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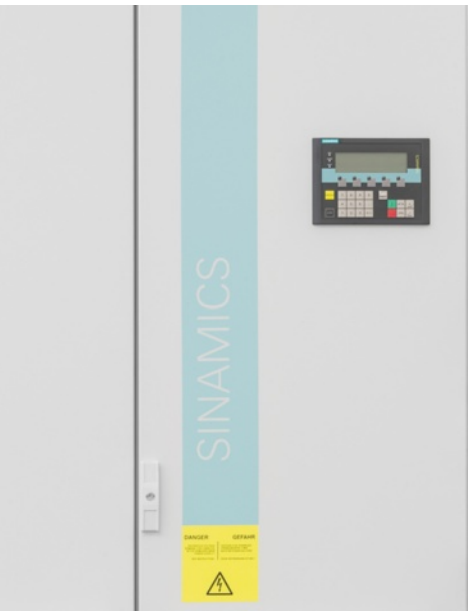

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Overview

SINAMICS G150 converter cabinet units, versions A and C

With its SINAMICS G150 converter cabinet units, a drive system is available on which all line-side and motor-side components are integrated together with the Power Module extremely compact into a specially designed cabinet enclosure. This approach minimizes the effort and expense required to configure and install them.

SINAMICS G150 has been specially designed to meet the requirements of drives with square-wave and constant load characteristics, with medium performance requirements, and without regenerative feedback capability.

The control accuracy of the sensorless vector control is suitable for most applications, which means that an additional actual speed value encoder is not required.

SINAMICS G150 converter cabinet units are optionally available with an encoder evaluation function in order to handle applications that require an encoder for plant-specific reasons.

SINAMICS G150 converter cabinet units offer an economic drive solution that can be adapted to customer-specific requirements through a wide range of components and options.

SINAMICS G150 is available in two versions:

- **Version A**
  All optionally available line connection components, such as the main switch, circuit breakers, line contactor, line fuses, line filter or motor-side components and additional monitoring devices, can be installed as required. This version is also available with power units connected in parallel.
- **Version C**
  Offers an extremely space-optimized structure without line-side components. This particularly slimline version can be used, for example, when line connection components are accommodated in a central low-voltage distribution panel (MCC) in the plant.

The following voltages and power ratings are available:

Line voltage	**Power range single connection** (versions A and C)	**Power range parallel connection** (version A)
380 ... 480 V 3 AC	110 ... 560 kW	630 ... 900 kW
500 ... 600 V 3 AC	110 ... 560 kW	630 ... 1000 kW
660 ... 690 V 3 AC	75 ... 800 kW	1000 ... 2700 kW

Degrees of protection are IP20 (standard) and optionally IP21, IP23, IP43 and IP54.

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Benefits

- Particularly quiet and compact converters thanks to state-of-the-art IGBT power semiconductors and an innovative cooling concept.
- Individual modules and power components can be replaced quickly and easily, which ensures a higher level of plant availability. Replaceable components have been designed so that they can be quickly and easily replaced. In addition, the "Spares On Web" Internet tool makes it easy to view the spare parts that are available for the particular order at all times.
- Can be easily integrated in automation solutions by means of a standard communications interface as well as a range of analog and digital interfaces.
- Easy commissioning and parameterization using interactive menus on the AOP30 Advanced Operator Panel with graphic LCD and plain-text display, or PC-supported using the STARTER commissioning tool (see Chapter Tools and configuration).
- Preset software functions make it easier to adapt the converter to the individual plant. For example, the key functions for controlling pumps are stored as a preprogrammed macro in the drive.
- With regard to EMC, the devices are subdivided into various zones, and as a consequence, they are extremely insensitive to disturbances and are very reliable in operation. With the help of simulated conditions, partitions have been designed to act as air guides and to help dissipate heat.
- Special measures used in the construction of the cabinets ensure that they remain mechanically durable over their entire life cycle. All components, from individual parts to the ready-to-connect cabinet, undergo rigorous testing throughout the entire production process. This guarantees a high level of functional reliability during installation and commissioning, as well as in operation.

Application

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

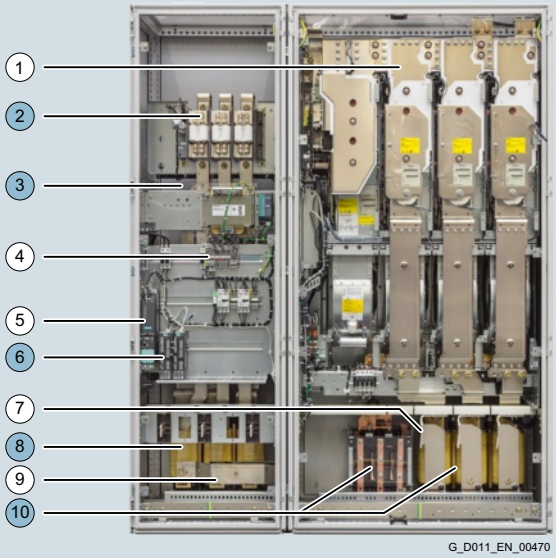
This means the following applications in particular:

- Pumps and fans
- Compressors
- Extruders and mixers
- Mills

Design

SINAMICS G150 converter cabinet units are characterized by their compact, modular and service-friendly design.

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



1 Power unit
2 Main switch with fuses (option **L26**)
3 Main contactor (option **L13**)
4 Customer terminal block
5 CU320-2 Control Unit
6 TM31 Terminal Module (option **G60**)
7 Motor connection
8 Line reactor (≤ 500 kW standard) (option **L23**)
9 Line connection
10 dv/dt-Filter compact plus VPL (option **L07**)

○ Standard version
● Option

Example of the design of a SINAMICS G150 converter cabinet unit, version A

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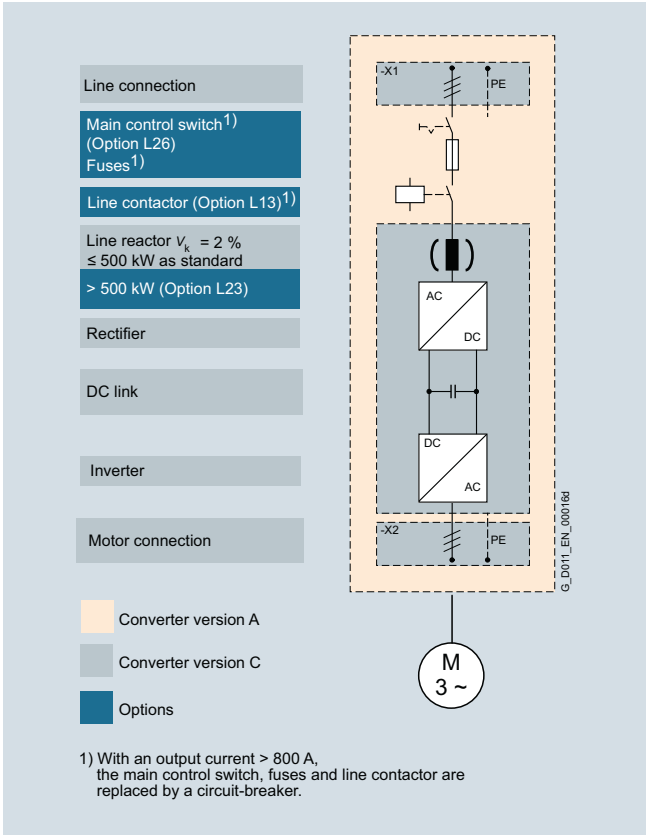
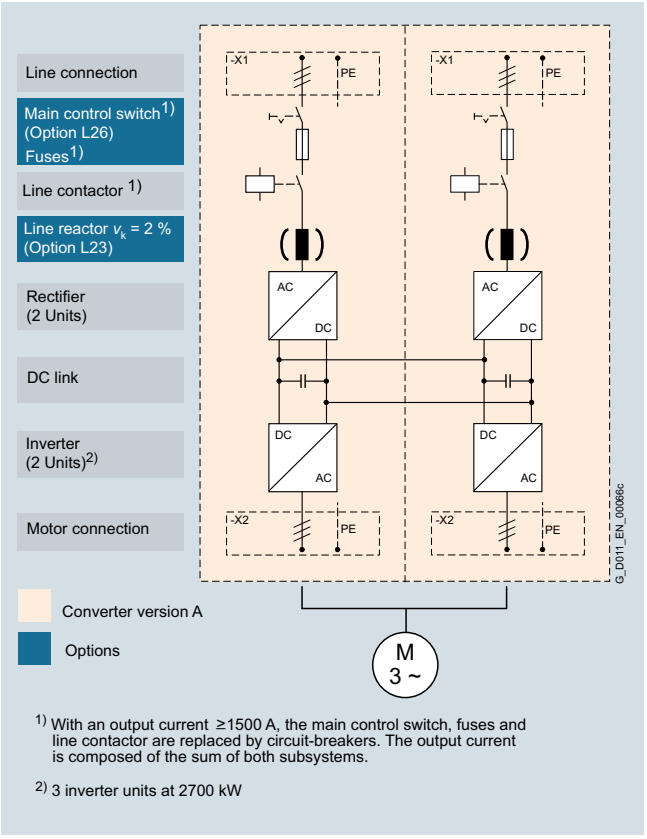
Design (continued)



1) With an output current > 800 A, the main control switch, fuses and line contactor are replaced by a circuit-breaker.

Basic design of a SINAMICS G150 converter cabinet unit with several essential options



1) With an output current ≥1500 A, the main control switch, fuses and line contactor are replaced by circuit-breakers. The output current is composed of the sum of both subsystems.

2) 3 inverter units at 2700 kW

Basic design of a SINAMICS G150 converter cabinet unit in parallel connection in order to increase the power rating, with several essential options

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Design (continued)

Coated modules

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

- Power Modules
- Control Units
- Sensor Modules
- Terminal Modules
- Advanced Operator Panel (AOP30)

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

Nickel-plated busbars

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

Note:

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

Degrees of protection of the cabinet units

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

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

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

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

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Function

AOP30 Advanced Operator Panel

An AOP30 Advanced Operator Panel is located in the cabinet door of the converter for the operator control and monitoring as well as for the commissioning.

The AOP30's two-stage safety concept prevents unintentional or unauthorized changes to settings. Operation of the drive from the operator panel can be disabled by the keyboard lock so that only parameter values and process variables can be displayed on the operator panel. The OFF key is factory-set to "active", but can be deactivated by the customer. A password can be used to prevent the unauthorized changing of converter parameters.

The user is guided by interactive menus through the drive commissioning screens. When commissioning the drive for the first time, only six motor parameters (which can be found on the motor rating plate) have to be entered on the AOP30. The closed-loop control is then optimized automatically to adapt the converter to the motor.

German, **English**, **French**, **Italian**, **Spanish** and **Chinese** are stored on the CU320-2 Control Unit CompactFlash card as operator panel languages. The desired language must be downloaded to the AOP30 prior to commissioning. In addition to these preinstalled languages, **Russian** and **Portuguese** (Brazil) are also available for subsequent installation. Further languages are available on request.

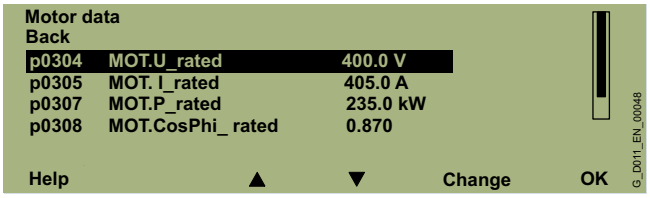
Examples of plain-text displays during various phases of operation are shown below.

The **first commissioning** is performed via the operator panel.

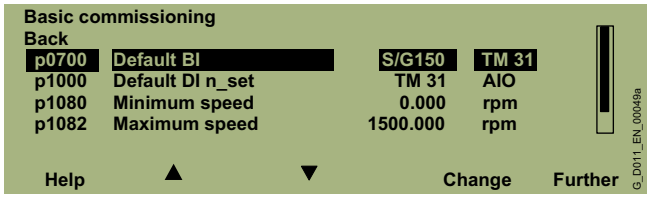
Only six motor parameters have to be entered:

Power, speed, current, cos φ, voltage and frequency of the motor.

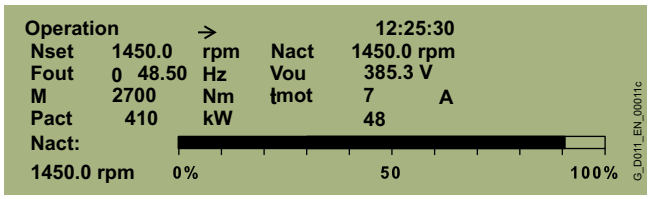
This information can be found on the motor rating plate, and must be entered in the screens on the display by following a short, menu-assisted procedure. The motor cooling method must also be specified.

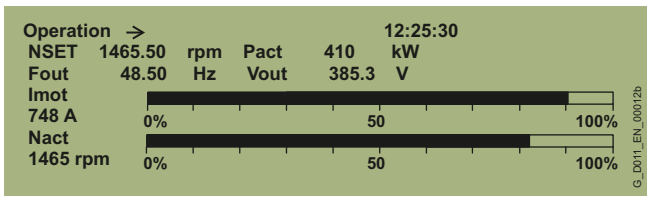


The next screen contains the parameter values that are used to automatically optimize the control.

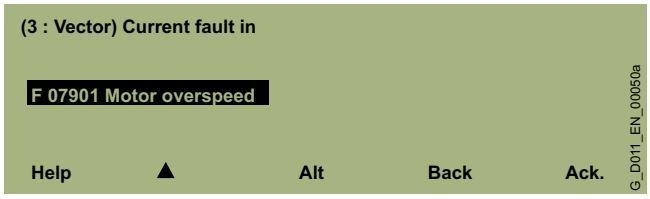


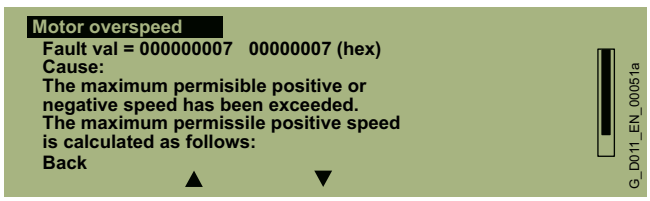
During **operation**, the display shows current data, such as set-points and actual values as absolute values or it is possible to parameterize up to three process variables as a quasi-analog bar display.





Any **alarms** which occur are signaled by the flashing of the yellow "ALARM" LED, **faults** by the lighting up of the red "FAULT" LED. There is also an indication of the cause displayed in plain text on the display's status line.





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Function (continued)

Communication with higher-level controller and customer terminal block

A PROFIBUS interface on the CU320-2 DP Control Unit is provided as standard as the customer interface for the controller.

When using the CU320-2 PN (PROFINET) Control Unit (option **K95**), communication is via PROFINET in accordance with the PROFIdrive profile.

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

The inputs and outputs available as standard can be optionally expanded using a TB30 Terminal Board (option **G62**) and/or up to two TM31 Terminal Modules (option **G60** or **G61**).

To simplify configuration and commissioning of the drive, the optional TM31 Terminal Module can be preset with a variety of factory settings.

For further information, please refer to the SINAMICS Low Voltage Engineering Manual.

Open-loop and closed-loop control functions

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

Software and protective functions

The software functions available as standard are described below:

Software and protective functions	Description
Setpoint specification	The setpoint can be specified both internally and externally; internally as a fixed setpoint, motorized potentiometer setpoint or jog setpoint, externally via the communications interface or an analog input on the customer terminal block. The internal fixed setpoint and the motorized potentiometer setpoint can be switched or adjusted via control commands from any interface.
Motor identification	The automatic motor identification function makes commissioning faster and easier and optimizes closed-loop control of the drive.
Ramp-function generator	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, allows the drive to be smoothly accelerated and braked. As a consequence, this avoids the drive train from being overloaded and reduces the stress on mechanical components. The down ramps can be parameterized separately for quick stop.
$V_{dc\ max}$ controller	The $V_{dc\ max}$ controller automatically prevents overvoltages in the DC link, if the set down ramp is too short, for example. This may also extend the set ramp-down time.
Vdc_min control	For brief line supply failures, the kinetic energy of the rotating drive is used to buffer the DC link and therefore prevents fault trips. The converter remains operational as long as the drive can provide regenerative energy as a result of its motion and the DC-link voltage does not drop below the shutdown threshold. When the line supply recovers within this time, the drive is again accelerated up to its speed setpoint.
Automatic restart [1]	The automatic restart switches the drive on again when the power is restored after a power failure, and ramps up to the current speed setpoint.
Flying restart [1]	The flying restart function allows the converter to be switched to a motor that is still turning. With the voltage sensing capability provided by the optional VSM10 Voltage Sensing Module, the flying restart time for large induction motors can be significantly reduced because the motor does not need to be de-magnetized.
Technology controller	The technology controller function module allows simple control functions to be implemented, e.g. level control or volumetric flow control. The technology controller is designed as a PID controller. The differentiator can be switched to the control deviation channel or to the actual value channel (factory setting). The P, I, and D components can be set separately.
Free function blocks	Using the freely programmable function blocks, it is easy to implement logic and arithmetic functions for controlling the SINAMICS G150. The blocks can be programmed by means of an operator panel or the STARTER commissioning tool.
Drive Control Chart (DCC)	Drive Control Chart (DCC) is an additional tool for the easy configuration of technology functions for the SINAMICS G150. The block library contains a large selection of control, arithmetic and logic blocks as well as extensive open-loop and closed-loop control functions. The user-friendly DCC editor enables easy graphics-based configuration, allows control loop structures to be clearly represented and provides a high degree of reusability of charts that have already been created. DCC is an add-on to the STARTER commissioning tool.
***I²t* detection for motor protection**	A motor model stored in the converter software calculates the motor temperature based on the current speed and load. More exact measurement of the temperature, which also takes into account the influence of the ambient temperature, is possible by means of direct temperature measurement using KTY84 sensors in the motor winding.
Motor temperature evaluation	Motor protection by evaluating a KTY84, PTC or Pt100 temperature sensor. When a KTY84 sensor is connected, the limit values can be set for alarm or trip. When a PTC thermistor is connected, the system reaction to triggering of the thermistor (alarm or trip) can be defined.
Motor blocking protection	A blocked motor is detected and protected against thermal overloading by a fault trip.
Essential service mode	Special converter operating mode that increases the availability of the drive system, e.g. in the event of a fire.
Bypass	This circuit allows the motor to be operated via the converter or directly on the line supply.
Brake control	"Simple brake control" for control of holding brakes: The holding brake is used to secure drives against unwanted motion when deactivated. "Extended brake control" function module for complex brake control, e.g. for motor holding brakes and operational brakes: When braking with a feedback signal, the brake control reacts to the feedback signal contacts of the brake.
Write protection	Write protection to prevent unintentional changing of the setting parameters (without password function).

