

SINAMICS S150 Converter Cabinet Units



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SINAMICS S150 Converter Cabinet Units

SINAMICS S150 converter cabinet units

Overview



SINAMICS S150 converter cabinet units are particularly suitable for all variable-speed single-axis drives with high performance requirements, i.e. drives with:

- High dynamic requirements
- Frequent braking cycles and high braking energy levels
- Four-quadrant operation

SINAMICS S150 offers high-performance speed control with excellent accuracy and a high dynamic response.

The following voltages and power ratings are available:

Line voltage	Type rating
380 ... 480 V 3 AC	110 ... 800 kW
500 ... 690 V 3 AC	75 ... 1200 kW

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

Line and motor-side components as well as additional monitoring devices can be installed in the converter cabinet units.

A wide range of electrical and mechanical components enable the drive system to be optimized individually to suit customer requirements.

Benefits

The self-commutating, pulsed infeed/regenerative unit uses IGBT technology and is equipped with a Clean Power Filter. This combination guarantees extremely line-friendly behavior which is characterized by the following:

- Negligible line harmonics as a result of the innovative Clean Power Filter ($<< 1\%$)
- The stringent limit values of the standard IEEE 519-1992 are fully complied with.
- Regenerative feedback (four-quadrant operation)
- Tolerant to fluctuations in the line voltage
- Operation on weak line supplies
- Reactive power compensation is possible (inductive or capacitive)
- High drive dynamic performance

In addition, factors have been considered to ensure easy handling of the drive from the planning and design phase through to operation. These factors include:

- Compact, modular design with an optimum degree of service friendliness
- Straightforward configuring and commissioning thanks to assistance provided by the SIZER for Siemens Drives and STARTER tools
- Simple installation, as it is ready to be connected up
- Fast, menu-prompted commissioning with no complex parameterization
- Clear and convenient drive monitoring/diagnostics, commissioning and operation via a user-friendly graphical operator panel with measured values displayed in plain text or in a quasi-analog bar display.
- SINAMICS as an integral part of Totally Integrated Automation (TIA). The TIA concept offers an optimized range of products for automation and drive technology. This concept is characterized by configuration, communication, and data management that are consistent throughout the product range. SINAMICS is fully integrated in the TIA concept. Separate S7/PCS7 blocks and faceplates for WinCC are available.
- Integration in SIMATIC H systems via a Y link
- SINAMICS Drive Control Chart (SINAMICS DCC) SINAMICS DCC is an additional tool for the easy configuration of process-oriented functions for SINAMICS. The block library encompasses a large selection of closed-loop, arithmetic and logic blocks, as well as a more comprehensive range of 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. SINAMICS DCC is an add-on to the STARTER commissioning tool.

Application

SINAMICS S150 is especially suitable for use in all applications that place the highest demands on process operations with dynamic, reproducible processes. These include, for example:

- Test stands
- Centrifuges
- Elevators and cranes
- Cross cutters and shears
- Conveyor belts with a high power demand and energy recovery
- Presses
- Cable winches

