
F97	Customer-specific system acceptance tests	on request	on request	on request
G20	CAN bus interface	on request	on request	–
G21	Modbus Plus interface	on request	on request	–
G22	Modbus RTU slave interface	on request	on request	–
G23	DeviceNet interface	on request	on request	–
G24	PROFINET interface (via CBE20)	on request	on request	–

✓	Options that can be ordered
–	Options that cannot be ordered

Description of options

Overview (continued)

Order code	Option	SINAMICS GM150 IGBT version	SINAMICS GM150 IGCT version	SINAMICS SM150 IGCT version
G25	TeleService connection TS Adapter II analog modem	✓	–	–
G34	PROFINET interface (via CBE30)	–	–	on request
G35	TeleService connection TS Adapter II ISDN modem	✓	–	–
G30	PROFIBUS master	only with static excitation unit	only with static excitation unit	–
G61	Additional TM31 Terminal Module	✓	✓	✓
G62	Second additional TM31 Terminal Module	✓	✓	✓
G63	Additional TM15 Terminal Module	✓	✓	✓
G66	PADU8 diagnostics module	–	✓	✓
G70	Pulse distributor for transferring the speed encoder signal	on request	on request	✓
G71	Optical bus terminal (OBT) for PROFIBUS	on request	on request	✓
K20	Indicator lights in the cabinet door	✓	✓	✓
K21	Display instruments in the cabinet door for voltage, current, speed and power as well as indicator lights	✓	✓	✓
K22	Display instruments in the cabinet door for current, speed, power and winding temperature as well as indicator lights	✓	✓	✓
K50	Sensor Module Cabinet-Mounted SMC30	✓	✓	included as standard
K80	Control of “Safe Torque Off” function	on request	on request	✓
L08	Output reactor	✓	✓	✓
L21	Overvoltage protection AC	only with static excitation unit	only with static excitation unit	only with static excitation unit
L29	Bidirectional synchronized bypass operation	only with induction motor	–	–
L32	Automatic restart	✓	✓	✓
L48	Make-proof grounding switch at converter input	✓	✓	✓
L49	Make-proof grounding switch at converter output	✓	✓	✓
L50	Cabinet lighting and service socket outlet in the closed-loop control section	✓	✓	✓
L51	Disconnector at the converter output	✓	✓	✓
L52	Circuit-breaker at the converter output	✓	✓	✓
L53	UPS for the power supply of the open-loop and closed-loop control	✓	✓	–
L55	Anti-condensation heating for the cabinet	✓	✓	✓
L60	EMERGENCY STOP, Stop Category 1 for controlled stopping	✓	✓	–
L72	Braking Module	✓	✓	on request
L80	2 thermistor protection relays for alarm and fault	✓	✓	✓
L81	2 x 2 thermistor protection relays for alarm and fault	✓	✓	✓
L82	3 x 2 thermistor protection relays for alarm and fault	✓	✓	✓

✓ Options that can be ordered
– Options that cannot be ordered

Overview (continued)

Order code	Option	SINAMICS GM150 IGBT version	SINAMICS GM150 IGCT version	SINAMICS SM150 IGCT version
L87	Rotor ground-fault monitoring	✓	✓	✓
L90	PT100 evaluation unit with 3 inputs	✓	✓	✓
L91	2 PT100 evaluation units with 3 inputs each	✓	✓	✓
L92	3 PT100 evaluation units with 3 inputs each	–	✓	✓
L93	PT100 evaluation unit with 6 inputs and 2 analog outputs	✓	✓	✓
L94	2 PT100 evaluation units each with 6 inputs and 2 analog outputs	–	✓	✓
L95	PT100 evaluation unit with 6 inputs for explosion-protected motors and 2 analog outputs	✓	✓	✓
L96	2 PT100 evaluation units each with 6 inputs for explosion-protected motors and each with 2 analog outputs	–	✓	✓
M10	Safety interlocking system	✓	✓	✓
M11	Dust protection	only for air cooling	–	included as standard
M13	Power cable connected at the converter input from the top	✓	–	–
M32	Customer's terminal strip with spring-loaded terminals for signal cables up to 2.5 mm^2	✓	✓	✓
M33	Customer's terminal strip with screw terminals for signal cables up to 2.5 mm^2	✓	✓	✓
M34	Auxiliary voltage and signal cables connected from the top	✓	–	–
M36	Cable entry, brass	✓	✓	✓
M42	Degree of protection IP42	only for air cooling	–	–
M54	IP54 degree of protection	only for water cooling	✓	✓
M61	Redundant fan in the power unit	only for air cooling	–	–
M64	Converter prepared for connection to an external air discharge system, with internal cabinet fans	only for air cooling	–	–
M66	Suitable for marine applications	only for water cooling	✓	–
M78	Power cable connected at the converter output from the top	✓	–	–
N13	Circuit-breaker at the converter input	24-pulse only on request	not for parallel circuit configuration	on request
N15	24-pulse Basic Line Module	✓	✓	–
N20	Capacitor tripping device 110 V to 120 V DC	✓	–	–
N21	Capacitor tripping device 230 V DC	✓	–	–
N22	Switch on the input side	only with static excitation unit	only with static excitation unit	only with static excitation unit
N30	Controlled motor feeder for auxiliaries 3 AC 400 V/3 AC 480 V, max. 4/4.8 kW	✓	✓	✓
N31	Controlled motor feeder for auxiliaries 3 AC 400 V/3 AC 480 V, max. 7/8 kW	✓	✓	✓
N32	Controlled motor feeder for auxiliaries 3 AC 400 V/3 AC 480 V, max. 11/12.7 kW	✓	✓	✓
N33	Controlled motor feeder for auxiliaries 3 AC 400 V/3 AC 480 V, max. 15/17.5 kW	✓	✓	✓
N35	Controlled outgoing feeder for auxiliaries 1 AC 230 V/1 AC 120 V, max. 1.2/1 kW	✓	✓	✓

✓	Options that can be ordered
–	Options that cannot be ordered

Description of options

Overview (continued)

Order code	Option	SINAMICS GM150 IGBT version	SINAMICS GM150 IGCT version	SINAMICS SM150 IGCT version
N36	Controlled outgoing feeder for auxiliaries 1 AC 230 V/1 AC 120 V, max. 2.2/1.5 kW	✓	✓	✓
N37	Controlled outgoing feeder for auxiliaries 1 AC 230 V/1 AC 120 V, max. 3.5/2.1 kW	✓	✓	✓
N38	Controlled outgoing feeder for auxiliaries 1 AC 230 V/1 AC 120 V, max. 4.5/2.8 kW	✓	✓	✓
T58	Rating plate in English/French	✓	✓	✓
T60	Rating plate in English/Spanish	✓	✓	✓
T80	Rating plate in English/Italian	✓	✓	✓
T82	Rating plate in English/Portuguese	on request	on request	on request
T85	Rating plate in English/Russian	on request	on request	on request
T86	Rating plate in English/Polish	on request	on request	on request
T90	Rating plate in English/Japanese	on request	on request	on request
T91	Rating plate in English/Chinese	on request	on request	on request
U01	Converter version for NAFTA with UL listing	only for air cooling	–	–
W02	Cooling unit with redundant stainless steel plate-type heat exchangers	only for water cooling	✓	✓
W11	Cooling unit with titanium plate-type heat exchanger	only for water cooling	✓	✓
W12	Cooling unit with redundant titanium plate-type heat exchangers	only for water cooling	✓	✓
W14	Converter without cooling unit, provided on the plant side	only for water cooling	✓	✓
W20	Raw-water connection from the bottom	only for water cooling	included as standard	included as standard
W80	Warranty extension of 6 months to 24 months (2 years) after delivery	✓	✓	✓
W81	Warranty extension of 12 months to 30 months (2½ years) after delivery	✓	✓	✓
W82	Warranty extension of 18 months to 36 months (3 years) after delivery	✓	✓	✓
W83	Warranty extension of 24 months to 42 months (3½ years) after delivery	✓	✓	✓
W84	Warranty extension by 30 months to 48 months (4 years) after delivery	✓	✓	✓
W85	Warranty extension by 42 months to 60 months (5 years) after delivery	✓	✓	✓
W86	Warranty extension by 54 months to 72 months (6 years) after delivery	✓	✓	✓
Y09	Special paint finish according to RAL...	✓	✓	✓
Y10	Customer-specific circuit diagrams	✓	✓	✓
Y15	Sine-wave filter	✓	–	–
Y17	Line reactor	only with static excitation unit	only with static excitation unit	only with static excitation unit
Y40	Raw-water data that deviates from the catalog data	only for water cooling, on request	on request	on request
Y73	Braking resistor	✓	✓	✓

✓ Options that can be ordered
– Options that cannot be ordered

Options

To enable the required description to be found more easily, the following descriptions of options are sorted alphabetically by order codes. If an option is only available for certain converter configurations, this is indicated in brackets after the option title.

Note: An option can only be ordered once per converter, if not explicitly specified.

Note: The "on request" comment can have the following meanings:

- The price has not been defined and must be determined after an inquiry has been sent to the factory before a quotation can be generated.
- The option requires technical clarification and – depending on the secondary technical conditions – may not be able to be realized for all types.

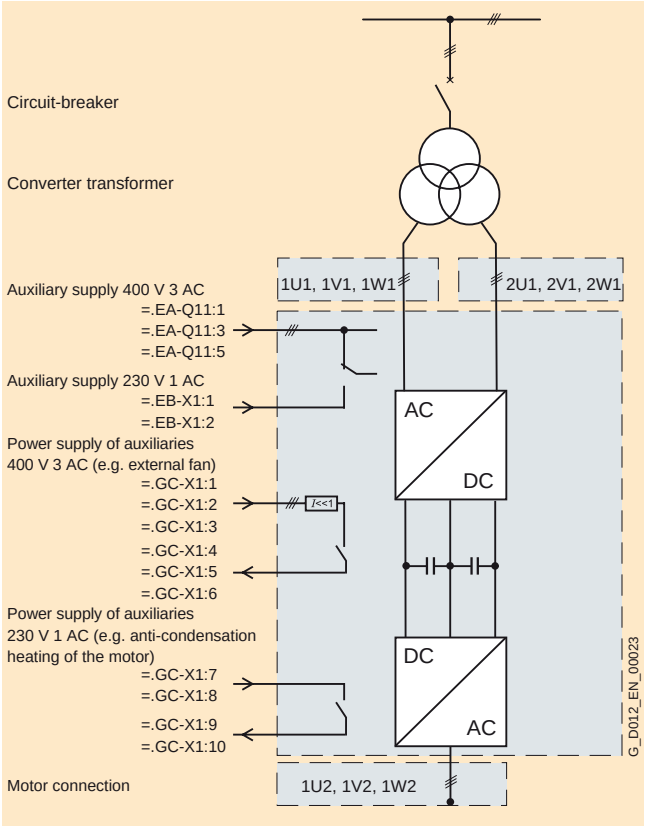
B00

NAMUR terminal strip

The terminal strip has been configured in accordance with the requirements and guidelines of the Standards Working Group for Instrumentation and Control in the Chemical Industry (NAMUR Recommendation NE37), i.e. fixed terminals are assigned to certain functions of the devices. The inputs and outputs assigned to the terminals comply with "Protective extra-low voltage PELV" requirements.

For temperature monitoring of explosion-protected motors, options for PTC thermistors with PTB approval and PT100 evaluation units for use in hazardous zones can be obtained.

This terminal strip and the associated functions are reduced to the required amount. Contrary to the NAMUR recommendation, no additional terminals are included.



Assignment of the NAMUR terminal strip

Terminal	No.	Type	Preassignment	Comment
For signal cables that must meet "Protective extra-low voltage PELV with safe separation" requirements				
=.LC–X2	1 1.0 1.1	M	Reference conductor to 24 V DC infeed	–
	3 3.0 3.1	P24	24 V DC infeed	Internally protected with 2 A
	10	DI	ON (dynamic)/ ON/OFF(static)	–
	11	DI	OFF (dynamic)	–
	12	DI	Faster	–
	13	DI	Slower	–
	14	DI	RESET	–
	15	DI	Interlock	Corresponds to OFF3
	16	DI	Counter-clockwise	„0"signal for CW phase sequence "1" signal for CCW phase sequence
	17 18		Line disconnection	EMERGENCY OFF circuit
	30 31		Ready for operation	Relay output (NO contact)
	32 33		Motor rotates	Relay output (NO contact)
	34	DO (NO)	Fault	Relay output (change-over contact)
	35	DO (COM)		
	36	DO (NC)		
	50 51	AI 0/4 mA to 20 mA	Speed setpoint	–
	60 61	AO 0/4 mA to 20 mA	Motor frequency	–
	62 63	AO 0/4 mA to 20 mA	Motor current	Motor current is default setting/ can be reparameterized for other quantities
For connecting the PTC sensor of the motor				
–A1–X3	90/91	AI	Connection of a PTC sensor	If the limit value is exceeded, the converter is tripped

If PT100 resistance thermometers are integrated into the windings of the motor in order to protect the motor, PT100 evaluation units for explosion-protected motors are available with options **L95** and **L96**.

If a force-ventilated motor is used due to the application (load torque/control range), controlled outgoing feeders – protected using motor circuit-breakers – are available with options **N30** to **N33** to supply an external fan. The power supply for the external fan must be provided on the plant side.

Options **N35** to **N38** include a controlled and fused external voltage outgoing feeder for the anti-condensation heating in the motor.

Options (continued)

B43 to B45

Production flowcharts

Production flowcharts are provided with options **B43** to **B45**. After the order has been clarified, these are sent as dual language (English/German) PDF file by E-Mail.

Option	Description
B43	Documentation, production flowchart: Generated once
B44	Documentation, production flowchart: Updated every two weeks
B45	Documentation, production flowchart: Updated every month

C30 to C49

Auxiliary voltage other than 3 AC/N/400 V (SINAMICS GM150)

A 3 AC/N/400 V auxiliary supply must be provided on the plant side to supply power for the fans, open-loop/closed-loop control, protection and monitoring systems as well as the DC link pre-charging. If the auxiliary supply in the plant differs from this value, you must order one of the options **C30** to **C49**. In this case, the three-phase power supply on the plant side – that differs from the standard version – is adapted to the required voltage level using three individual transformers. Tappings of 200 V 3 AC to 690 V 3 AC are available for this purpose. The current required for the auxiliary supply can be determined from the current requirement at 400 V 3 AC (see Technical data, conversion to existing auxiliary voltage).

Order codes for auxiliary voltages and line frequencies	
C30	3 AC 50 Hz 200 V
C33	3 AC 60 Hz 220 V
C34	3 AC 60 Hz 230 V
C35	3 AC 60 Hz 240 V
C36	3 AC 50 Hz 380 V
C37	3 AC 60 Hz 380 V
C38	3 AC 50 Hz 400 V
C39	3 AC 50 Hz 415 V
C40	3 AC 60 Hz 440 V
C41	3 AC 60 Hz 460 V
C42	3 AC 60 Hz 480 V
C43	3 AC 50 Hz 500 V
C44	3 AC 50 Hz 550 V
C46	3 AC 60 Hz 575 V
C48	3 AC 50 Hz 690 V
C49	3 AC 60 Hz 690 V

Note: A matching transformer is necessary if 3 AC 50 Hz 400 V is available on the plant side, however, without a neutral conductor connection. In this case, option **C38** should be selected. Exception: A separate 230 V supply can be provided for the closed-loop control on the plant side.

Note: For insulated line supplies, the maximum supply voltage is 500 V 3 AC.

Note: The matching transformers can only be accessed from the rear of the converter.

Note: The combination with option **M66** (suitable for marine applications) or options **E11** to **E71** (individual certification) is only available on request.

Auxiliary voltage infeed		Supply voltage for
=.EA-Q11:1	L1	Fan, DC link precharging
=.EA-Q11:3	L2	
=.EA-Q11:5	L3	
=.EB-X1:1	L1	Open-loop and closed-loop control, protection and monitoring equipment
=.EB-X1:2	N	

Options (continued)

D00 to D92

Documentation

The standard documentation is supplied in English on CD-ROM. The circuit diagrams/terminal diagrams are only available in English/German. Supplementary documentation for the components installed in the converter, which the manufacturers of these components provide, is supplied on the CD-ROM in English/German. For technical reasons, it is not possible to restrict the scope of this supplementary documentation to just the options that the customer has ordered.

Option	Description
D00	**Documentation in German** With order code **D00** the documentation is supplied in German on CD-ROM.
D02	**Circuit diagrams, terminal diagrams and dimension drawings in DXF format** Documents such as circuit diagrams, terminal diagrams, layout diagrams and dimension drawings can be ordered with order code **D02** in the DXF format, e.g. for use in AutoCAD systems.
D15	**One set of printed documentation (multiple orders possible)** If documentation is also required on paper, this must be ordered using order code **D15**.
D55	**Documentation in Polish (on request)** With order code **D55** the documentation is supplied in Polish on CD-ROM.
D56	**Documentation in Russian (on request)** With order code **D56** the documentation is supplied in Russian on CD-ROM.
D72	**Documentation in Italian (on request)** With order code **D72** the documentation is supplied in Italian on CD-ROM.
D76	**Documentation in English** If a documentation language other than English is selected using options **D00** or **D55** up to **D92**, then by specifying order code **D76**, an additional CD-ROM with documentation in English as second documentation language can be ordered. Note: When simultaneously selecting option **D15** (a set of printed documentation) the printed documentation is only supplied in the first documentation language.
D77	**Documentation in French (on request)** With order code **D77** the documentation is supplied in French on CD-ROM.
D78	**Documentation in Spanish** With order code **D78** the documentation is supplied in Spanish on CD-ROM.
D79	**Documentation in Portuguese (on request)** With order code **D79** the documentation is supplied in Portuguese on CD-ROM.
D84	**Documentation in Chinese** With order code **D84** the documentation is supplied in Chinese on CD-ROM.
D92	**Documentation in Japanese (on request)** With order code **D92** the documentation is supplied in Japanese on CD-ROM.

E00

Closed-loop control for separately excited synchronous motors (static excitation unit is provided on the plant side)

When option **E00** is selected, the converter is supplied without static excitation unit. The static excitation unit should be provided on the plant side.

E01

Closed-loop control for separately excited synchronous motors with slip-ring excitation (for static excitation units, see Accessories)

If the converter is to be used to control separately excited synchronous motors with slip-ring excitation, **E01** must be included in the order. For slip-ring excitation, the excitation cabinet with its own Order No. must be additionally ordered.

Note: The converter and excitation cabinet must be ordered together.
Option **E01** is available on request in connection with option **U01** (converter version for NAFTA with UL listing).

E02

Closed-loop control for separately excited synchronous motors with brushless reverse field excitation (for static excitation units, see Accessories)

If the converter is to be used to control separately excited synchronous motors with brushless reverse field excitation, **E02** must be included in the order. For brushless reverse field excitation, the excitation cabinet with its own Order No. must be additionally ordered.

Note: The converter and excitation cabinet must be ordered together.
Option **E01** is available on request in connection with option **U01** (converter version for NAFTA with UL listing).

E03

Closed-loop control for permanently excited synchronous motors

If the converter is to be used to control permanently excited synchronous motors, order code **E03** must be included in the order.

Note: Option **E03** requires that option **L52** is simultaneously ordered (circuit-breaker at the converter output).

Note: For SINAMICS GM150 in IGBT version, option **E03** on request.

Options (continued)

E11 to E71
(SINAMICS GM150, water-cooled)

Individual certification of the converter by the relevant certifying organizations, including the extensions described under option M66

Option	Description
E11	**Suitable for marine applications with individual certificate from Germanischer Lloyd (GL)** includes option **M66**
E21	**Suitable for marine applications with individual certificate from Lloyds Register (LR)** includes option **M66**
E31	**Suitable for marine applications with individual certificate from Bureau Veritas (BV)** includes option **M66**
E51	**Suitable for marine applications with individual certificate from Det Norske Veritas (DNV)** includes option **M66**
E61	**Suitable for marine applications with individual certificate from the American Bureau of Shipping (ABS)** includes option **M66**
E71	**Suitable for marine applications with individual certificate from the Chinese Classification Society (CCS)** includes option **M66**

Note: A combination of several individual certificates is not possible.

Note: The options **E11** to **E71** cannot be combined with option **L53** (UPS for the power supply for the open-loop and closed-loop control).

Note: The combination with options **Y15** (sine-wave filter) or **C30** to **C49** (an auxiliary voltage other than 3 AC /N/ 400 V) on request.

E86

Additional analog inputs (isolated)

With option **E86** an additional TM31 Terminal Module is available. Its analog inputs are isolated. Multi-range transformers are used (adjustment range: 0 V to 10 V; 0 mA to 20 mA or 4 mA to 20 mA).

Note: Option **E86** cannot be combined with option **G62** (second additional TM31 Terminal Module), as well as with options **L94** and **L96** (2 PT100 evaluation units).

E87

Additional analog outputs (isolated)

With option **E87** an additional TM31 Terminal Module is available. Its analog outputs are isolated. Multi-range transformers are used (adjustment range: 0 V to 10 V; 0 mA to 20 mA or 4 mA to 20 mA).

Note: Option **E87** cannot be combined with option **G62** (second additional TM31 Terminal Module).

Options (continued)

F03, F73, F77, F97

Converter acceptance tests with the customer present

Option	Description
F03	**Visual acceptance** The checks are carried out with the converter in a no-voltage condition. The following is included in the scope of the acceptance tests: • The degree of protection is checked • The equipment is checked (components) • The equipment codes are checked • The clearance and creepage distances are checked • The cabling and wiring are checked • The customer documentation is checked • Submission of the acceptance report
F73	**Functional acceptance of the converter with inductive load (SINAMICS GM150 in IGBT version, others on request)** After the converter has been visually accepted in the no-voltage state its rated voltage is connected. The rated current flows in an inductive load with an output frequency of 5 Hz (without connected motor) on the converter output side. The following is included in the scope of the acceptance tests: • Visual acceptance as described for option **F03** • The power supply is checked • The protection and monitoring equipment is checked (simulation) • The fan is checked (for water cooling: Cooling circuit elements in the converter) • The precharging is tested • Function test with inductive load at rated voltage and rated current • Submission of the acceptance report
F77	**Acceptance of insulation test of the converter (SINAMICS GM150 in IGBT version, others on request)** The following is included in the scope of the acceptance tests: • High-voltage test • The insulation resistance is measured The insulation test can only be ordered in connection with option **F73**.
F97	**Customer-specific system acceptance tests (on request)** For a system acceptance test, transformer (if technically required), converter, cooling system (if technically required) and motor should be set-up and commissioned. Converter, cooling system and transformer are either mounted directly next to the motor – or or separately from the motor. Only already pre-tested components (together with a test certificate) are subject to a system test. The tests that can be performed in the System Test Center are listed in the following. For each system acceptance test, the actual test scope must first be coordinated first with the sales partner. Temperature-rise test Full load operation or partial load operation of the motor in converter operation until the temperature reaches a steady-state. The operating point should be preferably selected where the highest temperature increases is expected (M_N, n_N). The resistance method is the basis to determine the temperature rise. During the temperature rise test, in addition to the motor temperatures, the electrical operating parameters of the complete drive system are also continuously recorded. Load tests • Load tests at four different operating points • The system efficiency is determined at the defined load points • Line-side harmonic analysis Additional tests • HV insulation test: The converter and motor have already been tested as part of the routine tests performed during production. Re-testing the converter is time consuming and is not recommended. It can only be performed as part of a test that is separately performed for options **F73/F77**. • Converter function test: The fault and alarm functions are checked using defined simulation routines (e.g. overtemperature trip, EMERGENCY STOP, overcurrent, overspeed, undervoltage) • 120 % overspeed test • Noise measurement (motor fed from the converter without load) • Vibration measurement (motor fed from the converter without load) • Visual inspection (converter and motor and where relevant, transformer)

Note: An acceptance test of static excitation units according to options **F03, F73** and **F77** is only possible together with the converter which must be ordered simultaneously.

Note: A high voltage test of the converter is always already performed during the type test. When the test is repeated as part of option **F77**, the test voltage is reduced to 80 % (according to DIN EN 61800-5-1/VDE 0160 T105 (IEC 61800-5-1)).

Note: Excitation units are only accepted as part of option **F97** when this option is simultaneously selected for the converter and excitation unit and is generally performed at another location and at another time.

Options (continued)

G20 to G24 and G34

Access to other bus systems

In the standard version the SINAMICS GM150 and SINAMICS SM150 are equipped with a PROFIBUS interface (slave). Additional interface modules are optionally available.

Option	Description
For SINAMICS GM150 (on request)	
G20	CAN bus interface (CANopen)
G21	Modbus Plus interface
G22	Modbus RTU slave interface
G23	DeviceNet interface
G24	PROFINET interface (via CBE20)
For SINAMICS SM150	
G34	PROFINET interface (via CBE30)

The SINAMICS Communication Boards CBC10 or CBE20 (option **G24** for SINAMICS GM150) and CBE30 (option **G34** for SINAMICS SM150) are used to connect to the CANopen bus system (option **G20**) or to PROFINET.

The “Anybus-X-Gateway” from the HMS Industrial Networks company is used to connect to third-party Modbus Plus systems (option **G21**), Modbus RTU (option **G22**) and DeviceNet (option **G23**).

When one of the options **G21** to **G23** is ordered, the Anybus-X-Gateway is installed when the equipment is delivered and is connected to the CU320 Control Unit via PROFIBUS cable. The scope of supply includes a null modem cable to configure the Anybus-X-Gateway. The Anybus-X-Gateway is preconfigured to 20 bytes of I/O data. The data size can be changed via the configuration interface from a PG/PC (standard PC tool “Windows Hyper Terminal”).

The “NetTool” supplied by HMS Industrial Networks must be used to configure the PROFIBUS. This is not included in the scope of supply.

Current information, documentation and tools for Anybus-X-Gateway are available under http://www.anybus.com.

G25, G35

TeleService connection TS Adapter II analog modem, ISDN modem (SINAMICS GM150 in IGBT version)

Using the TeleService connection, personnel in the central service department can perform all operator functions and settings with the STARTER software and provide support when service is required.

An appropriate modem is required for the TeleService connection. This permits communications to be established between the PROFIBUS inside the drive unit and a telephone cable to a central service department. This modem, with PROFIBUS connection, is integrated in a SIMATIC TS Adapter II, which is available in an analog (option **G25**) and an ISDN version (option **G35**). Under certain circumstances, an appropriate extension cable is required to connect to the telephone line.