[1] Factory setting: Not activated (can be parameterized).

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Function (continued)

Software and protective functions	Description
Know-how protection	Know-how protection for encrypting stored data, e.g. to protect configuration know-how, and to protect against changes and duplication (with password function).
Web server	The integrated web server provides information about the drive unit via its web pages. The web server is accessed using an Internet browser via unsecured (http) or secured transmission (https).
Power unit protection	**Description**
Ground fault monitoring at the output	A ground fault at the output is detected by a total current monitor and results in shutdown in grounded systems.
Electronic short-circuit protection at the output	A short-circuit at the output (e.g. at the converter output terminals, in the motor cable or in the motor terminal box) is detected and the converter shuts down with a "fault".
Thermal overload protection	An alarm is issued first when the overtemperature threshold responds. If the temperature rises further, the device either shuts down or independently adjusts the pulse frequency or output current so that a reduction in the thermal load is achieved. Once the cause of the fault has been eliminated (e.g. cooling has been improved), the original operating values are automatically resumed.

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Selection and ordering data

Single connection

Type rating		Rated output current	SINAMICS G150 converter cabinet units, versions A and C
at 50 Hz 400 V, 500 V or 690 V	at 60 Hz 460 V or 575 V		(Article No. supplement, see below)
kW	hp	A	Article No.
380 ... 480 V 3 AC			
110	150	210	**6SL3710-1GE32-1 A3**
132	200	260	**6SL3710-1GE32-6 A3**
160	250	310	**6SL3710-1GE33-1 A3**
200	300	380	**6SL3710-1GE33-8 A3**
250	400	490	**6SL3710-1GE35-0 A3**
315	500	605	**6SL3710-1GE36-1 A3**
400	600	745	**6SL3710-1GE37-5 A3**
450	700	840	**6SL3710-1GE38-4 A3**
560	800	985	**6SL3710-1GE41-0 A3**
500 ... 600 V 3 AC			
110	150	175	**6SL3710-1GF31-8 A3**
132	200	215	**6SL3710-1GF32-2 A3**
160	250	260	**6SL3710-1GF32-6 A3**
200	300	330	**6SL3710-1GF33-3 A3**
250	400	410	**6SL3710-1GF34-1 A3**
315	450	465	**6SL3710-1GF34-7 A3**
400	600	575	**6SL3710-1GF35-8 A3**
500	700	735	**6SL3710-1GF37-4 A3**
560	800	810	**6SL3710-1GF38-1 A3**
660 ... 690 V 3 AC			
75		85	**6SL3710-1GH28-5 A3**
90		100	**6SL3710-1GH31-0 A3**
110		120	**6SL3710-1GH31-2 A3**
132		150	**6SL3710-1GH31-5 A3**
160		175	**6SL3710-1GH31-8 A3**
200		215	**6SL3710-1GH32-2 A3**
250		260	**6SL3710-1GH32-6 A3**
315		330	**6SL3710-1GH33-3 A3**
400		410	**6SL3710-1GH34-1 A3**
450		465	**6SL3710-1GH34-7 A3**
560		575	**6SL3710-1GH35-8 A3**
710		735	**6SL3710-1GH37-4 A3**
800		810	**6SL3710-1GH38-1 A3**

Article No. supplement	
• **Version A** All available options can be installed as required	**A**
• **Version C** Especially space-saving design	**C**

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

Parallel connection

Type rating		Rated output current	SINAMICS G150 converter cabinet units, version A
at 50 Hz 400 V, 500 V or 690 V	at 60 Hz 460 V or 575 V		
kW	hp	A	Article No.
380 ... 480 V 3 AC			
630	900	1120	**6SL3710-2GE41-1AA3**
710	1000	1380	**6SL3710-2GE41-4AA3**
900	1250	1560	**6SL3710-2GE41-6AA3**
500 ... 600 V 3 AC			
630	900	860	**6SL3710-2GF38-6AA3**
710	1000	1070	**6SL3710-2GF41-1AA3**
1000	1250	1360	**6SL3710-2GF41-4AA3**
660 ... 690 V 3 AC			
1000		1070	**6SL3710-2GH41-1AA3**
1350		1360	**6SL3710-2GH41-4AA3**
1500		1500	**6SL3710-2GH41-5AA3**
1750		1729	**6SL3710-2GH41-8EA3**
1950		1948	**6SL3710-2GH42-0EA3**
2150		2158	**6SL3710-2GH42-2EA3**
2400		2413	**6SL3710-2GH42-4EA3**
2700		2752	**6SL3710-2GH42-7EA3**

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

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Options

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

Example:
6SL3710-1GE32-1CA3-Z
+M07+D60+...

See also ordering examples.

Available options	Order code	Version A	Version C
Input-side options			
Use in the first environment according to EN 61800-3 Category C2 (TN systems or TT systems with grounded neutral point) [1]	**L00**	✓	–
Clean Power version with integrated Line Harmonics Filter compact [2]	**L01**	✓	–
Line contactor (for currents ≤ 800 A for single connection)	**L13**	✓	–
Surge suppression	**L21**	✓	–
Scope of delivery without line reactor (for converters ≤ 500 kW)	**L22**	✓	✓
Line reactor u_k = 2% (for converters > 500 kW)	**L23**	✓	✓
Main switch incl. fuses or circuit breakers	**L26**	✓	–
Quick start (for option **L01**)	**L76**	✓	–
EMC shield bus [3] (cable connection from below)	**M70**	✓	✓
PE busbar [3] [4] (cable connection from below)	**M75**	–	✓
Output-side options			
dv/dt filter compact plus Voltage Peak Limiter	**L07**	✓	–
Motor reactor	**L08**	✓	–
dv/dt filter plus Voltage Peak Limiter [2]	**L10**	✓	–
Sine-wave filter (up to 250 kW at 380 ... 480 V, up to 132 kW at 500 ... 600 V)	**L15**	✓	–
EMC shield bus [3] (cable connection from below)	**M70**	✓	✓
PE busbar [3] [4] (cable connection from below)	**M75**	–	✓
Motor protection and safety functions			
EMERGENCY OFF pushbutton installed in the cabinet door	**L45**	✓	–
EMERGENCY OFF Category 0, 230 V AC or 24 V DC	**L57**	✓	–
EMERGENCY STOP Category 1, 230 V AC [5]	**L59**	✓	–
EMERGENCY STOP Category 1, 24 V DC [5]	**L60**	✓	–
Thermistor motor protection (alarm)	**L83**	✓	–
Thermistor motor protection (trip)	**L84**	✓	–
Pt100 evaluation unit	**L86**	✓	–
Insulation monitoring	**L87**	✓	–
Degree of protection increase			
Degree of protection IP21	**M21**	✓	✓
Degree of protection IP23	**M23**	✓	✓
Degree of protection IP43	**M43**	✓	✓
Degree of protection IP54	**M54**	✓	✓
Mechanical options			
Base 100 mm high, RAL 7022	**M06**	✓	✓
Cable-marshaling compartment 200 mm high, RAL 7035	**M07**	✓	✓
Line connection from above [2]	**M13**	✓	–
Motor connection from above [2]	**M78**	✓	–
Crane transport assembly (top-mounted)	**M90**	✓	✓

✓	Option can be ordered
–	Option cannot be ordered

Please refer to the selection matrix for information about possible option combinations.

[2] Applies to motor cable lengths < 100 m.

[3] Not available for converters > 1500 kW with power units connected in parallel.

[4] This option is listed for the input- and output-side options, but is only required once.

[5] This option is contained as standard in version A.

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

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Options (continued)

Available options	Order code	Version A	Version C
Safety Integrated			
Safety license for one axis	**K01**	✓	–
Additional SMC30 Sensor Module Cabinet-Mounted	**K52**	✓	–
Terminal module for controlling the "Safe Torque Off" and "Safe Stop 1" safety functions	**K82**	✓	–
TM54F Terminal Module	**K87**	✓	–
SBA Safe Brake Adapter, 230 V AC	**K88**	✓	–
Other options			
CBC10 Communication Board	**G20**	✓	✓
CBE20 Communication Board	**G33**	✓	✓
TM150 temperature sensor evaluation unit	**G51**	✓	✓
TM31 Terminal Module	**G60**	✓	✓
Additional TM31 Terminal Module	**G61**	✓	–
TB30 Terminal Board	**G62**	✓	✓
SMC30 Sensor Module Cabinet-Mounted	**K50**	✓	✓
VSM10 Voltage Sensing Module	**K51**	✓	–
Auxiliary power supply, 230 V AC	**K74**	✓	–
CU320-2 PN Control Unit	**K95**	✓	–
Connection for external auxiliary equipment	**L19**	✓	–
Cabinet lighting with service socket	**L50**	✓	–
Cabinet anti-condensation heating	**L55**	✓	✓
Braking unit 25 kW (P_{20} power: 100 kW)	**L61**	✓	–
Braking unit 50 kW (P_{20} power: 200 kW)	**L62**	✓	–
Marking of all control cable conductor ends	**M91**	✓	✓
Special cabinet paint finish [1]	**Y09**	✓	✓
One-line label for system identification, 40 × 80 mm	**Y31**	✓	✓
Two-line label for system identification, 40 × 180 mm	**Y32**	✓	✓
Four-line label for system identification, 40 × 180 mm	**Y33**	✓	✓
Documentation (standard: English/German)			
Documentation, production flowchart: Created once	**B43**	✓	✓
Documentation, production flowchart: Created every two weeks	**B44**	✓	✓
Documentation, production flowchart: Updated every month	**B45**	✓	✓
Additional documentation in German	**D00**	✓	✓
Customer documentation (circuit diagram, terminal diagram, layout diagram) in DXF format	**D02**	✓	✓
Customer documentation as hard copy	**D04**	✓	✓
Preliminary version of customer documentation	**D14**	✓	✓
Additional documentation in Russian	**D56**	✓	✓
Documentation language: English/French	**D58**	✓	✓
Documentation language: English/Spanish	**D60**	✓	✓
Additional documentation in Italian	**D72**	✓	✓
Additional documentation in English	**D76**	✓	✓
Additional documentation in French	**D77**	✓	✓
Additional documentation in Spanish	**D78**	✓	✓
Documentation language: English/Italian	**D80**	✓	✓
Additional documentation in Chinese	**D84**	✓	✓
Documentation language English/Chinese	**D91**	✓	✓
Documentation language English/Russian	**D94**	✓	✓

✓	Option can be ordered
–	Option cannot be ordered

Please refer to the selection matrix for information about possible option combinations.

[1] The order code Y.. requires data in plain text.

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Options (continued)

Available options	Order code	Version A	Version C
Rating plate language (standard: English/German)			
Rating plate data in English/French	**T58**	✓	✓
Rating plate data in English/Spanish	**T60**	✓	✓
Rating plate data in English/Italian	**T80**	✓	✓
Rating plate data in English/Russian	**T85**	✓	✓
Rating plate data in English/Chinese	**T91**	✓	✓
Options specific to the chemical industry			
NAMUR terminal block	**B00**	✓	–
Protective separation for 24 V supply (PELV)	**B02**	✓	–
Outlet for external auxiliary equipment (uncontrolled)	**B03**	✓	–
Options specific to the shipbuilding industry			
Marine version	**M66**	✓	✓
Individual certificate from Germanische Lloyd (GL)	**E11**	✓	✓
Individual certificate from Lloyds Register (LR)	**E21**	✓	✓
Individual certificate from Bureau Veritas (BV)	**E31**	✓	✓
Individual certificate from Det Norske Veritas (DNV)	**E51**	✓	✓
Individual certificate from American Bureau of Shipping (ABS)	**E61**	✓	✓
Individual certificate from Chinese Classification Society (CCS)	**E71**	✓	✓
Converter acceptance in presence of customer			
Visual acceptance	**F03**	✓	✓
Function test without connected motor	**F71**	✓	✓
Function test with test bay motor under no-load conditions	**F75**	✓	✓
Insulation test	**F77**	✓	✓
Customer-specific acceptance inspections (on request)	**F97**	✓	✓
Converter acceptance without the customer present			
Function test without connected motor	**F72**	✓	✓
Function test with test bay motor under no-load conditions	**F74**	✓	✓
Insulation test	**F76**	✓	✓

✓	Option can be ordered
–	Option cannot be ordered

Please refer to the selection matrix for information about possible option combinations.

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Options (continued)

Option selection matrix

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

Electrical options

	G20	G33	G51	G61	G62	K50	K51	K87	L00	L01	L13	L22	L23	L26	L57	L59	L60	L61	L62	L86	L87
G20		–	✓	✓	–	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
G33	–		✓	✓	–	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
G51	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	–	✓
G61	✓	✓	✓		✓	✓	✓	4)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
G62	–	–	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
K50	✓	✓	✓	✓	✓		–	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
K51	✓	✓	✓	✓	✓	–		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
K87	✓	✓	✓	4)	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
L00	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	–	1)	✓	✓	✓	✓	✓	✓	✓	–
L01	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	–	–	✓	✓	✓	✓	✓	✓	✓	✓
L13	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	2)	3)	3)	3)	✓	✓	✓	✓
L22	✓	✓	✓	✓	✓	✓	✓	✓	–	–	✓		–	✓	✓	✓	✓	✓	✓	✓	✓
L23	✓	✓	✓	✓	✓	✓	✓	✓	1)	–	✓	–		✓	✓	✓	✓	✓	✓	✓	✓
L26	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	2)	✓	✓		3)	3)	3)	✓	✓	✓	✓
L57	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	3)	✓	✓	3)		–	–	✓	✓	✓	✓
L59	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	3)	✓	✓	3)	–		–	✓	✓	✓	✓
L60	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	3)	✓	✓	3)	–	–		✓	✓	✓	✓
L61	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		–	✓	✓
L62	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	–		✓	✓
L86	✓	✓	–	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓
L87	✓	✓	✓	✓	✓	✓	✓	✓	–	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	

✓	Option can be ordered
–	Option cannot be ordered

1) For converters ≤ 500 kW / 700 hp, the line reactor (order code **L23**) is included in the converter scope of delivery. For converters > 500 kW / 700 hp, option **L23** must be ordered separately when the converter is to be operated on line supplies with high short-circuit power (R_{SC} > 20) or when a line filter is used (option **L00**).

2) Combination **L13/L26** only possible for currents < 800 A. As of 800 A, circuit breakers are used that also include the function of options **L13** and **L26**.

3) Options **L57**, **L59** and **L60** always require electrical separation from the line supply, this means for converters in a single circuit, for converter currents ≤ 800 A, option **L13** and for converter currents > 800 A, option **L26**. For converters with power units connected in parallel, electrical separation from the line supply is included as standard.

4) A combination of options **G61** and **K87** as a special version is available on request.

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Options (continued)

Mechanical options / electrical options

	E11	E21	E31	E51	E61	E71	L00	L01	L07	L08	L10	L15	M06	M07	M13	M21	M23	M43	M54	M66	M70	M78
E11		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	–	1)	✓	✓	✓	✓	✓
E21	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	–	1)	✓	✓	✓	✓	✓
E31	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	–	1)	✓	✓	✓	✓	✓
E51	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	–	1)	✓	✓	✓	✓	✓
E61	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	–	1)	✓	✓	✓	✓	✓
E71	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	–	1)	✓	✓	✓	✓	✓
L00	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	2)	✓
L01	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	–	✓	✓
L07	✓	✓	✓	✓	✓	✓	✓	✓		–	–	–	✓	✓	✓	✓	✓	✓	✓	✓	✓	–
L08	✓	✓	✓	✓	✓	✓	✓	✓	–		–	–	✓	✓	✓	✓	✓	✓	✓	✓	✓	–
L10	✓	✓	✓	✓	✓	✓	✓	✓	–	–		–	✓	✓	✓	✓	✓	✓	✓	✓	✓	–
L15	✓	✓	✓	✓	✓	✓	✓	✓	–	–	–		✓	✓	✓	✓	✓	✓	✓	✓	✓	–
M06	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		–	✓	✓	✓	✓	✓	✓	✓	✓
M07	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	–		✓	✓	✓	✓	✓	✓	✓	✓
M13	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		–	✓	✓	✓	✓	3)	✓
M21	–	–	–	–	–	–	✓	✓	✓	✓	✓	✓	✓	✓	–		–	–	–	–	✓	–
M23	1)	1)	1)	1)	1)	1)	✓	✓	✓	✓	✓	✓	✓	✓	✓	–		–	–	1)	✓	✓
M43	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	–	–		–	✓	✓	✓
M54	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	–	–	–		✓	✓	✓
M66	✓	✓	✓	✓	✓	✓	✓	–	✓	✓	✓	✓	✓	✓	✓	–	1)	✓	✓		✓	✓
M70	✓	✓	✓	✓	✓	✓	2)	✓	✓	✓	✓	✓	✓	✓	3)	✓	✓	✓	✓	✓		3)
M78	✓	✓	✓	✓	✓	✓	✓	✓	–	–	–	–	✓	✓	✓	–	✓	✓	✓	✓	3)	

✓	Option can be ordered
–	Option cannot be ordered

1) Option **M66** includes option **M23**.

2) Option **L00** includes option **M70**.

3) If the line connection (option **M13**) and the motor connection (option **M78**) are from above, the EMC shield bus (option **M70**) is not required in the lower cabinet area.

Rating plate data

	T58	T60	T80	T85	T91
T58		–	–	–	–
T60	–		–	–	–
T80	–	–		–	–
T85	–	–	–		–
T91	–	–	–	–	

Ordering examples

Example 1

Task:
A converter cabinet unit is required to control the fan speed for a 380 kW fan drive connected to an existing 400 V MCC outgoing feeder. The rated speed of the fan is 975 rpm. Due to the prevailing ambient conditions, the converter must be mounted on a 100 mm cabinet base and have IP54 degree of protection. The installation altitude is < 1000 m above sea level, the ambient temperature is 45° C.