Selection and ordering data

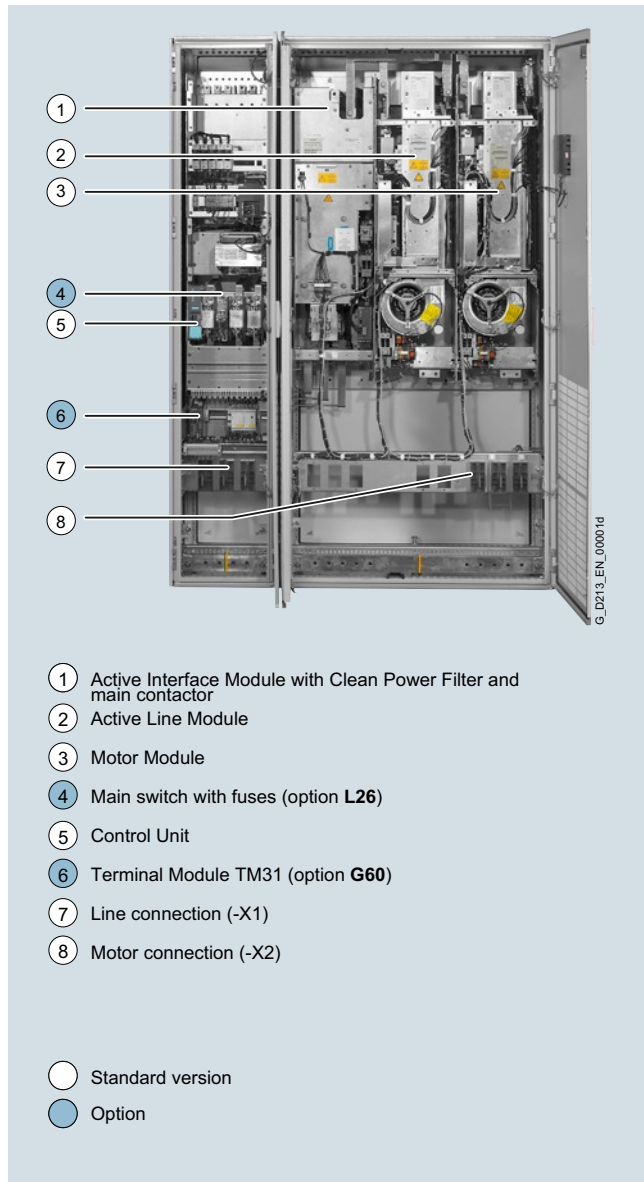
Type rating at 400 V or 690 V kW	Rated output current I_{rated} A	SINAMICS S150 converter cabinet unit Article No.
Line voltage 380 ... 480 V 3 AC		
110	210	6SL3710-7LE32-1AA3
132	260	6SL3710-7LE32-6AA3
160	310	6SL3710-7LE33-1AA3
200	380	6SL3710-7LE33-8AA3
250	490	6SL3710-7LE35-0AA3
315	605	6SL3710-7LE36-1AA3
400	745	6SL3710-7LE37-5AA3
450	840	6SL3710-7LE38-4AA3
560	985	6SL3710-7LE41-0AA3
710	1260	6SL3710-7LE41-2AA3
800	1405	6SL3710-7LE41-4AA3
Line voltage 500 ... 690 V 3 AC		
75	85	6SL3710-7LG28-5AA3
90	100	6SL3710-7LG31-0AA3
110	120	6SL3710-7LG31-2AA3
132	150	6SL3710-7LG31-5AA3
160	175	6SL3710-7LG31-8AA3
200	215	6SL3710-7LG32-2AA3
250	260	6SL3710-7LG32-6AA3
315	330	6SL3710-7LG33-3AA3
400	410	6SL3710-7LG34-1AA3
450	465	6SL3710-7LG34-7AA3
560	575	6SL3710-7LG35-8AA3
710	735	6SL3710-7LG37-4AA3
800	810	6SL3710-7LG38-1AA3
900	910	6SL3710-7LG38-8AA3
1000	1025	6SL3710-7LG41-0AA3
1200	1270	6SL3710-7LG41-3AA3

SINAMICS S150 Converter Cabinet Units

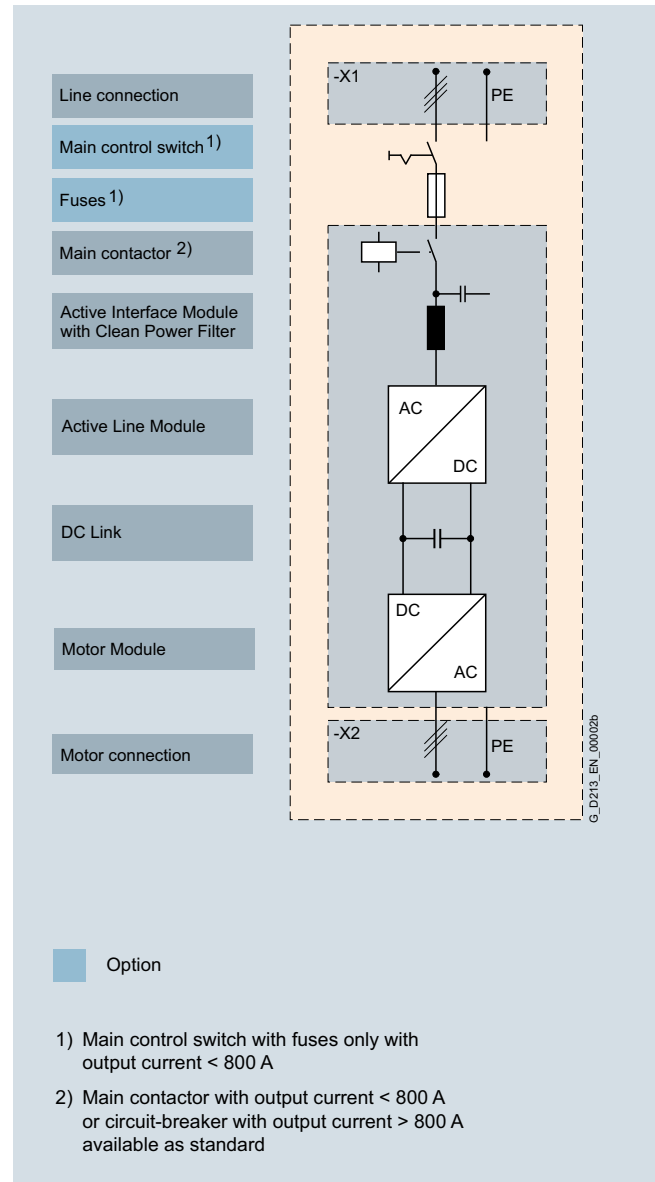
Converter cabinet units

Design

The SINAMICS S150 converter cabinet units are characterized by their compact, modular and service-friendly design.