Further, a 24 V DC power supply is required locally for the TS Adapter.

Note: You will find additional information on the TeleService in the following Service&Support article on the Internet:
http://support.automation.siemens.com/WW/view/en/20301397

G30

PROFIBUS master (SINAMICS GM150 with static excitation unit, see Accessories)

As standard SINAMICS GM150 converters can only communicate as PROFIBUS slaves. Therefore, in conjunction with a SINAMICS GM150 converter, a SIMATIC S7 control with PROFIBUS master capability is used in the static excitation unit.

Options (continued)

G61

Additional TM31 Terminal Module

One TM31 Terminal Module and two TM15 Terminal Modules for integrating alarm and fault messages as well as control signals and for communicating with a higher-level control are already included in the standard version of the converter. The interface can also be extended by an additional Terminal Module if the number of signals to be monitored is not sufficient. Additional digital inputs and outputs and two analog inputs and outputs are available with the TM31.

The TM31 Terminal Module has:

- 8 digital inputs
- 4 bidirectional digital inputs and outputs
- 2 relay outputs with change-over contact
- 2 analog inputs
- 2 analog outputs
- 1 temperature sensor (KTY84-130 or PTC)

The following table shows an overview of the exclusions, which must be considered when selecting options **G61** or **G62**.

	G61	G62	E86	E87	L80 to L93, L95	L94, L96
G61		✓	✓	✓	–	–
G62	✓		–	–	✓	–
E86	✓	–		✓	✓	–
E87	✓	–	✓		✓	✓
L80 to L93, L95	–	✓	✓	✓		✓
L94, L96	–	–	–	✓	✓	

✓ Options can be combined

– Options mutually exclude each other

Note: For isolated analog inputs/outputs options **E86** or **E87** are available.

TM31 Terminal Module	
Digital inputs	
• Voltage	–3 V to +30 V
• Low level (an open digital input is interpreted as "low")	–3 V to +5 V
• High level	15 V to 30 V
• Current drain (at 24 V DC)	typ. 10 mA
• Signal propagation delays for digital inputs	L → H: approx. 50 µs H → L: approx. 100 µs
• Max. connectable cross section	1.5 mm^2
Digital outputs (continuous short-circuit-proof)	
• Voltage	24 V DC
• Max. load current per digital output	100 mA
• Max. total current of digital outputs	400 mA
• Max. connectable cross section	1.5 mm^2
Analog inputs (a switch is used to toggle between voltage and current input)	
• As voltage input	
- Voltage range	–10 V to +10 V
- Internal resistance R_i	100 kOhm
• As current input	
- Current range	4 mA to 20 mA/–20 mA to +20 mA/0 mA to 20 mA
- Internal resistance R_i	250 Ohm
- Resolution	11 bit + sign
• Max. connectable cross section	1.5 mm^2
Analog outputs (continuous short-circuit-proof)	
• Voltage range	–10 V to +10 V
• Max. load current	–3 mA to +3 mA
• Current range	4 mA to 20 mA, –20 mA to +20 mA, 0 mA to 20 mA
• Max. load resistance	500 Ohm for outputs in the range –20 mA to +20 mA
• Resolution	11 bit + sign
• Max. connectable cross section	1.5 mm^2
Relay outputs (change-over contacts)	
• Max. load current	8 A
• Max. switching voltage	250 V AC, 30 V DC
• Max. switching power (at 250 V AC)	2000 VA (cos phi = 1) 750 VA (cos phi = 0.4)
• Max. switching power (at 30 V DC)	240 W (ohmic load)
• Required minimum current	100 mA
• Max. connectable cross section	2.5 mm^2

5

Options (continued)

G62

Second additional TM31 Terminal Module

With order code **G62** a second TM31 Terminal Module can be ordered (description and exclusions under option **G61**).

G63

Additional TM15 Terminal Module

One TM31 Terminal Module and two TM15 Terminal Modules for integrating alarm and fault messages as well as control signals and for communicating with a higher-level control are already included in the standard version of the converter. The number of digital inputs and outputs can be expanded with an additional TM15 Terminal Module. This is recommended if, for instance, external signals are to be read in and processed or external components are to be controlled in addition to the standard customer's terminal strip.

The TM15 Terminal Module has:

- 24 bidirectional digital inputs and outputs (isolation in three groups of eight channels)
- 24 green status LEDs for indicating the logical signal status of the relevant terminal

TM15 Terminal Module	
Digital inputs	
• Voltage	-30 V to +30 V
• Low level (an open digital input is interpreted as “low”)	-30 V to +5 V
• High level	15 V to 30 V
• Current drain (at 24 V DC)	5 mA to 11 mA
• Signal propagation delays for digital inputs, typical	L → H: 50 µs H → L: 100 µs
• Max. connectable cross section	1.5 mm^2
Digital outputs (continuous short-circuit-proof)	
• Voltage	24 V DC
• Max. load current per digital output	0.5 A
• Output delay (ohmic load)	
- typically	L → H: 50 µs H → L: 150 µs
- maximum	L → H: 100 µs H → L: 225 µs
• Max. total current of outputs (per group)	
- up to 60 °C	2 A
- up to 50 °C	3 A
- up to 40 °C	4 A
• Max. connectable cross section	1.5 mm^2

G66

PADU8 diagnostics module (SINAMICS GM150 in IGCT version and SINAMICS SM150)

The PADU8 diagnostics module reads out up to eight analog signals and up to eight digital signals from the power stack adapter of the power unit and makes these available for diagnostics purposes or for further processing. The typical detection cycle of all channels in parallel is 1 ms, enabling rapid signal characteristics to be detected and diagnosed simultaneously. The detected values are transferred to an evaluation system (e.g. notebook) either via fiber-optic conductors or via an RJ11 socket. All output data are available in parallel at the fiber-optic conductor output and at the RJ11 socket. This means that measurements can be taken in parallel at the RJ11 socket without disrupting data transfer along the fiber-optic conductor. With option **G66** a PADU8 diagnostics module is integrated in the control section of each Motor Module.

G70

Pulse distributor for transferring the speed encoder signal (SINAMICS SM150; SINAMICS GM150 on request)

With this pulse distributor it is possible to split the encoder signal. This possibility is used, for example, when speed actual values from an HTL incremental encoder are required at various points for measured-value acquisition and processing.

The pulse distributor splits the HTL incremental encoder signals into two separate RS422 signal outputs. The inputs are electrically isolated from the outputs.

8-pole terminal strips are used for the connection.

Note: For SINAMICS GM150, option **K50** (Sensor Module Cabinet-Mounted SMC30) should be ordered at the same time.

G71

Optical bus terminal (OBT) for PROFIBUS (SINAMICS SM150; SINAMICS GM150 on request)

The PROFIBUS OBT is a network component for use in optical PROFIBUS DP fieldbus networks. The individual bus stations are linked using two-phase plastic fiber-optic conductors. These automatically provide isolation and prevent potential differences in large plants from having any impact.

The OBT has three interfaces:
Channel 1 is an electrical RS485 interface which is implemented as a 9-pole Sub D socket connector and establishes the link to the converter control.
Channels 2 and 3 form the optical interface. They are implemented as a duplex socket connector and can be used to connect to higher-level systems on the plant side.

Note: For SINAMICS GM150, option **G71** cannot be combined with options **G20** to **G24** and **G34** (access to other bus systems) as well as with **G25** and **G35** (Teleservice).

Options (continued)

K20

Indicator lights in the cabinet door

With option **K20**, five indicator lights that display the operating status of the converter are provided in the cabinet door of the control section.

- Fault (red)
- Alarm (yellow)
- Operation (green)
- Drive ready (white)
- Local operation (white)

K21

Display instruments in the cabinet door for voltage, current, speed and power as well as indicator lights

Analog instruments to display process quantities are installed in the cabinet door. They display measured values as a %.

- Motor current (0 to +120 %)
- Motor speed (-120 % ... 0 … +120 %)
- Calculated motor power (0 to +120 %)
- Motor voltage (0 to +120 %)

Note: Option **K21** includes option **K20**.

K22

Display instruments in the cabinet door for current, speed, power and winding temperature as well as indicator lights

Analog display instruments are installed in the cabinet door indicating the measured value in % to display process variables: The motor winding temperature is displayed in °C as absolute value.

- Motor current (0 to +120 %)
- Motor speed (–120 % ... 0 … +120 %)
- Calculated motor power (0 to +120 %)
- Motor winding temperature (0 to 200 °C)

Note: Option **K22** includes option **K20**.

K50

SMC30 Sensor Module Cabinet-Mounted (SINAMICS GM150, standard for SINAMICS SM150)

The SMC30 encoder module can be used to detect the actual motor speed. The signals received from the rotary pulse encoder are converted here and made available via the DRIVE-CLiQ interface of the closed-loop control for evaluation purposes.

SMC30 supports the following encoders:

- TTL encoders
- HTL encoders

The max. connectable conductor cross section is 20 mm^2.

K80

Control of "Safe Torque Off" function (SINAMICS SM150; SINAMICS GM150 on request)

The "Safe Torque Off" function is a "mechanism for preventing the drive from unexpected starting" according to DIN EN 60204-1/VDE 0113 T1 (IEC 60204-1), Section 5.4. In conjunction with external circuitry, the "Safe Torque Off" function has been certified by TÜV-Süd [German Technical Inspectorate] in accordance with EN 954-1 Safety Category 3 and 61508 SIL 2. However, this certification is only valid if the circuit-breaker on the plant side is equipped with an undervoltage release.

The switch on the motor side as shutdown path can be eliminated as a result of the "Safe Torque Off" function.

Note: Option **K80** is only available on request for SINAMICS GM150. However, the option **L60** (EMERGENCY STOP, Stop Category 1 for controlled stopping) is available for this purpose.

Options (continued)

L08

Output reactor

The output reactor is used to limit the capacitive re-charging currents of motor cables. Depending on the power unit type (IGBT or IGCT technology) different cable lengths apply.

Converter	Max. cable lengths			
	without output reactor (standard)		with output reactor [1] (option **L08**)	
	shielded	unshielded	shielded	unshielded
Output voltage 2.3 kV to 4.16 kV				
SINAMICS GM150 IGBT version	up to 2 parallel cables: 100 m 3 parallel cables: 80 m >3 parallel cables: not permitted	not permitted [2]	1000 m	not permitted [2]
Output voltage 3.3 kV				
SINAMICS GM150 IGCT version	up to 2 parallel cables: 100 m 3 parallel cables: on request 4 parallel cables: on request	not permitted	500 m	not permitted
SINAMICS SM150	up to 2 parallel cables: 50 m 3 parallel cables: on request 4 parallel cables: on request	not permitted	200 m	not permitted

The output reactor is located in an additional cabinet.

Attention: When using an output reactor, the following values apply for the maximum output frequency:

- SINAMICS GM150 in IGBT version: 150 Hz
- SINAMICS GM150 in IGCT version and SINAMICS SM150: 90 Hz

Attention: Option **L08** increases the width of the cabinet as follows:

- SINAMICS GM150 in IGBT version:
  - Single circuit configuration: 600 mm
  - Parallel circuit configuration: 2 x 600 mm
- SINAMICS GM150 in IGCT version and SINAMICS SM150: 700 mm for each converter unit

When options **L49** or **L51**/**L52** are simultaneously selected the width does not have to be increased.

L21

Overvoltage protection AC (static excitation unit, see Accessories)

Option **L21** provides an integrated SICROWBAR overvoltage protection device on the input side.

[1] Distance between the converter and the motor depending on the current magnitude for max. 6 three-core EMC cables connected in parallel.

[2] A sine-wave filter (option **Y15**) must be provided if unshielded motor cables are used.

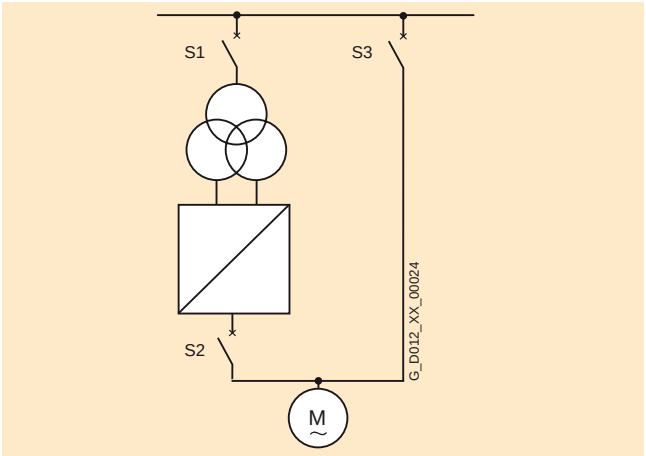
Options (continued)

L29

Bidirectional synchronized bypass operation (SINAMICS GM150 in IGBT version with induction motor)

Option **L29** offers synchronization with bumpless transfer of the motor to and from the line supply.

The converter synchronizes the motor to the supply voltage (phase position, frequency and amplitude). The motor is subsequently connected in parallel to the line supply through the S3 circuit-breaker before the output-side S2 circuit-breaker opens.



Approx. 100 ms expires taking into account the intrinsic time constants of both circuit-breakers (opening and closing times). The motor is transferred from the converter to the line supply within this time. This ensures that the motor is bumplessly transferred to the line supply.

If the motor is to be subsequently transferred from the line supply back to the converter, then the transfer process is executed in the reverse sequence. The converter is first run up in no-load operation and its output voltage is synchronized to the line supply voltage regarding phase position, frequency and amplitude (= motor voltage). Circuit-breaker S2 is then closed before S3 is opened and the motor is isolated from the line.

In this case the motor is bumplessly transferred to the converter and can either be operated with closed-loop speed control or ramped-down to zero speed in a controlled fashion. Variable speed operation when ramping-up and ramping-down ensures that no high starting and transient torques are generated that could damage the drive train or cause e.g. pressure fluctuations in the process.

With option **L29** a VSM10 Voltage Sensing Module is integrated into the converter. The VSM10 detects the line supply voltage regarding phase position, frequency and amplitude. A voltage transformer (PT) that should be provided on the primary side of circuit-breaker A1 (plant-side) is used for this purpose. This PT supplies the data to synchronize the motor to the line supply and from the line supply to the converter. The converter control outputs the control signals for the two circuit-breakers to be provided on the plant side.

In addition, an output reactor with u_K = 10 % (±2 %) or option **Y15** (sine-wave filter) is required to de-couple the converter during the transfer operation.

Note: A u_K value of 10 % cannot be achieved using option **L08** (output reactor).

Circuit-breaker S3 should be dimensioned so that it protects the motor against overvoltage and overcurrent during line supply operation. If temperature sensors are integrated in the motor, these must be monitored independently (plant-side) during line operation.

Attention: Option **L29** is only possible if the converter output voltage is the same as the line supply voltage.

L32

Automatic restart

Option **L32** enables the converter to be restarted after a power failure once the line supply has been restored.

If such a restart is required for process-related reasons, the following conditions must be taken into consideration.

The 3 AC 400 V and 1 AC 230 V auxiliary supplies must not fail, so that the voltage supply to the fans and coolant pumps as well as the closed-loop and open-loop control is maintained.

If the main supply fails, pulses are inhibited and the DC link voltage is buffered for a short period of time by the precharging unit. It is important to distinguish between two cases here:

Case A:

The circuit-breaker on the input side is still not closed.

If the medium-voltage line supply returns, the DC link voltage rises. This is detected by the open-loop and closed-loop control and operation is resumed when a threshold value is exceeded.

Case B:

The circuit-breaker on the input side has tripped (opened).

After a fixed, definable time, the circuit-breaker receives an “ON” command. The DC link voltage response is then checked.

If the DC link voltage continues to fall, the converter is shut down.

If the DC link voltage rises, operation is resumed when a threshold value is exceeded.

Depending on the failure time, load characteristic and moment of inertia, the drive may be “caught” again or the motor may need to be “excited” again first before operation can be resumed.

With option **L32** a VSM10 Voltage Sensing Module is integrated into the converter. The VSM10 detects the line supply voltage regarding phase position, frequency and amplitude. A voltage transformer (PT) that should be provided on the primary side of circuit-breaker A1 (plant-side) is used for this purpose. This enables the open-loop and closed-loop control to detect when the medium-voltage supply returns after a power failure if the circuit-breaker on the input side has opened.

For safety reasons, a time limit is built in between the power failure and the maximum permitted line restoration time so that the drive cannot start up again uncontrolled.

In addition, a signal that can be used to generate an acoustic warning is output when restarting.

Options (continued)

L48

Make-proof grounding switch at converter input (motor-operated)

If grounding on the line side is required for safety and protection reasons, a motor-operated make-proof grounding switch can be ordered with order code **L48**. The number of make-proof grounding switches depends on the particular infeed version (12-/24-pulse for SINAMICS GM150 or 6-pulse for SINAMICS SM150).

For safety reasons, the converter control interlocks these make-proof grounding switches so that they cannot be closed as long as voltage is still present. The control is integrated into the protection and monitoring circuit of the converter. The make-proof grounding switches are closed automatically when the standard make-proof grounding switch of the DC link is closed.

In the event of maintenance work on the converter, it must be ensured on the plant side that there is no external voltage present, e.g. auxiliary voltage for fans, the cooling system, open-loop and closed-loop control and any power outlet for auxiliaries in the converter.

Attention: Option **L48** increases the width of the cabinet as follows:

- SINAMICS GM150 in IGBT version: 600 mm
- SINAMICS GM150 in IGCT version: 4 x 700 mm per converter unit
- SINAMICS SM150: 700 mm for each converter unit

Note: An inquiry is required for option **L48** in conjunction with option **U01** (converter version for NAFTA with UL listing).

Note: For SINAMICS GM150 in IGCT version, option **L48** in combination with option **N15** (24-pulse Basic Line Module) on request.

L49

Make-proof grounding switch at converter output (motor-operated)

For certain operating modes/configurations of the load machine (e.g. drive group with gas turbines) and types of motor (e.g. PEM), operating states can occur where there is a danger that the motor feeds back energy to the converter. This can lead to dangerous voltages. In these cases a motor-operated make-proof grounding switch for the converter output side can be ordered with order code **L49**. The number of circuit-breakers increases as the number of power units connected in parallel increases.

For safety reasons, the converter open-loop control prevents the make-proof grounding switch from being closed while voltage is still present. The control is integrated into the protection and monitoring circuit of the converter. The make-proof grounding switches are closed automatically when the standard make-proof grounding switch of the DC link is closed.

Attention: Option **L49** increases the width of the cabinet as follows:

- SINAMICS GM150 in IGBT version: 600 mm; if options **L08** or **L51**/**L52** are simultaneously selected the width does not increase.
- SINAMICS GM150 in IGCT version and SINAMICS SM150: 700 mm per converter unit; if options **L08** and/or **L51**/**L52** are simultaneously selected the width does not increase

Note: An inquiry is required for option **L49** in conjunction with option **U01** (converter version for NAFTA with UL listing).

Options (continued)

L50

Cabinet lighting and service socket outlet in the closed-loop control section

If option **L50** is chosen, a universal lamp and a service socket outlet (Schuko version) are installed respectively in the cabinet panels of the closed-loop control sections for Motor Modules and Active Line Modules.

The voltage supply for the cabinet lighting and service socket outlet (on terminal strip =.EG-X1) is provided externally. The cabinet lighting is switched on manually via a switch or automatically by an integrated motion detector. The mode is selected using a switch.

Terminal	Meaning
=.EG–X1:1	L1 (230 V)
=.EG–X1:2	N

Note:In conjunction with option **U01** (converter version for NAFTA with UL listing), option **L50** is designed for a 120 V supply voltage. In this case the service socket outlet is a US version.

L51

Disconnector at the converter output

If the converter output has to be disconnected from the drive motor for safety and protection reasons, a motor-operated disconnector at the converter output can be ordered with order code **L51**.

Attention: The cabinet width increases as follows due to the supplementary cabinets at the converter:

- SINAMICS GM150 in IGBT version: 600 mm; if option **L49** is simultaneously selected the width does not increase
- SINAMICS GM150 in IGCT version and SINAMICS SM150: 700 mm per converter unit; if options **L08** and/or **L49** are simultaneously selected the width does not increase

Note: Option **L51** cannot be combined with option **L52** (circuit-breaker at the converter output).

L52

Circuit-breaker at the converter output

If the converter output has to be disconnected from the drive motor for safety and protection reasons, a motor-operated circuit-breaker at the converter output can be ordered with order code **L52**. The converter open-loop control controls this circuit-breaker. With the ON command, together with the auxiliaries, the circuit-breaker on the output side is closed. The circuit-breaker is opened with the OFF command.

Note: Option **L52** cannot be combined with option **L51** (disconnector at the converter output).

Attention: Option **L52** increases the width of the cabinet as follows:

- SINAMICS GM150 in IGBT version: 600 mm; if option **L49** is simultaneously selected the width does not increase
- SINAMICS GM150 in IGCT version and SINAMICS SM150: 700 mm per converter unit; if options **L08** and/or **L49** are simultaneously selected the width does not increase

L53

UPS for the power supply of the open-loop and closed-loop control (SINAMICSGM150)

If there is a danger of voltage dips and brief line supply failures in the plant, then the drive can continue to operate if the closed-loop control is supplied from a UPS. The prerequisite for continued operation is that the DC link voltage does not fall below the $V_{d\,min}$ limit and the medium-voltage switch does not trip due to an undervoltage condition. This means that the drive can tolerate voltage dips up to brief line supply failures; this is especially true if the driven load has a high moment of inertia and the DC link can be kinetically buffered.

In the case of line supply interruptions that cause the power unit to shut down, the down time is reduced using the automatic restart function (option **L32**). The UPS is configured for a buffer time of up to 10 min.

Note: In conjunction with option **U01** (converter version for NAFTA with UL listing) a special request is required for option **L53**.

Note: Option **L53** restricts the temperature range as follows:
Continuous operation: 0 to +40 °C
Operation <2 h/d: 0 to +45 °C
Transport and storage: –15 to +50 °C

Note: Option **L53** cannot be combined with options **M66** (suitable for marine applications) or **E11** to **E71** (individual certification).

Terminal	Meaning
=.EB–X1:1	L1 (230 V)
=.EB–X1:2	N

L55

Anti-condensation heating for the cabinet

The anti-condensation heating is recommended for low ambient temperatures and high levels of humidity to prevent condensation. The number of 100 W control cabinet heating elements that are installed depends on the number of cabinet fields. The anti-condensation heaters are controlled with a thermostat. Should the external auxiliary supply fail, this is monitored and signaled by the converter for safety reasons.

The supply voltage for the anti-condensation heating (110 V to 240 V AC, on terminal strip =.GB–X1:) must be supplied externally.

Terminal	Meaning
=.GB–X1:1A	L1 (110 V to 240 V)
=.GB–X1:2A	N

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Options (continued)

L60

EMERGENCY STOP, Stop Category 1 for controlled stopping (SINAMICS GM150)

For uncontrolled stopping, the standard converter includes an EMERGENCY OFF function that involves integrating an external safety circuit and a positively opening mushroom pushbutton at the front of the unit. When the mushroom pushbutton is pressed, the line supply voltage is disconnected from the converter through the circuit-breaker and the motor then coasts down.

As a supplement, "EMERGENCY STOP, Stop Category 1" function is available (acc. to DIN EN 60204-1/ VDE 0113 T1 (IEC 60204-1)) with option **L60**. This includes stopping the drive in an open-loop controlled fashion using a fast stop along a down ramp that should be parameterized by the user. The line supply is then disconnected from the converter – the same as for EMERGENCY OFF – via the time-delayed contact of the safety relay being used. The duration should be set at the safety relay corresponding to the selected down ramp. The selection and the feedback signal of the "EMERGENCY STOP, Stop Category 1" function are connected to the customer terminal strip.

Among others, depending on the safety relay selected (1 or 2-channel) and the selected fault detection (e.g. using cyclic tests) a maximum of Safety Category 3 according to EN 954-1:1996 or EN ISO 13849-1:2006 can be achieved for the "EMERGENCY STOP, Stop Category 1" function.

Attention: The braking process can take considerable time even with an EMERGENCY STOP category 1.
Among other things, this depends on the total moment of inertia of the drive train. It may be necessary to use a Braking Module (option **L72**).

In addition to option **L60**, the "Safe Torque Off (STO)" safety function is available as option **K80** on request. The two options are compared in the following table.

	Option L60 EMERGENCY STOP, Stop Category 1 for controlled stopping	**Option K80** Safe Torque Off (STO)
Functionality	When activated, the drive is braked down to zero speed and the energy feed to the converter is then interrupted by opening the circuit-breaker. In addition to the software intervention (OFF3), a safety relay also ensures that the circuit-breaker opens.	When activated, the drive is braked down to zero speed and then the gating commands of the power semiconductors are safely inhibited. The circuit-breaker remains closed so that the converter is still connected to the power supply. The option also fulfills the "EMERGENCY STOP, Stop Category 1" function as the rotating motion of the connected motor is brought to a standstill by removing the energy feed to the converter.
Guaranteed safety feature	The converter is disconnected from the power after the selected delay time of the safety relay has expired	The driving torque is safely switched-off according to the safety category
Safety category	Up to category 3 acc. to EN 954-1:1996 or EN ISO 13849-1:2006 can be achieved, depending on the circuit arrangement of the safety relay and the fault detection using separate tests.	EN 941-1:1996, Category 3 IEC 61508:2000, Parts 1 to 4, SIL2
Certification of the option	No; however, the German Statutory Industrial Accident Insurance Institution has certified the safety relay	Yes; by TÜV Süd [German Technical Inspectorate]
User's view	**The user is responsible for configuring and implementing the safety function.**	**The complete safety function is certified,** if the specifications are strictly met.
Availability	SINAMICS GM150	SINAMICS SM150, SINAMICS GM150 on request

Options (continued)

L72
Braking Module

In order to permit braking operation for Basic Infeed (SINAMICS GM150) or for Active Infeed (SINAMICS SM150) to be able to brake even if the power fails, a Braking Module with braking resistor can be used. The mechanical design of the Braking Module corresponds to that of a Motor Module; its actual version is adapted to the converter cooling type (air or water cooling).

The following should be ensured when engineering:

- Shielded cables should be used just the same as at the converter output.
- The same maximum cable lengths as for SINAMICS GM150 in IGBT version apply (without sine-wave filter or output reactor; refer to Power cables in Section 7).

Note: An external load resistor is connected as braking resistor. This is not included in the scope of supply (refer to option **Y73**).

Note: Option **L72** cannot be combined with option **M61** (redundant fan in the power unit).