Solution:
Because an MCC outgoing feeder already exists, line connection components, such as main switch, line contactor and line fuses, can be omitted and the space-saving version C can be selected. If we take into account the derating factors for the IP54 degree of protection and the increased ambient temperature, a 450 kW, 400 V converter cabinet unit with options
M06 (cabinet base 100 mm) and
M54 (IP54 degree of protection) must be selected for this constellation.

The ordering data is as follows:
6SL3710-1GE38-4CA3-Z
+M06 +M54

Example 2

Task:
A 280 kW pump to control pressure compensation is to be supplied via a converter for a completely new district heating pumping station. A 690 V supply is available. The installation altitude is 350 m above sea level and the ambient temperature is 40° C. The rated speed of the pump is 740 rpm. The pump unit and motor are located in an unmanned substation, so the winding temperature of the motor must be monitored by Pt100 thermistors and evaluated by the converter. The color of the converter cabinet units is to be RAL 3002.

Solution:
A converter cabinet unit with 315 kW, 690 V in the version A with the following options should be selected:
L26 (main switch including fuses),
L13 (line contactor),
L86 (Pt100 evaluation unit) and
Y09 (special cabinet paint finish).

The ordering data is as follows:
6SL3710-1GH33-3AA3-Z
+L26 +L13 +L86 +Y09
cabinet color RAL 3002

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Options (continued)

Description of options

Further descriptions of the options are provided in the SINAMICS Low Voltage Engineering Manual.

B00, B02, B03
Options compliant with NAMUR requirements

Exclusion list with other options:

The following restrictions and exclusions applicable to the NAMUR terminal block **B00** with regard to other available options must be taken into account.

Remark on the option	Reason
L45, L57, L59, L60	An EMERGENCY OFF Category 0 is already provided in the NAMUR version. The forced line supply disconnection is connected at terminal -A1-X2: 17, 18.
L83, L84	A thermistor evaluation unit (trip) is already included as standard with option **B00**.
L19	Alternatively, option **B03** can be selected. This means that a reduced scope is available for external auxiliaries.
L87	The insulation monitor monitors the complete electrically coupled network. This combination is available on request. An insulation monitor can also be provided on site.
G60	A TM31 Terminal Module is already included as standard with option **B00**.

With options such as **L50, L55, L86**, the connection is made as described in the standard. There is no wiring to the NAMUR terminal block.

Notice:

In addition to option **B00** for supply disconnection, option **L13** for currents ≤ 800 A or option **L26** for currents > 800 A must be ordered. For converters with power units connected in parallel, electrical separation from the line supply is included as standard.

B00
NAMUR terminal block

The terminal block has been designed and implemented 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. certain functions of the device are assigned to specified terminals. The inputs and outputs connected to the terminals fulfill PELV requirements ("protective extra-low voltage with protective separation").

The terminal block and associated functions have been reduced to the necessary minimum. Unlike the NAMUR recommendation, optional terminals are not available.

Terminal -A1-X2:	Meaning	Default	Remark
10	DI	ON (dynamic) / ON/OFF (static)	The effective mode can be encoded using a wire jumper at terminal -A1-400:9; 10.
11	DI	OFF (dynamic)	
12	DI	Faster	
13	DI	Slower	
14	DI	RESET	
15	DI	Interlock	
16	DI	Counter-clockwise	"0" signal for CW rotating field "1" signal for CCW rotating field
17, 18		Supply disconnection	EMERGENCY OFF circuit
30, 31		Ready	Relay output (NO contact)
32, 33		Motor is turning	Relay output (NO contact)
34	DO (NO)	Fault	Relay output (changeover contact)
35	DO (COM)		
36	DO (NC)		
50, 51	AI 0/4-20 mA	Speed setpoint	
60, 61	AO 0/4-20 mA	Motor frequency	
62, 63	AO 0/4-20 mA	Motor current	Motor current is default setting; can be reparameterized for other variables

The 24 V supply is provided on the plant side via terminals -A1-X2:1-3 (fused in the converter with 1 A). It must be ensured that the PELV safety requirements are fulfilled (protective extra-low voltage with protective separation).

Terminal -A1-X2:	Meaning	
1	M	Reference conductor
2	P24	24 V DC supply
3	P24	24 V DC outgoing feeder

For temperature monitoring of explosion-proof motors, option **B00** includes a PTC thermistor evaluation unit. Exceeding the limit value causes a shutdown. The associated PTC sensor is connected to terminal -A1-X3:90, 91.

Terminal -A1-X3:	Meaning	
90, 91	AI	Connection of PTC sensor

In parallel to operation via the NAMUR terminal block, there is also the option to operate the converter via the communications interface provided as standard on the CU320-2 Control Unit. The PROFIdrive profile "Process engineering" employed in the chemical industry can be selected by macros.

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Options (continued)

B02
Protective separation for 24 V supply (PELV)

If no protective separation for 24 V supply (PELV) is available at the customer site, this option is used to provide a second power supply to guarantee compliance with the PELV voltage. (Terminal assignments as for option **B00**, 24 V supply at terminals -X1:1, 2, 3 is not required)

Note:

Option **B02** is only possible in conjunction with option **B00**.

B03
Outgoing feeder for external auxiliaries (uncontrolled)

If a motor fan is to be supplied with power from the plant, option **B03** provides an uncontrolled external outgoing feeder with a 10 A fuse. As soon as the supply voltage is present at the converter input, a voltage is also present at these terminals. This corresponds to the converter input voltage ($U = U_{line}$). You must take this into account when configuring an external fan.

Terminal -A1-X1:	Meaning
1, 2, 3, PE	Outgoing feeder for external auxiliary equipment

Note:

Option **B03** is only possible in conjunction with option **B00**.

B43, B44, B45
Production flowcharts

Production flowcharts are provided with options **B43**, **B44** and **B45**. After the order has been clarified, these are e-mailed as a dual language (English/German) PDF file.

Order code	Description
B43	Documentation, production flowchart: Created once
B44	Documentation, production flowchart: Updated every two weeks
B45	Documentation, production flowchart: Updated every month

D00, D56, D72, D76, D77, D78, D84
Additional documentation

When options **D00, D56, D72, D76, D77, D78** and **D84** are selected, additional documentation is supplied in the appropriate language.

Order code	Description
D00	German
D56	Russian
D72	Italian
D76	English
D77	French
D78	Spanish
D84	Chinese

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

This option can be used to order documents such as circuit diagrams, terminal diagrams, layout diagrams, and dimension drawings in DXF format, in order to process them further in CAD systems, for example.

D04
Customer documentation as hard copy

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

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

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

D14
Preliminary version of customer documentation

If documents such as circuit diagrams, terminal diagrams, layout diagrams and dimensional drawings are required in advance for system engineering, a preliminary copy of the relevant documentation can be ordered with the converter. These documents are then supplied electronically a few working days following receipt of the order. If the order includes options that fall outside the scope of standard delivery, these will not be covered by the documentation due to the obvious time constraints. The system-specific documentation is supplied to the customer via e-mail in the desired language (standard is English/German, for other languages, see options for the documentation). The recipient's e-mail address must be specified with the order for this purpose. If option **D02** is selected at the same time, the documents are provided in the DXF format, otherwise they are sent in PDF format. In the e-mail, the recipient is also provided with a link for downloading general documentation which is not order-specific such as operating instructions, manual and commissioning guide.

D58, D60, D80, D91, D94
Documentation language

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

Note:

If a documentation option is not selected, the relevant documentation is supplied as standard in English/German.

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Options (continued)

E11 to E71
Individual certification of the converter

The individual certification of the converter by the relevant certification body contains the expansions described in option **M66**.

Order code	Description
E11	Individual certificate from Germanische Lloyd (GL)
E21	Individual certificate from Lloyds Register (LR)
E31	Individual certificate from Bureau Veritas (BV)
E51	Individual certificate from Det Norske Veritas (DNV)
E61	Individual certificate from American Bureau of Shipping (ABS)
E71	Individual certificate from Chinese Classification Society (CCS)

Note:

It is not possible to combine several individual certificates.

F03, F71, F75, F77, F97
Converter acceptance tests with the customer present

F72, F74, F76
Converter acceptance tests without the customer present

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

G20
CBC10 Communication Board

The CBC10 Communication Board is used to connect the CU320-2 Control Unit and thus the SINAMICS G150 to the CAN (Controller Area Network) protocol. The associated driver software fulfils the standards of the following CANopen specification of the CiA organization (CAN in Automation):

- Communication profiles according to DS 301
- Drive profile according to DSP 402 (in this case Profile Velocity Mode)
- EDS (Electronic Data Sheet) according to DSP 306
- Operational state signaling according to DSP 305

The CBC10 Communication Board is inserted into the option slot on the CU320-2 Control Unit. The CAN interface on the CBC10 has two SUB-D connections for input and output.

For a description of the CBC10 Communication Board, see SINAMICS G130 converter built-in units, Supplementary system components.

G33
CBE20 Communication Board

The CBE20 Communication Board is required when:

- A SINAMICS G130 or SINAMICS G150 converter, equipped with a CU320-2 DP (PROFIBUS) Control Unit, is to be connected to a PROFINET IO network
- SINAMICS Link is to be used to directly exchange data between several CU320-2 DP (PROFIBUS) or CU320-2 PN (PROFINET) Control Units without using a higher-level control system.

With the CBE20 Communication Board, a SINAMICS G130 or a SINAMICS G150 is a PROFINET IO device in the sense of PROFINET and offers the following functions:

- PROFINET IO device
- 100 Mbit/s full duplex
- Supports real-time classes of PROFINET IO:
  - RT (Real-Time)
  - IRT (Isochronous Real-Time), minimum send cycle 500 µs
- Connects to controllers as a PROFINET IO device according to the PROFIdrive profile
- Standard TCP/IP communication for engineering processes using the STARTER commissioning tool
- Integrated 4-port switch with four RJ45-B sockets based on PROFINET ASICs ERTEC400. The optimum topology (line, star, tree) can therefore be configured without additional external switches.

The CBE20 Communication Board is inserted into the option slot of the CU320-2 Control Unit.

For a description of the CBE20 Communication Board, see SINAMICS G130 converter built-in units, Supplementary system components.

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Options (continued)

G51
TM150 temperature sensor evaluation unit

The TM150 Terminal Module is a DRIVE-CLiQ component that is used to acquire and evaluate data from several temperature sensors. The temperature is measured in a temperature range from -99° C to +250° C for the following temperature sensors:

- Pt100 (with monitoring for wire breakage and short-circuit)
- Pt1000 (with monitoring for wire breakage and short-circuit)
- KTY84 (with monitoring for wire breakage and short-circuit)
- PTC (with monitoring for short-circuit)
- Bimetallic NC contact (without monitoring)

For the temperature sensor inputs, for each terminal block the evaluation can be parameterized for 1 × 2-wire, 2 × 2-wire, 3-wire or 4-wire. There is no galvanic isolation in the TM150 Terminal Module.

A maximum of 12 temperature sensors can be connected to the TM150 Terminal Module.

For a description of the TM150 Terminal Module, see SINAMICS G130 converter built-in units, Supplementary system components.

G60
TM31 Terminal Module

The TM31 Terminal Module is used to extend the customer terminals on the CU320-2 Control Unit.

The following additional interfaces are available:

- 8 digital inputs
- 4 bidirectional digital inputs/outputs
- 2 relay outputs with changeover contact
- 2 analog inputs
- 2 analog outputs
- 1 temperature sensor input (KTY84-130/PTC)
- 2 DRIVE-CLiQ sockets
- 1 connection for the electronics power supply via the 24 V DC supply connector
- 1 PE connection

To simplify configuration and commissioning of the drive, the optional TM31 Terminal Module can already be preset to a variety of factory settings, which can then be selected during commissioning.

For further information, please refer to the SINAMICS Low Voltage Engineering Manual.

For a description of the TM31 Terminal Module, see SINAMICS G130 converter built-in units, Supplementary system components.

G61
Additional TM31 Terminal Module

With option **G61**, the number of digital inputs/outputs, as well as the number of analog inputs/outputs in the drive system can be expanded using a second TM31 Terminal Module (in addition to the TM31 Terminal Module that can be selected using option **G60**).

Note:

Option **G61** requires option **G60**.

For a description of the TM31 Terminal Module, see SINAMICS G130 converter built-in units, Supplementary system components.

G62
TB30 Terminal Board

The TB30 Terminal Board is inserted into the option slot of the Control Unit and offers the possibility of expanding the CU320-2 Control Unit by four digital inputs/outputs each as well as two analog inputs/outputs each.

Note:

Option **G62** cannot be combined with options **G20** (CBC10 communication board) or **G33** (CBE20 communication board).

For a description of the TB30 Terminal Board, see SINAMICS G130 converter built-in units, Supplementary system components.

K01
Safety license for one axis

The Safety Integrated basic functions do not require a license. However, the Safety Integrated extended functions require a license for each axis equipped with safety functions. It is irrelevant which safety functions are used and how many. Option **K01** contains the license for one axis.

Subsequent licensing is possible in the Internet via the WEB License Manager by generating a license key:
www.siemens.com/automation/license

K50
SMC30 Sensor Module Cabinet-Mounted

The SMC30 Sensor Module Cabinet-Mounted can be used to evaluate the encoders of motors without a DRIVE-CLiQ interface. External encoders can also be connected via the SMC30.

The following encoder signals can be evaluated:

- Incremental encoders TTL/HTL with and without wire break detection (wire break detection is only available with bipolar signals)
- SSI encoders with TTL/HTL incremental signals
- SSI encoders without incremental signals

The motor temperature can also be measured using KTY84-130 or PTC thermistors.

For a description of the SMC30 Sensor Module Cabinet-Mounted, see SINAMICS G130 converter built-in units, Supplementary system components.

K51
VSM10 Voltage Sensing Module Cabinet-Mounted

The VSM10 Voltage Sensing Module is used to measure the voltage characteristic on the motor side, so that the following function can be implemented:

- Operation of a permanent-magnet synchronous motor without encoder with the requirement to be able to connect to a motor that is already running (flying restart function).
- Quick flying restart of large induction motors: The time for the demagnetization of the motor is eliminated through the measurement of the voltage.

For a description of the VSM10 Voltage Sensing Module Cabinet-Mounted, see SINAMICS G130 converter built-in units, Supplementary system components.

K52
Second SMC30 Sensor Module Cabinet-Mounted

With option **K50**, the converter cabinet contains an SMC30 Sensor Module Cabinet-Mounted. An additional SMC30 Sensor Module enables reliable actual-value acquisition when using Safety Integrated extended functions (requires a license: Option **K01**).

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Options (continued)

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

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

Note:

If there is no 230 V AC power supply in the plant, it is essential to select option **K74** in order to ensure proper functioning of the following SINAMICS G150 cabinet units:

- Type 6SL3710-2...
- Type 6SL3710-1... for options **B00, G61, K50, L13, L26 > 800 A, L57, L59, L60, L83, L84, L86** and **L87** for cabinet version A

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

K82
Terminal Module for controlling the Safe Torque Off and Safe Stop 1 safety functions

The Terminal Module is used to control the "Safety Integrated basic functions" with isolation

- Safe Torque Off (STO) and
- Safe Stop 1 (SS1) (time-controlled)

over a wide voltage range from DC/AC 24 V to 240 V (terminology according to IEC 61800-5-2).

As a consequence, the STO and SS1 safety functions can be flexibly controlled by the plant signal voltages.

The integrated safety functions, starting from the Safety Integrated (SI) input terminals of the components (Control Unit and Power Module), satisfy the requirements of EN 61800-5-2, EN 60204-1, DIN EN ISO 13849-1 Category 3 for Performance Level (PL) d and IEC 61508 SIL 2.

With option **K82**, the requirements specified in EN 61800-5-2, EN 60204-1, DIN EN ISO 13849-1 Category 3 for Performance Level (PL) d and IEC 61508 SIL 2 are fulfilled.

The Safety Integrated functions using option **K82** are only available in conjunction with certified components and software versions.

The Safety Integrated functions of SINAMICS are generally certified by independent institutes. An up-to-date list of certified components is available on request from your local Siemens office.

K87
TM54F Terminal Module

The TM54F Terminal Module is a terminal expansion module with safe digital inputs and outputs for controlling the Safety Integrated functions.

The TM54F provides four fail-safe digital outputs and ten fail-safe digital inputs. A fail-safe digital output consists of one 24 V DC switching output, one output switching to ground and one digital input to check the switching state. A fail-safe digital input consists of two digital inputs.

For a description of the TM54F Terminal Module, see SINAMICS G130 converter built-in units, Supplementary system components.

K88
SBA Safe Brake Adapter, 230 V AC

Safe Brake Control (SBC) is a safety function that is used in safety-related applications. In the no-current state, the brake acts on the drive motor using spring force. The brake is released when current flows in it (low active).

The SBA Safe Brake Adapter is installed in the converter cabinet in the factory. An infeed is connected to terminal -X12 on the SBA Safe Brake Adapter for the power supply. For control, a connection is also made between the SBA and the Control Interface Module in the factory using a cable harness.

On the plant side, to control the brake, a connection must be made between terminal -X14 on the SBA Safe Brake Adapter and the brake.

For a description of the SBA Safe Brake Adapter, see SINAMICS G130 converter built-in units, Supplementary system components.

K95
CU320-2 PN Control Unit (PROFINET)

Instead of the CU320-2 DP Control Unit (PROFIBUS) supplied as standard, the converter is supplied with a CU320-2 PN (PROFINET).

For a description of the CU320-2 Control Unit, see SINAMICS G130 converter built-in units, Supplementary system components.

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

To limit the **emitted interference**, the converters are equipped as standard with a radio interference suppression filter that conforms to the limits defined in Category C3. SINAMICS G150 converters equipped with a line filter also meet the limits for use in the first environment (Category C2) according to EN 61800-3 [1].

SINAMICS G150 units comply with the **noise immunity** requirements defined in this standard for the first and second environments.

In conjunction with line reactors, line filters also limit the conducted interference emitted by the Power Modules to the limit values of Category C2 defined in product standard EN 61800-3. For converter power ratings > 500 kW, option **L23** must also be ordered (not required when option **L01** has been selected).