Design example of a SINAMICS S150 converter cabinet unit



Basic design of a SINAMICS S150 converter cabinet unit with a number of version-specific options

Design (continued)**Coated modules**

The following devices are equipped as standard with coated modules:

- Chassis format units
- 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 cabinets are nickel-plated in order to achieve the best possible immunity to environmental effects. Further, it is possible to eliminate having to clean the contacts at the customer connections, which is required for bare copper connections.

Note:

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

Degrees of protection

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.

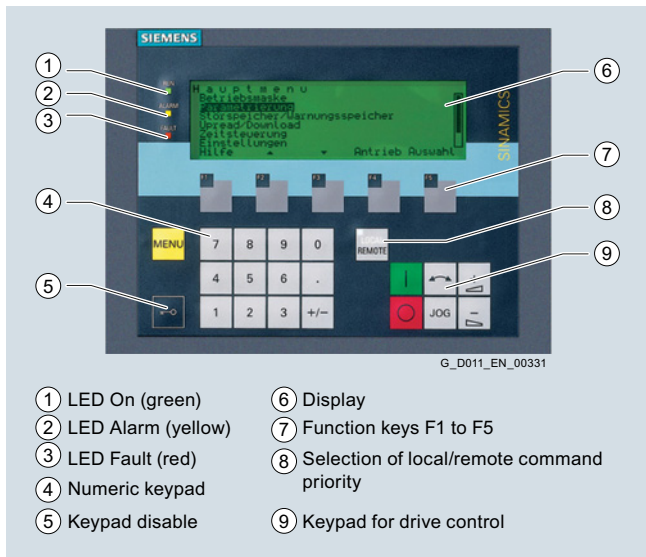
Degree of protection	First digit (Touch protection and protection against foreign bodies)	Second digit (Protection of equipment against the ingress of water)
IP20 (Standard)	Protected against solid foreign bodies with a diameter ≥ 12.5 mm	No water protection
IP21 (Option M21)	Protected against solid 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 both sides of the vertical at an angle of up to 60° shall not have a harmful effect.
IP43 (Option M43)	Protected against solid foreign bodies diameter ≥ 1 mm	Protected against spray water Water sprayed on both sides of the vertical at an angle of up to 60° shall not have a harmful effect.
IP54 (Option M54)	Dust protected Ingress of dust is not totally prevented, but dust must not be allowed to enter in such quantities that the functioning or safety of the equipment is impaired.	Protected against splash water Water splashing onto the housing from any direction must not have any harmful effects.

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Converter cabinet units

Function

AOP30 Advanced Operator Panel



An Advanced Operator Panel (AOP30) is installed in the cabinet door of the converter for operation, monitoring and commissioning tasks.

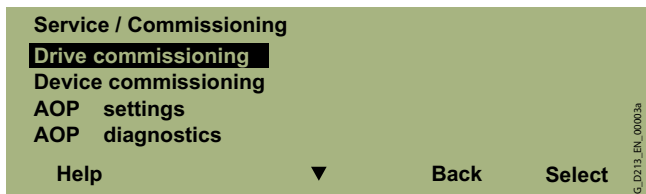
The user is guided by interactive menus through the drive commissioning screens. When the drive is commissioned for the first time, only 6 motor parameters (which can be found on the motor rating plate) have to be entered on the AOP30. The closed-loop control is then optimized automatically to adapt the converter to the motor.

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 and 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.

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 standard operator panel languages, Russian can also be retro-installed. Further languages are available on request.

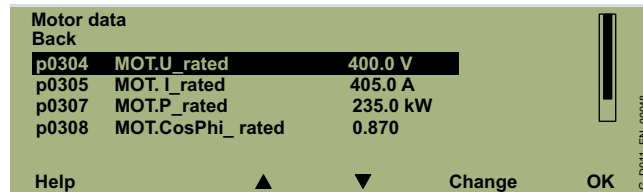
Examples of plain-text displays during various phases of operation are shown below.

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

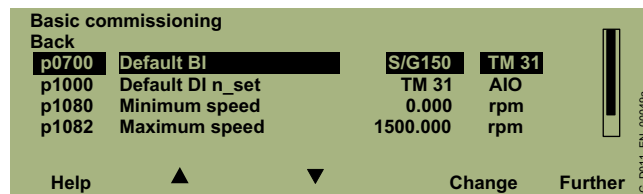


Only 6 motor parameters have to be entered: Power, speed, current, $\cos \varphi$, voltage and frequency of the motor.