Note: For SINAMICS SM150, option **L72** on request.

Note: For SINAMICS GM150 in IGCT version, option **L72** cannot be combined with option **N15** (24-pulse Basic Line Module).

Attention: Option **L72** increases the width of the cabinet as follows:

- SINAMICS GM150 in the 12-pulse IGBT version: 600 mm
- SINAMICS SM150: 1800 mm

Braking power of the Braking Module with external braking resistor

Converter output voltage	Cooling method	Braking resistor required (±10 %)	Supply voltage, braking resistor	Braking power Braking Module	
				P_{20}	P_{DB}
kV		Ω	kV	kW	kW
SINAMICS GM150 in IGBT version					
2.3	Air	9.5	4.1	1000	333
	Water	7.5	4.1	1250	417
3.3	Air	13.5	5.8	1400	467
	Water	11	5.8	1700	567
4.16	Air	17.5	7.5	1800	600
	Water	14	7.5	2250	750
SINAMICS GM150 in IGCT version and SINAMICS SM150					
3.3	Water	3.2	5.8	4000 [1)]	4000

Note: The data in the table above apply for the maximum control of the Braking Module.

[1)] Higher values are possible for a shorter time (in the area of seconds).

Options (continued)

L80

2 thermistor protection relays for alarm and fault

Option **L80** offers two thermistor protection relays (with PTB approval) for PTC thermistors (type A) for alarm and disconnection. The power supply for the relay and the evaluation is provided in the converter.

An additional TM31 Terminal Module is integrated as interface for further processing and to display signals.

Note: Option **L80** cannot be combined with option **G61** (additional TM31 Terminal Module).

Terminal	Meaning (alarm)
=.LF–A11:T1	Sensor circuit connection
=.LF–A11:T2	Sensor circuit connection

Terminal	Meaning (disconnection)
=.LF–A12:T1	Sensor circuit connection
=.LF–A12:T2	Sensor circuit connection

L81

2 × 2 thermistor protection relays for alarm and fault

Option **L81** offers four thermistor protection relays (with PTB approval) for PTC thermistors (type A) for alarm and disconnection. The power supply for the relay and the evaluation is provided in the converter.

An additional TM31 Terminal Module is integrated as interface for further processing and to display signals.

Note: Option **L81** cannot be combined with option **G61** (additional TM31 Terminal Module).

Terminal	Meaning (alarm)
=.LF–A11:T1	Sensor circuit connection
=.LF–A11:T2	Sensor circuit connection

Terminal	Meaning (disconnection)
=.LF–A12:T1	Sensor circuit connection
=.LF–A12:T2	Sensor circuit connection

Terminal	Meaning (alarm)
=.LF–A21:T1	Sensor circuit connection
=.LF–A21:T2	Sensor circuit connection

Terminal	Meaning (disconnection)
=.LF–A22:T1	Sensor circuit connection
=.LF–A22:T2	Sensor circuit connection

L82

3 × 2 thermistor protection relays for alarm and fault

Option **L81** offers six thermistor protection relays (with PTB approval) for PTC thermistors (type A) for alarm and disconnection. The power supply for the relay and the evaluation is provided in the converter.

An additional TM31 Terminal Module is integrated as interface for further processing and to display signals.

Note: Option **L82** cannot be combined with option **G61** (additional TM31 Terminal Module).

Terminal	Meaning (alarm)
=.LF–A11:T1	Sensor circuit connection
=.LF–A11:T2	Sensor circuit connection

Terminal	Meaning (disconnection)
=.LF–A12:T1	Sensor circuit connection
=.LF–A12:T2	Sensor circuit connection

Terminal	Meaning (alarm)
=.LF–A21:T1	Sensor circuit connection
=.LF–A21:T2	Sensor circuit connection

Terminal	Meaning (disconnection)
=.LF–A22:T1	Sensor circuit connection
=.LF–A22:T2	Sensor circuit connection

Terminal	Meaning (alarm)
=.LF–A31:T1	Sensor circuit connection
=.LF–A31:T2	Sensor circuit connection

Terminal	Meaning (disconnection)
=.LF–A32:T1	Sensor circuit connection
=.LF–A32:T2	Sensor circuit connection

L87

Rotor ground-fault monitoring (static excitation unit, see Accessories)

Option **L87** provides integrated ground-fault monitoring for the rotor circuit.

Options (continued)

L90 to L96

Three PT100 inputs are available in the standard version. As a consequence, together with one of the options **L90** to **L96** the following maximum number of PT100 inputs can be obtained:

- SINAMICS GM150 in IGBT version: 9 (with **L91**, **L93** or **L95**)
- SINAMICS GM150 in IGCT version and SINAMICS SM150: 15 (with **L94** or **L96**)

L90

PT100 evaluation unit with 3 inputs

The PT100 evaluation unit can monitor up to three sensors. The sensors can be connected using a two-wire or three-wire system. For all three sensors, the limits for alarm and disconnection must be set centrally.

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

An additional TM31 Terminal Module is integrated as interface for further processing and to display signals. The terminals that are assigned for the PT100 evaluation are listed in the following table.

Note: Option **L90** cannot be combined with option **G61** (additional TM31 Terminal Module).

Terminal	Meaning
=.LJ–A11:1T1 to 1T3	PT100; sensor 1
=.LJ–A11:2T1 to 2T3	PT100; sensor 2
=.LJ–A11:3T1 to 3T3	PT100; sensor 3

In a two-wire system inputs xT1 and xT2 must be assigned and a jumper inserted between terminals xT2 and xT3.

L91

2 PT100 evaluation units with 3 inputs each

Each PT100 evaluation unit can monitor up to three sensors. For all three sensors, the limits for alarm and disconnection must be set centrally.

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

An additional TM31 Terminal Module is integrated as interface for further processing and to display signals. The terminals that are assigned for the PT100 evaluation are listed in the following table.

Note: Option **L91** cannot be combined with option **G61** (additional TM31 Terminal Module).

Terminal	Meaning
=.LJ–A11:1T1 to 1T3	PT100; sensor 1
=.LJ–A11:2T1 to 2T3	PT100; sensor 2
=.LJ–A11:3T1 to 3T3	PT100; sensor 3

Terminal	Meaning
=.LJ–A12:1T1 to 1T3	PT100; sensor 1
=.LJ–A12:2T1 to 2T3	PT100; sensor 2
=.LJ–A12:3T1 to 3T3	PT100; sensor 3

The sensors can be connected using a two-wire or three-wire system. In a two-wire system inputs xT1 and xT2 must be assigned and a jumper inserted between terminals xT2 and xT3.

L92

3 PT100 evaluation units with 3 inputs each (SINAMICS GM150 in IGCT version and SINAMICS SM150)

Each PT100 evaluation unit can monitor up to three sensors. For all three sensors, the limits for alarm and disconnection must be set centrally.

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

An additional TM31 Terminal Module is integrated as interface for further processing and to display signals. The terminals that are assigned for the PT100 evaluation are listed in the following table.

Note: Option **L92** cannot be combined with option **G61** (additional TM31 Terminal Module).

Terminal	Meaning
=.LJ–A11:1T1 to 1T3	PT100; sensor 1
=.LJ–A11:2T1 to 2T3	PT100; sensor 2
=.LJ–A11:3T1 to 3T3	PT100; sensor 3

Terminal	Meaning
=.LJ–A12:1T1 to 1T3	PT100; sensor 1
=.LJ–A12:2T1 to 2T3	PT100; sensor 2
=.LJ–A12:3T1 to 3T3	PT100; sensor 3

Terminal	Meaning
=.LJ–A21:1T1 to 1T3	PT100; sensor 1
=.LJ–A21:2T1 to 2T3	PT100; sensor 2
=.LJ–A21:3T1 to 3T3	PT100; sensor 3

The sensors can be connected using a two-wire or three-wire system. In a two-wire system inputs xT1 and xT2 must be assigned and a jumper inserted between terminals xT2 and xT3.

Options (continued)

L93

PT100 evaluation unit with 6 inputs and 2 analog outputs (outputs for display connected to control)

The PT100 evaluation unit can monitor up to six sensors. The limit values can be freely programmed for each channel.

In the standard setting, the measuring channels are divided into two groups of three channels each. With motors, for example, three PT100 can be monitored in the stator windings and two PT100 in the motor bearings. Channels that are not used can be suppressed using appropriate parameter settings.

The output relays are integrated into the internal fault and shut-down circuit of the converter. Two freely programmable analog outputs (0/4 mA to 20 mA and 0/2 V to 10 V) are additionally available.

An additional TM31 Terminal Module is integrated as interface for further processing and to display signals and analog outputs. The terminals that are assigned for the PT100 evaluation are listed in the following table.

Note: Option **L93** cannot be combined with option **G61** (additional TM31 Terminal Module).

Terminal	Meaning
=.LG–A11:T11 to T13	PT100; sensor 1; group 1
=.LG–A11:T21 to T23	PT100; sensor 2; group 1
=.LG–A11:T31 to T33	PT100; sensor 3; group 1
=.LG–A11:T41 to T43	PT100; sensor 1; group 2
=.LG–A11:T51 to T53	PT100; sensor 2; group 2
=.LG–A11:T61 to T63	PT100; sensor 3; group 2
The sensors can be connected to the PT100 evaluation unit using either a two-wire or three-wire system. In a two-wire system inputs Tx1 and Tx3 must be assigned. In a three-wire system, input Tx2 must also be connected (x = 1, 2 , ..., 6).	
=.LG–A11:11/12/14	Relay output limit for group 1 reached (alarm); change-over contact
=.LG–A11:21/22/24	Relay output limit for group 1 reached (fault); change-over contact
=.LG–A11:T1 (OUT 1)	Analog output Out 1; sensor group 1
=.LG–A11:I1 (OUT 1)	Analog output Out 1; sensor group 1
=.LG–A11:31/32/34	Relay output limit for group 2 reached (alarm); change-over contact
=.LG–A11:41/42/44	Relay output limit for group 2 reached (fault); change-over contact
=.LG–A11:T2 (OUT 2)	Analog output Out 2; sensor group 2
=.LG–A11:I2 (OUT 2)	Analog output Out 2; sensor group 2

L94

2 PT100 evaluation units each with 6 inputs and 2 analog outputs (outputs for display connected to control; SINAMICS GM150 in IGCT version and SINAMICS SM150)

Option **L94** offers two PT100 evaluation units as described under option **L93**, enabling up to 12 sensors in total to be monitored.

Two additional TM31 Terminal Modules are integrated as interfaces for further processing and to display signals and analog outputs. The terminals that are assigned for the PT100 evaluation are listed in the following table.

Note: Option **L94** cannot be combined with options **G61** and **G62** (additional TM31 Terminal Modules), as well as with option **E86** (additional analog inputs).

Terminal	Meaning
=.LG–A11:T11 to T13	PT100; sensor 1; group 1
=.LG–A11:T21 to T23	PT100; sensor 2; group 1
=.LG–A11:T31 to T33	PT100; sensor 3; group 1
=.LG–A11:T41 to T43	PT100; sensor 1; group 2
=.LG–A11:T51 to T53	PT100; sensor 2; group 2
=.LG–A11:T61 to T63	PT100; sensor 3; group 2
The sensors can be connected to the PT100 evaluation unit using either a two-wire or three-wire system. In a two-wire system inputs Tx1 and Tx3 must be assigned. In a three-wire system, input Tx2 must also be connected (x = 1, 2 , ..., 6).	
=.LG–A11:11/12/14	Relay output limit for group 1 reached (alarm); change-over contact
=.LG–A11:21/22/24	Relay output limit for group 1 reached (fault); change-over contact
=.LG–A11:T1 (OUT 1)	Analog output Out 1; sensor group 1
=.LG–A11:I1 (OUT 1)	Analog output Out 1; sensor group 1
=.LG–A11:31/32/34	Relay output limit for group 2 reached (alarm); change-over contact
=.LG–A11:41/42/44	Relay output limit for group 2 reached (fault); change-over contact
=.LG–A11:T2 (OUT 2)	Analog output Out 2; sensor group 2
=.LG–A11:I2 (OUT 2)	Analog output Out 2; sensor group 2

Terminal	Meaning
=.LG–A21:T11 to T13	PT100; sensor 1; group 3
=.LG–A21:T21 to T23	PT100; sensor 2; group 3
=.LG–A21:T31 to T33	PT100; sensor 3; group 3
=.LG–A21:T41 to T43	PT100; sensor 1; group 4
=.LG–A21:T51 to T53	PT100; sensor 2; group 4
=.LG–A21:T61 to T63	PT100; sensor 3; group 4
The sensors can be connected to the PT100 evaluation unit using either a two-wire or three-wire system. In a two-wire system inputs Tx1 and Tx3 must be assigned. In a three-wire system, input Tx2 must also be connected (x = 1, 2 , ..., 6).	
=.LG–A21:11/12/14	Relay output limit for group 3 reached (alarm); change-over contact
=.LG–A21:21/22/24	Relay output limit for group 3 reached (fault); change-over contact
=.LG–A21:T1 (OUT 1)	Analog output Out 1; sensor group 3
=.LG–A21:I1 (OUT 1)	Analog output Out 1; sensor group 3
=.LG–A21:31/32/34	Relay output limit for group 4 reached (alarm); change-over contact
=.LG–A21:41/42/44	Relay output limit for group 4 reached (fault); change-over contact
=.LG–A21:T2 (OUT 2)	Analog output Out 2; sensor group 4
=.LG–A21:I2 (OUT 2)	Analog output Out 2; sensor group 4

Options (continued)

L95

PT100 evaluation unit with 6 inputs for explosion-protected motors and 2 analog outputs (outputs for display connected to control)

Six evaluation units are available for use in Hazardous Zone 2, Zone 22 (non-conductive dusts) Div. 2 and safe areas (intrinsically safe input: [Ex ia] IIC). The resistance thermometers (PT100, PT500, PT1000) can be operated in a two-wire, three-wire or four-wire system. The six evaluation units are arranged in two groups of three units each. For each group the alarm and disconnection signals are combined and integrated into the alarm and fault signaling circuit of the converter. In each group, a measured temperature value is also routed to an analog input on the converter, which means that it is available for the converter closed-loop control for measurement and display purposes.

An additional TM31 Terminal Module is integrated as interface for further processing and to display signals and analog outputs. The terminals that are assigned for the PT100 evaluation are listed in the following table.

Note: Option **L95** cannot be combined with option **G61** (additional TM31 Terminal Module), as well as with option **U01** (converter version for NAFTA with UL listing).

Terminal	Meaning
=.LH–A11:10 / 11 / 12 / 14	PT100; sensor 1; group 1
=.LH–A12:10 / 11 / 12 / 14	PT100; sensor 2; group 1
=.LH–A13:10 / 11 / 12 / 14	PT100; sensor 3; group 1

Terminal	Meaning
=.LH–A21:10 / 11 / 12 / 14	PT100; sensor 1; group 1
=.LH–A22:10 / 11 / 12 / 14	PT100; sensor 2; group 1
=.LH–A23:10 / 11 / 12 / 14	PT100; sensor 3; group 1

The sensors can be connected to the PT100 evaluation unit in either a two-wire, three-wire or four-wire system.
In a two-wire system the inputs 10 and 12 must be connected, in a three-wire system the inputs 10, 11 and 12 and in a four-wire system the inputs 10, 11, 12 and 14 must be connected.
Parameterization is done using software.

L96

2 PT100 evaluation units each with 6 inputs for explosion-protected motors and 2 analog outputs (outputs for display connected to control; SINAMICS GM150 in IGCT version and SINAMICS SM150)

Two times, six evaluation units are available for use in Hazardous Zone 2, Zone 22 (non-conductive dusts) Div. 2 and safe areas (intrinsically safe input: [Ex ia] IIC). The resistance thermometers (PT100, PT500, PT1000) can be operated in a two-wire, three-wire or four-wire system. The evaluation units are arranged in groups of three units each. For each group the alarm and disconnection signals are combined and integrated into the alarm and fault signaling circuit of the converter. Furthermore, a temperature measured value is led to an analog input of the converter in each group so that it is available to the converter control for measurement and display purposes.

Two additional TM31 Terminal Modules are integrated as interfaces for further processing and to display signals and analog outputs. The terminals that are assigned for the PT100 evaluation are listed in the following table.

Note: Option **L96** cannot be combined with options **G61** and **G62** (additional TM31 Terminal Modules), as well as with option **E86** (additional analog inputs).

Terminal	Meaning
=.LH–A11:10 / 11 / 12 / 14	PT100; sensor 1; group 1
=.LH–A12:10 / 11 / 12 / 14	PT100; sensor 2; group 1
=.LH–A13:10 / 11 / 12 / 14	PT100; sensor 3; group 1

Terminal	Meaning
=.LH–A21:10 / 11 / 12 / 14	PT100; sensor 1; group 1
=.LH–A22:10 / 11 / 12 / 14	PT100; sensor 2; group 1
=.LH–A23:10 / 11 / 12 / 14	PT100; sensor 3; group 1

Terminal	Meaning
=.LH–A31:10 / 11 / 12 / 14	PT100; sensor 1; group 1
=.LH–A32:10 / 11 / 12 / 14	PT100; sensor 2; group 1
=.LH–A33:10 / 11 / 12 / 14	PT100; sensor 3; group 1

Terminal	Meaning
=.LH–A41:10 / 11 / 12 / 14	PT100; sensor 1; group 1
=.LH–A42:10 / 11 / 12 / 14	PT100; sensor 2; group 1
=.LH–A43:10 / 11 / 12 / 14	PT100; sensor 3; group 1

The sensors can be connected to the PT100 evaluation unit in either a two-wire, three-wire or four-wire system.
In a two-wire system the inputs 10 and 12 must be connected, in a three-wire system the inputs 10, 11 and 12 and in a four-wire system the inputs 10, 11, 12 and 14 must be connected.
Parameterization is done using software.

Options (continued)

M10

Safety interlocking system

The safety locking system is based on the key transfer system developed by Castell. It is a supplementary mechanism to the electromagnetic door locking system integrated as standard. To obtain the coded key of the key exchange unit, the medium-voltage circuit-breaker must first be opened. The opened circuit-breaker releases the key to the key exchange unit, which in turn releases the keys to the converter cabinet doors of the power unit. This ensures that the converter is isolated from the medium voltage and that the medium voltage is no longer present in the cabinet. As long as the cabinet doors are not closed again and the keys of the converter cabinet doors are not put back into the key exchange unit, the key for the medium voltage circuit-breaker will not be released and the medium voltage circuit-breaker cannot be reclosed.

M11

Dust protection (SINAMICS GM150, air-cooled)

With option **M11** the cabinet doors are fitted with additional filter mats to prevent the ingress of dangerous dusts that would otherwise be deposited on the power unit components. The filter mats are fitted to the outside of the cabinet doors, which means that they can be replaced during operation.

A differential pressure technique continually determines the amount of dust in the filter mats. A maintenance request is issued in plenty of time before the filter mats get clogged up.

When replacing the filter mats, it must be ensured that dust is not drawn into the cabinet by the fans.

Note: For SINAMICS SM150, the filter elements are already included as standard.

M13

Power cable connected at the converter input from the top (SINAMICS GM150 in IGBT version)

For the appropriate installation conditions, option **M13** enables the line-side power cables to be introduced into the cabinet from the top.

Attention: Option **M13** increases the width of the cabinet by 600 mm. When simultaneously selecting option **L08** (output reactor) or **Y15** (sine-wave filter) the width does not increase. In the case of option **Y15**, the dimensions in the technical data apply.

Note: Option **M13** is included in option **M78** (power cables are connected at the converter output from the bottom).

M32

Customer's terminal strip with spring-loaded terminals for signal cables up to 2.5 mm^2

The signal cable is normally connected directly to the terminals of the TM31 or TM15 Terminal Modules. The maximum connectable cross section for TM31 and TM15 is limited to 1.5 mm^2.

With option **M32**, the signals are fed to a terminal strip with spring-loaded terminals. In this case connection cross sections of up to 2.5 mm^2 are permitted.

Note: It is not possible to lead out the signals of additional Terminal Modules in combination with options **G61**, **G62** and **L80** to **L96**.

M33

Customer's terminal strip with screw terminals for signal cables up to 2.5 mm^2

The signal cable is normally connected directly to the terminals of the TM31 or TM15 Terminal Modules. The maximum connectable cross section for TM31 and TM15 is limited to 1.5 mm^2.

With option **M33**, the signals are fed to a terminal strip with screw terminals. In this case connection cross sections of up to 2.5 mm^2 are permitted.

Note: It is not possible to lead out the signals of additional Terminal Modules in combination with options **G61**, **G62** and **L80** to **L96**.

Options (continued)

M34

Connection of auxiliary voltage and signal cables from the top (SINAMICS GM150 in IGBT version)

For the appropriate installation conditions, option **M34** enables the auxiliary supply and the signal cables to be introduced into the cabinet from the top.

M36

Cable entry, brass

With option **M36** the converter is supplied with brass cable entry.

M42

IP42 degree of protection (SINAMICS GM150 in the air-cooled IGBT version)

With option **M42**, the degree of protection of the air-cooled converters can be enhanced (IP22 is the standard degree of protection). Additional fine-meshed grills at the air intake and discharge prevent the ingress of solid matter with diameters >1.0 mm.

M54

IP54 degree of protection

With option **M54**, the degree of protection of the water-cooled converters can be enhanced (IP43 is the standard degree of protection).

M61

Redundant fan in the power unit (SINAMICS GM150, air-cooled IGBT version)

To improve system availability, it is possible to equip the converter with an additional redundantly operating fan. If a fan in the converter cabinet fails, this is immediately detected by the differential pressure in the cabinet and the redundant fan is activated by the converter control without the converter and hence the drive system tripping. This enables production downtimes or interruptions to be avoided and the faulty fan can be replaced at the next scheduled shutdown.

Note: Option **M61** cannot be combined with option **L72** (Braking Module).

Note: Option **M61** is not available for all converters.

Converters that are excluded

Rated voltage	Order No.	Type rating
2.3 kV	6SL3810-2LM36-0AA0	2400 kVA (without sine-wave filter) 2000 kVA (with sine-wave filter)
3.3 kV	6SL3810-2LN36-0AA0	3400 kVA (without sine-wave filter) 2900 kVA (with sine-wave filter)
	6SL3810-2LN41-1AA0	6300 kVA (without sine-wave filter) 5350 kVA (with sine-wave filter)
4.16 kV	6SL3810-2LP36-0AA0	4300 kVA (without sine-wave filter) 3600 kVA (with sine-wave filter)

M64

Converter prepared for connection to an external air discharge system, with internal cabinet fans (SINAMICS GM150, air-cooled IGBT version)

Keeping the internal cabinet fans ensures that the volume of cool air required for cooling can be supplied without the risk of air distribution problems. If the discharged air is fed into a duct system over long sections or even around bends, then the pressure drop that arises in this duct system must be compensated by additional fans in the air discharge system. Suitable “flange connections” to connect the converter to an external air discharge system are located in the top part of the cabinet.

Options (continued)

M66

Suitable for marine applications (SINAMICS GM150, water-cooled)

With option **M66**, the version of the converter meets the requirements of the following classification societies:

- Lloyds Register
- American Bureau of Shipping
- Germanischer Lloyd
- Bureau Veritas
- Det Norske Veritas
- Chinese Classification Society.

Option **M66** includes a seawater-proof paint finish, a strengthened mechanical design of the cabinet, handrails below the operator panel and a mechanical locking the cabinet doors. The cabinet has degree of protection IP44, includes anti-condensation heating (option **L55**) and can be welded to the ship's structure to mount the converter.

Note: For SINAMICS GM150 in IGBT version, the cabinet has a reinforced base frame. The cabinet height is therefore increased by 100 mm. (The cabinet in IGCT version is already equipped with an appropriate base frame as standard).

Note: With option **M66**, the following modified ambient conditions in operation change when compared to standard values:
Ambient temperature: 0 °C to 45 °C
(derating must be taken into account, refer to Page 2/19)
Relative air humidity: 5 % to 95 %

Note: Option **M66** cannot be combined with option **L53** (UPS for the power supply of the open-loop and closed-loop control).

Note: The combination with options **Y15** (sine-wave filter) or **C30** to **C49** (an auxiliary voltage other than 3 AC /N/ 400 V) on request.

Note: If the converter is used for a safety-relevant drive ("essential service") on the ship, individual certification is additionally required (see options **E11** to **E71**).

M78

Power cable connected at the converter output from the top (SINAMICS GM150 in IGBT version)

For the appropriate installation conditions, option **M78** enables the motor-side power cables to be introduced into the cabinet from the top.

Option **M78** includes option **M13**
(power cable connection at the converter input from the top).

Attention: Option **M78** increases the width of the cabinet by 600 mm. When simultaneously selecting option **L08** (output reactor) or **Y15** (sine-wave filter) the width does not increase. In the case of option **Y15**, the dimensions in the technical data apply.

N13

Circuit-breaker at the converter input (SINAMICS GM150, for 24-pulse Basic Line Module on request; not available for the IGCT version with converter units operated in parallel; SINAMICS SM150 on request)

Option **N13** provides integrated circuit-breakers. Option **N13** is particularly important in the retrofit business where existing circuit-breakers do not meet requirements (tripping times, undervoltage release coil). The circuit-breakers are installed below the Basic Line Module in the converter cabinet and are thus located on the secondary side of the line-side transformer.

Attention: Option **N13** increases the width of the cabinet as follows:

- SINAMICS GM150 in IGBT version: 600 mm
- SINAMICS GM150 in IGCT version: 2 × 700 mm

Note: In conjunction with option **U01** (converter version for NAFTA with UL listing), as well as for converters with 24-pulse Basic Line Module, a special request is required for option **N13** .