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

[1] Applies to motor cable lengths < 100 m.

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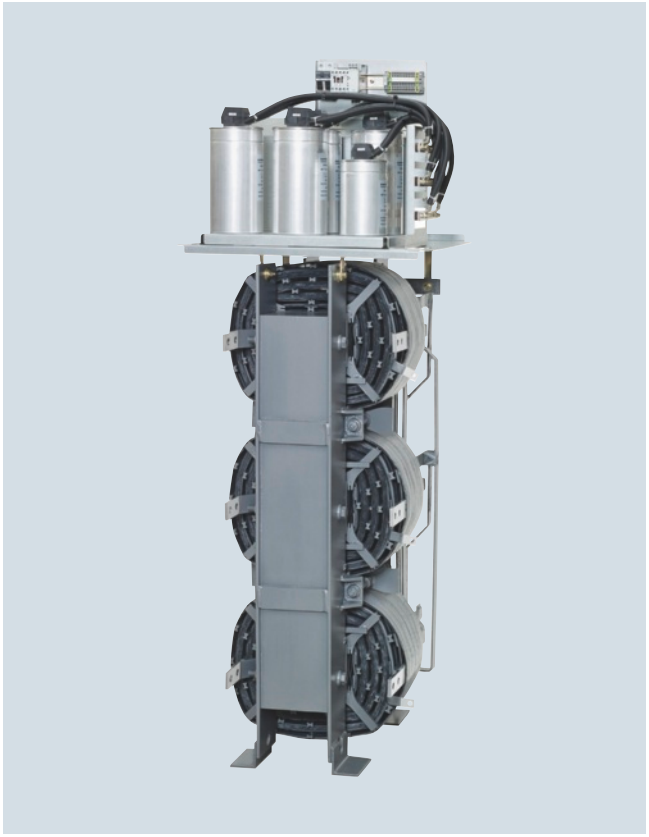
Options (continued)

L01
Clean Power version with integrated Line Harmonics Filter compact



Instead of the line reactor, a line harmonics filter is integrated in the control cabinet; this minimizes the harmonics that occur due to the principle of operation. As a consequence, the unit fully complies with the limit values stipulated in standard IEEE 519: 1992 without any exceptions (precondition: $u_k \leq 5\%$ or RSC ≥ 20).

Option **L01** always requires electrical separation from the line supply, this means for converters in a single circuit, for converter currents ≤ 800 A, option **L13** and for converter currents > 800 A, option **L26**. For converters with power units connected in parallel, electrical separation from the line supply is included as standard.

SINAMICS G150 Clean Power with integrated Line Harmonics Filter is available for power ratings up to 1500 kW in all available degrees of protection up to IP54 (see options M21 to M54).

Notice:

When using option **L01** on 60 Hz line supplies, a restricted voltage tolerance of +8% applies!

Note:

Option **L01** is not available for converters > 1500 kW with power units connected in parallel and cannot be combined with the following options:

- **L22** (without line reactor)
- **L23** (line reactor u_k = 2%)
- **M66** (marine version)

Power loss, width and weight of the SINAMICS G150 Clean Power converter cabinet units

SINAMICS G150 Clean Power 6SL3710-...	Type rating	Power loss at 50 Hz/60 Hz [1]	Width	Weight
Z = +L01	kW	kW	mm	kg
380 ... 480 V 3 AC				
1GE32-1AA3-Z	110	5.36/4.52	1200	685
1GE32-6AA3-Z	132	6.26/5.34	1200	685
1GE33-1AA3-Z	160	7.38/6.57	1200	940
1GE33-8AA3-Z	200	8.28/7.17	1400	940
1GE35-0AA3-Z	250	10.03/9.01	1400	955
1GE36-1AA3-Z	315	12.77/12.2	1800	1115
1GE37-5AA3-Z	400	15.22/14.5	1800	1170
1GE38-4AA3-Z	450	15.72/15	1800	1200
1GE41-0AA3-Z	560	22.07/21.45	2200	1580
2GE41-1AA3-Z	630	25.34/24.4	3600	2430
2GE41-4AA3-Z	710	30.24/29	3600	2550
2GE41-6AA3-Z	900	31.14/30	3600	2970
500 ... 600 V 3 AC				
1GF31-8AA3-Z	110	6.93/6.5	1200	705
1GF32-2AA3-Z	132	7.33/6.9	1200	705
1GF32-6AA3-Z	160	9.68/8.95	1200	755
1GF33-3AA3-Z	200	10.78/9.95	1200	755
1GF34-1AA3-Z	250	13.97/13.1	1800	1130
1GF34-7AA3-Z	315	13.67/13.9	1800	1130
1GF35-8AA3-Z	400	16.07/16.2	1800	1270
1GF37-4AA3-Z	500	19.32/19.6	2200	1730
1GF38-1AA3-Z	560	20.72/20.9	2200	1730
2GF38-6AA3-Z	630	27.14/27.8	3600	2460
2GF41-1AA3-Z	710	31.94/32.4	3600	2460
2GF41-4AA3-Z	1000	37.04/39.2	4400	3780
660 ... 690 V 3 AC				
1GH28-5AA3-Z	75	3.71	1200	655
1GH31-0AA3-Z	90	4.11	1200	655
1GH31-2AA3-Z	110	4.96	1200	695
1GH31-5AA3-Z	132	5.06	1200	695
1GH31-8AA3-Z	160	6.93	1200	935
1GH32-2AA3-Z	200	7.33	1200	935
1GH32-6AA3-Z	250	9.68	1200	975
1GH33-3AA3-Z	315	10.78	1200	975
1GH34-1AA3-Z	400	13.97	1800	1150
1GH34-7AA3-Z	450	14.97	1800	1150
1GH35-8AA3-Z	560	18.17	1800	1250
1GH37-4AA3-Z	710	20.12	2200	1900
1GH38-1AA3-Z	800	21.32	2200	1940
2GH41-1AA3-Z	1000	36.04	3600	2560
2GH41-4AA3-Z	1350	39.84	4400	3780
2GH41-5AA3-Z	1500	42.24	4400	3860

[1] Associated voltages for 50 Hz/60 Hz, see Section Technical specifications.

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Options (continued)

L07
dv/dt filter compact plus Voltage Peak Limiter

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

- < 1150 V at U_{line} < 575 V
- < 1400 V at 660 V < U_{line} < 690 V

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

By using a dv/dt filter compact plus VPL, standard motors with standard insulation and without insulated bearings can be used with supply voltages up to 690 V in converter operation.

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

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

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

Notice:

- Operation with output frequencies < 10 Hz is permissible for max. 5 min.
- The maximum permissible output frequency is 150 Hz.

The appropriate information in the SINAMICS Low Voltage Engineering Manual should also be carefully observed.

Note:

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

- **L08** (motor reactor)
- **L10** (dv/dt filter plus VPL)
- **L15** (sine-wave filter)
- **M78** (motor connection from above)

L08
Motor reactor

Motor reactors reduce the voltage load on the motor windings by reducing the voltage gradients at the motor terminals that occur during converter operation. At the same time, the capacitive charge/discharge currents that place an additional load on the converter output when long motor cables are used, are reduced. The maximum permissible output frequency when a motor reactor is used is 150 Hz.

Motor reactors are designed for the following maximum motor cable lengths:

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

Note:

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

- **L07** (dv/dt filter compact plus VPL)
- **L10** (dv/dt filter plus VPL)
- **L15** (sine-wave filter)
- **M78** (motor connection from above)

L10
dv/dt filter plus Voltage Peak Limiter

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

- < 1000 V at U_{line} < 575 V
- < 1250 V at 660 V < U_{line} < 690 V

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

Depending on the converter output rating, option **L10** can be accommodated in the converter cabinet unit or an additional cabinet of 400 mm or 600 mm width is required.

Voltage range	Installation of the dv/dt filter plus VPL within the converter cabinet unit	Installation of the dv/dt filter plus VPL in an additional cabinet
V	kW	kW
380 ... 480	110 ... 250	315 ... 900
500 ... 600	110 ... 200	250 ... 1000
660 ... 690	75 ... 315	400 ... 2700

By using a dv/dt filter plus VPL, standard motors with standard insulation and without insulated bearings can be used with supply voltages up to 690 V in converter operation.

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

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

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

The appropriate information in the SINAMICS Low Voltage Engineering Manual should also be carefully observed.

Note:

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

- **L07** (dv/dt filter compact plus VPL)
- **L08** (motor reactor)
- **L15** (sine-wave filter)
- **M78** (motor connection from above)

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Options (continued)

L13
Line contactor (for currents ≤ 800 A for single connection)

SINAMICS G150 converter cabinet units in a single connection do not have a line contactor as standard. Option **L13** is required if a switching element is required for disconnecting the cabinet from the supply (required for EMERGENCY OFF). The contactor is controlled and powered inside the converter. For devices with rated input currents > 800 A in single connection, the function of option **L13** is provided by option **L26**.

Note:

For converters with power units connected in parallel, the line contactor is included as standard.

Terminal -X50:	Meaning
4	Checkback contact (NO contact), contactor closed
5	Checkback contact (NC contact), contactor closed
6	Common potential

L15
Sine-wave filter

Sine-wave filters are available in the voltage range 380 V to 480 V up to a type rating of 250 kW, and in the voltage range 500 V to 600 V up to a type rating of 132 kW.

The sine-wave filter at the converter output supplies almost perfect sinusoidal voltages to the motor so that standard motors can be used without special insulation and without insulated bearings. The sine-wave filter also reduces the converter-related supplementary motor noise. The maximum permissible motor supply cable length is limited to 300 m.

Notice:

In conjunction with the option **L15**, the pulse frequency of the converter must be increased. This reduces the power available at the converter output (for the derating factor, see SINAMICS Low Voltage Engineering Manual). The modulation depth of the output voltage decreases to approx. 85% (380 V to 480 V) or approx. 83% (500 V to 600 V). The maximum output frequency is 150 Hz (for 380 V to 480 V) or 115 Hz (for 500 V to 600 V). It should be noted that the reduced voltage at the motor terminals compared to the rated motor voltage means that the motor switches to field weakening mode earlier.

Note:

Option **L15** cannot be combined with the following options:

- **L07** (dv/dt filter compact plus VPL)
- **L08** (motor reactor)
- **L10** (dv/dt filter plus VPL)
- **M78** (motor connection from above)

L19
Connection for external auxiliary equipment

An outgoing, controlled feeder fused with max. 10 A for external auxiliary equipment (e.g. motor external fan).

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

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

Terminal -X155:	Meaning	Range
1	L1	380 ... 690 V AC
2	L2	380 ... 690 V AC
3	L3	380 ... 690 V AC
11	Contactor control	230 V AC
12	Contactor control	230 V AC
13	Feedback signal, circuit breaker	230 V AC / 0.5 A; 24 V DC / 2 A
14	Feedback signal, circuit breaker	230 V AC / 0.5 A; 24 V DC / 2 A
15	Feedback signal, contactor	230 V AC / 6 A
16	Feedback signal, contactor	230 V AC / 6 A
PE	PE	

L21
Surge suppression

In ungrounded IT systems, the line voltage is not permanently connected to the ground potential because of the missing ground connection of the supply network. Therefore, when a ground fault occurs during operation, a voltage against ground increased by a factor of 2 can occur. For this reason, it is recommended that a surge suppression against ground be installed for operation on IT systems. The surge suppression option includes the installation of line-side surge arresters and upstream fuses for each system phase. The signaling contacts of the surge arresters are connected in series for the monitoring and connected to a customer interface.

Note:

Option **L21** does not include the installation of an insulation monitor for the IT system. An insulation monitor should always be ordered separately as option **L87** when the supplying IT system is not monitored at another position (e.g. at the transformer outgoing feeder). Only one insulation monitor can be used in each galvanically coupled network.
Option **L21** also does not include the factory-side removal of the metal bracket which establishes the connection to ground of the radio interference suppression filter installed as standard. The metal bracket should therefore be removed during the installation or commissioning of the converter if the device is to be operated on an ungrounded IT system.

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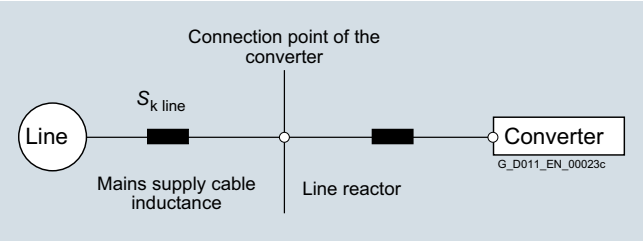
Options (continued)

L22
Scope of delivery without line reactor (for converters ≤ 500 kW)
L23
Line reactor u_k = 2% (for converters > 500 kW)

The line reactor is included as standard in converters up to 500 kW. For converter power ratings > 500 kW, including the parallel connections, the line reactor (u_K = 2%) is optionally available, as in this power range, the converter is often connected to the medium-voltage line supply via transformers that are adapted to the converter rating.

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

RSC = Relative Short-Circuit power: Ratio of short-circuit power $S_{K\ line}$ at the supply connection point to fundamental apparent output S_{conv} of the connected converters (according to EN 50178/VDE 0160).

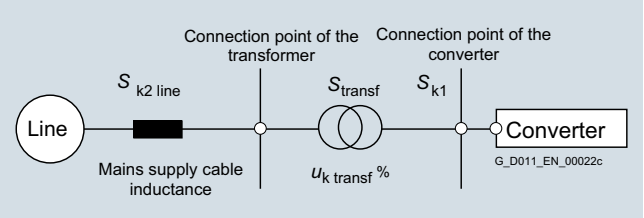


The following applies for SINAMICS G150 converter cabinet units:

Type rating	**Line reactor can be omitted**		**Line reactor required**	
kW	For RSC	Order code (option)	For RSC	Order code (option)
<200	≤43	**L22**	>43	–
200 ... 500	≤33	**L22**	>33	–
≥500	≤20	–	>20	**L23**

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

The line reactor can only be omitted (option **L22**) if the values for RSC are lower than those shown in the table. This is the case, as shown in the following diagram, when the converter is connected to the line supply via a transformer with the appropriate rating.



As high-rating converters are usually connected to medium-voltage supply systems via transformers to reduce their harmonic effects on the supply, cabinet units over 500 kW are not equipped with line reactors as standard.

A line reactor (option **L23**) is always required when

- For cabinet units > 500 kW, the RSC ratio is > 20, or
- Several converters are connected to the same line connection point
- For cabinet units in a parallel connection, the line supply is not fed-in through a three-winding transformer, or
- A line filter is used

For further information, please refer to the SINAMICS Low Voltage Engineering Manual.

Note:

When option **L01** is selected, a line reactor is not required (options **L22**/**L23** and **L01** cannot be combined).

L26
Main switch incl. fuses or circuit breakers

A switch disconnector with fuses is available as main switch for converters in single connection with ratings up to 800 A. With currents above 800 A, a circuit breaker is used instead of a switch disconnector. The circuit breaker is controlled and supplied within the converter.

Option L26 is included as standard for converters with power units connected in parallel and a rated input current of ≥ 1500 A. Circuit breakers are installed in this case. For rated input currents < 1500 A, by selecting option **L26**, main switches including fuses are installed in addition to the line contactors provided as standard.

L45
EMERGENCY OFF pushbutton installed in the cabinet door

Option **L45** only includes the EMERGENCY OFF pushbutton. This is fitted with a protective collar in the cabinet door of the converter. The contacts of the pushbutton are brought out and connected to a terminal block. The EMERGENCY OFF functions, Category 0 or 1, can be activated in conjunction with options **L57**, **L59** and **L60** .

Notice:

By pressing the EMERGENCY OFF pushbutton, in compliance with IEC 60204-1 (VDE 0113), the motor is stopped – either uncontrolled or controlled depending on the selected Category 0 or 1 – and the converter disconnected from the line supply. Auxiliary voltages such as the supply for an external fan or anti-condensation heating may still be present. Certain areas within the converter also remain live (under voltage), such as the control or auxiliary equipment. If complete disconnection of all voltages is required, the EMERGENCY OFF pushbutton must be incorporated into a protective system to be implemented by the customer. For this purpose, an NC contact is provided at terminal -X120.

The EMERGENCY OFF button is preconfigured at the factory only when one of the options **L57** to **L60** is selected simultaneously. Additional wiring must be provided at the plant.

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Options (continued)

L50
Cabinet lighting with service socket

With option **L50**, cabinet lighting is included with an additional service socket for a SCHUKO connector (connector type F) according to CEE 7/4. The power supply for the cabinet lighting and the service socket is external and must be fuse-protected for max. 10 A.

The cabinet lighting consists of an LED hand lamp with On/Off switch and with magnetic fasteners on an approx. 3 m long connecting cable. The lamp is factory-positioned in the cabinet door at a defined marking, and the connecting cable is wound on the associated mount.

L55
Anti-condensation heating for cabinet

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

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

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

L57
EMERGENCY OFF Category 0, 230 V AC or 24 V DC

EMERGENCY OFF Category 0 for uncontrolled stopping according to EN 60204-1.

The function includes interrupting the power supply for the converter via the line contactor and bypassing the microprocessor controller using a safety combination according to EN 60204-1. The motor coasts to a standstill. When delivered, the pushbutton circuit is preset to 230 V AC. Jumpers must be appropriately set when using 24 V DC.

Notice:

Option **L57** always requires electrical separation from the line supply, this means for converters in a single circuit, for converter currents ≤ 800 A, option **L13** and for converter currents > 800 A, option **L26**. For converters with power units connected in parallel, electrical separation from the line supply is included as standard.

Terminal -X120:	Meaning
7	Loop in the EMERGENCY OFF pushbutton from the plant side; remove jumper 7-8!
8	Loop in the EMERGENCY OFF pushbutton from the plant side; remove jumper 7-8!
15	"On" for monitored start; remove jumper 15-16!
16	"On" for monitored start; remove jumper 15-16!
17	Checkback signal, "Safety combination has tripped"
18	Checkback signal, "Safety combination has tripped"

L59
EMERGENCY STOP Category 1, 230 V AC

EMERGENCY STOP Category 1 for controlled stopping according to EN 60204-1.

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

In order to maintain the specified stopping times, it may be necessary to use a braking unit.