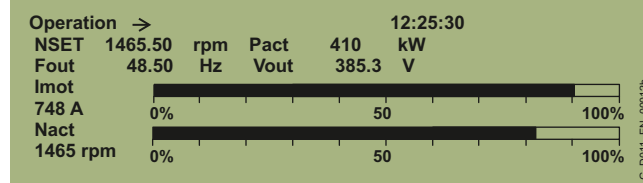
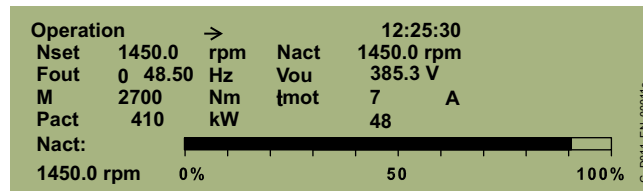
This information can be found on the motor rating plate, and must be entered in the screens on the display by following a short, menu-assisted procedure. The motor cooling method must also be specified.



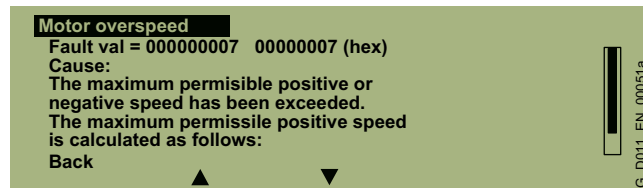
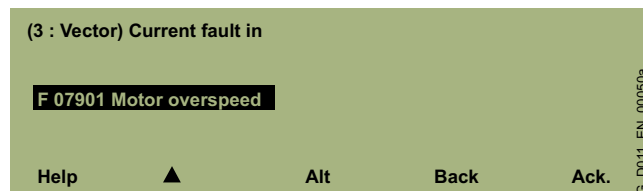
The next screen contains the parameter values that are used to automatically optimize the control.



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 3 process variables as a quasi-analog bar display.



Any **alarms** that occur are signaled by flashing of the yellow ALARM LED, **faults** by the red FAULT LED, which is then lit. There is also an indication of the cause displayed in plain text on the display's status line (with counter/remedial measures).



Function (continued)**Communication with higher-level controller and customer terminal block**

A PROFIBUS or PROFINET interface on the Control Unit CU320-2 is provided as standard as the customer control interface.

This interface can be used to connect the system to the higher-level controller using analog and digital signals, or to connect additional units.

The inputs and outputs available as standard can be optionally expanded by up to two Terminal Modules TM31 (refer to the description of options, option **G60** or **G61**). To simplify configuration and commissioning of the drive, the TM31 Terminal Module can be preset to a variety of factory settings.

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

Open-loop and closed-loop control functions

SINAMICS S150 has a high-dynamic vector control with speed and current control – with and without speed actual value feedback.

Software and protective functions

The software functions available as standard are described below.

Software and protective functions	Description
Setpoint input	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. 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. This results in a good speed control response and plays its role in reducing the stress on the mechanical system. The down ramps can be parameterized separately for quick stop.
$V_{dc\ max}$ controller	The $V_{dc\ max}$ controller automatically prevents overvoltages in the DC link, if the set down ramp is too short, for example. This may also extend the set ramp-down time.
Kinetic buffering (KIP)	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 drive 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 bumplessly accelerated up to its setpoint speed.
Automatic restart	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	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, 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 and complex tension controls. The existing D component can act both on the system deviation well as on the actual value (factory setting). The P, I, and D components are set separately.
Free function blocks	Using the freely programmable function blocks, it is easy to implement logic and arithmetic functions for controlling the SINAMICS drive. The blocks can be programmed at the operator panel or the STARTER commissioning tool.
SINAMICS Drive Control Chart (SINAMICS DCC)	SINAMICS DCC is an additional tool for the easy configuration of technological functions for SINAMICS. 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. SINAMICS DCC is an add-on to the STARTER commissioning tool (→ Tools and Engineering).
\dot{I}^2t sensing 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 temperature sensor is connected, the limit values can be set for alarm or shutdown. When a PTC thermistor is connected, the system reaction to triggering of the thermistor (alarm or trip) can be defined.
Motor blocking protection	A blocked motor is detected and protected against thermal overloading by a fault trip.
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).
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).

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Function (continued)

Power unit protection

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 continues to rise, the unit either shuts down or independently adjusts the pulse frequency or output current so that thermal load is reduced. Once the cause of the fault has been eliminated (e.g. cooling has been improved), the original operating values are automatically resumed.

Technical specifications

The most important directives and standards are listed below. These are used as basis for the SINAMICS S150 converter cabinet units and they must be carefully observed to achieve an EMC-compliant configuration that is safe both functionally and in operation.