Options (continued)

N15

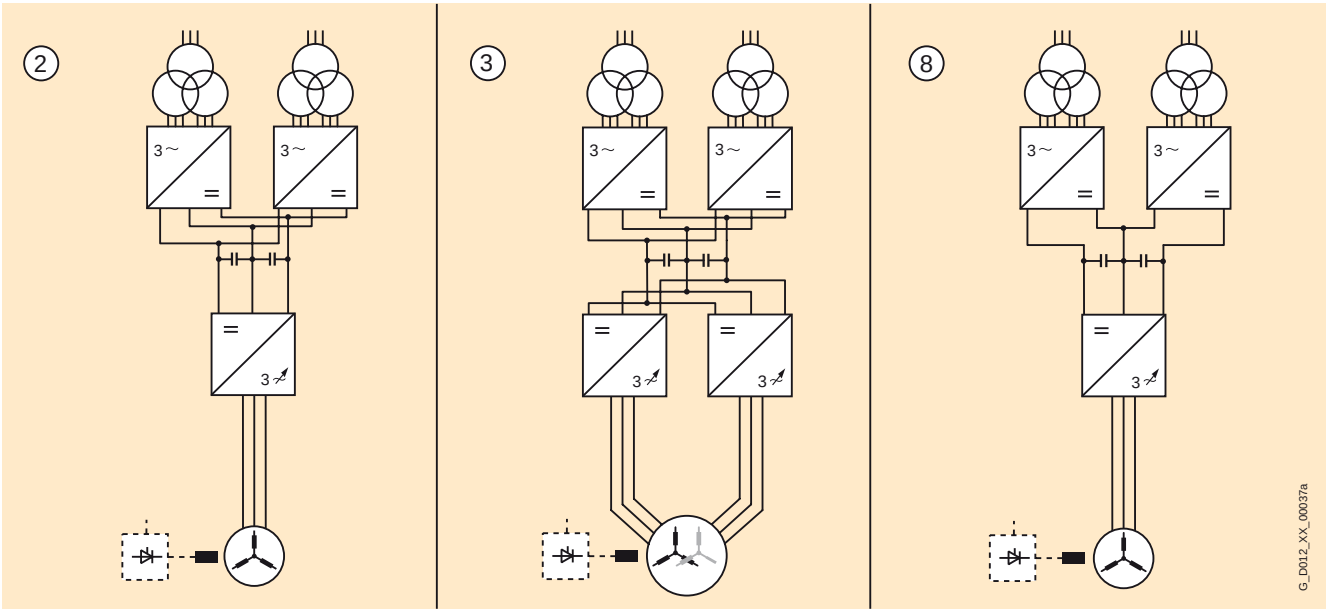
24-pulse Basic Line Module (SINAMICS GM150)

For particularly high requirements regarding low line harmonic distortion, the power units of voltage ranges 2.3 kV, 3.3 kV and 4.16 kV can be implemented with a 24-pulse Basic Line Module. (Circuit design ② for IGBT version, circuit design ⑧ for the IGCT version).

Converters with high power ratings with power units connected in parallel can also be operated without this 24-pulse option (circuit design ③). The converter transformer required at the medium-voltage level must be implemented as a five-winding transformer, or else two two-tier transformers must be provided. Vector groups and winding offsets must be appropriately engineered.

Attention: With option **N15** the width of the converter cabinet for SINAMICS GM150 in IGBT version increases by 600 mm.

Note: For SINAMICS GM150 in IGCT version, option **N15** cannot be combined with option **L72** (Braking Module) and in combination with option **L48** (make-proof grounding switch at the converter input) on request.



② SINAMICS GM150 in IGBT version, basic circuit 2.3 kV to 4.16 kV (option **N15**)
③ SINAMICS GM150 in IGBT version, parallel circuit 2.3 kV to 4.16 kV (24-pulse infeed as standard)
⑧ SINAMICS GM150 in IGCT version (option **N15**)

Options (continued)

N20

Capacitor tripping device 110 V to 120 V DC (SINAMICS GM150 in IGBT version)

The capacitor tripping device is used if the existing circuit-breaker has no undervoltage release coil and cannot be retrofitted with one.

It is installed in the converter and has the following functions:

- Monitoring of the auxiliary voltage supply of the circuit-breaker on the plant side
- Monitoring its own internal voltage supply
- Locking the circuit-breaker in the open position if there is insufficient voltage

The capacitor tripping device ensures that the circuit-breaker on the plant side can still be safely opened even if there is a power failure or the normal OPEN command is not effective, e.g. because of wire breakage.

Note: Option **N20** cannot be combined with option **U01** (converter version for NAFTA with UL listing).

N21

Capacitor tripping device 230 V DC (SINAMICS GM150 in IGBT version)

The capacitor tripping device is used if the existing circuit-breaker has no undervoltage release coil and cannot be retrofitted with one.

It is installed in the converter and has the following functions:

- Monitoring of the auxiliary voltage supply of the circuit-breaker on the plant side
- Monitoring its own internal voltage supply
- Locking the circuit-breaker in the open position if there is insufficient voltage

The capacitor tripping device ensures that the circuit-breaker on the plant side can still be safely opened even if there is a power failure or the normal OPEN command is not effective, e.g. because of wire breakage.

Note: Option **N21** cannot be combined with option **U01** (converter version for NAFTA with UL listing).

N22

Switch on the input side (static excitation unit, see Accessories)

If option **N22** is selected, a switch that is controlled by the static excitation unit itself is integrated on the input side. For versions with brushless reverse field excitation this switch is implemented as a contactor, on the versions with slip-ring excitation as a disconnector.

Note: An external switch must be provided if this switch is not available.

Options (continued)

N30 to N33

Controlled motor feeder for auxiliaries 3 AC 400 V/ 3 AC 480 V

A controlled outgoing feeder for the operation of external auxiliary equipment, e.g. separate fans on the motor or pumps/oil supplies, is available in the converter. It is controlled and fused by motor circuit-breakers. The power supply required for the drive must be provided externally.

Depending on the drive power that is required, four different outgoing feeders are available.

The contactor is closed with the **ON** command at the converter and opened with the **OFF** command.

Option	Description
N30	Controlled motor feeder for auxiliaries 50 Hz 400 V 3 AC, max. 4 kW or 60 Hz 480 V 3 AC, max. 4.8 kW (cos phi = 0.8; setting range of the motor protection circuit-breaker from 9 A to 12.5 A)
N31	Controlled motor feeder for auxiliaries 50 Hz 400 V 3 AC, max. 7 kW or 60 Hz 480 V 3 AC, max. 8 kW (cos phi = 0.8; setting range of the motor protection circuit-breaker from 14 A to 20 A)
N32	Controlled motor feeder for auxiliaries 50 Hz 400 V 3 AC, max. 11 kW or 60 Hz 480 V 3 AC, max. 12.7 kW (cos phi = 0.8; setting range of the motor protection circuit-breaker from 18 A to 25 A)
N33	Controlled motor feeder for auxiliaries 50 Hz 400 V 3 AC, max. 15 kW or 60 Hz 480 V 3 AC, max. 17.5 kW (cos phi = 0.8; setting range of the motor protection circuit-breaker from 28 A to 40 A)

Note: Other voltages are possible taking into account the corresponding power ratings.

Note: It is not possible to combine several options (**N30** to **N33**).

Auxiliary voltage infeed	Outgoing feeder for auxiliaries	Protective circuit-breaker external power supply ON
=.GC–X1:1 L1	=.GC–X1:4 L1	=.GC–X2:1 Relay contact max. 60 V DC
=.GC–X1:2 L2	=.GC–X1:5 L2	=.GC–X2:2
=.GC–X1:3 L3	=.GC–X1:6 L3	

N35 to N38

Controlled outgoing feeder for auxiliaries 1 AC 230 V/1 AC 120 V

A controlled outgoing feeder protected by miniature circuit-breakers is available in the converter for controlling external auxiliaries, e.g. the anti-condensation heating for the motor. The power supply required e.g. for the anti-condensation heating, must be provided externally.

Depending on the power that is required, four different outgoing feeders are available.

The contactor is opened with the **ON** command at the converter and closed with the **OFF** command.

Option	Description
N35	Controlled outgoing feeder for auxiliaries 1 AC 50 Hz 230 V, max. 1.2 kW or 1 AC 60 Hz 120 V, max. 1 kW
N36	Controlled outgoing feeder for auxiliaries 1 AC 50 Hz 230 V, max. 2.2 kW or 1 AC 60 Hz 120 V, max. 1.5 kW
N37	Controlled outgoing feeder for auxiliaries 1 AC 50 Hz 230 V, max. 3.5 kW or 1 AC 60 Hz 120 V, max. 2.1 kW
N38	Controlled outgoing feeder for auxiliaries 1 AC 50 Hz 230 V, max. 4.5 kW or 1 AC 60 Hz 120 V, max. 2.8 kW

Note: It is not possible to combine several options (**N35** to **N38**).

Auxiliary voltage infeed	Outgoing feeder for auxiliaries	Protective circuit-breaker external power supply ON
=.GC–X1:7 L1	=.GC–X1:9 L1	=.GC–X2:3 Relay contact max. 60 V DC
=.GC–X1:8 N	=.GC–X1:10 L2	=.GC–X2:4

Options (continued)

T58, T60, T80, T85, T90, T91

Rating plate languages

As standard the rating plate is supplied in two languages (English/German). Other languages can be ordered using the following order codes.

Option	Description
T58	Rating plate in English/French
T60	Rating plate in English/Spanish
T80	Rating plate in English/Italian
T82	Rating plate in English/Portuguese (on request)
T85	Rating plate in English/Russian (on request)
T86	Rating plate in English/Polish (on request)
T90	Rating plate in English/Japanese (on request)
T91	Rating plate in English/Chinese (on request)

Note: It is not possible to combine several options (**T58** to **T91**).

U01

Design of converter for NAFTA with UL Listing (SINAMICS GM150 in an air-cooled IGBT version)

A converter version for the North American market is supplied by specifying option **U01**. It is approved and listed by the Underwriter Laboratories (UL).

The following options are included as standard in option **U01**:
- **M10** (safety interlocking system)
- **M11** (dust protection)
- **T58** (rating plate in English/French)

Furthermore, the converters in NAFTA version have an auxiliary voltage connection for 3 AC 480 V/1 AC 120 V. Both of the auxiliary voltages must be provided on the plant side.

In conjunction with option **U01**, option **L50** (cabinet lighting and service socket outlet in the control section) is designed for a supply voltage of 120 V. In this case the service socket outlet is a US version.

The following options cannot be combined with option **U01**:
- **N20** and **N21** (capacitor tripping device)
- **L95** (PT100 evaluation unit with 6 inputs for explosion-protected motors)

The following options are available in conjunction with option **U01** on special request:
- **N13** (circuit-breaker at the converter input)
- **L48** and **L49** (make-proof grounding switch at converter input and output)
- **E01** and **E02** (closed-loop control of separately excited synchronous motors)
- **L53** (UPS for the power supply of the open-loop and closed-loop control)

Note: Option **U01** is only available for the following types:

Type rating	Shaft output		Rated output current	**SINAMICS GM150 in IGBT version, air cooling**
kVA	kW	hp	A	
Output voltage 2.3 kV				
1000	820	1000	250	**6SL3810-2LM32-5AA0**
1200	1000	1250	300	**6SL3810-2LM33-0AA0**
1400	1150	1500	350	**6SL3810-2LM33-5AA0**
1600	1300	1750	400	**6SL3810-2LM34-0AA0**
2400	2000	2750	600	**6SL3810-2LM36-0AA0**
Output voltage 3.3 kV				
1000	850	1000	180	**6SL3810-2LN31-8AA0**
1300	1050	1250	220	**6SL3810-2LN32-2AA0**
1500	1250	1500	260	**6SL3810-2LN32-6AA0**
1700	1400	2000	300	**6SL3810-2LN33-0AA0**
2000	1650	2250	350	**6SL3810-2LN33-5AA0**
2300	1900	2500	400	**6SL3810-2LN34-0AA0**
3400	2850	3750	600	**6SL3810-2LN36-0AA0**
6300	5300	7000	2 × 550	**6SL3810-2LN41-1AA0**
Output voltage 4.16 kV				
1300	1000	1500	180	**6SL3810-2LP31-8AA0**
1600	1300	1750	220	**6SL3810-2LP32-2AA0**
1900	1550	2000	260	**6SL3810-2LP32-6AA0**
2200	1800	2500	300	**6SL3810-2LP33-0AA0**
2500	2100	3000	350	**6SL3810-2LP33-5AA0**
2900	2400	3250	400	**6SL3810-2LP34-0AA0**
4300	3600	5000	600	**6SL3810-2LP36-0AA0**
7900	6600	9000	2 × 550	**6SL3810-2LP41-1AA0**

Options (continued)

W02

Cooling unit with redundant stainless steel plate-type heat exchangers (for water cooling)

The cooling unit is used to dissipate the power loss from the converter and consists of two cooling circuits: the internal cooling circuit with deionized water and the external raw water circuit for dissipating the power loss. In the standard version the internal cooling circuit has two redundant circulating pumps and one stainless steel plate-type heat exchanger. With option **W02**, a second stainless steel plate-type heat exchanger is integrated to enable fully redundant operation.

W11

Cooling unit with a redundant titanium plate-type heat exchanger (for water cooling)

If the raw water specified in the technical data is not available for the cooling unit, option **W11** must be selected. This is required in the case of aggressive raw water such as seawater. With option **W11**, a titanium plate-type heat exchanger is installed instead of the stainless steel plate-type heat exchanger. The three-way valve for preventing condensation and the necessary pipe connections are also manufactured of stainless steel.

Attention: When option **W11** is selected, the piping on the raw water side is manufactured of stainless steel and not titanium.

W12

Cooling unit with redundant titanium plate-type heat exchangers (for water cooling)

With option **W12**, two completely redundant titanium plate-type heat exchangers are integrated for the internal cooling circuit (other characteristics as described under option **W11**).

Attention: When option **W12** is selected, the piping on the raw water side is manufactured of stainless steel and not titanium.

W14

Converter without cooling unit; this must be provided on the plant side (for water cooling)

When option **W14** is selected, the water-cooled converter is supplied without a cooling unit. The necessary cooling system must be provided on the plant side.

Note: Option **W14** reduces the width and weight of the cabinet (relevant data available on request).

W20

Raw-water connection from the bottom (SINAMICS GM150 in IGBT version)

Option **W20** enables the raw water for the cooling unit to be supplied from the bottom through the cabinet floor with a flange connection. The necessary mating flanges are included as a pack together with the cooling unit.

Note: For water-cooled converters in IGBT technology, the raw water is connected at the cooling unit from the lefthand side through the side panel. For converters in IGCT technology, the raw water is connected at the cooling unit from the bottom.

W80 to W86

Warranty extension

The standard warranty can be extended by ordering options **W80** to **W86**

The standard warranty ends 18 months after delivery.

Option	Description
W80	Warranty extension of 6 months to 24 months (2 years) after delivery
W81	Warranty extension of 12 months to 30 months (2½ years) after delivery
W82	Warranty extension of 18 months to 36 months (3 years) after delivery
W83	Warranty extension of 24 months to 42 months (3½ years) after delivery
W84	Warranty extension by 30 months to 48 months (4 years) after delivery
W85	Warranty extension by 42 months to 60 months (5 years) after delivery
W86	Warranty extension by 54 months to 72 months (6 years) after delivery

Y09

Special paint finish according to RAL...

Converters are supplied as standard in RAL 7035 (light gray). With option **Y09** a special color can be ordered by specifying plain text.

Note: For SINAMICS GM150 in the air-cooled version, the following applies: The fans still have the standard RAL 7035 color even when the cabinet has a special paint finish.

Y10

Customer-specific circuit diagrams

The circuit diagrams have a customer-specific header.

The data for the header must be specified in plain text (up to three lines of 45 characters per line).

Options (continued)

Y15

Sine-wave filter (SINAMICS GM150 in IGBT version)

Sine-wave filters are required for the following applications:

- When operating old motors (retrofit)
- When operating third-party motors without taking supplementary measures for converter operation
- When using non-shielded cables

The sine-wave filters supply the motors with almost sine-wave motor currents and voltages so that standard motors can be used. Standard cables (without EMC shielding) can also be used between the sine-wave filter and the motor. The voltage harmonic distortion at an output frequency of 50 Hz is less than 5 % when sine-wave filters are used.

If the sine-wave filter is used, the power of the converter must be reduced (see technical data).

It should also be noted that only driven loads with a variable torque may be operated (e.g. pumps, fans). Field weakening operation is not permitted. Possible rated output frequencies are limited to the range 30 Hz to max. 66 Hz. The frequency setting range is 1:10.

Note: The rated motor current, the motor current at the operating point and the motor no-load current must be specified in plain text when ordering filters.

Converter	**Max. cable lengths**			
	without sine-wave filter (standard)		with sine-wave filter [1] (option **Y15**)	
	shielded	unshielded	shielded	unshielded
Output voltage 2.3 kV to 4.16 kV				
SINAMICS GM150 IGBT version	up to 2 parallel cables: 100 m 3 parallel cables: 80 m >3 parallel cables: not permitted	not permitted	1000 m	1000 m

Attention: Option **Y15** increases the width of the cabinet (for dimensions see Technical data).

Y17

Line reactor (static excitation unit, see Accessories)

With option **Y17** a line reactor is integrated to protect against excessive harmonic currents and to limit line harmonic distortion. The exact values for the reactor must be specified in plain text as they are dependent on the line supply.

Y40

Raw-water data deviates from the technical data (for water cooling, on request)

With option **Y40**, raw water whose data does not conform to the technical data can also be used with water-cooled converters (for specifications, see Section, Cooling unit in Chapter, Engineering information). Deviations from the values indicated in the specifications must be clarified as part of the inquiry.

Y73

Braking resistor

The braking resistor is connected to the braking module (option **L72**) via two (SINAMICS GM150 in IGBT version) or three (SINAMICS GM150 in IGCT version and SINAMICS SM150) connections. For dimensioning, refer to the table in the description of option **L72**.

Attention: The power loss of the braking resistor must be taken into account when dimensioning the room or the area is which the converters is mounted. If required, the braking resistor should be mounted outside the room/area. The braking resistor is equipped with a temperature monitor. This must be connected-up so that when it responds, the converter is shut down. Regarding inductance L, the following requirements apply to the braking resistor and cable routing: The time constant L/R must not exceed 20 µs, i.e. L must be less than R x 20 µs.

The signal cable to the temperature monitoring and the power cable are not included in the scope of supply.

Note: When ordering, the following data must be specified in plain text: Brake output, braking duration and cycle.

[1] Distance between the converter and the motor depending on the current magnitude for max. 6 three-core EMC cables connected in parallel.

Accessories

6

Accessories for grounding and short-circuiting the converter

Overview

Accessories for grounding and short-circuiting the converter for commissioning and maintenance work

For safety reasons, devices for grounding and short-circuiting the converter are required when working on the converter in the no-voltage condition (DIN EN 61230/VDE 0683-100 (IEC 61230)). For example, they are required for commissioning or performing maintenance work – as well as when replacing fans or power cards/phase modules.

As some of this work has to be performed by operator personnel with the relevant training, the specified devices and equipment must be available on the plant side. If they are not available, the work must not be performed due to the electrical hazards.

In the case of SINAMICS GM150 and SINAMICS SM150, spherical grounding points are fitted on the input and output side in the area of the connecting bar which can be short-circuited and grounded with an appropriate three-pole grounding device (grounding harness).

As a rule, this must be done in the no-voltage condition for all work (in the case of converters with power units connected in parallel at both supply points and motor feeders).

If appropriate devices are not available on the plant side, then the relevant converter accessories must be ordered in the required quantity.

Please note in this case that the number of three-pole grounding devices required depends on the number of three-phase power systems that are being used. One grounding device per three-phase current system is required.

If there is a risk of power being supplied from the motor side back into the converter, one grounding device per three-phase power system must be fitted here as well.

Selection and ordering data

Description	Order No.
Grounding pole 1000 mm for connecting the grounding device	**6SY8101-0AB54**
Three-pole grounding device (grounding harness) for 20 mm spherical grounding points for grounding and short-circuiting the DC link	**6SY8101-0AB55**
Three-pole grounding device (grounding harness) with universal terminals	**6SY8101-0AB58**

Accessories for replacing phase modules

Overview

Accessories for replacing phase modules (SINAMICS GM150 in IGCT version and SINAMICS SM150)

The phase modules of the converters with IGCT power semiconductors SINAMICS GM150 in IGCT version and SINAMICS SM150 can be completely replaced as a unit by trained personnel. To replace, the entire phase module must be extracted from the converter using a special lifting tool and transported on a stacker truck.

Selection and ordering data

Description	Order No.
Contact spray	**6SC8476-1DA00-0AA0**
Stacker truck RHM23 standard	**6SC8476-1EA00-0AA0**
Replacement equipment (roller track)	**6SL3986-6YX00-0AA0**

Static excitation units

Overview

The following versions are available as static excitation units for SINAMICS GM150 and SINAMICS SM150:

- Static excitation unit for separately excited synchronous motors with brushless reverse field excitation
- Static excitation unit for separately excited synchronous motors with slip-ring excitation

Both versions are controlled by the converter via a PROFIBUS interface.

Static excitation unit must always be ordered together with the converter, but it has its own order number. Add "-Z" to the order number of the converter and specify order code E01 or E02.
The static excitation unit cannot be ordered on its own.

Note: Option **G30** (PROFIBUS master) must be ordered in conjunction with SINAMICS GM150.

Selection and ordering data

Rated current	Comment	**Static excitation unit** for supply voltage 3 AC 500 V	for supply voltage 3 AC 690 V
A		Order No.	Order No.
130	–	**6RN7030-1RH31-3AA0**	**6RN7030-1RF31-3AA0**
250	–	**6RN7030-2RH32-5AA0**	**6RN7030-2RF32-5AA0**
250	Can only be ordered together with option **M66** (suitable for marine applications).	**6RN7031-1RH32-5AA0-Z M66**	**6RN7031-1RF32-5AA0-Z M66**

Accessories

PROFIBUS connecting cable between the basic unit and static excitation unit

Designation	Order No.
PROFIBUS cable	**6XV1830-0EH10**
Connector for PROFIBUS without PG/PC connection	**6ES7972-0BA41-0XA0**
Connector for PROFIBUS with PG/PC connection	**6ES7972-0BB41-0XA0**

Options

When ordering a piece of equipment with options, add the suffix **"-Z"** after the order number and then state the order code(s) for the desired option(s) after the suffix.

In the following tables, related options are arranged in groups. Whether the options can be combined or are mutually exclusive is indicated within these groups. A detailed description of the options can be found in the Chapter, Description of options.

Input-side options	
Switch on the input side (implemented as a contactor)	**N22**

Output-side options	
Disconnector at the output for redundancy [1]	**L51**

[1] Option **L51** can only be ordered in connection with option **M66** (suitable for marine applications).

Increased degree of protection for cabinets	
IP43 degree of protection [1]	**M43**

[1] Option **M43** is only available for static excitation units **6RN7031-1RH32-5AA0-Z** and **6RN7031-1RF32-5AA0-Z** in conjunction with option **M66** (suitable for marine applications).

Connection of power and signal cables		**M13**	**M78**	**M34**
Power cables connected at the input from the top [1] (on request)	**M13**		✓	✓
Power cables connected at the output from the top [1] (on request)	**M78**	✓		✓
Auxiliary voltage and signal cables connected from the top	**M34**	✓	✓	

[1] If options **M13** and/or **M78** are selected, an additional cabinet is required (600 mm wide x 600 mm deep).

✓	Options can be combined
–	Options mutually exclude each other

Options (continued)

PROFIBUS communication (SINAMICS GM150)	
PROFIBUS master	**G30**

Sector-specific options	
Suitable for marine applications [1]	**M66**

[1] Option **M66** is only available for static excitation units **6RN7031-1RH32-5AA0-Z** and **6RN7031-1RF32-5AA0-Z**.

Documentation (standard: PDF format in English on CD-ROM)		D00	D02	D15	D56	D72	D76	D77	D78	D84	D92	Y10
Documentation in German	D00		✓	✓	–	–	✓	–	–	–	–	✓
Circuit diagrams, terminal diagrams and dimension drawings in the DXF format [1]	D02	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓
One set of printed documentation (multiple orders possible)	D15	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓
Documentation in Russian (on request)	D56	–	✓	✓		–	✓	–	–	–	–	✓
Documentation in Italian (on request)	D72	–	✓	✓	–		✓	–	–	–	–	✓
Documentation in English (additional CD-ROM in English, independent of the selected language)	D76	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓
Documentation in French (on request)	D77	–	✓	✓	–	–	✓		–	–	–	✓
Documentation in Spanish (on request)	D78	–	✓	✓	–	–	✓	–		–	–	✓
Documentation in Chinese (on request)	D84	–	✓	✓	–	–	✓	–	–		–	✓
Documentation in Japanese (on request)	D92	–	✓	✓	–	–	✓	–	–	–		✓
Circuit diagrams with customer-specific text field (plain text is required) [1]	Y10	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	

1) The equipment-specific documents (circuit diagrams etc.) are only available in English/German.

Rating plate language (standard: English/German)		T58	T60	T80	T82	T85	T86	T90	T91
Rating plate in English/French	T58		–	–	–	–	–	–	–
Rating plate in English/Spanish	T60	–		–	–	–	–	–	–
Rating plate in English/Italian	T80	–	–		–	–	–	–	–
Rating plate in English/Portuguese (on request)	T82	–	–	–		–	–	–	–
Rating plate in English/Russian (on request)	T85	–	–	–	–		–	–	–
Rating plate in English/Polish (on request)	T86	–	–	–	–	–		–	–
Rating plate in English/Japanese (on request)	T90	–	–	–	–	–	–		–
Rating plate in English/Chinese (on request)	T91	–	–	–	–	–	–	–	

✓ Options can be combined
– Options mutually exclude each other

Options (continued)

Auxiliary power supply	
Auxiliary voltage other than 3 AC /N/ 400 V (primary voltage must be specified in plain text; available: 3 AC 110, 220, 240, 380 and 400 V)	**Y75**

Equipment acceptance tests with the customer present [1]		F03	F73	F77	F97
Visual acceptance	**F03**		–	–	–
Functional acceptance with inductive load	**F73**	–		✓	–
Insulation acceptance test	**F77**	–	✓		–
Customer-specific acceptance (on request)	**F97**	–	–	–	

[1] An acceptance test of static excitation units is only possible together with the converter, which must be ordered simultaneously.

Other options		L50	L55	Y09	M03	M06
Cabinet lighting and service socket outlet	**L50**		✓	✓	✓	✓
Anti-condensation heating for the cabinet	**L55**	✓		✓	✓	✓
Special paint finish acc. to RAL .... (in a color other than RAL 7035; plain text required)	**Y09**	✓	✓		✓	✓
Rittal TS8 cabinet [1]	**M03**	✓	✓	✓		✓
100 mm base (base frame in the cabinet color)	**M06**	✓	✓	✓	✓	

[1] Not in conjunction with option **M66** (suitable for marine applications).