Notice:

Option **L59** always requires electrical separation from the line supply, this means for converters in a single circuit, for converter currents ≤ 800 A, option **L13** and for converter currents > 800 A, option **L26**. For converters with power units connected in parallel, electrical separation from the line supply is included as standard.

Terminal -X120:	Meaning
7	Loop in the EMERGENCY OFF pushbutton from the plant side; remove jumper 7-8!
8	Loop in the EMERGENCY OFF pushbutton from the plant side; remove jumper 7-8!
15	"On" for manual start; remove jumper 15-16!
16	"On" for manual start; remove jumper 15-16!
17	Checkback signal, "Safety combination has tripped"
18	Checkback signal, "Safety combination has tripped"

L60
EMERGENCY STOP Category 1, 24 V DC

EMERGENCY STOP Category 1 for controlled stopping according to EN 60204-1.

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

In order to maintain the specified stopping times, it may be necessary to use a braking unit.

Notice:

Option **L60** always requires electrical separation from the line supply, this means for converters in a single circuit, for converter currents ≤ 800 A, option **L13** and for converter currents > 800 A, option **L26**. For converters with power units connected in parallel, electrical separation from the line supply is included as standard.

Terminal -X120:	Meaning
7	Loop in the EMERGENCY OFF pushbutton from the plant side; remove jumper 7-8!
8	Loop in the EMERGENCY OFF pushbutton from the plant side; remove jumper 7-8!
15	"On" for manual start; remove jumper 15-16!
16	"On" for manual start; remove jumper 15-16!
17	Checkback signal, "Safety combination has tripped"
18	Checkback signal, "Safety combination has tripped"

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Options (continued)

L61, L62
Braking units

Braking units may be required for drives in which motors might operate in generator mode, but have no facility for feeding energy back into the supply system.

The braking unit comprises two components:

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

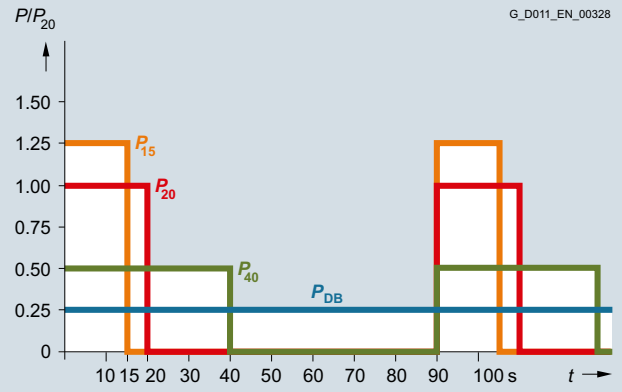
The braking unit functions as an autonomous unit, and does not require an external power supply. The braking energy is converted into heat in the braking resistor that must be mounted externally.

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

The braking resistor is connected to terminal block –X5 on the converter cabinet unit:

Terminal -X5:	Meaning
1	Braking resistor connection
2	Braking resistor connection

Characteristic curves



P_{DB} = Rated power
P_{15} = 5 x P_{DB} = Power which is permissible every 90 s for 15 s
P_{20} = 4 x P_{DB} = Power which is permissible every 90 s for 20 s
P_{40} = 2 x P_{DB} = Power which is permissible every 90 s for 40 s

Load diagram for Braking Modules and braking resistors

Information about possible duty cycles of the braking units and other configuration notes are contained in the SINAMICS Low Voltage Engineering Manual.

The following braking units are available for SINAMICS G150 converters – depending on the converter type:

Option	SINAMICS G150 converter cabinet units	Braking Module				Braking resistor R_B
	Type rating	P_{DB}	P_{40}	P_{20}	P_{15}	
	kW	kW	kW	kW	kW	Ω
380 ... 480 V 3 AC						
L61	110 ... 132	25	50	100	125	4.4 ±7.5 %
L62	160 ... 900	50	100	200	250	2.2 ±7.5 %
3500 ... 600 V AC						
L62	110 ... 1000	50	100	200	250	3.4 ±7.5 %
660 ... 690 V 3 AC						
L61	75 ... 132	25	50	100	125	9.8 ±7.5 %
L62	160 ... 2700	50	100	200	250	4.9 ±7.5 %

P_{DB}: Rated power (continuous braking power)
P_{40}: 40 s power in relation to a braking interval of 90 s
P_{20}: 20 s power in relation to a braking interval of 90 s
P_{15}: 15 s power in relation to a braking interval of 90 s

A second 50 kW braking unit can be used in converters with power units connected in parallel in order to increase the braking power. In this case, a Braking Module is assigned to each braking resistor. You can order a second braking unit by selecting option **L62** twice.

If more braking power is required than provided by the braking units listed here, then braking units may be connected in parallel for higher converter outputs (on request).
For further information, please refer to the SINAMICS Low Voltage Engineering Manual.

L76
Quick start (for option L01)

If **L01** (line harmonics filter) is in use, after the converter has been switched off, as a result of the principle of operation, a waiting period of at least 30 seconds must be allowed to elapse before switching on again. With option **L76**, the wait time is shortened to approx. 3 s.

L83
Thermistor motor protection device (alarm)

Thermistor motor protection device for PTC thermistors (PTC resistors, type A) for alarm. The thermistor motor protection device is supplied with power and evaluated internally in the converter.

Terminal -F127:	Meaning
T1	Sensor circuit connection
T2	Sensor circuit connection

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Options (continued)

L84
Thermistor motor protection device (trip)

Thermistor motor protection device for PTC thermistors (PTC resistors, type A) for trip. The thermistor motor protection device is supplied with power and evaluated internally in the converter.

Terminal -F125:	Meaning
T1	Sensor circuit connection
T2	Sensor circuit connection

L86
Pt100 evaluation unit

The Pt100 evaluation unit can monitor up to six sensors. The sensors can be connected using a two-wire or three-wire system. The limit values can be freely programmed for each channel.

In the factory setting, the measuring channels are subdivided into two groups, each with three channels. With motors, for example, this means that three Pt100s in the stator windings and two Pt100s in the motor bearings can be monitored. Unused channels can be hidden via parameters.

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

L87
Insulation monitoring

An insulation monitor must be used if the converter is connected to an ungrounded line supply. The device monitors the entire galvanically coupled circuit for insulation faults.

An alarm is output in the event of a fault.

Notice:

Only **one** insulation monitor can be used in each galvanically coupled network.

As there are different response strategies when a ground fault occurs in an ungrounded system, output relays of the insulation monitor are provided for integration in a plant-side control. It is also possible to integrate the outputs into the converter monitoring system on the plant side.

Terminal -A1-A101:	Meaning
11	Signaling relay ALARM 1
12	Signaling relay ALARM 1
14	Signaling relay ALARM 1
21	Signaling relay ALARM 2
22	Signaling relay ALARM 2
24	Signaling relay ALARM 2
M+	External kΩ display, 0 – 400 µA
M-	External kΩ display, 0 – 400 µA
R1	External reset button (NC contact or wire jumper, otherwise the error message is not stored)
R2	External reset button (NC contact or wire jumper)
T1	External test button
T2	External test button

Insulation monitoring can be supplied on request for converter cabinet units with power units connected in parallel.

M06
Base 100 mm high, RAL 7022

The additional cabinet base allows larger bending radii for cables (cable inlet from below) and enables them to be routed within the cabinet base.

The cabinet base is supplied in RAL 7022 as standard. A special paint finish is not available for the base. It is delivered completely assembled with the cabinet. The height of the operator panel changes accordingly.

M07
Cable marshalling space 200 mm high, RAL 7035

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

Note:

The cable compartment is painted as standard with RAL 7035. If a special color is requested for the cabinet (order code **Y09**), the cable-marshaling space is also painted in this color.

M13
Line connection from above

The control cabinet is provided with an additional roof section to allow a line connection from above. The connection lugs for the power cables, the clamping bar for mechanically securing the cables, an EMC shield bus, and a PE busbar are located within this roof section.

This increases the cabinet height by 405 mm. The busbars for the connection from above are delivered completely pre-installed. For transport reasons, the roof sections are delivered separately and must be fitted on site. Crane transport assemblies (option **M90**) can still be used.

However, they must be removed on site before the roof sections can be installed. Use of rope spreaders should be considered in the case of small crane hook heights.

An undrilled aluminum mounting plate (5 mm thick) is provided in the roof section for feeding in the cables. Depending on the number of cables and the cross-sections used, holes for attaching cable glands for feeding in the cables must be drilled in this mounting plate on site.

Notice:

The control cables are still connected from below. When option **M13** is selected, the standard line connection from below is omitted.

The degree of protection of the roof sections is IP21. In combination with options **M23, M43** and **M54** , additional plastic ventilation grilles and filter elements are provided.

Note:

The roof sections are painted in RAL 7035 as standard. If a special color is requested for the cabinet (order code **Y09**), the roof sections are also painted in this color. Ventilation grilles used with IP23, IP43 and IP54 degrees of protection are in RAL 7035 and cannot be painted.

Option **M13** is not available for converters > 1500 kW with power units connected in parallel.

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Options (continued)

M21
Degree of protection IP21

Cabinet version in IP20, but with additional top cover or canopy. This increases the cabinet height by 250 mm.

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

Note:

The top covers or canopies are painted in RAL 7035 as standard. If a special color is requested for the cabinet (order code **Y09**), the top covers or canopies will also be painted this color.

M23/M43/M54
Degree of protection IP23/IP43/IP54

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

For transport reasons, the roof sections are delivered separately and must be fitted on site.

Note:

The roof sections are painted in RAL 7035 as standard. If a special color is requested for the cabinet (order code **Y09**), the roof sections are also painted in this color. The molded plastic parts (e.g. ventilation grilles) are in RAL 7035 and cannot be painted.

M66
Marine version

For compliance with the requirements of the classification institutes:

- Lloyds Register
- American Bureau of Shipping
- Germanischer Lloyd
- Bureau Veritas
- Det Norske Veritas
- Chinese Classification Society

This option includes a strengthened mechanical version of the cabinet, handles (handrail) below the operator panel and mechanical locking of the cabinet doors. The cabinet has degree of protection IP23 (option **M23**) and includes a cabinet anti-condensation heater (option **L55**). To attach the converter to the ship's deck, a welding frame (5 mm high) is supplied separately.

Option **M66** is not available for converters > 1500 kW with power units connected in parallel.

Note:

A combination with options **M21, M23** and **L01** or **L55** is not possible. If the converter is used for a safety-relevant drive on a ship, then individual certification is also required (see options E11 to E71) – these include option **M66**.

M70
EMC shield bus (cable connection from below)

The EMC shield bus is used to connect shielded line and motor supply cables. The EMC shield bus is included as standard with option **L00** (RFI suppression filter).

M75
PE busbar (cable connection from below)

The PE busbar is used to connect and secure PE cables. The PE busbar is contained as standard in version A. For version C, the PE busbar can be ordered separately as option **M75**.

M78
Motor connection from above

The control cabinet is provided with an additional roof section for a motor connection from above. The connection lugs for the power cables, the clamping bar for mechanically securing the cables, an EMC shield bus, and a PE busbar are located within this roof section.

This increases the cabinet height by 405 mm. The busbars for the connection from above are delivered completely pre-installed. For transport reasons, the roof sections are delivered separately and must be fitted on site. Crane transport assemblies (option **M90**) can still be used. However, they must be removed on site before the roof sections can be installed.

An undrilled aluminum mounting plate (5 mm thick) is provided in the roof section for feeding in the cables. Depending on the number of cables and the cross-sections used, holes for attaching cable glands for feeding in the cables must be drilled in this mounting plate on site.

Notice:

The control cables are still connected from below. When option **M78** is selected, the standard motor connection from below is omitted. A combination with motor-side options **L07**, **L08, L10** and **L15** is not possible. If option **L61** or **L62** is selected at the same time as option **M78**, the braking-resistor should also be connected from above.

The degree of protection of the roof sections is IP21. In combination with options **M23, M43** and **M54** , additional plastic ventilation grilles and filter elements are provided.

Note:

The roof sections are painted in RAL 7035 as standard. If a special color is requested for the cabinet (order code **Y09**), the roof sections are also painted in this color. Ventilation grilles used with IP23, IP43 and IP54 degrees of protection are in RAL 7035 and cannot be painted.
Option **M78** is not available for converters > 1500 kW with power units connected in parallel

M90
Crane transport assembly (top-mounted)

For single cabinets up to a width of 600 mm, the crane transport assembly consists of transport eyebolts. For cabinet widths of 800 mm and wider, transport rails are used.

Rope spreaders should be used for low crane hook heights.

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Options (continued)

M91
Marking of all control cable conductor ends

When this option is selected, all control cables or conductor ends (including all customer-specific options) are labeled throughout the cabinet.

T58, T60, T80, T85, T91
Rating plate data

The standard version of the rating plate is in English/German.

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

Order code	Rating plate language
T58	English/French
T60	English/Spanish
T80	English/Italian
T85	English/Russian
T91	English/Chinese

Y09
Special cabinet paint finish

The converter cabinet units are delivered in RAL7035 as standard. The special paint finish must be specified in plain text when ordering. All RAL colors which are available as powder coatings can be selected.

Note:

If options such as cable marshalling space (order code **M07**), top covers or canopies (order code **M21**), roof sections (order codes **M23/M43/M54**) or cable connection from above (order codes **M13/M78**) are ordered for the converter cabinet units, they will also be supplied in the paint finish specified in the order. The molded plastic parts (e.g. ventilation grilles) are in RAL 7035 and cannot be painted.

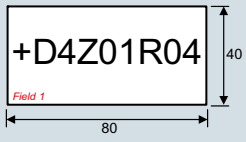
Y31
One-line label for system identification, 40 × 80 mm

Resopal labels (white with black lettering) for identifying the control cabinets are available. The labels are stuck to the cabinet door.

Dimensions H × W: 40 × 80 mm

The text must be specified in plain text when ordering.

Field 1: Max. 9 characters, font size 10 mm.



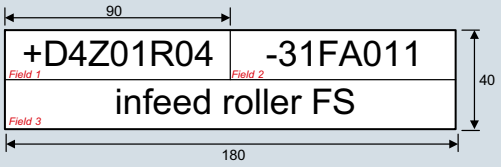
Y32
Two-line label for system identification, 40 × 180 mm

Resopal labels (white with black lettering) for identifying the control cabinets are available. The labels are stuck to the cabinet door.

Dimensions H × W: 40 × 180 mm

The text must be specified in plain text when ordering.

Field 1: Max. 9 characters, font size 10 mm
Field 2: Max. 9 characters, font size 10 mm
Field 3: Max. 20 characters, font size 10 mm.



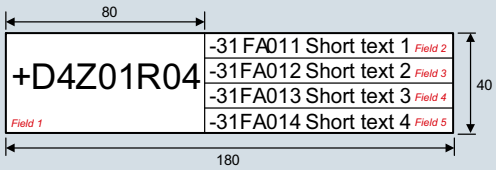
Y33
Four-line label for system identification, 40 × 180 mm

Resopal labels (white with black lettering) for identifying the control cabinets are available. The labels are stuck to the cabinet door.

Dimensions H × W: 40 × 180 mm

The text must be specified in plain text when ordering.

Field 1: Max. 9 characters, font size 10 mm
Field 2: Max. 20 characters, font size 6 mm
Field 3: Max. 20 characters, font size 6 mm
Field 4: Max. 20 characters, font size 6 mm
Field 5: Max. 20 characters, font size 6 mm



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Technical specifications

The most important directives and standards are listed below. These are used as basis for the SINAMICS G150 converter cabinet units and they must be carefully observed to achieve an EMC-compliant configuration that is safe both functionally and in operation.

European directives	
2006/95/EC	Low-voltage directive: Directive of the European Parliament and Council of December 12, 2006, on the approximation of the laws of the member states relating to electrical equipment designed for use within certain voltage limits
2006/42/EC	Machinery directive: Directive of the European Parliament and Council of May 17, 2006 on machinery and for changing Directive 95/16/EC (amendment)
2004/108/EC	EMC directive: Directive of the European Parliament and Council of December 15, 2004, which repeals directive 89/336/EEC, on the approximation of laws of the member states relating to electromagnetic compatibility
European standards	
EN ISO 3744	Acoustics – Determination of the sound power level and sound energy level for noise sources that result from sound pressure measurements – envelope surface procedure of the accuracy class 2 for a largely free sound field over a reflecting plane
EN ISO 13849-1	Safety of machinery – Safety-related parts of control systems Part 1: General design principles (ISO 13849-1:2006) (replaced EN 954-1)
EN 60146-1-1	Semiconductor converters – General requirements and line-commutated converters Part 1-1: Specification of basic requirements
EN 60204-1	Electrical equipment of machines Part 1: General definitions
EN 60529	Degrees of protection provided by enclosures (IP code)
EN 61508-1	Functional safety of electrical/electronic/programmable electronic safety-related systems Part 1: General requirements
EN 61800-2	Adjustable speed electrical power drive systems Part 2: General requirements – Rating specifications for the measurement of low-voltage adjustable frequency AC power drive systems
EN 61800-3	Adjustable speed electrical power drive systems Part 3: EMC product standard including special test procedure
EN 61800-5-1	Adjustable speed electrical power drive systems Part 5: Safety requirements Main section 1: Electrical and thermal requirements
EN 61800-5-2	Adjustable speed electrical power drive systems Part 2: Safety requirements – Functional safety (IEC 61800-5-2:2007)

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Technical specifications (continued)