European directives

2006/95/EC	Low Voltage Directive: Directive of the European Parliament and Council of December 12, 2006, on the approximation of the laws of the member states relating to electrical equipment designed for use within certain voltage limits
2004/108/EC	EMC Directive: Directive of the European Parliament and Council of December 15, 2004, which repeals directive 89/336/EEC, on the approximation of laws of the member states relating to electromagnetic compatibility
2006/42/EC	Machinery Directive: Directive of the European Parliament and Council of May 17, 2006, on machinery and amending Directive 95/16/EC (recast).

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 guidelines (ISO 13849-1: 2006)
EN 60146-1-1	Semiconductor converters – General requirements and line-commutated converters Part 1-1: Specification of basic requirements
EN 60204-1	Safety of machinery – Electrical equipment of machines; Part 1: General requirements
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 low voltage adjustable frequency AC power drive systems
EN 61800-3	Adjustable speed electrical power drive systems Part 3: EMC requirements and specific test methods
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 5-2: Safety requirements – Functional safety (IEC 61800-5-2: 2007)

Technical specifications (continued)

General technical specifications

Electrical specifications			
Line voltages	380 ... 480 V 3 AC, ±10% (-15% <1 min) 500 ... 690 V 3 AC, ±10% (-15% <1 min)		
Line supply types	Grounded TN/TT systems and non-grounded IT systems		
Line frequency	47 ... 63 Hz		
Output frequency ¹⁾	0 ... 550 Hz		
Line power factor	Adjustable (factory-set to $\cos \varphi = 1$)		
Efficiency	>96%		
Overvoltage category	III 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/PROFINET)		
Skippable speed ranges	4, parameterizable		
Setpoint resolution	0.001 rpm digital (14 bits + sign) 12 bits analog		
Braking operation	Four-quadrant operation is possible as standard (optional via a braking unit if braking is required when power fails)		
Mechanical specifications			
Degree of protection	IP20 (higher degrees of protection up to IP54 optional)		
Protection class	I acc. 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 ²⁾	Transport ²⁾	Operation
Ambient temperature	-25 ... +55 °C	-25 ... +70 °C from <u>-40 °C</u> for 24 hours	<u>0 ... 40 °C</u> to +50 °C, see derating data
Relative humidity (condensation not permissible)	<u>5 ... 95%</u> Class 1K4 acc. to IEC 60721-3-1	5 ... 95% at 40 °C Class 2K3 acc. to IEC 60721-3-2	5 ... <u>95%</u> Class 3K3 acc. to IEC 60721-3-3
Environmental class/ harmful chemical substances	Class 1C2 acc. to IEC 60721-3-1	Class 2C2 acc. to IEC 60721-3-2	Class 3C2 acc. to IEC 60721-3-3
Organic/biological influences	Class 1B1 acc. to IEC 60721-3-1	Class 2B1 acc. to IEC 60721-3-2	Class 3B1 acc. to IEC 60721-3-3
Degree of pollution	2 acc. to EN 61800-5-1		
Installation altitude	Up to 2000 m above sea level without derating; > 2000 m see derating data		
Mechanical stability	Storage ²⁾	Transport ²⁾	Operation
Vibratory load	Class 1M2 acc. to IEC 60721-3-1	Class 2M2 acc. to IEC 60721-3-2	–
• Deflection	1.5 mm at <u>5 ... 9 Hz</u> ³⁾	3.1 mm at <u>5 ... 9 Hz</u> ³⁾	0.075 mm at 10 ... 58 Hz
• Acceleration	5 m/s ² at >9 ... 200 Hz	10 m/s ² at <u>9 ... 200 Hz</u>	9.8 m/s ² at 58 ... 200 Hz
Shock load	Class 1M2 acc. to IEC 60721-3-1	Class 2M2 acc. to IEC 60721-3-2	Class 3M4 acc. to IEC 60721-3-3
• Acceleration	40 m/s ² at 22 ms	100 m/s ² at 11 ms	100 m/s ² at 11 ms
Compliance with standards			
Conformances/approvals, according to	CE (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	SINAMICS drive converter systems are not designed for connection to the public grid (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 additional measures are taken (e.g. line filter), it can also be operated in the "first environment".		

Deviations from the specified classes are underlined.

¹⁾ Please note:

- The correlation between the maximum output frequency, pulse frequency and current derating. Higher output frequencies on request.
- The correlation between the maximum output frequency and permissible output current (current derating).

[Information is provided in the SINAMICS Low Voltage Configuration Manual.](#)

²⁾ In transport packaging.