✓	Options can be combined
–	Options mutually exclude each other

Static excitation units for brushless reverse field excitation

Technical data

Brushless reverse field excitation	Type	6RN7030-1R . 31-3AA0	6RN7030-2R . 32-5AA0	6RN7031-1R . 32-5AA0-Z M66
Rated current	A	130	250	250
Supply voltage	V	3 AC 500 V or 3 AC 690 V	3 AC 500 V or 3 AC 690 V	3 AC 500 V or 3 AC 690 V
Voltage range		110 V -10 % to 500 V +10 %	110 V -10 % to 500 V +10 %	110 V -10 % to 500 V +10 %
Rated supply frequency	Hz	50/60	50/60	50/60
Frequency range	Hz	45 to 65	45 to 65	45 to 65
Power loss at rated current (SIMOTRAS HD)	kW	1.3	2 × 1.3	1.3
Electronics power supply	V	2 AC 400 V, 1 A or 1 AC 230, 2 A	2 AC 400 V, 1 A or 1 AC 230, 2 A	2 AC 400 V, 1 A or 1 AC 230, 2 A
Fan power supply		without fan	without fan	3 AC 50 Hz 400 V, 0.24 A 3 AC 60 Hz 460 V, 0.24 A
Max. current demand of the auxiliary supply 1 AC 50/60 Hz 230 V [1]	A	16	16	16
Max. current demand of the auxiliary supply 3 AC 50/60 Hz 400 V	A	–	–	6
Cooling air flow rate	m^3/s	–	–	0.85
Sound pressure level L_{pA} (1 m)	dB	<73	<73	<73
Measuring surface level L_s (1 m)	dB	16	16	16
Cable cross-sections, line-side, max. connectable per phase	mm^2 (DIN VDE)	1 × 70	2 × 70	2 × 70
	AWG/MCM (NEC, CEC)	1 × 3/0 AWG/1 × 138 MCM	2 × 3/0 AWG/2 × 138 MCM	2 × 3/0 AWG/2 × 138 MCM
Cable cross-sections, motor-side, max. connectable per phase	mm^2 (DIN VDE)	1 × 70	2 × 70	2 × 70
	AWG/MCM (NEC, CEC)	1 × 3/0 AWG/1 × 138 MCM	2 × 3/0 AWG/2 × 138 MCM	2 × 3/0 AWG/2 × 138 MCM
PE connection, max. connection cross-section at enclosure with M12 screw	mm^2 (DIN VDE)	1 × 70	1 × 70	1 × 70
	AWG/MCM (NEC, CEC)	1 × 3/0 AWG	1 × 3/0 AWG	1 × 3/0 AWG
Degree of protection		IP42	IP42	IP44
Dimensions (with doors and panels)				
• Width	mm	600	1200	600
• Height	mm	2300	2300	2200
• Depth	mm	600	600	600
Weight	kg	300	400	300

[1] Data without taking into account options.

Selection and ordering data

Rated DC current A	Supply voltage V	Comment	**Static excitation unit** Order No.
600	3 AC 400	–	**6RN7011-5SE36-0AA0**
600	3 AC 460	Suitable for marine applications	**6RN7011-5SE36-0AA0-Z M66**
1200	3 AC 460	–	**6RN7011-2SE41-2AA0**
1200	3 AC 460	compact	**6RN7011-3SE41-2AA0**
1900	3 AC 830	–	**6RN7011-0SJ41-9AA0**
2000	3 AC 690	–	**6RN7011-1SH42-0AA0**

Accessories

PROFIBUS connecting cable between the basic unit and static excitation unit

Designation	Order No.
PROFIBUS cable	**6XV1830-0EH10**
Connector for PROFIBUS without PG/PC connection	**6ES7972-0BA41-0XA0**
Connector for PROFIBUS with PG/PC connection	**6ES7972-0BB41-0XA0**

Options

When ordering a piece of equipment with options, add the suffix **"-Z"** after the order number and then state the order code(s) for the desired option(s) after the suffix.

In the following tables, related options are arranged in groups. Whether the options can be combined or are mutually exclusive is indicated within these groups. A detailed description of the options can be found in the Chapter, Description of options.

Input-side options		**N22**	**Y17**
Switch on the input side [1] (implemented as a disconnector)	**N22**		✓
Line reactor [2] (plain text is required)	**Y17**	✓	

[1] Option **N22** is not available for the compact static excitation unit **6RN7011-3SE41-2AA0**. In this case a switch must be provided on the plant side.

[2] Option **Y17**is not available for the compact static excitation units **6RN7011-3SE41-2AA0** and **6RN7011-0SJ41-9AA0**. With option **Y17**, the cabinet size can vary – depending on the reactor.

Output-side options	
Disconnector at the output for redundancy [1]	**L51**

[1] Option **L51** can only be ordered in connection with option **M66** (suitable for marine applications).

Protective functions		**L21**	**L87**
Overvoltage protection AC [1]	**L21**		✓
Insulation monitoring device for rotor system	**L87**	✓	

[1] Option **L21** is not available for the compact static excitation unit **6RN7011-3SE41-2AA0**. In this case, AC overvoltage protection must be provided on the plant side. Otherwise a supply voltage of 200 V must not be exceeded.

Increased degree of protection for cabinets		**M11**	**M43**
Dust protection	**M11**		–
Degree of protection IP43	**M43**	–	

✓	Options can be combined
–	Options mutually exclude each other

Options (continued)

Design for air cooling	
Redundant fan in power unit [1] (on request)	**M61**

[1] If option **M61** is selected, the specified height of the cabinets changes. Option **M61** is not available for the compact static excitation unit **6RN7011-3SE41-2AA0** as well as in conjunction with option **M66** (suitable for marine applications).

Connection of power and signal cables		M13	M78	M34
Power cables connected at the input from the top [1] (on request)	**M13**		✓	✓
Power cables connected at the output from the top [1] (on request)	**M78**	✓		✓
Auxiliary voltage and signal cables connected from the top	**M34**	✓	✓	

[1] If options **M13** and/or **M78** are selected, an additional cabinet is required (600 mm wide x 600 mm deep).

PROFIBUS communication (SINAMICS GM150)	
PROFIBUS master	**G30**

Sector-specific options	
Suitable for marine applications [1]	**M66**

[1] Option **M66** is only available for version **6RN7011-5SE36-0AA0-Z**. Option **M66** cannot be combined with options **M61** and **L87**. Insulation monitoring must be provided externally.

Documentation (standard: PDF format in English on CD-ROM)		D00	D02	D15	D56	D72	D76	D77	D78	D84	D92	Y10
Documentation in German	**D00**		✓	✓	–	–	✓	–	–	–	–	✓
Circuit diagrams, terminal diagrams and dimension drawings in the DXF format [1]	**D02**	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓
One set of printed documentation (multiple orders possible)	**D15**	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓
Documentation in Russian (on request)	**D56**	–	✓	✓		–	✓	–	–	–	–	✓
Documentation in Italian (on request)	**D72**	–	✓	✓	–		✓	–	–	–	–	✓
Documentation in English (additional CD-ROM in English, independent of the selected language)	**D76**	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓
Documentation in French (on request)	**D77**	–	✓	✓	–	–	✓		–	–	–	✓
Documentation in Spanish (on request)	**D78**	–	✓	✓	–	–	✓	–		–	–	✓
Documentation in Chinese (on request)	**D84**	–	✓	✓	–	–	✓	–	–		–	✓
Documentation in Japanese (on request)	**D92**	–	✓	✓	–	–	✓	–	–	–		✓
Circuit diagrams with customer-specific text field (plain text is required) [1]	**Y10**	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	

[1] The equipment-specific documents (circuit diagrams etc.) are only available in English/German.

✓ Options can be combined
– Options mutually exclude each other

Options (continued)

Rating plate language (standard: English/German)		T58	T60	T80	T82	T85	T86	T90	T91
Rating plate in English/French	T58		–	–	–	–	–	–	–
Rating plate in English/Spanish	T60	–		–	–	–	–	–	–
Rating plate in English/Italian	T80	–	–		–	–	–	–	–
Rating plate in English/Portuguese (on request)	T82	–	–	–		–	–	–	
Rating plate in English/Russian (on request)	T85	–	–	–	–		–	–	–
Rating plate in English/Polish (on request)	T86	–	–	–	–	–		–	–
Rating plate in English/Japanese (on request)	T90	–	–	–	–	–	–		–
Rating plate in English/Chinese (on request)	T91	–	–	–	–	–	–	–	

Auxiliary power supply	
Auxiliary voltage other than 3 AC /N/ 400 V (primary voltage must be specified in plain text; available: 3 AC 110, 220, 240, 380 and 400 V)	Y75

Equipment acceptance tests with the customer present [1]		F03	F73	F77	F97
Visual acceptance	F03		–	–	–
Functional acceptance with inductive load	F73	–		✓	–
Insulation acceptance test	F77	–	✓		–
Customer-specific acceptance (on request)	F97	–	–	–	

[1] An acceptance test of static excitation units is only possible together with the converter, which must be ordered simultaneously.

Other options		L50	L55	Y09	M03	M06
Cabinet lighting and service socket outlet	L50		✓	✓	✓	✓
Anti-condensation heating for the cabinet	L55	✓		✓	✓	✓
Special paint finish acc. to RAL .... (in a color other than RAL 7035; plain text required)	Y09	✓	✓		✓	✓
Rittal TS8 cabinet [1]	M03	✓	✓	✓		✓
100 mm base (base frame in the cabinet color)	M06	✓	✓	✓	✓	

[1] Not in conjunction with option **M66** (suitable for marine applications).

✓	Options can be combined
–	Options mutually exclude each other

Static excitation units for slip-ring excitation

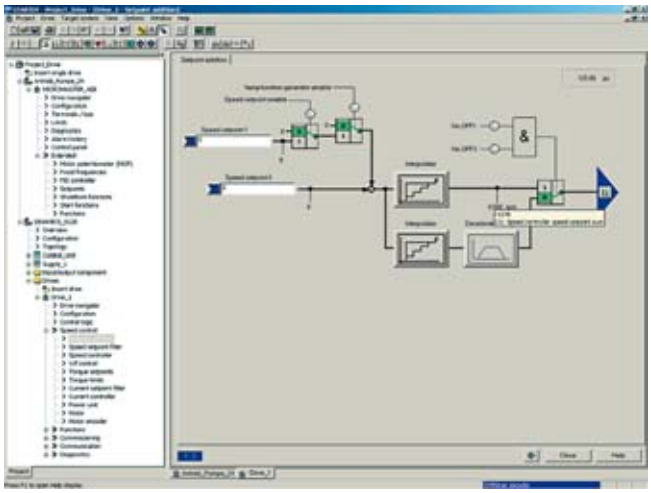
Technical data

Slip-ring static static excitation unit	Type	6RN7011-5SE36-0AA0	6RN7011-5SE36-0AA0-ZM66	6RN7011-2SE41-2AA0	6RN7011-3SE41-2AA0	6RN7011-0SJ41-9AA0	6RN7011-1SH42-0AA0
Rated DC current	A	600	600	1200	1200	1900	2000
Supply voltage	V	3 AC 400	3 AC 460	3 AC 460	3 AC 460	3 AC 830	3 AC 690
Voltage range	%	-20 to +15	-20 to +15	-20 to +15	-20 to +15	-20 to +10	-20 to +10
Rated supply frequency	Hz	50/60	50/60	50/60	50/60	50/60	50/60
Frequency range	Hz	45 to 65	45 to 65	45 to 65	45 to 65	45 to 65	45 to 65
Power loss at rated direct current (SIMOREG DC-Master)	kW	1.8	1.8	4.7	4.7	8.7	8.2
Electronics power supply		1 AC 230 V, 2 A	2 AC 400 V, 1 A or 1 AC 230 V, 2 A	1 AC 230 V, 2 A	1 AC 230 V, 2 A	1 AC 230 V, 2 A	1 AC 230 V, 2 A
Fan power supply		3 AC 400 V, 50 Hz, 0.3 A 3 AC 460 V, 60 Hz, 0.3 A	3 AC 400 V, 50 Hz, 0.55 A 3 AC 460 V, 60 Hz, 0.55 A	1 AC 230 V, 50/60 Hz, 2.6/3.3 A	1 AC 230 V, 50/60 Hz, 2.6/3.3 A	3 AC 400 V, 50 Hz, 1.0 A 3 AC 460 V, 60 Hz, 1.25 A	3 AC 400 V, 50 Hz, 1.0 A 3 AC 460 V, 60 Hz, 1.25 A
Max. current demand of the auxiliary supply 1 AC 50/60 Hz 230 V [1]	A	2.5	16	5.1	5.1	2.5	2.5
Max. current demand of the auxiliary supply 3 AC 50/60 Hz 400 V	A	Plant-specific, typically 50	6	–	–	2	2
Cooling air flow rate	m^3/s	0.16	0.85	0.36	0.36	0.67	0.67
Sound pressure level L_{pA} (1 m)	dB	<73	<85	<85	<85	<87	<87
Measuring surface level L_s (1 m)	dB	17	17	17	16	17	17
Cable cross-sections, line-side, max. connectable per phase	mm^2 (DIN VDE)	2 × 185	1 × 95	4 × 240	4 × 240	4 × 240	4 × 240
	AWG/MCM (NEC, CEC)	2 × 350 MCM	1 × 3/0 AWG	4 × 500 MCM	4 × 500 MCM	4 × 500 MCM	4 × 500 MCM
Cable cross-sections, motor-side, max. connectable per phase	mm^2 (DIN VDE)	2 × 240	2 × 95	4 × 240	4 × 240	6 × 240	6 × 240
	AWG/MCM (NEC, CEC)	2 × 500 MCM	2 × 3/0 AWG	4 × 500 MCM	4 × 500 MCM	6 × 500 MCM	6 × 500 MCM
PE connection, max. connection cross-section at enclosure with M12 screw	mm^2 (DIN VDE)	1 × 185	1 × 50	2 × 240	2 × 240	3 × 240	3 × 240
	AWG/MCM (NEC, CEC)	1 × 350 MCM	1 × 1/0 AWG	2 × 500 MCM	2 × 500 MCM	3 × 500 MCM	3 × 500 MCM
Degree of protection		IP23	IP44	IP23	IP23	IP23	IP23
Dimensions (with doors and panels)							
• Width	mm	1200	900	600	600	600	600
• Height	mm	2300	2200	2300	2300	2300	2300
• Depth	mm	600	1200	1200	600 (compact)	1200	1200
Weight	kg	550	1100	850	450	900	900

[1] Data without taking into account options.

STARTER commissioning tool

Overview



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

- Commissioning
- Optimization
- Diagnostics

This software can be operated as autonomous PC application, via Drive ES Basic in conformance with TIA, integrated in SIMATIC STEP 7 as well a integrated to a high level in the SCOUT engineering system (for SIMOTION). The basic functions and handling are the same in both cases.

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

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

First-time users are supported by a solution-based dialog prompting, with a standard graphics-based display that makes it easy to parameterize the drive.

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

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

Examples of individual settings that can be made include:

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

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

In addition, the following function is available for optimization:

- Self-optimization of the controller settings (depending on drive unit)

Diagnostic functions provide information about:

- Control/status words
- Parameter status
- Operating conditions
- Communication states

Performance features

- Easy to use: Only a small number of settings need to be made for successful first commissioning: The motor starts to rotate
- Solution-based user navigation simplifies commissioning
- Self-optimization functions reduce the manual effort required to optimize the drive

Minimum hardware and software requirements

PG or PC with Pentium III 1 GHz

512 MB RAM (1 GB RAM recommended)

Screen resolution 1024 × 768 pixels, 16-bit color depth

Free hard disk memory: 2 GB

Windows 2000 SP4, Windows 2003 Server SP1, SP2

Windows XP Professional SP1 or SP2

Windows Vista Business SP1, Windows Vista Ultimate SP1

Microsoft Internet Explorer 6.0

Selection and ordering data

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

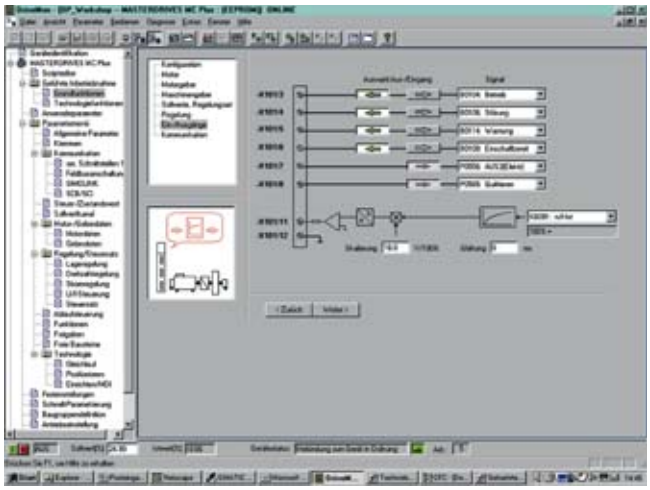
Further information

The STARTER commissioning tool is also available for update purposes in the Internet under

http://support.automation.siemens.com/WW/view/en/10804985/133100

Drive ES engineering system

Overview



Drive ES is the engineering system used to integrate the communication, configuration and data management functions of Siemens drive technology into the SIMATIC automation world easily, efficiently and cost-effectively. The STEP 7 Manager user interface provides the ideal basis for this.

Various software packages are available for SINAMICS:

- **Drive ES Basic**
  For entry into the world of Totally Integrated Automation and the capability of routing beyond network boundaries and the use of the SIMATIC teleservice.
  Drive ES Basic is the basic software package for parameterizing all drives, both online and offline.
  With Drive ES Basic, the automation and drives are processed on the SIMATIC Manager screen. Drive ES Basic is the starting point for common data archiving for complete projects and for extending the use of routing and the SIMATIC teleservice to drives. Drive ES Basic provides the engineering tools for the new motion control functions, slave-to-slave communication, equidistant mode and clock cycle synchronization with PROFIBUS DP and ensures that drives with PROFINET IO are simply integrated into the SIMATIC environment.
- **Drive ES SIMATIC**
  to simply parameterize the STEP 7 communication program instead of programming.
  Drive ES SIMATIC requires that STEP 7 is installed. It incorporates a SIMATIC block library; this means that the PROFIBUS and/or the PROFINET IO interface can be simply and reliably programmed in the SIMATIC CPU for the drives.
  There is no need for separate, time-consuming programming of the data exchange between the SIMATIC CPU and the drive.
  All Drive ES users have to remember is:
  Copy – Modify – Download – Ready.
  Coordinated, fully developed function blocks are copied from the library into a user-specific project.
  Frequently-used functions are completely programmed and ready to run:
  - The complete diagnostics memory is automatically read-out of the drive
  - Download complete parameter sets automatically from the SIMATIC CPU into the drive, e.g. when a device has to be replaced.
  - Automatically download partial parameter sets (e.g. for recipe and product change) into the drive from the SIMATIC CPU
  - Upload the complete parameter assignment or partial parameter sets into the SIMATIC CPU from the drive, i.e. update.
- **Drive ES PCS 7**
  integrates drives with PROFIBUS interface into the SIMATIC PCS 7 process control system.
  Drive ES PCS 7 requires a pre-installed SIMATIC PCS 7 process control system, from Version 5.2 and higher. Drive ES PCS 7 provides a function block library with function blocks for the drives and the corresponding faceplates for the operator station. This means that the drives can be operated from the PCS 7 process control system. From version V6.1 and higher, drives will also be able to be represented in the PCS7 Maintenance Station.

Selection and ordering data

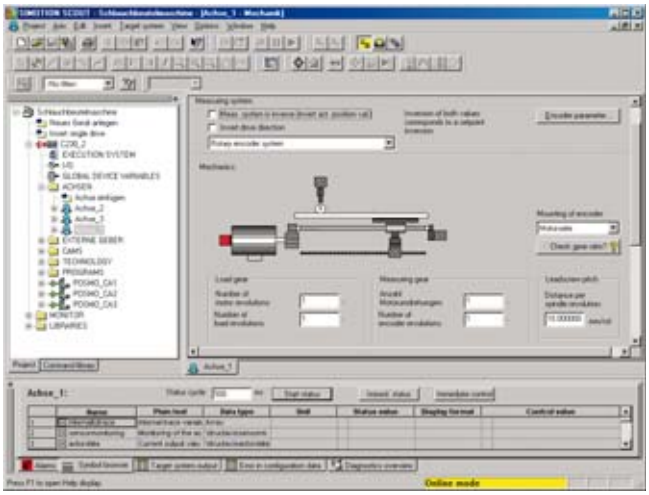
	Order No.
Drive ES Basic V5.4 SPx [1]	
• Configuration software for the integration of drives into Totally Integrated Automation • Prerequisite: STEP 7 from V5.3, SP 3 and higher • Supplied as: DVD, de, en, fr, es, it with electronic documentation	
Floating license, 1 user	**6SW1700-5JA00-4AA0**
Floating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

Further information

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

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

Overview



The SIMOTION SCOUT software package is the basis for implementation of the SIMOTION motion control system.

It mainly contains the SIMOTION SCOUT engineering system including the integrated STARTER commissioning tool and the runtime software for all SIMOTION platforms.

SCOUT also supports the engineering of SIMOTION platforms with older runtime versions.

Scope of delivery

SIMOTION SCOUT Engineering Software

- SCOUT with corresponding license
- License key for SCOUT
- Integrated STARTER commissioning tool

Optional packages for SIMOTION SCOUT

- Optional CamTool package without license
  The license must be ordered separately.
- Optional Drive Control Chart (DCC) package without license
  The license must be ordered separately.

Documentation

- Complete SIMOTION documentation on CD-ROM/DVD

Other software

- SIMOTION – Utilities & Applications
  Free utilities (e.g. calculation tools, optimization tools) and application examples (ready-to-apply solutions such as winders, cross cutters or handling)
- SIMATIC NET without license
- DriveES Basic with license
- SIMATIC software:
  With SCOUT stand-alone, the necessary components of STEP 7.

System prerequisites

Software

- Windows XP Professional SP2
- STEP 7 SP2 V5.4 (not required for SCOUT stand-alone)

Hardware

Minimum system requirements PG/PC for SCOUT:

- Pentium III or higher, 1 GHz/512 MB RAM
- At least 512 MB main memory for PG/PC and SIMOTION P350-3; 1 GB main memory is recommended
- Screen resolution: 1024 x 768 pixels, 16 bit color depth
- Free hard disk memory: 1.6 GB, 2.3 GB for SCOUT stand-alone

With additional installation of WinCC flexible (ES):

- Windows XP, Pentium IV, 2.5 GHz/1024 MB RAM

Integrated STARTER commissioning tool

The STARTER commissioning tool is directly integrated in SCOUT.

SIMOTION SCOUT stand-alone software package

If STEP 7 is not installed, the SIMOTION SCOUT stand-alone software package can be used. It also contains the components of STEP 7 that are required for SIMOTION SCOUT as well as the license key for SCOUT stand-alone.

SIMOTION Kernel updates

SIMOTION Kernel updates for all SIMOTION platforms are supplied on CD-ROM/DVD and can then be copied from the PG/PC to the SIMOTION Micro Memory Card (C2xx) or SIMOTION CompactFlash Card (D4x5, D410) or installed on P350-3.

A PC card adapter is needed to write to the SIMOTION MMC (Micro Memory Card) or the SIMOTION CF (CompactFlash Card). Adapters can usually be found in PC shops and at electronics shops.

SIMOTION SCOUT software package

Selection and ordering data

Description	Order No.
SIMOTION SCOUT software package	
SIMOTION SCOUT V4.1 SP1 (English/German/Italian/French), single-user license including STARTER, runtime software and documentation	
• CD-ROM	**6AU1810-0BA41-1XA0**
• DVD	**6AU1810-1BA41-1XA0**
SIMOTION SCOUT V4.1 SP1 Upgrade (English/German/Italian/French), single-user license including STARTER, runtime software and documentation	
• CD-ROM	**6AU1810-0BA41-1XE0**
• DVD	**6AU1810-1BA41-1XE0**
SIMOTION SCOUT stand-alone software package	
SIMOTION SCOUT V4.1 SP1 Stand-alone (English/German/Italian/French), single-user license including STARTER, runtime software and documentation	
• CD-ROM	**6AU1810-0CA41-1XA0**
• DVD	**6AU1810-1CA41-1XA0**
SIMOTION SCOUT V4.1 SP1 Stand-alone Upgrade (English/German/Italian/French), single-user license including STARTER, runtime software and documentation	
• CD-ROM	**6AU1810-0CA41-1XE0**
• DVD	**6AU1810-1CA41-1XE0**

Description	Order No.
Software update service	
SIMOTION SCOUT software update service latest software version is required	**6AU1810-0BA00-0XL0**
SIMOTION SCOUT stand-alone software update service latest software version is required	**6AU1810-0CA00-0XL0**
Optional SCOUT packages	
Optional package SIMOTION CamTool V2.2 (English/German), CD-ROM incl. floating license	**6AU1810-0FA22-0XA0**
Optional package SIMOTION CamTool V2.2 Upgrade (English/German), CD-ROM incl. floating license	**6AU1810-0FA22-0XE0**
DCC-SIMOTION/SINAMICS V2.0 SP1 for SCOUT/STARTER V4.1 SP1 DVD incl. floating license DCC editor + DCB libraries for use on • SIMOTION V4.1 SP1 (English/German/French/Italian) • SINAMICS S120 V2.5 SP1 (English/German/French/ Italian/Spanish)	**6AU1810-1JA20-1XA0**
DCC SINAMICS V2.0 SP1 for STARTER V4.1 SP1 DVD incl. floating license DCC editor + DCB library for use on SINAMICS S120 V2.5 SP1 (English/German/French/Italian/Spanish)	**6AU1810-1HA20-1XA0**

Further information

A number of additional software products can be used in conjunction with SIMOTION SCOUT. It must be ensured that these software products – with their corresponding versions – are fully compatible. Please consult the compatibility list “Software Products for Use with SIMOTION”.

You can find further information on the Internet at:

http://support.automation.siemens.com/WW/view/en/18857317

Overview

Please observe the availability of the licenses for SIMOTION technology and communication functions for SINAMICS SM150 listed in the following.

Unlicensed basic functions

The rights of use for these software components are included when the basic unit is purchased:

- SIMOTION Kernel runtime software
  The SIMOTION Kernel is already installed on the device.
- Motion Control Basic technology functions
  Use of technology functions for speed-controlled axes, single output cams and cam tracks, sensor probes, and external encoders.
- Technology functions for Drive Control Chart
  By installing the optional SCOUT package Drive Control Chart, the technology functions of Drive Control Chart are made available to the SIMOTION runtime system.
- Supplementary technology functions
  Use of supplementary technology functions, such as adders, formula objects and fixed gears.
- Function libraries for I/O interfacing
- Communication functions
  This covers SIMATIC S7 communication functions on the SIMOTION side (programming device/OP communication to programming devices, for engineering and communication to TPs/OPs/MPs and PCs with SIMATIC HMI, e.g., ProTool/Pro, WinCC flexible or SIMATIC NET OPC), as well as UDP and TCP/IP communication.