General technical specifications

Electrical specifications		Single connection	Parallel connection
Line voltages and power ranges	• 380 ... 480 V 3 AC ±10% (-15% < 1 min)	110 ... 560 kW	630 ... 900 kW
	• 500 ... 600 V 3 AC ±10% (-15% < 1 min)	110 ... 560 kW	630 ... 1000 kW
	• 660 ... 690 V 3 AC ±10% (-15% < 1 min)	75 ... 800 kW	1000 ... 2700 kW
Line system configurations	Grounded TN/TT systems or ungrounded IT systems (a grounded line conductor is not permissible in 690 V line supplies)		
Line frequency	47 ... 63 Hz		
Output frequency	0 ... 550 Hz[1]		
Line power factor			
- Fundamental	> 0.96		
- Total	0.75 ... 0.93		
Efficiency	> 98%		
Overvoltage category	III according to EN 61800-5-1		
Control method	Vector control with and without encoder or V/f control		
Fixed speeds	15 fixed speeds plus 1 minimum speed, parameterizable (in the default setting, 3 fixed setpoints plus 1 minimum speed are selectable using terminal block / PROFIBUS)		
Speed ranges that can be skipped	4, parameterizable		
Setpoint resolution	0.001 rpm digital 12-bit analog		
Braking operation	Optional via braking unit		
Mechanical specifications			
Degree of protection	IP20 (higher degrees of protection up to IP54 optional)		
Protection class	I according to EN 61800-5-1		
Touch protection	EN 50274 / BGV A3 when used for the intended purpose		
Cabinet system	Rittal TS8, doors with double-bit key, three-section base plates for cable entry		
Paint finish	RAL 7035 (indoor requirements)		
Cooling method	Forced air cooling AF according to EN 60146		
Ambient conditions	**Storage**	**Transport**	**Operation**
Ambient temperature	-25 ... +55° C	-25 ... +70° C as of -40° C for 24 hours	0 ... +40° C to +50° C see derating data
Relative humidity (condensation not permissible)	5 ... 95%	5 ... 95% at 40° C	5 ... 95%
	Class 1K4 according to EN 60721-3-1	Class 2K3 according to EN 60721-3-2	Class 3K3 according to EN 60721-3-3
Environmental class / harmful chemical substances	Class 1C2 according to EN 60721-3-1	Class 2C2 according to EN 60721-3-2	Class 3C2 according to EN 60721-3-3
Organic/biological influences	Class 1B1 according to EN 60721-3-1	Class 2B1 according to EN 60721-3-2	Class 3B1 according to EN 60721-3-3
Degree of pollution	2 according to EN 61800-5-1		
Installation altitude	Up to 2000 m above sea level without derating; > 2000 m see derating data		
Mechanical stability	**Storage**	**Transport**	**Operation**
Vibratory load			
- Deflection	1.5 mm at 5 ... 9 Hz	3.1 mm at 5 ... 9 Hz	0.075 mm at 10 ... 58 Hz
- Acceleration	5 m/s^2 at > 9 ... 200 Hz	10 m/s^2 at > 9 ... 200 Hz	10 m/s^2 at > 58 ... 200 Hz
	Class 1M2 according to EN 60721-3-1	Class 2M2 according to EN 60721-3-2	–
Shock load			
- Acceleration	40 m/s^2 for 22 ms	100 m/s^2 for 11 ms	100 m/s^2 for 11 ms
	Class 1M2 according to EN 60721-3-1	Class 2M2 according to EN 60721-3-2	Class 3M4 according to EN 60721-3-3
Compliance with standards			
CE marking	According to EMC Directive No. 2004/108/EC and Low Voltage Directive No. 2006/95/EC and Machinery Directive No. 2006/42/EC for functional safety		
Radio interference suppression	The SINAMICS G150 converter systems are not designed for connection to the public power network ("first environment"). Radio interference suppression is compliant with the EMC product standard for variable-speed drives EN 61800-3, "Second environment" (industrial networks). EMC disturbances can occur when connected to the public power networks. However, if supplementary measures are taken (e.g. line filter, see option **L00**) operation in the "first environment" is possible. [2]		

Deviations from the specified classes are underlined.

[1] The output frequency is also affected by the selected control method and the pulse frequency. For further information, please refer to the SINAMICS Low Voltage Engineering Manual.

[2] Applies to motor cable lengths < 100 m.

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Technical specifications (continued)

Technical specifications for single connection

Line voltage 380 ... 480 V 3 AC		SINAMICS G150 converter cabinet units 6SL3710-1GE..-....								
Single connection		**32-1.A3**	**32-6.A3**	**33-1.A3**	**33-8.A3**	**35-0.A3**	**36-1.A3**	**37-5.A3**	**38-4.A3**	**41-0.A3**
Type rating										
• For I_L at 50 Hz 400 V [1]	kW	**110**	**132**	**160**	**200**	**250**	**315**	**400**	**450**	**560**
• For I_H at 50 Hz 400 V [1]	kW	90	110	132	160	200	250	315	400	450
• For I_L at 60 Hz 460 V [2]	hp	150	200	250	300	400	500	600	600	800
• For I_H at 60 Hz 460 V [2]	hp	125	150	200	250	350	350	450	500	700
Output current										
• Rated current I_n	A	210	260	310	380	490	605	745	840	985
• Base-load current I_L [3]	A	205	250	302	370	477	590	725	820	960
• Base-load current I_H [4]	A	178	233	277	340	438	460	570	700	860
Input current										
• Rated input current [5]	A	229	284	338	395	509	629	775	873	1024
• Input current, max.	A	335	410	495	606	781	967	1188	1344	1573
• Current requirement, 24 V DC auxiliary power supply [6]	A	1.1	1.1	1.35	1.35	1.35	1.4	1.4	1.4	1.5
Rated short-circuit current according to IEC [7]	kA	65	65	65	65	65	65	65	84	84
Minimum short-circuit current [8]	A	3000	3600	4400	4400	8000	10000	10500	16000/1800 [9]	18400/2000 [9]
Power loss, max. [10]										
• At 50 Hz 400 V	kW	2.9	3.8	4.4	5.3	6.4	8.2	9.6	10.1	14.4
• At 60 Hz 460 V	kW	2.54	3.36	4.07	4.67	5.96	8.3	9.7	10.2	14.7
Cooling air requirement	m^3/s	0.17	0.23	0.36	0.36	0.36	0.78	0.78	0.78	1.48
Sound pressure level L_{pA} (1 m) at 50/60 Hz	dB	67/68	69/73	69/73	69/73	69/73	70/73	70/73	70/73	72/75
Cable lengths between converter and motor [11]										
• Shielded	m	300	300	300	300	300	300	300	300	300
• Unshielded	m	450	450	450	450	450	450	450	450	450
Dimensions										
• Width for version A/C	mm	800/400	800/400	800/400	1000/400	1000/400	1200/600	1200/600	1200/600	1600/1000
• Height [12]	mm	2000	2000	2000	2000	2000	2000	2000	2000	2000
• Depth	mm	600	600	600	600	600	600	600	600	600
Weight, approx. (degree of protection IP20, without options) for version A/C	kg	460/225	460/225	670/300	670/300	670/300	750/670	750/670	780/670	1100/880

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

For information on the line connection, motor connection and cabinet grounding, see Section Configuration.

1) Rated output of a typical 6-pole standard induction motor based on I_L or I_H for 3 AC 50 Hz 400 V.

2) Rated output of a typical 6-pole standard induction motor based on I_L or I_H for 3 AC 60 Hz 460 V.

3) The base-load current I_L is based on a load cycle of 110% for 60 s or 150% for 10 s with a load cycle duration of 300 s. See Characteristic curves, Section Overload capability.

4) The base-load current I_H is based on a duty cycle of 150% for 60 s or 160% for 10 s with a duty cycle duration of 300 s. See Characteristic curves, Section Overload capability.

5) The currents listed here are based on the rated output current.

6) If the drive control is to remain active after a main infeed failure, the converter must be externally supplied with 24 V DC.
The following must also be taken into account:
– CU320-2: 1 A
– TM31: 0.5 A
– AOP30: 0.2 A
– SMC: 0.6 A
– Current requirement of digital inputs/outputs.

7) In conjunction with the specified fuses or circuit breakers.

8) Minimum current required for reliably triggering the protective devices.

9) For option **L26** (version A) the low value applies.

10) The specified power losses are the maximum values for a utilization of 100%. The values are lower under normal operating conditions.

11) Longer cable lengths for specific configurations are available on request.

12) Version A: The cabinet height increases by
– 250 mm for degree of protection IP21
– 400 mm for degrees of protection IP23, IP43 and IP54
– 405 mm for options **M13** and **M78**
Version C: The cabinet height increases by
– 250 mm for degree of protection IP21
– 400 mm for degrees of protection IP23, IP43 and IP54

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Technical specifications (continued)

Line voltage 500 ... 600 V 3 AC		SINAMICS G150 converter cabinet units 6SL3710-1GF..-....								
Single connection		**31-8.A3**	**32-2.A3**	**32-6.A3**	**33-3.A3**	**34-1.A3**	**34-7.A3**	**35-8.A3**	**37-4.A3**	**38-1.A3**
Type rating										
• For I_L at 50 Hz 500 V [1]	kW	**110**	**132**	**160**	**200**	**250**	**315**	**400**	**500**	**560**
• For I_H at 50 Hz 500 V [1]	kW	90	110	132	160	200	250	315	450	500
• For I_L at 60 Hz 575 V [2]	hp	150	200	250	300	400	450	600	700	800
• For I_H at 60 Hz 575 V [2]	hp	150	200	200	250	350	450	500	700	700
Output current										
• Rated current I_n	A	175	215	260	330	410	465	575	735	810
• Base-load current I_L [3]	A	171	208	250	320	400	452	560	710	790
• Base-load current I_H [4]	A	157	192	233	280	367	416	514	657	724
Input current										
• Rated input current [5]	A	191	224	270	343	426	483	598	764	842
• Input current, max.	A	279	341	410	525	655	740	918	1164	1295
• Current requirement, 24 V DC auxiliary power supply [6]	A	1.35	1.35	1.35	1.4	1.4	1.4	1.4	1.5	1.5
Rated short-circuit current according to IEC [7]	kA	65	65	65	65	65	65	65	84	84
Minimum short-circuit current [8]	A	2400	3000	3600	5200	5200	6200	8400	10500	10400/1800 [9]
Power loss, max. [10]										
• At 50 Hz 500 V	kW	3.8	4.2	5	6.1	8.1	7.8	8.7	12.7	14.1
• At 60 Hz 575 V	kW	3.2	3.6	4.1	5.1	6.7	7.5	8.4	12.5	13.8
Cooling air requirement	m^3/s	0.36	0.36	0.36	0.36	0.78	0.78	0.78	1.48	1.48
Sound pressure level L_{pA} (1 m) at 50/60 Hz	dB	69/73	69/73	69/73	69/73	72/75	72/75	72/75	72/75	72/75
Cable lengths between converter and motor [11]										
• Shielded	m	300	300	300	300	300	300	300	300	300
• Unshielded	m	450	450	450	450	450	450	450	450	450
Dimensions										
• Width for version A/C	mm	800/400	800/400	800/400	800/400	1200/600	1200/600	1200/600	1600/1000	1600/1000
• Height [12]	mm	2000	2000	2000	2000	2000	2000	2000	2000	2000
• Depth	mm	600	600	600	600	600	600	600	600	600
Weight, approx. (degree of protection IP20, without options) for version A/C	kg	460/300	460/300	460/300	460/300	750/670	750/670	860/670	1150/940	1150/960

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

For information on the line connection, motor connection and cabinet grounding, see Section Configuration.

1) Rated output of a typical 6-pole standard induction motor based on I_L or I_H for 3 AC 50 Hz 400 V.

2) Rated output of a typical 6-pole standard induction motor based on I_L or I_H for 3 AC 60 Hz 460 V.

3) The base-load current I_L is based on a load cycle of 110% for 60 s or 150% for 10 s with a load cycle duration of 300 s. See Characteristic curves, Section Overload capability.

4) The base-load current I_H is based on a duty cycle of 150% for 60 s or 160% for 10 s with a duty cycle duration of 300 s. See Characteristic curves, Section Overload capability.

5) The currents listed here are based on the rated output current.

6) If the drive control is to remain active after a main infeed failure, the converter must be externally supplied with 24 V DC.
The following must also be taken into account:
– CU320-2: 1 A
– TM31: 0.5 A
– AOP30: 0.2 A
– SMC: 0.6 A
– Current requirement of digital inputs/outputs.

7) In conjunction with the specified fuses or circuit breakers.

8) Minimum current required for reliably triggering the protective devices.

9) For option **L26** (version A) the low value applies.

10) The specified power losses are the maximum values for a utilization of 100%. The values are lower under normal operating conditions.

11) Longer cable lengths for specific configurations are available on request.

12) Version A: The cabinet height increases by
– 250 mm for degree of protection IP21
– 400 mm for degrees of protection IP23, IP43 and IP54
– 405 mm for options **M13** and **M78**
Version C: The cabinet height increases by
– 250 mm for degree of protection IP21
– 400 mm for degrees of protection IP23, IP43 and IP54

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Technical specifications (continued)

Line voltage 660 ... 690 V 3 AC		SINAMICS G150 converter cabinet units 6SL3710-1GH..-....						
Single connection		**28-5.A3**	**31-0.A3**	**31-2.A3**	**31-5.A3**	**31-8.A3**	**32-2.A3**	**32-6.A3**
Type rating								
• For I_L at 50 Hz 690 V [1]	kW	**75**	**90**	**110**	**132**	**160**	**200**	**250**
• For I_H at 50 Hz 690 V [1]	kW	55	75	90	110	132	160	200
Output current								
• Rated current I_n	A	85	100	120	150	175	215	260
• Base-load current I_L [2]	A	80	95	115	142	171	208	250
• Base-load current I_H [3]	A	76	89	107	134	157	192	233
Input current								
• Rated input current [4]	A	93	109	131	164	191	224	270
• Input current, max.	A	131	155	188	232	279	341	410
• Current requirement, 24 V DC auxiliary power supply [5]	A	1.1	1.1	1.1	1.1	1.35	1.35	1.35
Rated short-circuit current according to IEC [6]	kA	65	65	65	65	65	65	65
Minimum short-circuit current [7]	A	1500	1500	1200	1600	2400	3000	3600
Power loss, max. [8] at 50 Hz 690 V	kW	1.7	2.1	2.7	2.8	3.8	4.2	5
Cooling air requirement	m^3/s	0.17	0.17	0.17	0.17	0.36	0.36	0.36
Sound pressure level L_{pA} (1 m) at 50/60 Hz	dB	67/68	67/68	67/68	67/68	67/73	67/73	67/73
Cable lengths between converter and motor [9]								
• Shielded	m	300	300	300	300	300	300	300
• Unshielded	m	450	450	450	450	450	450	450
Dimensions								
• Width for version A/C	mm	800/400	800/400	800/400	800/400	800/400	800/400	800/400
• Height [10]	mm	2000	2000	2000	2000	2000	2000	2000
• Depth	mm	600	600	600	600	600	600	600
Weight, approx. (degree of protection IP20, without options) for version A/C	kg	460/225	460/225	460/225	460/225	670/300	670/300	670/300

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

For information on the line connection, motor connection and cabinet grounding, see Section Configuration.

1) Rated output of a typical 6-pole standard induction motor based on I_L or I_H for 3 AC 50 Hz 400 V.

2) The base-load current I_L is based on a load cycle of 110% for 60 s or 150% for 10 s with a load cycle duration of 300 s. See Characteristic curves, Section Overload capability.

3) The base-load current I_H is based on a duty cycle of 150% for 60 s or 160% for 10 s with a duty cycle duration of 300 s. See Characteristic curves, Section Overload capability.

4) The currents listed here are based on the rated output current.

5) If the drive control is to remain active after a main infeed failure, the converter must be externally supplied with 24 V DC.
The following must also be taken into account:
– CU320-2: 1 A
– TM31: 0.5 A
– AOP30: 0.2 A
– SMC: 0.6 A
– Current requirement of digital inputs/outputs.

6) In conjunction with the specified fuses or circuit breakers.

7) Minimum current required for reliably triggering the protective devices.

8) The specified power losses are the maximum values for a utilization of 100%. The values are lower under normal operating conditions.

9) Longer cable lengths for specific configurations are available on request.

10) Version A: The cabinet height increases by
– 250 mm for degree of protection IP21
– 400 mm for degrees of protection IP23, IP43 and IP54
– 405 mm for options **M13** and **M78**
Version C: The cabinet height increases by
– 250 mm for degree of protection IP21
– 400 mm for degrees of protection IP23, IP43 and IP54

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Technical specifications (continued)

Line voltage 660 ... 690 V 3 AC		SINAMICS G150 converter cabinet units 6SL3710-1GH..-....					
Single connection		**33-3.A3**	**34-1.A3**	**34-7.A3**	**35-8.A3**	**37-4.A3**	**38-1.A3**
Type rating							
• For I_L at 50 Hz 690 V [1]	kW	**315**	**400**	**450**	**560**	**710**	**800**
• For I_H at 50 Hz 690 V [1]	kW	250	315	400	450	560	710
Output current							
• Rated current I_n	A	330	410	465	575	735	810
• Base-load current I_L [2]	A	320	400	452	560	710	790
• Base-load current I_H [3]	A	280	367	416	514	657	724
Input current							
• Rated input current [4]	A	343	426	483	598	764	842
• Input current, max.	A	525	655	740	918	1164	1295
• Current requirement, 24 V DC auxiliary power supply [5]	A	1.35	1.4	1.4	1.4	1.5	1.5
Rated short-circuit current according to IEC [6]	kA	65	65	84	84	85	85
Minimum short-circuit current [7]	A	5200	5200	6200	8400	10500	10400/1800 [8]
Power loss, max. [9] at 50 Hz 690 V	kW	6.1	8.1	9.1	10.8	13.5	14.7
Cooling air requirement	m^3/s	0.36	0.78	0.78	0.78	1.48	1.48
Sound pressure level L_{pA} (1 m) at 50/60 Hz	dB	67/73	72/75	72/75	72/75	72/75	72/75
Cable lengths between converter and motor [10]							
• Shielded	m	300	300	300	300	300	300
• Unshielded	m	450	450	450	450	450	450
Dimensions							
• Width for version A/C	mm	800/400	1200/600	1200/600	1200/600	1600/1000	1600/1000
• Height [11]	mm	2000	2000	2000	2000	2000	2000
• Depth	mm	600	600	600	600	600	600
Weight, approx. (degree of protection IP20, without options) for version A/C	kg	670/300	780/670	780/670	840/670	1320/940	1360/980

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

For information on the line connection, motor connection and cabinet grounding, see Section Configuration.

1) Rated output of a typical 6-pole standard induction motor based on I_L or I_H for 3 AC 50 Hz 690 V.

2) The base-load current I_L is based on a load cycle of 110% for 60 s or 150% for 10 s with a load cycle duration of 300 s. See Characteristic curves, Section Overload capability.

3) The base-load current I_H is based on a duty cycle of 150% for 60 s or 160% for 10 s with a duty cycle duration of 300 s. See Characteristic curves, Section Overload capability.

4) The currents listed here are based on the rated output current.