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Technical specifications (continued)

Line voltage 380 ... 480 V 3 AC		SINAMICS S150 Converter Cabinet Units					
		6SL3710-7LE32-1AA3	6SL3710-7LE32-6AA3	6SL3710-7LE33-1AA3	6SL3710-7LE33-8AA3	6SL3710-7LE35-0AA3	6SL3710-7LE36-1AA3
Type rating							
• At I_L (50 Hz 400 V) ¹⁾	kW	110	132	160	200	250	315
• At I_H (50 Hz 400 V) ¹⁾	kW	90	110	132	160	200	250
• At I_L (60 Hz 460 V) ²⁾	hp	150	200	250	300	400	500
• At I_H (60 Hz 460 V) ²⁾	hp	150	200	200	250	350	350
Output current							
• Rated current $I_{rated O}$	A	210	260	310	380	490	605
• Base-load current I_L ³⁾	A	205	250	302	370	477	590
• Base-load current I_H ⁴⁾	A	178	233	277	340	438	460
• Maximum current $I_{max O}$	A	307	375	453	555	715	885
Infeed/regenerative feedback current							
• Rated input current $I_{rated I}$	A	197	242	286	349	447	549
• Maximum input current $I_{max I}$	A	315	390	570	570	735	907
Current demand, max. ⁵⁾							
• 24 V DC aux. power supply	A	Internal	Internal	Internal	Internal	Internal	Internal
Pulse frequency ⁶⁾							
• Rated frequency	kHz	2	2	2	2	2	1.25
• Pulse frequency, max.							
- Without current derating	kHz	2	2	2	2	2	1.25
- With current derating	kHz	8	8	8	8	8	7.5
Power loss, max. ⁷⁾							
• At 50 Hz 400 V	kW	6.31	7.55	10.01	10.72	13.13	17.69
• At 60 Hz 460 V	kW	6.49	7.85	10.45	11.15	13.65	18.55
Cooling air requirement		m ³ /s	0.58	0.7	1.19	1.19	1.96
Sound pressure level L_{pA} (1 m) at 50/60 Hz		dB	71/73	71/73	72/74	72/74	77/79
Cable length, max.							
• Shielded	m	300	300	300	300	300	300
• Unshielded	m	450	450	450	450	450	450
Degree of protection			IP20	IP20	IP20	IP20	IP20
Dimensions							
• Width	mm	1400	1400	1600	1800	1800	2200
• Height	mm	2000	2000	2000	2000	2000	2000
• Depth	mm	600	600	600	600	600	600
Weight (without options), approx.		kg	708	708	892	980	1716
Short-circuit current rating according to IEC ⁸⁾		kA	65	65	65	65	65
Minimum short-circuit current ⁹⁾		A	3000	3000	4500	4500	8000
Frame sizes							
• Active Interface Module		FI	FI	GI	GI	GI	HI
• Active Line Module		FX	FX	GX	GX	GX	HX
• Motor Module		FX	FX	GX	GX	GX	HX

Note:

The power data in hp units is based on the NEC/CEC standards for the North American market. Information about line supply connections, motor connections and cabinet grounding can be found under **Cable cross-sections and connections**.

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

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

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.

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.

⁵⁾ If the drive closed-loop control is still to remain active when the line supply fails, the equipment must be provided with an external 24 V DC supply.

⁶⁾ Information regarding the correlation between the pulse frequency and max. output current/output frequency is provided in the SINAMICS Low Voltage Configuration Manual.

⁷⁾ The specified power losses are the maximum values at 100% utilization. The values are lower under normal operating conditions.

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

⁹⁾ Current required for reliably triggering protective devices.

Technical specifications (continued)

Line voltage 380 ... 480 V 3 AC		SINAMICS S150 Converter Cabinet Units				
		6SL3710- 7LE37-5AA3	6SL3710- 7LE38-4AA3	6SL3710- 7LE41-0AA3	6SL3710- 7LE41-2AA3	6SL3710- 7LE41-4AA3
Type rating						
• At I_L (50 Hz 400 V) ¹⁾	kW	400	450	560	710	800
• At I_H (50 Hz 400 V) ¹⁾	kW	315	400	450	560	710
• At I_L (60 Hz 460 V) ²⁾	hp	600	700	800	900	1150
• At I_H (60 Hz 460 V) ²⁾	hp	450	600	700	900	1000
Output current						
• Rated current $I_{rated O}$	A	745	840	985	1260	1405
• Base-load current I_L ³⁾	A	725	820	960	1230	1370
• Base-load current I_H ⁴⁾	A	570	700	860	1127	1257
• Maximum current $I_{max O}$	A	1087	1230	1440	1845	2055
Infeed/regenerative feedback current						
• Rated input current $I_{rated I}$	A	674	759	888	1133	1262
• Maximum input current $I_{max I}$	A	1118	1260	1477	1891	2107
Current demand, max. ⁵⁾						
• 24 V DC aux. power supply	A	Internal	Internal	Internal	Internal	Internal
Pulse frequency ⁶⁾						
• Rated frequency	kHz	1.25	1.25	1.25	1.25	1.25
• Pulse frequency, max.						
- Without current derating	kHz	1.25	1.25	1.25	1.25	1.25
- With current derating	kHz	7.5	7.5	7.5	7.5	7.5
Power loss, max. ⁷⁾						
• At 50 Hz 400 V	kW	20.63	21.1	27.25	33.05	33.95
• At 60 Hz 460 V	kW	21.75	22.25	28.65	34.85	35.85
Cooling air requirement		m ³ /s	1.96	1.96	2.6	2.6
Sound pressure level L_{pA} (1 m) at 50/60 Hz		dB	77/79	77/79	77/79	78/80
Cable length, max.						
• Shielded	m	300	300	300	300	300
• Unshielded	m	450	450	450	450	450
Degree of protection			IP20	IP20	IP20	IP20
Dimensions						
• Width	mm	2200	2200	2800	2800	2800
• Height	mm	2000	2000	2000	2000	2000
• Depth	mm	600	600	600	600	600
Weight (without options), approx.		kg	1731	1778	2408	2408
Short-circuit current rating according to IEC ⁸⁾		kA	65	65	84	100
Minimum short-circuit current ⁹⁾		A	15000	2000	2500	3200
Frame sizes						
• Active Interface Module		HI	HI	J1	J1	J1
• Active Line Module		HX	HX	JX	JX	JX
• Motor Module		HX	HX	JX	JX	JX