Motion Control technology functions under license

The Motion Control Basic technology functions can be used without a license. When other technology functions of the Motion Control technology package are used, a license is required for each axis used. Licenses are only necessary for real axes; virtual axes and speed-controlled axes are not subject to license. A license is obtained for the different axis types using a separate order number for each.

POS, GEAR, CAM axis licenses
Three different axis licenses are available:

- POS – Use of the positioning technology function for a created positioning axis
- GEAR – Use of the positioning and synchronous operation technology function for a created synchronous axis
- CAM – Use of the positioning, synchronous operation, path interpolation and cam technology functions for a created synchronous axis with cam
- MultiAxes Packages
  The MultiAxes Package supports particularly simple licensing. It contains the license for unlimited use of the POS/GEAR/CAM technology functions on one CPU.

TControl technology function subject to license

The SIMOTION technology package for closed-loop temperature control provides temperature channels with extensive functions. The TControl technology package is licensed channel-specifically in packages of 8 temperature channels.

Licensing model for technology functions

License	Licensed technology functions
POS axis license	Positioning
GEAR axis licensing	Positioning, synchronous operation
CAM axis license	Positioning, synchronous operation, cam (all functions of the motion control technology package)
MultiAxes Package	CAM
TControl	8 temperature channels per license

SIMOTION IT communication functions subject to license

SIMOTION IT enables additional communication functions via Industrial Ethernet (HTML through the Internet browser):

- Diagnostics functions via SIMOTION IT DIAG
- Communication via SIMOTION IT OPC XML-DA
- SIMOTION IT Virtual Machine: Creation of Java applications for SIMOTION

Licenses for SIMOTION IT

One license is required for each SIMOTION device for the software options “SIMOTION IT DIAG”, “SIMOTION IT OPC XML-DA” and the multiple license “SIMOTION IT”.

How can licenses be obtained for runtime software?

Licenses for SIMOTION runtime software are ordered separately, independently of purchase of a SIMOTION controller or a SIMOTION memory card (CompactFlash Card). The required software options are assigned to hardware (memory cards) by generating a license key over the Internet at:

www.siemens.com/automation/license

Selection and ordering data

CompactFlash card

Description	Order No.
CompactFlash card (CF) 1 GB for SINAMICS SM150 with SIMOTION D445 incl. SINAMICS drive software, current firmware version	**6AU1400-2PM00-0AA0**

Licenses

Description	Order No.
Axis licenses	
POS License to use the positioning technology functions for 1 axis	**6AU1820-1AA20-0AB0**
GEAR License to use the positioning and synchronous operation technology functions for 1 axis	**6AU1820-1AB20-0AB0**
CAM License to use the positioning, synchronous operation or cam technology functions for 1 axis	**6AU1820-1AC20-0AB0**
MultiAxes Packages	
MultiAxes Package for D445 License for unlimited use of the CAM technology function on a D445	**6AU1820-0AA44-0AB0**
TControl closed-loop temperature control	
TControl License to use the TControl technology functions for 8 temperature channels	**6AU1820-2AA20-0AB0**
SIMOTION IT	
SIMOTION IT DIAG Software option for licensing the integrated web server	**6AU1820-8BA20-0AB0**
SIMOTION IT OPC XML-DA Software option for licensing the integrated OPC XML-DA server	**6AU1820-8BB20-0AB0**
SIMOTION IT (multiple license) Software option to license SIMOTION IT Virtual Machine for Java applications, SIMOTION IT DIAG and SIMOTION IT OPC XML-DA	**6AU1820-8BD20-0AB0**

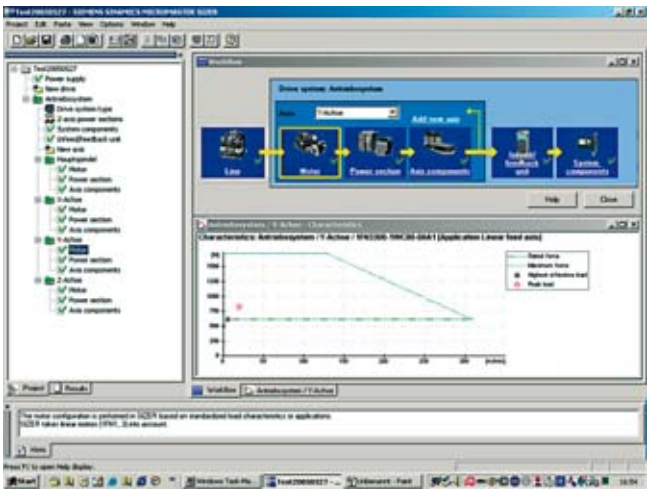
Notes

Engineering information

7

SIZER engineering tool

Overview



The SIZER engineering tool provides an easy-to-use means of engineering the SINAMICS and MICROMASTER 4 drive families, as well as the SINUMERIK solution line CNC control. It provides technical support when selecting and dimensioning the hardware and firmware components required for a drive task. SIZER supports the complete engineering of the drive system, from simple individual drives to complex multi-axis applications.

SIZER supports all engineering stages in one workflow:

- Selecting the line supply infeed
- Selecting and dimensioning the motor
- Calculating the drive components
- Selecting the required accessories
- Selecting the line-side and motor-side power options

When SIZER was being designed, particular importance was placed on high usability and a universal, function-based approach to the drive task. The extensive user navigation makes the tool easy to use. Status information keeps you continually informed about the progress of the configuration process.

The SIZER user interface is available in German and English.

The engineered drive is saved in a project. In the project, the components and functions used are displayed in a hierarchical tree structure.

The project view supports engineering drive systems and copying/inserting/modifying drives that have already been engineered.

Results of the engineering process include:

- Parts list of the components required
- Technical data
- Characteristics
- Comments on line harmonics
- Layout and dimension drawings

These results are displayed in a results tree and can be used for documentation purposes.

User support is provided by the technological online help menu, which provides the following information:

- Detailed technical data
- Information about the drive systems and their components
- Decision-making criteria for the selection of components

Minimum hardware and software requirements

PG or PC with Pentium™ II 400 MHz (Windows™ 2000), Pentium™ III 500 MHz (Windows™ XP)

256 MB RAM (512 MB RAM recommended)

At least 675 MB of free hard disk space

An additional 100 MB of free hard disk space on Windows system drive

Monitor resolution 1024 × 768 pixels

Windows™ 2000 SP2, XP Professional SP1, XP Home Edition SP2

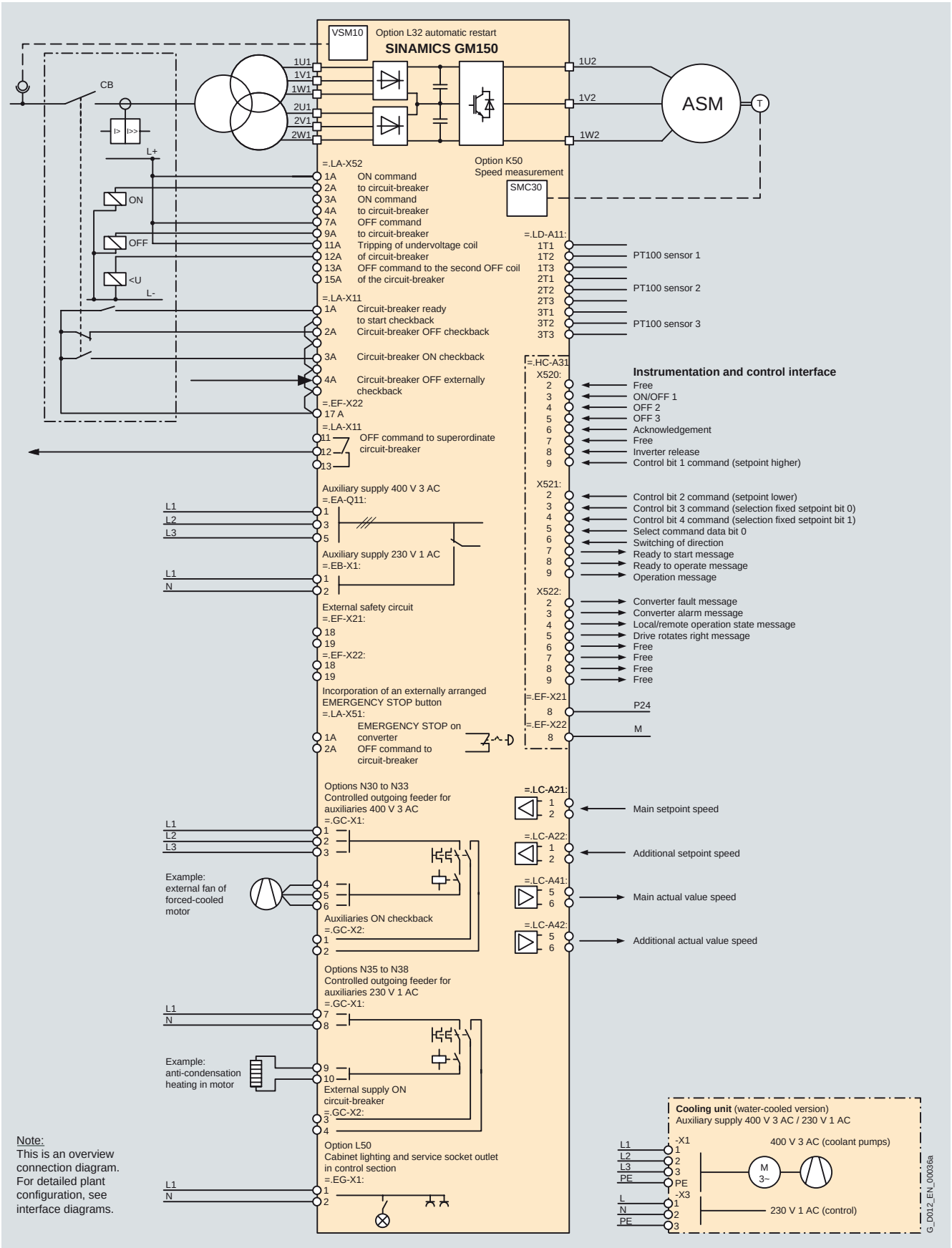
Microsoft Internet Explorer 5.5 SP2

Selection and ordering data

Description	Order No.
SINAMICS MICROMASTER SIZER engineering tool German/English	**6SL3070-0AA00-0AG0**
SIZER LD Snap-In Suite Extension for medium-voltage systems, motors and DC converters German/English	on request

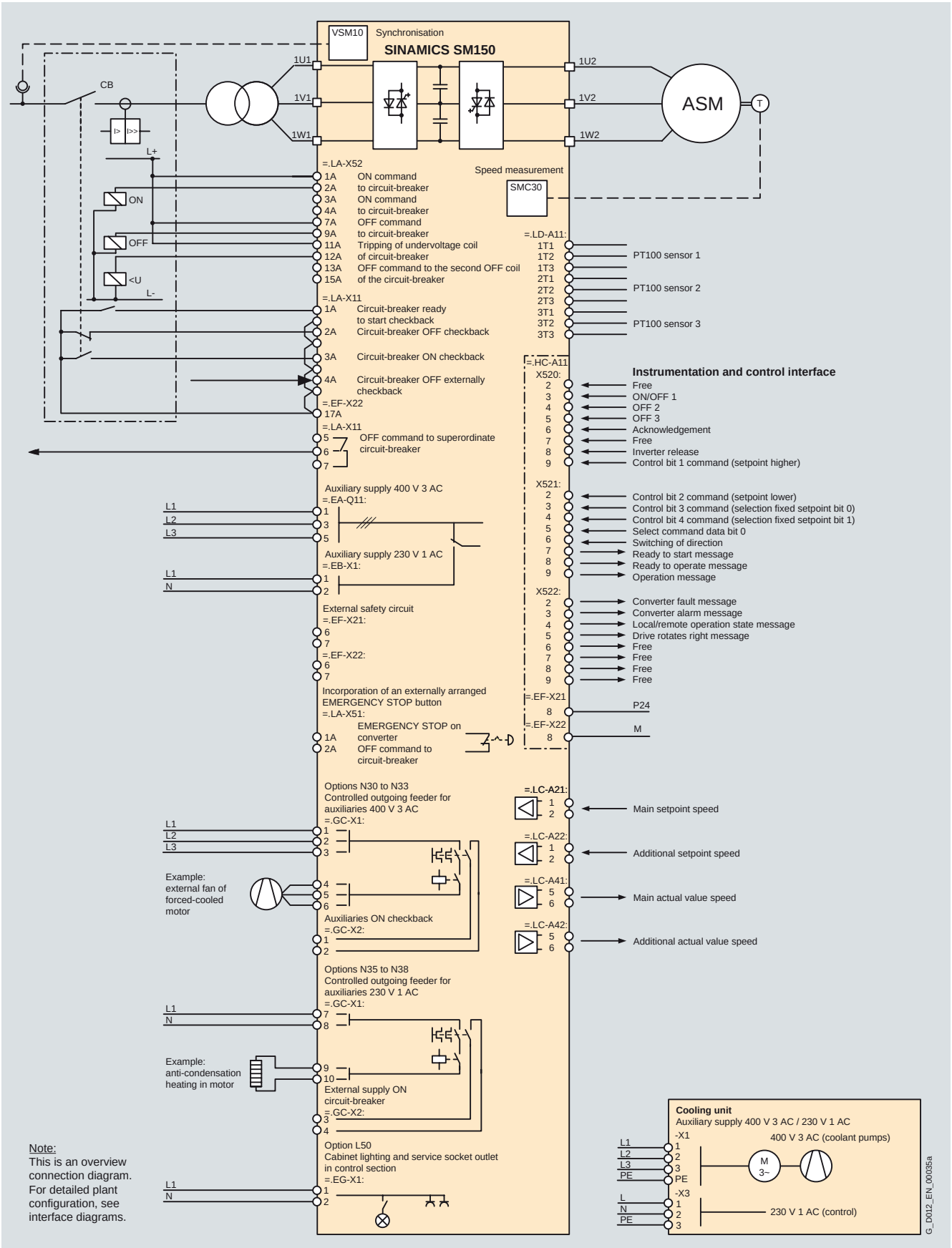
7

Overview of connections SINAMICS GM150



Note:
This is an overview connection diagram. For detailed plant configuration, see interface diagrams.

Overview of connections SINAMICS SM150



Note:
This is an overview connection diagram. For detailed plant configuration, see interface diagrams.

Engineering

The interfaces of the TM31 and TM15 Terminal Modules are available for communication with the higher-level control. Additional terminal strips can be used to connect the circuit-breaker or external protection and monitoring devices. The following tables give an overview of the type and preassignment of the interfaces in the standard version.

Note: For max. conductor cross-section and further technical data on TM31 and TM15 Terminal Modules, see Description of options **G61** and **G63**.

Terminal strip on TM31 (=.HC–A51)				
Terminal	**Type**		**Preassignment**	**Comment**
X540:				
1-8	P24	24 V DC supply for inputs DI0 to DI7	–	–
X520:				
1	DI0	Digital input isolated through an optocoupler	Preassigned internally	–
2	DI1		Preassigned internally	–
3	DI2		–	–
4	DI3		–	–
5	M1	Reference ground for digital inputs DI0 to DI3	–	–
6	M	Reference ground for P24, auxiliary voltage for digital inputs	–	–
X530:				
1	DI4	Digital input isolated through an optocoupler	Preassigned internally	–
2	DI5		–	–
3	DI6		–	–
4	DI7		–	–
5	M2	Reference ground for digital inputs DI4 to DI7	–	–
6	M	Reference ground for P24, auxiliary voltage for digital inputs	–	–
X541:				
1	P24	24 V DC supply for inputs/outputs DI/DO8 to DI/DO11	–	–
2	DI/DO8	Digital inputs/ digital outputs non-isolated	Preassigned internally	–
3	DI/DO9		–	–
4	DI/DO10		–	–
5	DI/DO11		–	–
6	M	Reference ground for P24, ground of digital inputs/digital outputs	–	–

Terminal strip on TM31 (=.HC–A51)				
Terminal	**Type**		**Preassignment**	**Comment**
X521:				
1	AI0+	Analog inputs set up as differential inputs for the following ranges: –10 V to +10 V +4 mA to +20 mA 0 mA to +20 mA –20 mA to +20 mA	Main speed setpoint	Isolating amplifiers are used here for electrical isolation (4 mA to 20 mA, 0 V to 10 V, 0 mA to 20 mA)
2	AI0-			
3	AI1+	The voltage input/ current input is selected with a switch	Supplementary speed setpoint	Isolating amplifiers are used here for electrical isolation (4 mA to 20 mA, 0 V to 10 V, 0 mA to 20 mA)
4	AI1-			
5	P10	Auxiliary voltage ±10 V (10 mA) to connect a potentiometer to enter a setpoint via an analog input	–	–
6	M		–	–
7	N10		–	–
8	M		–	–
X522:				
1	AO 0V+	Analog outputs for the following ranges: –10 V to +10 V +4 mA to +20 mA 0 mA to +20 mA –20 mA to +20 mA	Main speed actual value	Isolating amplifiers are used here for electrical isolation (4 mA to 20 mA, 0 V to 10 V, 0 mA to 20 mA)
2	AO 0V-			
3	AO0C+			
4	AO 1V+		Main speed actual value	Isolating amplifiers are used here for electrical isolation (4 mA to 20 mA, 0 V to 10 V, 0 mA to 20 mA)
5	AO 1V-			
6	AO 1C+			
7	KTY+	Temperature sensor KTY84 0 °C to 200 °C or PTC (R_{cold} <1.5 kOhm)	–	The sensor type must be parameterized.
8	KTY-		–	
X542:				
1	DO 0.NC	Relay output, changeover contact Max. switching voltage: 250 V AC, 30 V DC Max. switching capacity at 250 V AC: 2000 VA Max. switching capacity at 30 V DC: 240 W	–	NC contact
2	DO 0.COM		–	Common
3	DO 0.NO		–	NO contact
4	DO 1.NC	Relay output, changeover contact Max. switching voltage: 250 V AC, 30 V DC Max. switching capacity at 250 V AC: 2000 VA Max. switching capacity at 30 V DC: 240 W	–	NC contact
5	DO 1.COM		–	Common
6	DO 1.NO		–	NO contact

Overview of interfaces

Engineering

Terminal strip on TM15 (SINAMICS GM150: =.HC-A31, SINAMICS SM150: =.HC-A11)			
Terminal	**Type**		**Preassignment**
X520:			
2	DI/DO0	Bidirectional digital inputs/ outputs [1]	Free
3	DI/DO1		ON/OFF1
4	DI/DO2		OFF2
5	DI/DO3		OFF3
6	DI/DO4		Acknowledgement
7	DI/DO5		Free
8	DI/DO6		Inverter enable
9	DI/DO7		Control bit 1 (increase setpoint)
X521:			
2	DI/DO8	Bidirectional digital inputs/ outputs [1]	Control bit 2 command (decrease setpoint)
3	DI/DO9		Control bit 3 command (select fixed setpoint bit 0)
4	DI/DO10		Control bit 4 command (select fixed setpoint bit 1)
5	DI/DO11		Select command data set bit 0
6	DI/DO12		Reverse the direction of rotation
7	DI/DO13		Ready to power-up signal
8	DI/DO14		Ready for operation signal
9	DI/DO15		Operation signal
X522:			
2	DI/DO16	Bidirectional digital inputs/ outputs [1]	Converter fault signal
3	DI/DO17		Converter alarm signal
4	DI/DO18		Status signal Local/Remote operation
5	DI/DO19		Signal, drive rotating clockwise
6	DI/DO20		Free
7	DI/DO21		Free
8	DI/DO22		Free
9	DI/DO23		Free
=.EF–X21:			
8	P24		The jumper must be removed according to the control mode (non-isolated/isolated).
=.EF–X22:			
8	M		The jumper must be removed according to the control mode (non-isolated/isolated).

[1] The digital inputs/outputs can be parameterized individually as inputs or outputs (isolation in three groups of eight channels each). The preassignment as an input or output is identified by underlining.

Terminal strip at the isolating amplifier		
Terminal	**Preassignment**	**Comment**
=.LC–A21:		
1	Main speed setpoint (4 mA to 20 mA)	Signal level can be adjusted (0 V to 10 V; 0 mA to 20 mA; 4 mA to 20 mA)
2		
=.LC–A22:		
1	Supplementary speed setpoint (4 mA to 20 mA)	Signal level can be adjusted (0 V to 10 V; 0 mA to 20 mA; 4 mA to 20 mA)
2		
=.LC–A41:		
1	Main speed actual value (4 mA to 20 mA)	Signal level can be adjusted (0 V to 10 V; 0 mA to 20 mA; 4 mA to 20 mA)
2		
=.LC–A42:		
1	Supplementary speed actual value (4 mA to 20 mA)	Signal level can be adjusted (0 V to 10 V; 0 mA to 20 mA; 4 mA to 20 mA)
2		

Temperature monitoring with PT100 evaluation unit		
Terminal	**Type**	**Comment**
=.LD–A11:		
1T1 to 1T3	PT100	Sensor 1
2T1 to 2T3	PT100	Sensor 2
3T1 to 3T3	PT100	Sensor 3

The sensors can be connected to the PT100 evaluation unit using either a two-wire or three-wire system. In the two-wire system, inputs xT1 and xT2 must be assigned and terminals xT2 and xT3 must be jumpered.
The limit values for alarm and shutdown must be set centrally for all three sensors.
The output relays are integrated into the internal fault and shutdown circuit of the converter. The signals can also be acquired on the plant side with two spare fault signaling relays.

Incorporating an external safety shutdown, SINAMICS GM150		
Terminal	**Type**	**Comment**
=.EF-X21:		
18	External safety shut-down	Jumper =.EF-X21:18-19 should be removed when incorporating the external safety shut-down.
19		
=.EF-X22:		
18	Reference ground	If the power supply is externally provided then jumper =.EF-X22:18-19 must be removed and the reference ground of the external supply must be connected with =.EF-X22:19.
19		

Engineering

Incorporating an external safety shutdown, SINAMICS SM150		
Terminal	**Type**	**Comment**
=.EF-X21:		
6	External safety shut-down	Jumper =.EF-X21:6-7 should be removed when incorporating the external safety shutdown.
7		
=.EF-X22:		
6	Reference ground	If the power supply is externally provided then jumper =.EF-X22:6-7 must be removed and the reference ground of the external supply must be connected with =.EF-X22:7.
7		

Incorporating the EMERGENCY OFF button in a plant-side EMERGENCY OFF circuit		
Terminal	**Type**	**Comment**
=.LA–X51:		
1A	Pushbutton (NC contact)	EMERGENCY OFF at the converter Permissible contact load DC-13 acc. to DIN EN 60947-5-1/ VDE 0660-200 (IEC 60947-5-1): 24 V/3 A (min. 5 mA)
2A		

Controlling the circuit-breaker on the input side		
Terminal	**Type**	**Comment**
=.LA–X52:		
1A	Isolated contact	ON command to the circuit-breaker
2A		
3A	Isolated contact	ON command to the circuit-breaker
4A		
7A	Isolated contact	OFF command to circuit-breaker
9A		
11A	Isolated contact	Trips the undervoltage release coil of the circuit-breaker
12A		
13A	Isolated contact	OFF command to the second OFF coil of the circuit-breaker
15A		

Feedback signals from the circuit-breaker on the input side		
Terminal	**Type**	**Comment**
=.LA–X11:		
1A	Digital input	Feedback signal, circuit-breaker ready to be closed
2A	Digital input	Feedback signal, circuit-breaker OPEN
3A	Digital input	Feedback signal, circuit-breaker CLOSED
4A	Digital input	Feedback signal, circuit-breaker OPEN from external

OFF command to the higher-level circuit-breaker, SINAMICS GM150		
Terminal	**Type**	**Comment**
=.LA–X11:		
11	Relay output, changeover contact Reliable contact load DC-13 acc. to DIN EN 60947-5-1/ VDE 0660-200 (IEC 60947-5-1): 24 V/10 A	Common
12		NC contact
13		NO contact

OFF command to the higher-level circuit-breaker, SINAMICS SM150		
Terminal	**Type**	**Comment**
=.LA–X11:		
5	Relay output, changeover contact Reliable contact load DC-13 acc. to DIN EN 60947-5-1/ VDE 0660-200 (IEC 60947-5-1): 24 V/10 A	Common
6		NC contact
7		NO contact

Connection of the auxiliary voltage supply

Connection for the auxiliary voltage 3 AC 50 Hz 400 V or others		
Terminal	**Type**	**Comment**
=.EA–Q11:		
1	L1	e.g. fan, DC link precharging
3	L2	
5	L3	

Connection for the auxiliary voltage 1 AC 50 Hz 230 V or 1 AC 60 Hz 120 V		
Terminal	**Type**	**Comment**
=.EB–X1:		
1	L1	e.g. open-loop and closed-loop control, protection and monitoring units
2	N	

Connecting the cooling unit

Cooling unit connection of voltage supply		
Terminal	**Type**	
–X1:		
1	L1	Voltage supply connection for the cooling unit
2	L2	
3	L3	
PE	PE	
–X3:		
1	L	Supply voltage for the cooling-medium pumps
2	N	
3	PE	

Cooling unit

Overview

The cooling unit is used to dissipate the power loss from the converter. It consists of an inner deionized water circuit and an outer raw water circuit.

Mode of operation

The hot deionized water in the inner circuit of the converter passes through two redundant, maintenance-free circulating water pumps into the water/water plate-type heat exchanger. This is manufactured of stainless steel and connected to the raw water circuit on the plant side. The deionized water is cooled by the raw water of the outer circuit and flows back into the converter.

The closed inner deionized water circuit is filled with deionized water and vented using an expansion tank. This expansion tank is located at the highest point of the cooling circuit.

Function

Raw-water specifications

The raw water must be chemically neutral, clean and free of any solids. Additional specifications relating to the quality of the raw water are listed in the following table.