5) If the drive control is to remain active after a main infeed failure, the converter must be externally supplied with 24 V DC.
The following must also be taken into account:
– CU320-2: 1 A
– TM31: 0.5 A
– AOP30: 0.2 A
– SMC: 0.6 A
– Current requirement of digital inputs/outputs.

6) In conjunction with the specified fuses or circuit breakers.

7) Minimum current required for reliably triggering the protective devices.

8) For option **L26** (version A) the low value applies.

9) The specified power losses are the maximum values for a utilization of 100%. The values are lower under normal operating conditions.

10) Longer cable lengths for specific configurations are available on request.

11) Version A: The cabinet height increases by
– 250 mm for degree of protection IP21
– 400 mm for degrees of protection IP23, IP43 and IP54
– 405 mm for options **M13** and **M78**
Version C: The cabinet height increases by
– 250 mm for degree of protection IP21
– 400 mm for degrees of protection IP23, IP43 and IP54

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Technical specifications (continued)

Technical specifications for parallel connection

		SINAMICS G150 converter cabinet units, version A 6SL3710-2GE..-....			SINAMICS G150 converter cabinet units, version A 6SL3710-2GF..-....		
Parallel connection		**41-1AA3**	**41-4AA3**	**41-6AA3**	**38-6AA3**	**41-1AA3**	**41-4AA3**
Line voltage		**380 ... 480 V 3 AC**			**500 ... 600 V 3 AC**		
Type rating							
• For I_L [1]	kW	**630**	**710**	**900**	**630**	**710**	**1000**
• For I_H [1]	kW	500	560	710	560	630	800
• For I_L at 60 Hz 460 V or 575 V [2]	hp	900	1000	1250	900	1000	1250
• For I_H at 60 Hz 460 V or 575 V [2]	hp	700	900	1000	800	900	1000
Output current							
• Rated current I_n [3]	A	1120	1380	1560	860	1070	1360
• Base-load current I_L [3][4]	A	1092	1340	1516	836	1036	1314
• Base-load current I_H [3][5]	A	850	1054	1294	770	950	1216
Input current							
• Rated input current [3][6]	A	1174	1444	1624	904	1116	1424
• Input current, max.	A	1800	2215	2495	1388	1708	2186
• Current requirement, 24 V DC auxiliary power supply [7]	A	2.8	2.8	3	2.8	2.8	3
Rated short-circuit current according to IEC [8]	kA	2 × 65	2 × 65	2 × 65	2 × 65	2 × 65	2 × 84
Minimum short-circuit current [9]	A	2 × 1000	2 × 10500	2 × 1800	2 × 6200	2 × 8400	2 × 10500
Power loss, max. [10]							
• At 50 Hz 400 V / 500 V	kW	16.2	19	19.9	15.4	17.2	23.8
• At 60 Hz 460 V / 575 V	kW	16.6	19.4	20.4	15	16.8	25
Cooling air requirement	m^3/s	1.56	1.56	1.56	1.56	1.56	2.96
Sound pressure level L_{pA} (1 m) at 50/60 Hz	dB	73/76	73/76	73/76	75/78	75/78	75/78
Cable lengths between converter and motor [11]							
• Shielded	m	300	300	300	300	300	300
• Unshielded	m	450	450	450	450	450	450
Dimensions							
• Width [12]	mm	2400	2400	2400	2400	2400	3200
• Height [13]	mm	2000	2000	2000	2000	2000	2000
• Depth	mm	600	600	600	600	600	600
Weight, approx. (degree of protection IP20, without options)	kg	1700	1710	2130	1700	1700	2620

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

For information on the line connection, motor connection and cabinet grounding, see Section Configuration.

1) Rated output of a typical 6-pole standard induction motor based on I_L or I_H for 3 AC 50 Hz 400 V, 500 V or 690 V.

2) Rated output of a typical 6-pole standard induction motor based on I_L or I_H for 3 AC 60 Hz 460 V or 575 V.

3) The currents listed here are the aggregate current of the two converter sections.

4) The base-load current I_L is based on a load cycle of 110% for 60 s or 150% for 10 s with a load cycle duration of 300 s. See Characteristic curves, Section Overload capability.

5) The base-load current I_H is based on a duty cycle of 150% for 60 s or 160% for 10 s with a duty cycle duration of 300 s. See Characteristic curves, Section Overload capability.

6) The currents listed here are based on the rated output current.

7) If the drive control is to remain active after a main infeed failure, the converter must be externally supplied with 24 V DC.
The following must also be taken into account:
– CU320-2: 1 A
– TM31: 0.5 A
– AOP30: 0.2 A
– SMC: 0.6 A
– Current requirement of digital inputs/outputs.

8) In conjunction with the specified fuses or circuit breakers.

9) Minimum current required for reliably triggering the protective devices.

10) The specified power losses are the maximum values for a utilization of 100%. The values are lower under normal operating conditions.

11) Longer cable lengths for specific configurations are available on request.

12) Power units connected in parallel are shipped as two transport units.

13) Version A: The cabinet height increases by
– 250 mm for degree of protection IP21
– 400 mm for degrees of protection IP23, IP43 and IP54
– 405 mm for options **M13** and **M78**

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Technical specifications (continued)

		SINAMICS G150 converter cabinet units, version A 6SL3710-2GH..-....							
Parallel connection		**41-1AA3**	**41-4AA3**	**41-5AA3**	**41-8EA3**	**42-0EA3**	**42-2EA3**	**42-4E A3**	**42-7E A3**
Line voltage		**660 ... 690 V 3 AC**							
Type rating									
• For I_L [1]	kW	**1000**	**1350**	**1500**	**1750**	**1950**	**2150**	**2400**	**2700**
• For I_H [1]	kW	900	1200	1350	1500	1750	1950	2150	2400
• For I_L at 60 Hz 460 V or 575 V [2]	hp	–	–	–	–	–	–	–	–
• For I_H at 60 Hz 460 V or 575 V [2]	hp	–	–	–	–	–	–	–	–
Output current									
• Rated current I_n [3]	A	1070	1360	1500	1729	1948	2158	2413	2752
• Base-load current I_L [3] [4]	A	1036	1314	1462	1720	1940	2150	2390	2685
• Base-load current I_H [3] [5]	A	950	1216	1340	1547	1742	1930	2158	2463
Input current									
• Rated input current [3] [6]	A	1116	1424	1568	1800	2030	2245	2510	2865
• Input current, max.	A	1708	2186	2406	2765	3115	3450	3860	4400
• Current requirement, 24 V DC auxiliary power supply [7]	A	2.8	2.8	3	4.7	4.7	4.7	4.7	6
Rated short-circuit current according to IEC [8]	kA	2 × 65	2 × 84	2 × 84	2 × 85	2 × 85	2 × 85	2 × 85	2 × 85
Minimum short-circuit current [9]	A	2 × 8400	2 × 10500	2 × 1800	2 × 1800	2 × 2000	2 × 2300	2 × 2500	2 × 3000
Power loss, max. [10] at 50 Hz 690 V	kW	21.3	26.6	29	35	38	40	46	52
Cooling air requirement	m^3/s	1.56	2.96	2.96	3.67	3.67	3.67	3.67	5.15
Sound pressure level L_{pA} (1 m) at 50/60 Hz	dB	75/78	75/78	75/78	75/78	75/78	75/78	75/78	75/78
Cable lengths between converter and motor [11]									
• Shielded	m	300	300	300	300	300	300	300	300
• Unshielded	m	450	450	450	450	450	450	450	450
Dimensions									
• Width [12]	mm	2400	3200	3200	3600	3600	3600	3600	4400
• Height [13]	mm	2000	2000	2000	2000	2000	2000	2000	2000
• Depth	mm	600	600	600	600	600	600	600	600
Weight, approx. (degree of protection IP20, without options)	kg	1700	2620	2700	3010	3010	3070	3860	4580

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

For information on the line connection, motor connection and cabinet grounding, see Section Configuration.

1) Rated output of a typical 6-pole standard induction motor based on I_L or I_H for 3 AC 50 Hz 400 V, 500 V or 690 V.

2) Rated output of a typical 6-pole standard induction motor based on I_L or I_H for 3 AC 60 Hz 460 V or 575 V.

3) The currents listed here are the aggregate current of the two converter sections.

4) The base-load current I_L is based on a load cycle of 110% for 60 s or 150% for 10 s with a load cycle duration of 300 s. See Characteristic curves, Section Overload capability.

5) The base-load current I_H is based on a duty cycle of 150% for 60 s or 160% for 10 s with a duty cycle duration of 300 s. See Characteristic curves, Section Overload capability.

6) The currents listed here are based on the rated output current.

7) If the drive control is to remain active after a main infeed failure, the converter must be externally supplied with 24 V DC.
The following must also be taken into account:
– CU320-2: 1 A
– TM31: 0.5 A
– AOP30: 0.2 A
– SMC: 0.6 A
– Current requirement of digital inputs/outputs.

8) In conjunction with the specified fuses or circuit breakers.

9) Minimum current required for reliably triggering the protective devices.

10) The specified power losses are the maximum values for a utilization of 100%. The values are lower under normal operating conditions.

11) Longer cable lengths for specific configurations are available on request.

12) Power units connected in parallel are shipped as two transport units.

13) Version A: The cabinet height increases by
– 250 mm for degree of protection IP21
– 400 mm for degrees of protection IP23, IP43 and IP54
– 405 mm for options **M13** and **M78**

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Characteristic curves

Derating data

SINAMICS G150 converter cabinet units and the associated system components are rated for an ambient temperature of 40° C and installation altitudes up to 2000 m above sea level.

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

At installation altitudes > 2000 m above sea level, it must be taken into account that the air pressure, and therefore air density, decreases as the height increases. As a consequence, the cooling efficiency and the insulation capacity of the air also decrease.

Due to the reduced cooling efficiency, it is necessary, on the one hand, to reduce the ambient temperature and on the other hand, to lower heat loss in the converter cabinet unit by reducing the output current, whereby ambient temperatures lower than 40° C may be offset to compensate.

The following table lists the permissible output currents depending on the installation altitude and ambient temperature for the various degrees of protection. The specified values already include a permitted compensation in respect of installation altitude and ambient temperatures < 40° C (temperature at the air intake of the converter cabinet unit).

The values apply under the precondition that it is guaranteed that the cooling air, as specified in the technical data, flows through the units as a result of the cabinet arrangement.

As additional measure for installation altitudes from 2000 m up to 5000 m, an isolating transformer is required in order to reduce transient overvoltages according to EN 60664-1.

For further information, please refer to the SINAMICS Low Voltage Engineering Manual.

Current-derating factors for converter cabinet units depending on the ambient / air intake temperature, the installation altitude and the degree of protection

Degree of protection	Installation altitude above sea level	**Current derating factor** (as a percentage of the rated current) for an ambient / air intake temperature of						
	m	20 °C	25 °C	30 °C	35 °C	40 °C	45 °C	50 °C
IP20, IP21, IP23 and IP43	0 ... 2000						93.3 %	86.7 %
	2001 ... 2500					96.3 %		
	2501 ... 3000		100 %		98.7 %			
	3001 ... 3500							
	3501 ... 4000			96.3 %				
	4001 ... 4500		97.5 %					
	4501 ... 5000	98.2 %						
IP54	0 ... 2000					93.3 %	86.7 %	80 %
	2001 ... 2500		100 %		96.3 %	89.8 %		
	2501 ... 3000			98.7 %	92.5 %			
	3001 ... 3500			94.7 %				
	3501 ... 4000		96.3 %	90.7 %				
	4001 ... 4500	97.5 %	92.1 %					
	4501 ... 5000	93 %						

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Characteristic curves (continued)

Current derating depending on the pulse frequency

To reduce motor noise or to increase output frequency, the pulse frequency can be increased relative to the factory setting (1.25 kHz or 2 kHz). When the pulse frequency is increased, the derating factor of the output current must be taken into account. This derating factor must be applied to the currents specified in the technical specifications.

For further information, please refer to the SINAMICS Low Voltage Engineering Manual.

Derating factor of the output current depending on the pulse frequency for devices with a rated pulse frequency of 2 kHz

SINAMICS G150	Type rating	Output current at 2 kHz	**Derating factor** for pulse frequency	
6SL3710-...	kW	A	2.5 kHz	4 kHz
380 ... 480 V 3 AC				
1GE32-1 . A3	110	210	95 %	82 %
1GE32-6 . A3	132	260	95 %	83 %
1GE33-1 . A3	160	310	97 %	88 %
1GE33-8 . A3	200	380	96 %	87 %
1GE35-0 . A3	250	490	94 %	78 %

Derating factor of the output current depending on the pulse frequency for devices with a rated pulse frequency of 1.25 kHz

SINAMICS G150	Type rating	Output current at 1.25 kHz	**Derating factor** for pulse frequency		
6SL3710-...	kW	A	2 kHz	2.5 kHz	4 kHz
380 ... 480 V 3 AC					
1GE36-1 . A3	315	605	83 %	72 %	64 %
1GE37-5 . A3	400	745	83 %	72 %	64 %
1GE38-4 . A3	450	840	87 %	79 %	64 %
1GE41-0 . A3	560	985	92 %	87 %	70 %
2GE41-1AA3	630	1120	83 %	72 %	64 %
2GE41-4AA3	710	1380	83 %	72 %	64 %
2GE41-6AA3	900	1560	87 %	79 %	64 %
500 ... 600 V 3 AC					
1GF31-8 . A3	110	175	92 %	87 %	70 %
1GF32-2 . A3	132	215	92 %	87 %	70 %
1GF32-6 . A3	160	260	92 %	88 %	71 %
1GF33-3 . A3	200	330	89 %	82 %	65 %
1GF34-1 . A3	250	410	89 %	82 %	65 %
1GF34-7 . A3	315	465	92 %	87 %	67 %
1GF35-8 . A3	400	575	91 %	85 %	64 %
1GF37-4 . A3	500	735	87 %	79 %	64 %
1GF38-1 . A3	560	810	83 %	72 %	61 %
2GF38-6AA3	630	860	92 %	87 %	67 %
2GF41-1AA3	710	1070	91 %	85 %	64 %
2GF41-4AA3	1000	1360	87 %	79 %	64 %

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Characteristic curves (continued)

SINAMICS G150	Type rating	Output current at 1.25 kHz	**Derating factor** for pulse frequency		
6SL3710-...	kW	A	2 kHz	2.5 kHz	4 kHz
660 ... 690 V 3 AC					
1GH28-5 . A3	75	85	93 %	89 %	71 %
1GH31-0 . A3	90	100	92 %	88 %	71 %
1GH31-2 . A3	110	120	92 %	88 %	71 %
1GH31-5 . A3	132	150	90 %	84 %	66 %
1GH31-8 . A3	160	175	92 %	87 %	70 %
1GH32-2 . A3	200	215	92 %	87 %	70 %
1GH32-6 . A3	250	260	92 %	88 %	71 %
1GH33-3 . A3	315	330	89 %	82 %	65 %
1GH34-1 . A3	400	410	89 %	82 %	65 %
1GH34-7 . A3	450	465	92 %	87 %	67 %
1GH35-8 . A3	560	575	91 %	85 %	64 %
1GH37-4 . A3	710	735	87 %	79 %	64 %
1GH38-1 . A3	800	810	83 %	72 %	61 %
2GH41-1AA3	1000	1070	91 %	85 %	64 %
2GH41-4AA3	1350	1360	87 %	79 %	64 %
2GH41-5AA3	1500	1500	83 %	72 %	61 %
2GH41-8EA3	1750	1729	92 %	87 %	67 %
2GH42-0EA3	1950	1948	91 %	86 %	64 %
2GH42-2EA3	2150	2158	87 %	79 %	55 %
2GH42-4EA3	2400	2413	87 %	79 %	55 %
2GH42-7EA3	2700	2752	91 %	86 %	64 %

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Characteristic curves (continued)

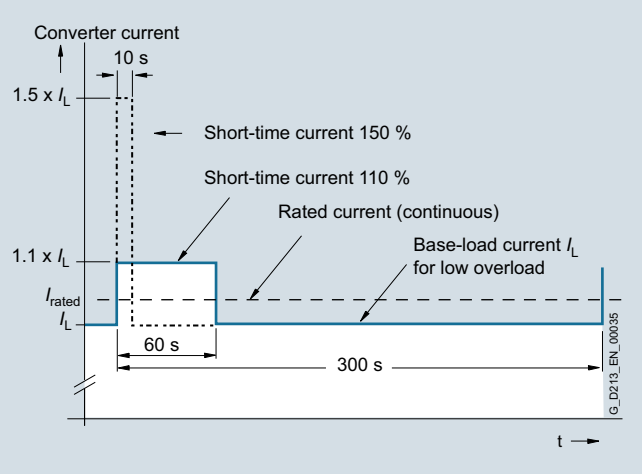
Overload capability

The SINAMICS G150 converter cabinet units have an overload reserve in order to overcome breakaway torques, for example. If larger surge loads occur, this must be taken into account in the configuration. For drives with overload requirements, the appropriate base load current must, therefore, be used as a basis for the required load.

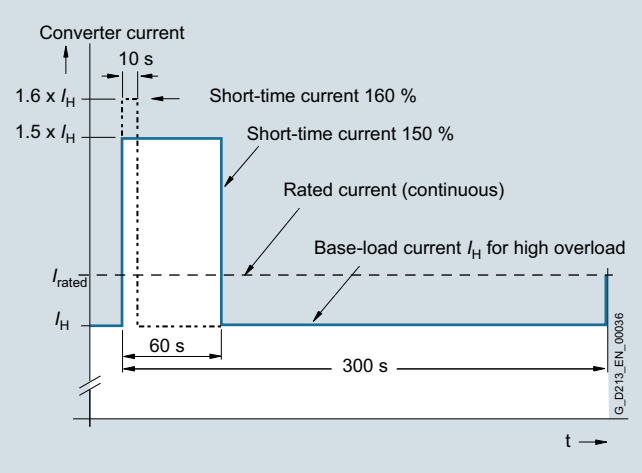
The criterion for overload is that the drive is operated with its base load current before and after the overload occurs on the basis of a duty cycle duration of 300 s.

The base load current for a low overload I_L is based on a duty cycle of 110% for 60 s or 150% for 10 s.

The base load current for a high overload I_H is based on a duty cycle of 150% for 60 s or 160% for 10 s.