Note:

The power data in hp units is based on the NEC/CEC standards for the North American market. Information about line supply connections, motor connections and cabinet grounding can be found under **Cable cross-sections and connections**.

- 1) Rated output of a typical 6-pole standard induction motor based on I_L or I_H for 400 V 3 AC 50 Hz.
- 2) Rated output of a typical 6-pole standard induction motor based on I_L or I_H for 460 V 3 AC 60 Hz.
- 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.
- 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.
- 5) If the drive closed-loop control is still to remain active when the line supply fails, the equipment must be provided with an external 24 V DC supply.

- 6) Information regarding the correlation between the pulse frequency and max. output current/output frequency is provided in the SINAMICS Low Voltage Configuration Manual.
- 7) The specified power losses are the maximum values at 100% utilization. The values are lower under normal operating conditions.
- 8) In conjunction with the specified fuses or circuit breakers.
- 9) Current required for reliably triggering protective devices.

SINAMICS S150 Converter Cabinet Units

Converter cabinet units

Technical specifications (continued)

Line voltage 500 ... 690 V 3 AC		SINAMICS S150 Converter Cabinet Units					
		6SL3710-7LG28-5AA3	6SL3710-7LG31-0AA3	6SL3710-7LG31-2AA3	6SL3710-7LG31-5AA3	6SL3710-7LG31-8AA3	6SL3710-7LG32-2AA3
Type rating							
• At I_L (50 Hz 690 V) ¹⁾	kW	75	90	110	132	160	200
• At I_H (50 Hz 690 V) ¹⁾	kW	55	75	90	110	132	160
• At I_L (50 Hz 500 V) ¹⁾	kW	55	55	75	90	110	132
• At I_H (50 Hz 500 V) ¹⁾	kW	45	55	75	90	90	110
• At I_L (60 Hz 575 V) ²⁾	hp	75	75	100	150	150	200
• At I_H (60 Hz 575 V) ²⁾	hp	75	75	100	125	150	200
Output current							
• Rated current $I_{rated O}$	A	85	100	120	150	175	215
• Base-load current I_L ³⁾	A	80	95	115	142	170	208
• Base-load current I_H ⁴⁾	A	76	89	117	134	157	192
• Maximum current $I_{max O}$	A	120	142	172	213	255	312
Infeed/regenerative feedback current							
• Rated current $I_{rated I}$	A	86	99	117	144	166	202
• Maximum current $I_{max I}$	A	125	144	170	210	253	308
Current demand, max. ⁵⁾							
• 24 V DC aux. power supply	A	Internal	Internal	Internal	Internal	Internal	Internal
Pulse frequency ⁶⁾							
• Rated frequency	kHz	1.25	1.25	1.25	1.25	1.25	1.25
• Pulse frequency, max.							
- Without current derating	kHz	1.25	1.25	1.25	1.25	1.25	1.25
- With current derating	kHz	7.5	7.5	7.5	7.5	7.5	7.5
Power loss, max. ⁷⁾							
• At 50 Hz 690 V	kW	5.12	5.38	5.84	5.75	11.02	11.44
• At 60 Hz 575 V	kW	4.45	4.65	5.12	4.97	11.15	11.56
Cooling air requirement		m ³ /s	0.58	0.58	0.58	0.58	1.19
Sound pressure level L_{pA} (1 m) at 50/60 Hz		dB	71/73	71/73	71/73	71/73	75/77
Cable length, max.							
• Shielded	m	300	300	300	300	300	300
• Unshielded	m	450	450	450	450	450	450
Degree of protection			IP20	IP20	IP20	IP20	IP20
Dimensions							
• Width	mm	1400	1400	1400	1400	1600	1600
• Height	mm	2000	2000	2000	2000	2000	2000
• Depth	mm	600	600	600	600	600	600
Weight (without options), approx.		kg	708	708	708	892	892
Short-circuit current rating according to IEC ⁸⁾		kA	65	65	65	65	65
Minimum short-circuit current ⁹⁾		A	1000	1000	1300	1800	2500
Frame size							
• Active Interface Module		FI	FI	FI	FI	GI	GI
• Active Line Module		FX	FX	FX	FX	GX	GX
• Motor Module		FX	FX	FX	FX	GX	GX