Raw-water	
Grain size of particles in the water	<0.5 mm
pH value	6.5 to 8.0
Carbonate hardness	<0.9 mMol/l (5 °dH)
Total hardness	<1.7 mMol/l (9.5 °dH)
Chlorides	60 mg/l
Sulfates	80 mg/l
Nitrates	10 mg/l
Iron (Fe)	0.2 mg/l
Ammonia	10 mg/l
Dissolved substances	<3.4 mMol/l (340 ppm)

In case of deviations it is recommended to carry out an analysis of the water in order to ensure the heat exchanger's endurance strength. In case of aggressive cooling water (including sea water), plate-type heat exchangers made of titanium should be used (options **W11**, **W12**).

Avoiding condensation

To avoid condensation at low raw water temperatures, a three-way valve for controlling the water temperature is installed as standard.

Specifications for the cooling water in the deionized water circuit

Clean water (battery water) should be used to fill and top-up the deionized water circuit

Deionized water	**in acco. with DIN EN 60993 (IEC 60993)**
Specific conductivity when filled	≤30 µS/cm [1]
Evaporation residue	<20 mg/l
pH value	5 to 9
Content of • Metals from the hydrogen sulfide group (lead, antimony, tin, bismuth, arsenic, copper, cadmium) • Metals from the ammonium sulfide group (iron, cobalt, nickel, chrome, manganese) • Sulfur monochloride and nitrogen chloride compounds	Not detectable
Content of organic substances that can be oxidized	No more than a quantity equivalent to the usage of 30mg/l potassium permanganate KMnO4

Monitoring devices in the deionized water circuit

To guarantee the self-protection of the converter, the deionized water is monitored by the converter:

- Conductivity measurement:
  The conductivity of the cooling water is constantly monitored in order to ensure that the leakage currents in the converter between different voltage levels and with respect to ground remain low. An ion exchanger (in the cooling unit) maintains the conductivity below the permitted maximum value of 1.0 µS/cm. If the conductivity is too high, the ion exchanger charge must be changed. After the first year, an ion exchanger charge must be changed at least every two years as a rule.
- Temperature monitoring
- Flow monitoring
- Leakage water monitoring

Additional monitoring functions and the control of electrical equipment are performed in the cooling unit:

- An expansion tank to compensate for changes in the cooling water volume as a result of evaporation or temperature changes
- Pressure display in the converter water intake

The operating state is signaled to the converter.

Piping

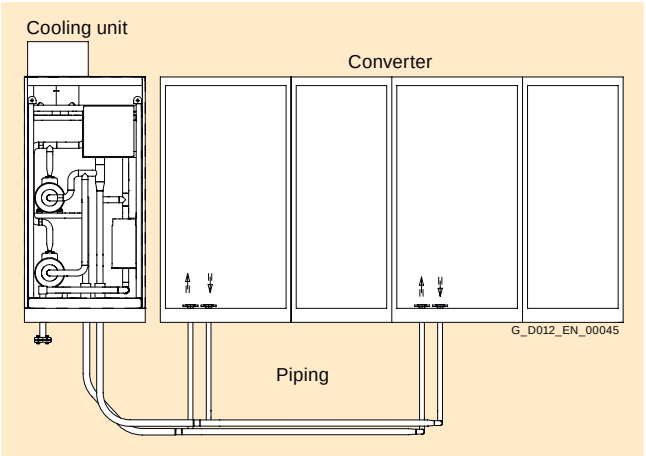
The cooling unit consists of one transport unit and is supplied without deionized water.

For SINAMICS GM150 in IGBT version, a pipe-connecting element between the cooling unit and converter is included in the scope of delivery. As standard, the water connections are located on the side.

For SINAMICS GM150 in IGCT version and SINAMICS SM150, the piping between the cooling unit and the basic unit is realized below the units (for example, refer to the following diagram). The necessary pipes and connection pieces are included in the scope of delivery and are supplied loose.

Special installation conditions have not been taken into account and, where applicable, a separate inquiry is necessary (e.g. where the cooling unit is not mounted directly next to the basic unit).

The piping for the raw water supply on the plant side is not included.



Piping for the SINAMICS GM150 in IGCT version and for SINAMICS SM150

[1] After the converter has been filled and powered-up, the conductivity is reduced to the permissible operating value of <1.0µS/cm by the ion exchanger integrated in the cooling unit.

Function

Redundancy (options W02, W12)

On request, the cooling unit can be designed for fully redundant operation, i.e. two plate-type heat exchangers are provided. In this case, defective parts can be exchanged while the system continues to run.

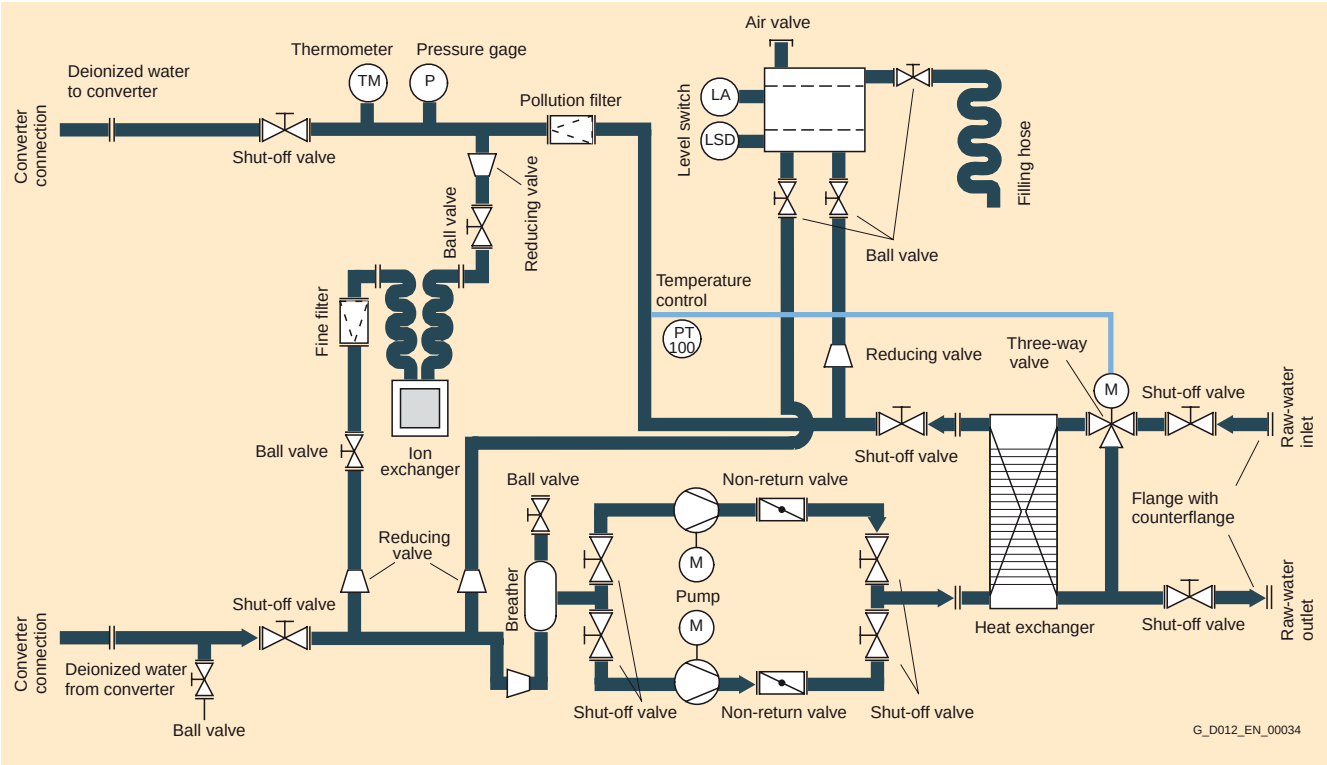
Tube-nest heat exchanger (on request)

If the raw water quality deviates from the standard values specified above (e.g. the water contains suspended particles), on request, a tube-nest heat exchanger can be used.
Attention: A supplementary cabinet is required if a tube-nest heat exchanger is used.

The following additional options are available on request:

- External air-to-water heat exchanger (on request)
  An external air-to-water heat exchanger can be used on request if there is no process water available on the plant side. In this case, the ambient temperature may be a maximum of 35 °C.
- Chillers (on request)
  If there is no process water on the plant side and if the ambient temperature exceeds 35 °C, then on request, a so-called chiller (incl. compressor) can be used.
- Specification for the cooling unit (on request)
  When selecting option **W14** (converter without cooling unit), specifications of the cooling unit are available on request.

Flowchart of the cooling unit



Technical data

Technical data of the cooling unit	
Degree of protection	
• Cabinet	IP20
• All internal components	IP54
Supply voltage	3/N/PE/AC 400 V ±10 % 50/60 Hz ±3 %
Raw-water circuit	
• Inlet temperature	min. +5 °C max. +35 °C (when the converter is derated, max. +40 °C)
• Temperature rise in converter	max. 10 K (for minimum flow)
• Input pressure	min. 2 bar max. 10 bar
Pressure drop	<1 bar

Circuit-breakers

Engineering

The circuit-breaker connected on the primary side of the incoming transformer on the plant side is part of the converter safety system. If a fault occurs inside the converter, the energy that is effective at the fault location must be limited. This is realized as a result of the inductance of the incoming transformer, which limits the rate-of-rise and magnitude of the current and the circuit-breaker that trips as quickly as possible.

In order to guarantee these conditions, the circuit-breaker must have the following features:

- The total opening time of the circuit-breaker – from the command to actually opening – may be a maximum of 80 ms.
- The circuit-breaker must be equipped with an undervoltage release. The undervoltage release (undervoltage release coil) is controlled through the release circuit into which also the "undervoltage release" output of the converter must be integrated. The auxiliary voltage from the switchgear (this is a reliable supply) is used as supply.
- Additional delay times in controlling the circuit-breaker must be avoided. All commands from the converter to the circuit-breaker must act directly without using any coupling relays.
- A separate feedback signal must exist for each of the circuit-breaker states – OPEN and CLOSED. The feedback signals must not be delayed, i.e. coupling relays must not be used.
- An additional, independently operating overcurrent protection for the circuit-breaker must be provided on the plant side (transformer and cable protection).
- Under no circumstances may the circuit-breaker be electrically or mechanically closed externally. A mechanical interlock of the manual CLOSE command at the circuit-breaker prevents the converter from being destroyed as a result of uncoordinated power-on operations.

Transformers

Engineering

The SINAMICS GM150 and SINAMICS SM150 converters are always connected to the medium-voltage system through a converter transformer.

By using a transformer, the drive (converter and motor) is decoupled and electrically isolated from the line supply:

- The short-circuit power is limited to a defined permissible value
- Converter and motor are operated ground-free
- The line harmonics and the voltage ripple are limited

A ground-fault monitor integrated in the converter monitors the insulation resistance with respect to ground.

SINAMICS GM150

A three-winding transformer is required for the 12-pulse Basic Line Module of the SINAMICS GM150 converter. The secondary windings of the three-winding transformer have a phase shift of 30°el, resulting in a 12-pulse infeed with accordingly lower line harmonic distortion.

Two three-winding transformers are required for the 24-pulse Basic Line Module. A 24-pulse infeed can be configured by additionally shifting the primary-side windings of the two transformers through +7.5° and –7.5° respectively. After prior consultation with the transformer manufacturer, a five-winding transformer can be used instead of the two three-winding transformers.

Engineering

The following characteristics must be taken into account when engineering the system:

- Short-circuit voltage:
  - u_k ≥8 % for SINAMICS GM150 in IGBT version
  - u_k ≥10 % for SINAMICS GM150 in IGCT version
  (referred to 10 MVA)
- Taps for voltage adjustments:
  2 × ±2.5 % or ±5 % for operation with a sine-wave filter
  (the winding taps are usually located on the primary side of the transformer)
- The voltages and insulation of the secondary-side windings must be selected according to the following table:

	SINAMICS GM150 IGBT version, basic circuit and SINAMICS GM150 IGCT version		**SINAMICS GM150 IGBT version**
Circuit	Basic circuit configuration		Basic Line Module and Motor Module connected in parallel to a common DC bus
Infeed	12-pulse	24-pulse	24-pulse
Circuit designs (Pages 2/4 and 3/4)	①, ⑦	②, ⑧	③
Infeed transformers	1 three-winding transformer	2 three-winding transformers	2 three-winding transformers or 1 five-winding transformer
Recommended vector group	Dy5 Dd0	Dy5 Dd0 with 15° offset between the transformers	
Converter output voltage	Transformer secondary voltage (no-load voltage)		
	Basic circuit configuration		Parallel connection to increase the power
kV	kV	kV	kV
2.3	2 × 1.2	2 × (2 × 1.2)	–
3.3 (IGBT)	2 × 1.7	2 × (2 × 1.7)	2 × (2 × 1.7)
3.3 (IGCT)	2 × 1.7	2 × (2 × 0.85)	[1]
4.16	2 × 2.2	2 × (2 × 2.2)	2 × (2 × 2.2)

Option **N15**

Minimum test voltages with respect to ground, basis isolation

Converter output voltage	**Test voltage AC 50 Hz for 3 s**	**Associated impulse withstand voltage**
kV	**kV**	**kV**
2.3	9.4	15.6
3.3 (IGBT)	12.9	22.0
3.3 (IGCT)	12.9	22.0
4.16	14.5	26.9

Minimum test voltages with respect to other measuring and auxiliary equipment (e.g. temperature sensors), higher insulation strength

Converter output voltage	**Test voltage AC 50 Hz for 3 s**	**Associated impulse withstand voltage**
kV	**kV**	**kV**
2.3	9.4	28.9
3.3 (IGBT)	13.4	40.0
3.3 (IGCT)	13.4	40.0
4.16	16.0	47.0

SINAMICS SM150

A two-winding transformer is required for each Active Line Module. In the case of a parallel connection of two complete converter units it is also possible to use a three-winding transformer with offset windings to suppress line harmonics.

Please contact your partner in sales when it comes to selecting and dimensioning the transformers.

[1] Two or three converter units for SINAMICS GM150, IGCT version connected in parallel (circuit designs – and ⑩):
2 × (2 × 1.7) or 3 × (2 × 1.7).

Engineering

Motor cables

If the SINAMICS GM150 and SINAMICS SM150 converters are operated without sine-wave filters, higher voltages occur at the motor terminals and therefore on the cable due to the switching edges. As a consequence, suitable cables must be selected to meet the EMC and voltage strength requirements. Different technical characteristics result in differences between the converters with IGBT power units and those with IGCT power units.

The correct cable cross-section depends not only on the motor current but also on the number of cables that are routed in parallel, the routing conditions and the ambient temperature. It must be determined on a case-for-case basis. Local installation regulations must also be observed.

For extensive systems it is recommended to install a cable for equipotential bonding in addition to the power cables. Local regulations must also be observed in this case.

SINAMICS GM150 in IGBT version (without sine-wave filter)

Shielded three-core medium-voltage cables for 3.6/6kV must be used to connect the converter to the motor. Symmetrical cables with individually shielded copper conductors are recommended. An additional common outer shield is an advantage for improving the EMC characteristics. The cables must have a maximum cable capacitance of 0.5µF/km with a diameter of 185 mm^2 (typically 0.4 µF/km). Single-core cables (also shielded versions) are not recommended for EMC reasons. It is not permissible to use more than three cables in parallel per phase.

SINAMICS GM150 in IGBT version (with sine-wave filter)

For operation with a sine-wave filter there are no special requirements for the cables from the converter to the motor. Unshielded standard medium-voltage cables can be used. The voltage class of the cables must be selected in accordance with the voltage applied to the motor.

SINAMICS GM150 in IGCT version and SINAMICS SM150

Shielded medium-voltage cables for 3.6/6kV must be used to connect the converter to the motor. Symmetrical three-core cables with individually shielded copper conductors are recommended. An additional outer shield is an advantage for improving the EMC characteristics. Single-core cables (also shielded versions) are permitted if three-wire, symmetrically arranged cable bundles with one cable for each phase are formed (three-phase current systems). Preferably four cables per phase should be installed (but at least two cables per phase).

Cables between the transformer and the converter

The same versions apply as in the case of the motor cables.

Permissible cable lengths

In the case of long cables between the converter and the motor, reflection phenomena lead to overvoltage conditions at the motor terminals and, in turn, to a higher level of stress on the motor insulation. These recharging currents – and with them the voltage stress – can be limited by using output reactors or sine-wave filters.

Maximum cable lengths with and without output reactor

Converter	Max. cable lengths			
	without output reactor (standard)		with output reactor [1] (option **L08**)	
	shielded	unshielded	shielded	unshielded
Output voltage 2.3 kV to 4.16 kV				
SINAMICS GM150 IGBT version	up to 2 parallel cables: each 100 m 3 parallel cables: each 80 m >3 parallel cables: not permitted	not permitted	1000 m	not permitted
Output voltage 3.3 kV				
SINAMICS GM150 IGCT version	up to 2 parallel cables: each 100 m 3 parallel cables: each 80 m 4 parallel cables: each 80 m Mechanically, up to six parallel cables are possible (an inquiry is required).	not permitted	500 m	not permitted
SINAMICS SM150	up to 4 parallel cables: each 80 m Mechanically, up to six parallel cables are possible (an inquiry is required).	not permitted	200 m	not permitted

Maximum cable lengths with and without sine-wave filter

Converter	Max. cable lengths			
	without sine-wave filter (standard)		with sine-wave filter [1] (option **Y15**)	
	shielded	unshielded	shielded	unshielded
Output voltage 2.3 kV to 4.16 kV				
SINAMICS GM150 IGBT version	up to 2 parallel cables: each 100 m 3 parallel cables: each 80 m >3 parallel cables: not permitted	not permitted	1000 m	1000 m

Maximum cable lengths between line-side transformer and converter

Converter	Max. cable lengths	
	shielded	unshielded
Output voltage 2.3 kV to 4.16 kV		
SINAMICS GM150	300 m	300 m
Output voltage 3.3 kV		
SINAMICS SM150	80 m	not permitted

[1] Distance between the converter and the motor depending on the current magnitude for max.6 three-core EMC cables connected in parallel.

Engineering

Operation of Siemens high-voltage motors

A sine-wave filter is not required between the Siemens high-voltage motors H-compact, H-compact PLUS, H-modyn and special motors for e.g. marine, rolling mill and high-speed applications and the SINAMICS GM150 and SINAMICS SM150 converters. Reliable operation of the drive is assured by taking the following measures:

- The MICALASTIC VPI insulation system is optimally suited to handle the voltage stressing that occurs in converter operation.
- The protection concept for high voltage motors when fed from converters involves two insulating bearings to avoid damaging bearing currents.
  Further, shaft grounding is absolutely necessary so that no voltage can be established at the motor shaft with respect to ground. The shaft is either grounded using a rotary pulse encoder with integrated grounding track on the non-drive end or using a separate grounding brush on the motor drive end. In the second case, the rotary pulse encoder is integrated on the non-drive end in an insulated fashion.
- In order to additionally protect the bearings of the driven load, we recommend that an insulated coupling is used.

Minimum motor rated requency:

- SINAMICS GM150 in IGBT version: 20 Hz
- SINAMICS GM150 in IGCT version and SINAMICS SM150:
  - 8.5 Hz for an output voltage of 3.3 kV
  - 5.0 Hz for a reduced voltage of 3.15 kV

Note: For motors with rated frequency of less than 8.5 Hz, a reduced voltage of 3.15 kV should always be selected.

Operating motors with several winding systems

Several power units can be operated in parallel in order to increase the output rating of the converter. In this way, a maximum power rating of up to 10 MVA with an output voltage of 4.16 kV can be achieved by connecting two SINAMICS GM150 in IGBT version converters in parallel. Using the same principle, a maximum power rating of 21 MVA or 31.5 MVA is achieved by connecting three SINAMICS GM150, in IGCT version and SINAMICS SM150 converters in parallel.

Two or three isolated winding systems – that are not electrically offset with respect to one another – are required in the motor to ensure that the current is uniformly distributed between the two subsystems.

Operating two-pole motors

High-speed converter drives with 2-pole motors require special measures regarding their mechanical design (limiting and critical speed, bearings, rotor design, foundation design). An inquiry is required for such applications.

For retrofit applications, in the control range intended, motors must not manifest any mechanical natural resonance. If necessary, the converter can suppress any critical speed ranges.

Operating explosion-protected motors

Motors from Siemens are also available in versions for use in hazardous zones. Available motor types of protection are:

- Pressurized enclosure: Ex pe IIC T3 acc. to DIN EN 60079-2/ VDE 0170/0171 T301 (IEC 60079-2)
- Non-sparking: Ex n AIIC T3 acc. to DIN EN 60079-15/ VDE 0170/0171 T16 (IEC 60079-15)

Apart from the measures required – also for fixed-speed motors – to increase the type of protection, for variable speed motors it is also necessary to have a shaft grounding device with type of protection type Ex d IIC T6 (without rotary pulse encoder) or Ex de IIC T6 (with rotary pulse encoder).

An inquiry is always necessary for motors with increased safety Ex e.

Ex certification

For motors with Ex n type of protection and converter operation it may be necessary to accept the complete system on a case-for-case basis in order to issue an Ex certificate. An inquiry is necessary for cases such as these.

An acceptance test of the complete drive system is not required for motors with Ex pe type of protection and converter operation.

Drives for a square-law load torque

Driven loads with a square-law load torque ($M \sim n^2$) such as pumps and fans, require the full torque at rated speed. Generally, increased starting torques or load surges do not occur. Thus, the converter does not have to be dimensioned for an overload condition.

The following applies when selecting a suitable converter for driven loads with a square-law load torque: The rated converter current must be at least as high as the motor current which flows at full torque at the required load operating point.

Drives for a constant load torque

Self-ventilated motors cannot provide their full rated torque in continuous operation over the complete speed range. The continually permissible torque decreases with decreasing speed due to the reduced cooling effect. For self-ventilated motors, the torque and power rating must be reduced according to the specific speed control range.

For frequencies above the rated frequency f_{rated}, force-ventilated motors are operated in the field-weakening mode. In this case, the torque that can be utilized decreases with approx. f_{rated}/f. The power remains constant. Thus, a safety margin of ≥30 % to the stall torque must be observed, which decreases according to the function $(f_{rated}/f)^2$.

Drives requiring an overload capability

The rated data of the converters specified in the technical data do not include any reserves for overload capability.
The current rating of the converter must always be reduced if the specifications call for an increased overload capability of the converter. The derating required differs according to the application, operating mode and converter type. The derating can be determined on request if all of the boundary conditions are specified.

Operating standard line motors (only SINAMICS GM150 in IGBT version)

In conjunction with the optional sine-wave filter (option **Y15**) the SINAMICS GM150 in IGBT version is ideal for operating standard line motors in applications with a square-law load torque (e.g. pumps and fans). Stressing on the insulation system and bearings is avoided as a result of the almost sine-wave output voltages and currents. The voltage harmonic distortion at an output frequency of 50 Hz is less than 5 % when using a sine-wave filter.

It should be noted that only driven loads with a square-law load torque (e.g. fans, pumps, compressors) can be operated and that operation in the field weakening range is not permitted. The possible rated output frequencies (corner frequencies) are limited to a range of 30 Hz to max. 66 Hz. The frequency setting range is 1:10.

In order to optimally adapt the sine-wave filter to the motor, the rated motor current, the motor current at the rated point and the motor no-load current must be specified when ordering.

Scope of delivery

Engineering

The standard scope of delivery of the SINAMICS GM150 and SINAMICS SM150 comprises:

1. Basic unit

The basic unit consists of the converter power unit including closed-loop control, in either an air-cooled or water-cooled version. One or more transport units are supplied depending on the converter type. Exact details are to be found in the dimension drawing for the specific order.

2. Cooling unit for water-cooled converters

The cooling unit consists of one transport unit and is supplied without deionized water.
For SINAMICS GM150 in IGBT version, a pipe-connecting element between the cooling unit and converter is included in the scope of delivery.
For SINAMICS GM150 in IGCT version and SINAMICS SM150, the piping between the cooling unit and the basic unit is routed below the units. The necessary pipes and connection pieces are included in the scope of delivery and are supplied loose.
Special installation conditions have not been taken into account and, where applicable, a separate inquiry is necessary (e.g. where the cooling unit is not mounted directly next to the basic unit).

The piping for the raw water supply on the plant side is not included.

3. Optional components

Optional components, e.g. sine-wave filters or output reactors, are supplied as separate transport units. If necessary, cables for connecting the optional components to the power unit are also supplied. For the DC bus configurations of SINAMICS SM150, the cabling between the basic unit and the option cabinets is routed below the units. The cables required are not included in the scope of delivery as they have to be selected according to the particular project.

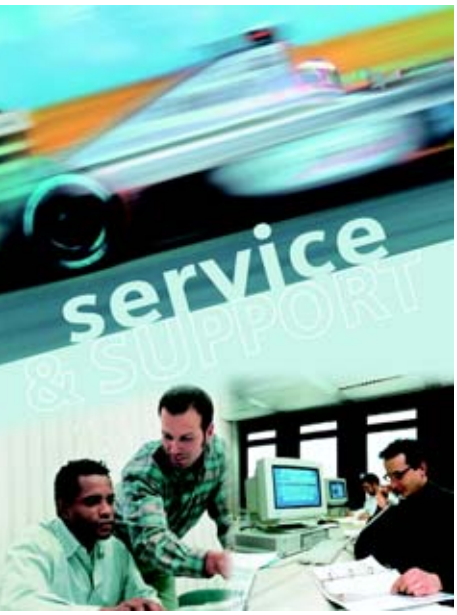
4. Static excitation unit

For converters that are to supply synchronous motors, static excitation unit is generally included in the scope of supply. This must be ordered with a separate Order No. (see Chapter “Accessories”).

The following items are not included in the standard scope of delivery:
Cables between the transformer and converter, motor cables, circuit-breakers, transformer, motor, cable ducts, filter systems and piping for the raw water supply of the cooling

Services and Documentation

8



Overview

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SITRAIN highlights

Top trainers

Our trainers have a wealth of practical and didactic experience. Course developers have direct contact to product development, and directly pass on their knowledge to the trainers.

Practical experience

The practical experience of our trainers enables them to teach theory effectively. But since it is known that all theory is drab, we attach great importance to practical exercises which can comprise up to half of the course time. You can therefore immediately implement your new knowledge in practice. We train you on state-of-the-art equipment that has been designed both from the methodology and didactic perspectives. You feel absolutely certain when trained in this environment.

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With a total of about 300 local attendance courses, we train the complete range of A&D products as well as interaction of the products in systems. Telecourses, teach-yourself software and web-hosted seminars supplement our classic range of courses.