Low overload



High overload

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Configuration

Cable cross-sections and connections

The following tables list the recommended and maximum possible cable connections at the line and motor ends for a single connection (versions A and C) and a parallel connection (version A).

The recommended cross-sections are based on the specified fuses. They are valid for a three-conductor copper cable routed horizontally in air with PVC insulation and a permissible conductor temperature of 70° C (e.g. Protodur NYY or NYCWY) at an ambient temperature of 40° C and individual routing.

For deviating conditions (cable routing, cable accumulation, ambient temperature), the appropriate correction factors according to IEC 60364-5-52 must be taken into account.

For further information, please refer to the SINAMICS Low Voltage Engineering Manual.

Single connection

Type rating	Converter cabinet unit	Line connection			Motor connection			Cabinet grounding	
	SINAMICS G150, versions A and C	Recommended cross-section [1]	Maximum cable cross-section	Fixing screws	Recommended cross-section [1]	Maximum cable cross-section	Fixing screws	Fixing screws	Remark
		IEC	IEC		IEC	IEC			
kW	6SL3710-...	mm^2	mm^2		mm^2	mm^2			
380 ... 480 V 3 AC									
110	1GE32-1 . A3	2 × 70	4 × 240	M12	2 × 50	2 × 150	M12	M12	
132	1GE32-6 . A3	2 × 95	4 × 240	M12	2 × 70	2 × 150	M12	M12	
160	1GE33-1 . A3	2 × 120	4 × 240	M12	2 × 95	2 × 150	M12	M12	
200	1GE33-8 . A3	2 × 120	4 × 240	M12	2 × 95	2 × 150	M12	M12	
250	1GE35-0 . A3	2 × 185	4 × 240	M12	2 × 150	2 × 240	M12	M12	
315	1GE36-1 . A3	2 × 240	4 × 240	M12	2 × 185	4 × 240	M12	M12	
400	1GE37-5 . A3	3 × 185	4 × 240	M12	2 × 240	4 × 240	M12	M12	Cu busbar
450	1GE38-4 . A3	4 × 150	8 × 240	M12	3 × 185	4 × 240	M12	M12	Cu busbar
560	1GE41-0 . A3	4 × 185	8 × 240	M12	4 × 185	6 × 240	M12	M12	Cu busbar
500 ... 600 V 3 AC									
110	1GF31-8 . A3	120	4 × 240	M12	95	2 × 150	M12	M12	
132	1GF32-2 . A3	2 × 70	4 × 240	M12	120	2 × 150	M12	M12	
160	1GF32-6 . A3	2 × 95	4 × 240	M12	2 × 70	2 × 185	M12	M12	
200	1GF33-3 . A3	2 × 120	4 × 240	M12	2 × 95	2 × 240	M12	M12	
250	1GF34-1 . A3	2 × 185	4 × 240	M12	2 × 120	4 × 240	M12	M12	
315	1GF34-7 . A3	2 × 185	4 × 240	M12	2 × 150	4 × 240	M12	M12	
400	1GF35-8 . A3	2 × 240	4 × 240	M12	2 × 185	4 × 240	M12	M12	
500	1GF37-4 . A3	3 × 185	8 × 240	M12	2 × 240	6 × 240	M12	M12	Cu busbar
560	1GF38-1 . A3	4 × 150	8 × 240	M12	3 × 185	6 × 240	M12	M12	Cu busbar
660 ... 690 V 3 AC									
75	1GH28-5 . A3	50	4 × 240	M12	35	2 × 70	M12	M12	
90	1GH31-0 . A3	50	4 × 240	M12	50	2 × 150	M12	M12	
110	1GH31-2 . A3	70	4 × 240	M12	70	2 × 150	M12	M12	
132	1GH31-5 . A3	95	4 × 240	M12	70	2 × 150	M12	M12	
160	1GH31-8 . A3	120	4 × 240	M12	95	2 × 150	M12	M12	
200	1GH32-2 . A3	2 × 70	4 × 240	M12	120	2 × 150	M12	M12	
250	1GH32-6 . A3	2 × 95	4 × 240	M12	2 × 70	2 × 185	M12	M12	
315	1GH33-3 . A3	2 × 120	4 × 240	M12	2 × 95	2 × 240	M12	M12	
400	1GH34-1 . A3	2 × 185	4 × 240	M12	2 × 120	4 × 240	M12	M12	
450	1GH34-7 . A3	2 × 185	4 × 240	M12	2 × 150	4 × 240	M12	M12	
560	1GH35-8 . A3	2 × 240	4 × 240	M12	2 × 185	4 × 240	M12	M12	
710	1GH37-4 . A3	3 × 185	8 × 240	M12	3 × 150	6 × 240	M12	M12	Cu busbar
800	1GH38-1 . A3	4 × 150	8 × 240	M12	3 × 185	6 × 240	M12	M12	Cu busbar

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

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Configuration (continued)

Parallel connection

Type rating	Converter cabinet unit	Line connection			Motor connection			Schrankerdung	
	SINAMICS G150, version A	Recommended cross-section [1]	Maximum cable cross-section	Fixing screws	Recommended cross-section [1]	Maximum cable cross-section	Fixing screws	Fixing screws	Remark
		IEC	IEC		IEC	IEC			
kW	6SL3710-...	mm^2	mm^2		mm^2	mm^2			
380 ... 480 V 3 AC									
630	2GE41-1AA3	2 × 240	4 × 240	M12	2 × 185	4 × 240	M12	M12	
710	2GE41-4AA3	3 × 185	4 × 240	M12	2 × 240	4 × 240	M12	M12	Cu busbar
900	2GE41-6AA3	4 × 150	8 × 240	M12	2 × 240	4 × 240	M12	M12	Cu busbar
500 ... 600 V 3 AC									
630	2GF38-6AA3	2 × 185	4 × 240	M12	2 × 150	4 × 240	M12	M12	
710	2GF41-1AA3	2 × 240	4 × 240	M12	2 × 185	4 × 240	M12	M12	
1000	2GF41-4AA3	3 × 185	8 × 240	M12	2 × 240	6 × 240	M12	M12	Cu busbar
660 ... 690 V 3 AC									
1000	2GH41-1AA3	2 × 240	4 × 240	M12	2 × 185	4 × 240	M12	M12	
1350	2GH41-4AA3	3 × 185	8 × 240	M12	3 × 150	6 × 240	M12	M12	Cu busbar
1500	2GH41-5AA3	4 × 150	8 × 240	M12	3 × 185	6 × 240	M12	M12	Cu busbar
1750	2GH41-8EA3	2 × 4 × 150	2 × 8 × 240	M12	2 × 3 × 185	2 × 6 × 240	M12	M12	Cu busbar
1950	2GH42-0EA3	2 × 4 × 150	2 × 8 × 240	M12	2 × 3 × 185	2 × 6 × 240	M12	M12	Cu busbar
2150	2GH42-2EA3	2 × 4 × 150	2 × 8 × 240	M12	2 × 3 × 185	2 × 6 × 240	M12	M12	Cu busbar
2400	2GH42-4EA3	2 × 4 × 150	2 × 8 × 240	M12	2 × 3 × 185	2 × 6 × 240	M12	M12	Cu busbar
2700 [2]	2GH42-7EA3	2 × 4 × 150	2 × 8 × 240	M12	3 × 3 × 185	3 × 6 × 240	M12	M12	Cu busbar

Note:

The recommended and maximum conductor cross-sections refer to one of the two converter sections in the parallel connection.

Minimum motor cable lengths for operation with power units connected in parallel

When using power units connected in parallel, the following motor cable lengths must be observed if a motor is connected with only one winding system and no motor-side reactors or filters are used:

Type rating	Converter cabinet unit SINAMICS G150, version A	Minimum cable length
kW		m
380 ... 480 V 3 AC		
630	6SL3710-2GE41-1AA3	13
710	6SL3710-2GE41-4AA3	10
900	6SL3710-2GE41-6AA3	9
500 ... 600 V 3 AC		
630	6SL3710-2GF38-6AA3	18
710	6SL3710-2GF41-1AA3	15
1000	6SL3710-2GF41-4AA3	13
660 ... 690 V 3 AC		
1000	6SL3710-2GH41-1AA3	20
1350	6SL3710-2GH41-4AA3	18
1500	6SL3710-2GH41-5AA3	15
1750	6SL3710-2GH41-8EA3	12
1950	6SL3710-2GH42-0EA3	10
2150	6SL3710-2GH42-2EA3	8
2400	6SL3710-2GH42-4EA3	8
2700	6SL3710-2GH42-7EA3	8

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

[2] The motor-side inverter comprises three Motor Modules connected in parallel.

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Configuration (continued)

Cable cross-sections for line and motor connection

It is generally recommended to use shielded 3-conductor three-phase cables between the converter and motor – and for higher power ratings, symmetrical cables where possible. If required, several of these cables can be connected in parallel. There are two main reasons for this:

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

The cable cross-section required depends on the current being conducted in the cable. The permissible current load capability of cables is defined, for example in IEC 60364-5-52. It depends partly on the ambient conditions such as temperature, but also on the routing method. It should be taken into account whether cables are individually routed with relatively good cooling, or whether several cables are routed together; in this case, cable ventilation is significantly poorer, which can therefore result in higher cable temperatures. Regarding this topic, reference is made to the corresponding correction factors for these secondary conditions in IEC 60364-5-52.

For 3-conductor copper and aluminum cables with PVC insulation and a permissible conductor temperature of 70° C (e.g. Protodur NYY or NYCWY), as well as an ambient temperature of 40° C, the cross-sections can be determined from the following table, which is based on IEC 60364-5-52.

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

Cross-section of 3-conductor cable	**Copper cable**		**Aluminum cable**	
	Individual routing	Several cables next to one another [1]	Individual routing	Several cables next to one another [1]
mm^2	A	A	A	A
3 × 2.5	22	17	17	13
3 × 4	30	23	23	18
3 × 6	37	29	29	22
3 × 10	52	41	40	31
3 × 16	70	54	53	41
3 × 25	88	69	68	53
3 × 35	110	86	84	65
3 × 50	133	104	102	79
3 × 70	171	133	131	102
3 × 95	207	162	159	124
3 × 120	240	187	184	144
3 × 150	278	216	213	166
3 × 185	317	247	244	190
3 × 240	374	292	287	224

[1] Maximum nine cables may be routed directly next to one another horizontally on a cable tray.

Cables must be connected in parallel for higher currents.

Note:

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

Grounding and protective conductor cross-section

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

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

Cross-section, line conductor	**Minimum cross-section, external protective conductor**
mm^2	mm^2
Bis 16	Minimum cross-section of line conductor
16 ... 35	16
As of 35	Minimum half the cross-section of line conductor

Note:

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

- Switchgear and motors are usually grounded separately via a local grounding electrode. With this constellation, the ground fault current flows via the parallel ground connections and is divided. In spite of the relatively low protective conductor cross-sections used in accordance with the table above, no inadmissible touch voltages occur with this grounding system. However, from experience gained with different grounding constellations, we recommend that the ground cable from the motor returns directly to the converter. For EMC reasons and to prevent bearing currents, symmetrical 3-conductor, three-phase cables should be used where possible instead of 4-conductor cables, especially on drives in the higher power range. For 3-conductor cables, the protective or PE conductor must be routed separately or arranged symmetrically in the motor cable. The symmetry of the PE conductor is achieved using a conductor surrounding all phase conductors or using a cable with a symmetrical arrangement of the three phase conductors and three ground conductors. For more detailed information on this topic, please refer to the SINAMICS Low Voltage Engineering Manual.
- Through their high-speed control, the converters limit the load current (motor and ground fault currents) to an rms value corresponding to the rated current. Based on this, we recommend that the cross-section of the protective conductor to ground the cabinets be the same as for the line conductor.

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Selection and ordering data

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

If option **L26** has not been selected, we strongly advise that type 3NE fuses are used [1].

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

Single connection

Type rating		**SINAMICS G150 converter cabinet units**	**Fuse with existing fuse switch disconnector (option L26)**			**Fuse (incl. semiconductor protection) without fuse switch disconnector**		
at 50 Hz, 400 V, 500 V or 690 V	at 60 Hz, 460 V or 575 V	Versions A and C		Rated current	Frame size acc. to IEC 60269-2		Rated current	Frame size acc. to IEC 60269-2
kW	hp	6SL3710-...	Article No.	A		Article No.	A	
380 ... 480 V 3 AC								
110	150	1GE32-1 . A3	**3NA3144**	250	2	**3NE1230-2**	315	1
132	200	1GE32-6 . A3	**3NA3250**	300	2	**3NE1331-2**	350	2
160	250	1GE33-1 . A3	**3NA3254**	355	3	**3NE1334-2**	500	2
200	300	1GE33-8 . A3	**3NA3260**	400	3	**3NE1334-2**	500	2
250	400	1GE35-0 . A3	**3NA3372**	630	3	**3NE1436-2**	630	3
315	500	1GE36-1 . A3	**3NA3475**	800	4	**3NE1438-2**	800	3
400	600	1GE37-5 . A3	**3NA3475**	800	4	**3NE1448-2**	850	3
450	600	1GE38-4 . A3	**3NA3365**	2 × 500	3	**3NE1436-2**	2 × 630	3
560	800	1GE41-0 . A3	**3NA3472**	2 × 630	3	**3NE1437-2**	2 × 710	3
500 ... 600 V 3 AC								
110	150	1GF31-8 . A3	**3NA3244-6**	250	2	**3NE1227-2**	250	1
132	200	1GF32-2 . A3	**3NA3252-6**	315	2	**3NE1230-2**	315	1
160	250	1GF32-6 . A3	**3NA3354-6**	355	3	**3NE1331-2**	350	2
200	300	1GF33-3 . A3	**3NA3365-6**	500	3	**3NE1334-2**	500	2
250	400	1GF34-1 . A3	**3NA3365-6**	500	3	**3NE1334-2**	500	2
315	450	1GF34-7 . A3	**3NA3352-6**	2 × 315	3	**3NE1435-2**	560	3
400	500	1GF35-8 . A3	**3NA3354-6**	2 × 355	3	**3NE1447-2**	670	3
500	700	1GF37-4 . A3	**3NA3365-6**	2 × 500	3	**3NE1448-2**	850	3
560	800	1GF38-1 . A3	**3NA3365-6**	2 × 500	3	**3NE1343-2**	2 × 500	2
660 ... 690 V 3 AC								
75		1GH28-5 . A3	**3NA3132-6**	125	1	**3NE1022-2**	125	00
90		1GH31-0 . A3	**3NA3132-6**	125	1	**3NE1022-2**	125	00
110		1GH31-2 . A3	**3NA3136-6**	160	1	**3NE1224-2**	160	1
132		1GH31-5 . A3	**3NA3240-6**	200	2	**3NE1225-2**	200	1
160		1GH31-8 . A3	**3NA3244-6**	250	2	**3NE1227-2**	250	1
200		1GH32-2 . A3	**3NA3252-6**	315	2	**3NE1230-2**	315	1
250		1GH32-6 . A3	**3NA3354-6**	355	3	**3NE1331-2**	350	2
315		1GH33-3 . A3	**3NA3365-6**	500	3	**3NE1334-2**	500	2
400		1GH34-1 . A3	**3NA3365-6**	500	3	**3NE1334-2**	500	2
450		1GH34-7 . A3	**3NA3352-6**	2 × 315	3	**3NE1435-2**	560	3
560		1GH35-8 . A3	**3NA3354-6**	2 × 355	3	**3NE1447-2**	670	3
710		1GH37-4 . A3	**3NA3365-6**	2 × 500	3	**3NE1448-2**	850	3
800		1GH38-1 . A3	**3NA3365-6**	2 × 500	3	**3NE1334-2**	2 × 500	2

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

[1] The double function fuses (3NE1) with operating class gS for cable and semiconductor protection are recommended to protect the converter. These fuses are specially adapted to the requirements of the semiconductors in the input rectifier
- Superfast
- Adapted to the limit current integral of the semiconductor
- Lower arc voltage
- Improved current limiting

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Selection and ordering data (continued)

Parallel connection (data for each converter subsystem)

Type rating		SINAMICS G150 converter cabinet units	Fuse with existing fuse switch disconnector (option L26)			Fuse (incl. semiconductor protection) without fuse switch disconnector		
at 50 Hz, 400 V, 500 V or 690 V	at 60 Hz, 460 V or 575 V	Version A		Rated current	Frame size acc. to IEC 60269-2		Rated current	Frame size acc. to IEC 60269-2
kW	hp	6SL3710-...	Article No.	A		Article No.	A	
380 ... 480 V 3 AC								
630	900	2GE41-1AA3	**3NA3475**	800	4	**3NE1438-2**	800	3
710	1200	2GE41-4AA3	**3NA3475**	800	4	**3NE1448-2**	850	3
900	1200	2GE41-6AA3	**3NA3365**	2 × 500	3	**3NE1436-2**	2 × 630	3
500 ... 600 V 3 AC								
630	900	2GF38-6AA3	**3NA3352-6**	2 × 315	3	**3NE1435-2**	560	3
710	1000	2GF41-1AA3	**3NA3365-6**	2 × 500	3	**3NE1447-2**	670	3
1000	1600	2GF41-4AA3	**3NA3365-6**	2 × 500	3	**3NE1448-2**	850	3
660 ... 690 V 3 AC								
1000		2GH41-1AA3	**3NA3354-6**	2 × 355	3	**3NE1447-2**	670	3
1350		2GH41-4AA3	**3NA3365-6**	2 × 500	3	**3NE1448-2**	850	3
1500		2GH41-5AA3	**3NA3365-6**	2 × 500	3	**3NE1334-2**	2 × 500	2
1750		2GH41-8EA3	**3NA3365-6**	2 × 500	3	**3NE1435-2**	2 × 560	3
1950		2GH42-0EA3	**3NA3362-6**	3 × 425	3	**3NE1436-3**	2 × 630	3
2150		2GH42-2EA3	**3NA3365-6**	3 × 500	3	**3NE1334-2**	3 × 500	2
2400		2GH42-4EA3	**3NA3365-6**	3 × 500	3	**3NE1334-2**	3 × 500	2
2700		2GH42-7EA3	**3NA3372**	3 × 630	3	**3NE1436-3**	3 × 630	3

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

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