Customized training

We are never far away. You can find us at more than 50 locations in Germany, and in 62 countries worldwide. You wish to embark on an individual training course instead of one of our 300 courses? Our solution: We will provide a program tailored exactly to your personal requirements. Training can be carried out in our Training Centers or at your company.

The right combination: Blended learning

Blended learning is the combination of various training media and sequences. For example, attending a course in a local training center can be optimally supplemented by a teach-yourself program as preparation or follow-up. Spin-off: Lower travel costs and shorter times away from work.

Design

Range of training courses for SINAMICS GM150/SM150

Here you will find an overview of the training courses available for the SINAMICS GM150/SM150.

The courses have a modular structure and are intended for a variety of target groups as well as individual customer requirements.

The system overview will quickly acquaint decision makers and sales personnel with the courses that are offered.

The engineering course provides with all of the information you need to engineer a drive system.

The basic and follow-up courses are sure to provide all the technical knowledge service personnel will need for servicing/commissioning motion control applications, communication and cabinet units.

All modules contain as many practical exercises as possible, in order to enable intensive and direct training on the drive system and with the tools in small groups.

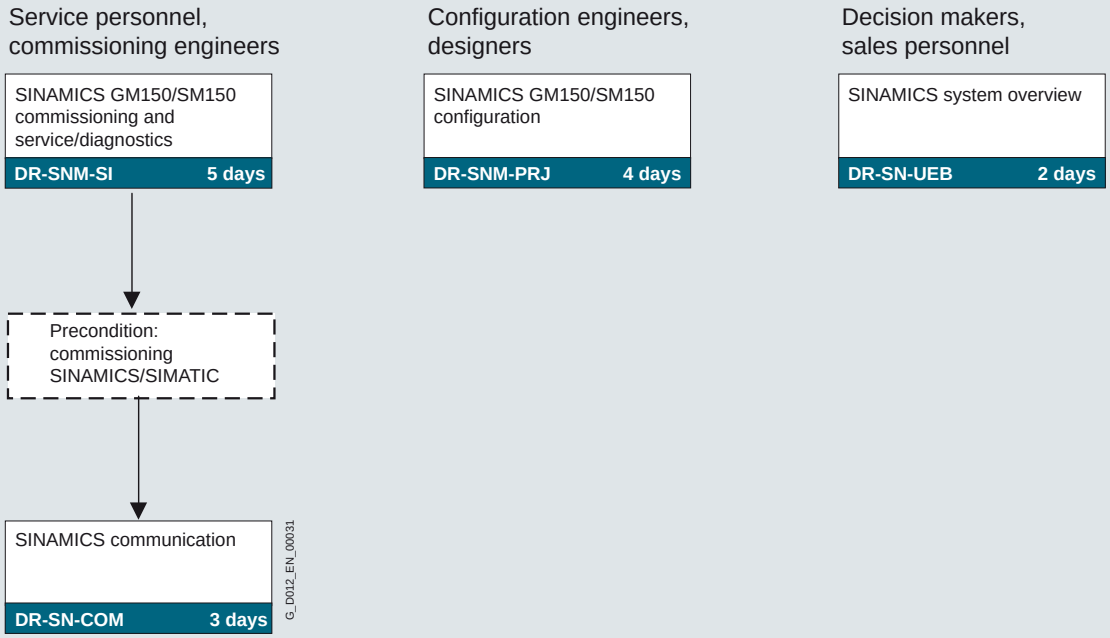
More information on course contents, dates and prices is available on the Internet at:

http://www.siemens.com/sitrain

Title	Target group					Duration	Course code
	Decision makers, sales personnel	Project managers, project personnel	Programmers	Commissioning engineers, application engineers	Service personnel		
SINAMICS System Overview	✓					2 days	DR-SN-UEB
SINAMICS GM150/SM150 engineering		✓	✓			4 days	DR-SNM-PRJ
SINAMICS GM150/SM150 commissioning and service/diagnostics				✓	✓	5 days	DR-SNM-SI
SINAMICS Communication			✓	✓	✓	3 days	DR-SN-COM

Design (continued)

SINAMICS GM150/SM150 learning path



Description

SINAMICS system overview (2 days) DR-SN-UEB

Description/learning objective

This course has been specifically designed for sales personnel and decision makers who wish to obtain a quick overview of the SINAMICS drive concept and its position in the existing Siemens drive environment.

The system overview is supplemented by an introduction to the fundamentals of motor and converter technology.

The SIZER engineering tool and the STARTER commissioning tool are presented and explained using short exercises.

Target group

Decision makers and sales personnel

Contents

- SINAMICS system overview
- Position with respect to existing drive systems
- Fundamentals of converter technology and motors
- SIZER engineering tool
- STARTER commissioning tool
- Simple commissioning of a drive
- Practical exercises using the training case

SINAMICS GM150/SM150 engineering (4 days) DR-SNM-PRJ

Description/learning objective

The course addresses design engineers, application engineers and sales personnel who are involved in the application engineering for SINAMICS GM150/SM150. Training covers the fundamental physical interrelationships when engineering a drive system. Using the self-explanatory SIZER engineering tool, different SINAMICS applications are calculated, and consolidated using exercises on PCs. Open-loop and closed-loop control functions are explained, and their associated secondary conditions described. The various options for SINAMICS are also presented together with how they are used.

Target group

Project managers, project engineers, programmers

Prerequisites

Knowledge of drives, open-loop and closed-loop control technology

Contents

- SINAMICS system overview
- Physical fundamentals for calculating a drive
- Engineering SINAMICS GM150/SM150 cabinet components together with background information: Line supplies, EMC, EMERGENCY STOP, interfaces
- SIZER engineering tool with exercises for various applications
- Technical documentation: Catalogs, engineering information, Operating Instructions
- Open-loop and closed-loop control functions
- Simple commissioning using the AOP30 operator panel
- Transformers/reactors
- Cooling systems
- High-voltage motors
- Medium-voltage cables

Description (continued)

SINAMICS GM150/SM150 commissioning and service/diagnostics (5 days) DR-SNM-SI

Description/learning objective

Technical information about planning, engineering, commissioning and troubleshooting is provided in this course. Following an introduction to the hardware and documentation of the drive system, detailed information is given about software functions, the parameter structure and function diagrams. Practical exercises on training equipment and the STARTER commissioning tool consolidate this knowledge.

Target group

Commissioning engineers, project engineers, service personnel

Prerequisites

Knowledge of drives, open-loop and closed-loop control technology

Contents

- Components of the converters
  - Rectifiers, DC link, inverters
  - Air/water cooling
  - Terminal Board/Terminal Module
  - Open-loop and closed-loop control
  - Gating IGBTs
  - Common power supply
- Exercises on the simulator
  - Operation from the AOP
  - First commissioning steps/test mode
  - Parameterizing the converter using the STARTER commissioning tool
  - Upload/download functions, learning function
  - Setpoint channel
- Open-loop control of the converter via PROFIBUS DP
- Basic principles of closed-loop control (vector control)
- Circuit diagrams
- Spare parts/maintenance

SINAMICS communication (3 days) DR-SN-COM

Description/learning objective

The course is appropriate for programmers and service engineers who, as an extension to the DR-SNS-SI course, require further knowledge of the PROFIBUS and RS232 communications interfaces for STARTER and AOP30, as well as I/O terminals.

The focus is on PROFIBUS with the PROFIDrive V3 profile with routing, TeleService, and the functions associated with the equidistant bus cycle, isochronous mode for servo applications and direct OP access. The libraries of DriveES SIMATIC for cyclic and acyclic data exchange are also presented.

This knowledge is expanded in the form of practical exercises using SINAMICS and SIMATIC S7 training cases with CPU 315-2 DP.

Target group

Commissioning engineers, project engineers, service personnel

Contents

- Overview of the interfaces PROFIBUS DP, RS232-PPI, CAN and I/O-terminals: Function, topology, parameterization
- Fundamentals of PROFIBUS with the PROFIDrive V3 profile
- Basic functions on PROFIBUS: Routing, TeleService and direct access
- PROFIBUS for motion control with: Equidistant bus cycle and isochronous mode for servo control
- Cyclic and acyclic data exchange with DriveES SIMATIC components
- Fault diagnostics of the drive via the bus system
- Practical exercises on the SINAMICS S120 and SIMATIC S7 training cases with CPU 315-2 DP

Training case AOP30 cabinet operator panel

Applications

This training case is used for training and marketing of SINAMICS cabinet units.

When used as a stand-alone unit, it can be used to demonstrate commissioning and usability offline. Online operation is implemented by connecting to a SINAMICS cabinet unit or the SINAMICS S120 training case.

Design

- Cabinet operator panel with line connection
- Internal 24 V DC power supply
- Can be set upright for demonstration purposes
- Offline functions
- Online functions with SINAMICS CU320 Control Unit via RS232 PPI

Technical data

AOP30 cabinet operator panel training case	
Degree of protection in accordance with DIN VDE 0470	IP00
Width	377 mm
Height	158 mm
Depth	277 mm
Weight, approx.	7 kg

Selection and ordering data

Description	Order No.
AOP30 cabinet operator panel training case TG-SN-AOP	**6ZB2480-0CA00**

Documentation

Overview

The documentation is supplied with the converter in PDF format on CD-ROM as standard.
It consists of the following sections:

- Operating Instructions
- List Manual (parameter lists and function diagrams)
- Equipment-specific documents such as circuit diagrams, dimension drawings, layout diagrams and terminal diagrams
- Supplementary operating instructions (comprehensive component descriptions)

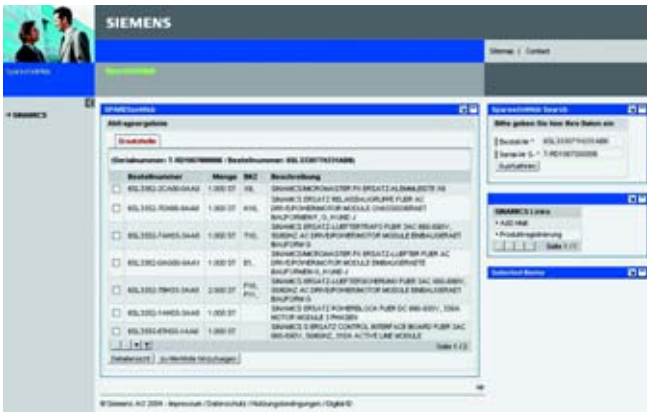
The documentation is in English. Further languages can be ordered if required (see Description of options).

Attention: Due to US embargo restrictions, the documentation cannot be supplied on CD-ROM to countries such as Iran, Syria, Cuba, Sudan or Libya, as Adobe Acrobat Reader is not permitted in these countries for reading PDF documents. The documentation must be ordered in paper form when exporting converters to these countries (option **D15**).

SPARESonWeb

Overview

SPARESonWeb – spare parts catalog on the Internet



SPARESonWeb is a web-based tool for selecting the spare parts available for the SINAMICS system. After you have registered and entered the serial number and Order No., the spare parts available for the relevant unit are displayed.

The delivery state for specific orders can be displayed for all shipped SINAMICS products.

http://workplace.automation.siemens.com/sparesonweb

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Service & Support

Our Service & Support accompanies you worlwide in all concerns related to the automation and drive technology of Siemens. In more than 100 countries directly on site and covering all phases of the life cycle of your machines and plants. Round the clock.

An experienced team of specialists with their combined knowhow is ready to assist you. Regular training courses and a close contact of our employees among each other - also across continents - assure a reliable service for multifaceted scopes.

Online Support

The comprehensive information system available round the clock via Internet ranging from Product Support and Service & Support services to Support Tools in the Shop.

http://www.siemens.com/automation/service&support

Technical Support

Competent consulting in technical questions covering a wide range of customer-oriented services for all our products and systems.

http://www.siemens.com/automation/support-request

You find contact details in the Internet under:
http://www.siemens.com/automation/service&support

Technical Consulting

Support in the planning and designing of your project from detailed actual-state analysis, target definition and consulting on product and system questions right to the creation of the automation solution.

Engineering Support

Support in configuring and developing with customer-oriented services from actual configuration to implementation of the automation project.

Field Service

With Field Service, we offer services for startup and maintenance essential for ensuring system availability.

Spare Parts and Repairs

In the operating phase of a machine or automation system, we provide a comprehensive repair and spare parts service ensuring the highest degree of plant availability.

Optimization and Upgrading

After startup or during the operating phase, additional potential for inceasing the productiviy or for reducing costs often arises. For this purpose, we offer you high-quality services in optimization and upgrading.

Product registration

To ensure high service performance (availability of spare parts, hotline-function, availability of personnel), you can register you SINAMICS drive units. We can ensure a timely service response by letting us know the final destination (site location) and nominating a contact partner. You can provide us with this information either using the feedback form (enclosed with each converter) or via the Internet:

http://www.siemens.com/reg

Appendix

Glossary

Overview

Active Infeed

Overall function of an infeed unit with → "Active Line Module", including the supplementary components required (filter, switching devices, percentage computational performance of a → "Control Unit", voltage sensing, etc.).

→ "Motor Modules" can be used in the cabinet units instead of the → "Active Line Modules".

Active Line Module

A controlled, self-commutating feed/feedback unit (with IGBTs in feed/feedback direction) which supplies a constant DC link voltage for the → "Motor Modules".

Induction motor

An induction motor is a three-phase motor, which operates at a speed that is lower than the synchronous speed.

Induction motors can be connected directly to the three-phase line supply in a star or delta circuit or connected to a converter.

When combined with a converter, induction motors form a "variable-speed drive system".

Other generally used terms: Squirrel-cage induction motor

See also → "Synchronous motor".

Output reactor

Reactor (inductance) in the converter or at the inverter output to reduce capacitive re-charging currents of long power cables.

Basic Infeed

Overall functionality of an infeed unit with → "Basic Line Module", including the supplementary components required (filter, switching devices, etc.).

Basic Line Module

Uncontrolled infeed unit (diode bridge or thyristor bridge, without regenerative feedback) to rectify the line supply voltage for the DC link.

CompactFlash card

Memory card that is used to save the drive software and the associated parameters in a non-volatile fashion (retentive memory). The memory card is inserted into the → "Control Unit" from the outside.

Control Unit

Central control modules, in which the open-loop and closed-loop control functions are implemented for one or several SINAMICS → "Line Modules" and/or → "Motor Modules".

DRIVE-CLiQ

Abbreviation for "Drive Component Link with IQ".

Communication system to couple various components of a SINAMICS drive system, such as e.g. → "Control Unit", → "Line Modules", → "Motor Modules", motors and speed/position encoder.

From the hardware perspective, DRIVE-CLiQ is based on the standard Industrial Ethernet with twisted-pair conductors. In addition to the send and receive signals, the +24 V power supply is also made available via the DRIVE-CLiQ cable.

Field-weakening

Field weakening involves reducing the magnetizing current of an electric motor in order to be able to further increase the speed when the rated voltage is reached.

Third-party motor

A motor is designated as a third-party motor if its motor data is not known to the drive line-up and it cannot be identified by means of its order number.

The data of a third-party motor is required for commissioning. It must be manually entered in the corresponding parameters.

Kinetic buffering

Kinetic buffering (KIP) is a software function that can be used to buffer brief line supply failures (up to approx. 1 s or as long as the drive is rotating). Kinetic buffering can usually only be used for drives that are predominantly in the motoring mode. For kinetic buffering, the driven load must have a sufficiently high flywheel mass, i.e. it must have an adequate level of kinetic energy. During the line supply failure, KIP causes the motor to either operate under no-load conditions or slightly regenerative operation (in order to cover the low losses of the motor and inverter). Once the line supply returns, then normal motoring operation is immediately resumed.

A prerequisite when using kinetic buffering is that from the process side it can be tolerated that the motor coasts down or brakes during the line supply failure time. In some applications with multi-motor drives, the speed ratios between the individual drives have to be maintained during kinetic buffering, in order to prevent the material web from tearing or damage. In such cases, kinetic buffering may only be activated on one of the drives (usually the main drive). The lower speed setpoints must then be fed into the complete setpoint cascade.

Overview

Line Module

A Line Module is a power unit that generates the DC link voltage for one or several → “Motor Modules” from a three-phase line supply.

For SINAMICS, the following types of Line Modules are available:

→ “Basic Line Module”, and → “Active Line Module”.

Motor Module

A Motor Module is a power unit (DC-AC inverter) that provides the power supply for the connected motor.

The energy is supplied from the → “DC link” of the drive group.

A Motor Module must be connected with a → “Control Unit” via → “DRIVE-CLiQ”. The open-loop and closed-loop control functions for the Motor Module are saved in the Control Unit.

PROFIBUS

Standard fieldbus according to IEC 61158, Part 2 to 6.

PROFIdrive

PROFIBUS profile for closed-loop speed and position control drives specified by the PNO (PROFIBUS User Organization).

The latest version is PROFIdrive Profile V3.

Sensor Module

Hardware module to evaluate the speed/position encoder signals.

Synchronous motor

Synchronous motors rotate precisely with their supply frequency. They do not have any slip (as is the case for → “Induction motors”). Depending on their version, synchronous motors require different open-loop and closed-loop control concepts so that they can be fed from a converter.

A differentiation is made between synchronous motors

- permanently excited/separately excited
- with/without damping cage
- with/without position encoder

Synchronous motors are used for various reasons:

- High drive dynamic performance
- High overload capability
- High speed accuracy when a precise frequency is input (SIEMOSYN motors).

Terminal Module

Terminal expansion module that is snapped onto the installation rail for mounting in the electrical cabinet.

TM31 Terminal Module with analog and digital I/O terminals is available for SINAMICS.

DC link

This is the part of the converter (or converter system) that connects the input converter (rectifier) with the output converter (one or several inverters).

For a voltage-source converter such as SINAMICS, the DC link has a constant DC voltage (rectified line supply voltage).

Siemens contact partners worldwide

At

http://www.siemens.com/automation/partner

you can find details of Siemens contact partners worldwide responsible for particular technologies.

You can obtain in most cases a contact partner for

- Technical Support,
- Spare parts/repairs,
- Service,
- Training,
- Sales or
- Consultation/engineering.

You start by selecting a

- Country,
- Product or
- Sector.

By further specifying the remaining criteria you will find exactly the right contact partner with his/her respective expertise.

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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

http://www.siemens.com/automation

you will find everything you need to know about products, systems and services.

Product Selection Using the Offline Mall of Industry

Detailed information together with convenient interactive functions:
The Offline Mall 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 Offline Mall CA 01 can be found in the Internet under

http://www.siemens.com/automation/ca01

or on DVD.

Easy Shopping with the Industry Mall

The Industry Mall is the virtual department store of Siemens AG in the Internet. Here you have access to a huge range of products presented in electronic catalogs in an informative and attractive way.

Data transfer via EDIFACT allows the whole procedure from selection through ordering to tracking of the order to be carried out online via the Internet.

Numerous functions are available to support you.

For example, powerful search functions make it easy to find the required products, which can be immediately checked for availability. Customer-specific discounts and preparation of quotes can be carried out online as well as order tracking and tracing.

Please visit the Industry Mall on the Internet under:

http://www.siemens.com/automation/mall

Order No. index

Subject index

Order No. index

Subject index

Subject index (continued)

Conditions of sale and delivery
Export regulations

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The dimensions are in mm. In Germany, according to the German law on units in measuring technology, data in inches only apply to devices for export.

Illustrations are not binding.

Insofar as there are no remarks on the corresponding pages, - especially with regard to data, dimensions and weights given – these are subject to change without prior notice.

The prices are in € (Euro) ex works, exclusive packaging.

The sales tax (value added tax) is not included in the prices. It shall be debited separately at the respective rate according to the applicable legal regulations.

Prices are subject to change without prior notice. We will debit the prices valid at the time of delivery.

Surcharges will be added to the prices of products that contain silver, copper, aluminum, lead and/or gold if the respective basic official prices for these metals are exceeded. These surcharges will be determined based on the official price and the metal factor of the respective product.

The surcharge will be calculated on the basis of the official price on the day prior to receipt of the order or prior to the release order. The metal factor determines the official price as of which the metal surcharges are charged and the calculation method used. The metal factor, provided it is relevant, is included with the price information of the respective products.

An exact explanation of the metal factor and the text of the Comprehensive Terms and Conditions of Sale and Delivery are available free of charge from your local Siemens business office under the following Order Nos.:

- 6ZB5310-0KR30-0BA1
  (for customers based in Germany)
- 6ZB5310-0KS53-0BA1
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The deciding factors are the AL or ECCN export authorization indicated on order confirmations, delivery notes and invoices.

Errors excepted and subject to change without prior notice.

I IA/DT /VuL_ohne MZ/En 12.05.09

Notes

Notes

CD-ROM for Catalog D 12

On the CD-ROM attached to Catalog D 12 · 2009, you will find:

- Dimension drawings of the converter (PDF format)
- Catalog D 12 (PDF format)
- Catalog D 84.1 three-phase induction motors H-compact, H-compact PLUS (PDF format)

Hardware and software requirements

- Intel Pentium 333 MHz or higher
- Min. 128 MB RAM
- Screen resolution 1024 × 768 pixels
- 4 x CD-ROM drive
- Windows 9x/NT 4.x/2000/XP
- Acrobat Reader
- Excel 2000
- MS Internet Explorer from V5.5

Start

Insert the CD-ROM into your CD-ROM drive. The program automatically starts.
If the AutoRun function in your system is not activated, please start the “start.hta” file from the CD-ROM in your windows Explorer.

If you do not have Excel on your PC, then you can use the Excel view (xlviewer.exe) supplied on the CD-ROM.

Note

No software has to be installed to view the information on this CD-ROM.

Catalogs

Industry Automation, Drive Technologies and Electrical Installation Technology

Further information can be obtained from our branch offices listed in the appendix or at www.siemens.com/automation/partner

Interactive catalog on DVD	*Catalog*
for Industry Automation, Drive Technologies and Electrical Installation Technology	**CA 01**

Drive Systems

Variable-Speed Drives	
SINAMICS G110/SINAMICS G120 Inverter Chassis Units SINAMICS G120D Distributed Frequency Inverters	D 11.1
SINAMICS G130 Drive Converter Chassis Units, SINAMICS G150 Drive Converter Cabinet Units	D 11
SINAMICS GM150/SINAMICS SM150 Medium-Voltage Converters	D 12
SINAMICS S150 Drive Converter Cabinet Units	D 21.3
Asynchronous Motors Standardline	D 86.1
Synchronous Motors with Permanent-Magnet Technology, HT-direct	D 86.2
DC Motors	DA 12
SIMOREG DC MASTER 6RA70 Digital Chassis Converters	DA 21.1
SIMOREG K 6RA22 Analog Chassis Converters	DA 21.2
PDF: SIMOREG DC MASTER 6RM70 Digital Converter Cabinet Units	*DA 22*
SIMOVERT PM Modular Converter Systems	DA 45
SIEMOSYN Motors	DA 48
MICROMASTER 420/430/440 Inverters	DA 51.2
MICROMASTER 411/COMBIMASTER 411	DA 51.3
SIMOVERT MASTERDRIVES Vector Control	DA 65.10
SIMOVERT MASTERDRIVES Motion Control	DA 65.11
Synchronous and asynchronous servomotors for SIMOVERT MASTERDRIVES	DA 65.3
SIMODRIVE 611 universal and POSMO	DA 65.4
SIMOTION, SINAMICS S120 and Motors for Production Machines	PM 21
SINAMICS S110 The Basic Positioning Drive	PM 22
Low-Voltage Three-Phase-Motors	
IEC Squirrel-Cage Motors	D 81.1
MOTOX Geared Motors	D 87.1
Automation Systems for Machine Tools SIMODRIVE	NC 60
• Motors	
• Converter Systems SIMODRIVE 611/POSMO	
Automation Systems for Machine Tools SINAMICS	NC 61
• Motors	
• Drive System SINAMICS S120	
Drive and Control Components for Hoisting Equipment	HE 1
Mechanical Driving Machines	
Flender Standard Couplings	MD 10.1

Electrical Installation Technology

PDF: ALPHA Distribution Boards and Terminal Blocks	*ET A1*
PDF: ALPHA 8HP Molded-Plastic Distribution System	*ET A3*
PDF: BETA Low-Voltage Circuit Protection	*ET B1*
PDF: DELTA Switches and Socket Outlets	*ET D1*
PDF: GAMMA Building Management Systems	*ET G1*

PDF: These catalogs are only available as pdf files.

Motion Control

	Catalog
SINUMERIK & SIMODRIVE Automation Systems for Machine Tools	NC 60
SINUMERIK & SINAMICS Automation Systems for Machine Tools	NC 61
SIMOTION, SINAMICS S120 and Motors for Production Machines	PM 21
SINAMICS S110 The Basic Positioning Drive	PM 22

Low-Voltage

Controls and Distribution – SIRIUS, SENTRON, SIVACON	LV 1
Controls and Distribution – Technical Information SIRIUS, SENTRON, SIVACON	LV 1 T
SICUBE System Cubicles and Cubicle Air-Conditioning	LV 50
SIDAC Reactors and Filters	LV 60
SIVACON 8PS Busbar Trunking Systems	LV 70

Process Instrumentation and Analytics

Field Instruments for Process Automation	FI 01
PDF: Indicators for panel mounting	*MP 12*
SIREC Recorders and Accessories	MP 20
SIPART, Controllers and Software	MP 31
PDF: Products for Weighing Technology	*WT 10*
Process Analytical Instruments	PA 01
PDF: Process Analytics, Components for the System Integration	*PA 11*

SIMATIC HMI

Human Machine Interface Systems	ST 80

SIMATIC Industrial Automation Systems

Products for Totally Integrated Automation and Micro Automation	ST 70
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Add-ons for the SIMATIC PCS 7 Process Control System	ST PCS 7.1
Migration solutions with the SIMATIC PCS 7 Process Control System	ST PCS 7.2
pc-based Automation	ST PC
SIMATIC Control Systems	ST DA

SIMATIC NET

Industrial Communication	IK PI

SIMATIC Sensors

Sensors for Factory Automation	FS 10

Systems Engineering

Power supplies SITOP power and LOGO! Power	KT 10.1
System cabling SIMATIC TOP connect	KT 10.2

System Solutions

Applications and Products for Industry are part of the interactive catalog CA 01

TELEPERM M Process Control System

PDF: AS 488/TM automation systems	*PLT 112*

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Order No.: E86060-K5512-A101-A2-7600
3P.8122.88.12/Dispo 18402
KG 0809 2. E 184 En
Printed in Germany

Token fee: 5.00 € / 8.00 $