Note:

The power data in hp units is based on the NEC/CEC standards for the North American market. Information about line supply connections, motor connections and cabinet grounding can be found under **Cable cross-sections and connections**.

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

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

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.

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.

⁵⁾ If the drive closed-loop control is still to remain active when the line supply fails, the equipment must be provided with an external 24 V DC supply.

⁶⁾ Information regarding the correlation between the pulse frequency and max. output current/output frequency is provided in the SINAMICS Low Voltage Configuration Manual.

⁷⁾ The specified power losses are the maximum values at 100% utilization. The values are lower under normal operating conditions.

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

⁹⁾ Current required for reliably triggering protective devices.

Technical specifications (continued)

Line voltage 500 ... 690 V 3 AC		SINAMICS S150 Converter Cabinet Units					
		6SL3710-7LG32-6AA3	6SL3710-7LG33-3AA3	6SL3710-7LG34-1AA3	6SL3710-7LG34-7AA3	6SL3710-7LG35-8AA3	6SL3710-7LG37-4AA3
Type rating							
• At I_L (50 Hz 690 V) ¹⁾	kW	250	315	400	450	560	710
• At I_H (50 Hz 690 V) ¹⁾	kW	200	250	315	400	450	630
• At I_L (50 Hz 500 V) ¹⁾	kW	160	200	250	315	400	500
• At I_H (50 Hz 500 V) ¹⁾	kW	132	160	200	250	315	450
• At I_L (60 Hz 575 V) ²⁾	hp	250	300	400	450	600	700
• At I_H (60 Hz 575 V) ²⁾	hp	200	250	350	450	500	700
Output current							
• Rated current $I_{rated O}$	A	260	330	410	465	575	735
• Base-load current I_L ³⁾	A	250	320	400	452	560	710
• Base-load current I_H ⁴⁾	A	233	280	367	416	514	657
• Maximum current $I_{max O}$	A	375	480	600	678	840	1065
Infeed/regenerative feedback current							
• Rated current $I_{rated I}$	A	242	304	375	424	522	665
• Maximum current $I_{max I}$	A	370	465	619	700	862	1102
Current demand, max. ⁵⁾							
• 24 V DC aux. power supply	A	Internal	Internal	Internal	Internal	Internal	Internal
Pulse frequency ⁶⁾							
• Rated frequency	kHz	1.25	1.25	1.25	1.25	1.25	1.25
• Pulse frequency, max.							
- Without current derating	kHz	1.25	1.25	1.25	1.25	1.25	1.25
- With current derating	kHz	7.5	7.5	7.5	7.5	7.5	7.5
Power loss, max. ⁷⁾							
• At 50 Hz 690 V	kW	11.97	12.69	19.98	20.55	24.05	30.25
• At 60 Hz 575 V	kW	12.03	12.63	18.86	19.47	22.85	28.75
Cooling air requirement		m ³ /s	1.19	1.19	1.96	1.96	2.6
Sound pressure level L_{pA} (1 m) at 50/60 Hz		dB	75/77	75/77	77/79	77/79	77/79
Cable length, max.							
• Shielded	m	300	300	300	300	300	300
• Unshielded	m	450	450	450	450	450	450
Degree of protection			IP20	IP20	IP20	IP20	IP20
Dimensions							
• Width	mm	1600	1600	2200	2200	2200	2800
• Height	mm	2000	2000	2000	2000	2000	2000
• Depth	mm	600	600	600	600	600	600
Weight (without options), approx.		kg	892	892	1716	1716	2300
Short-circuit current rating according to IEC ⁸⁾		kA	65	65	65	65	85
Minimum short-circuit current ⁹⁾		A	3000	4500	4500	7000	9000
Frame size							
• Active Interface Module		GI	GI	HI	HI	HI	J1
• Active Line Module		GX	GX	HX	HX	HX	JX
• Motor Module		GX	GX	HX	HX	HX	JX

Note:

The power data in hp units is based on the NEC/CEC standards for the North American market. Information about line supply connections, motor connections and cabinet grounding can be found under **Cable cross-sections and connections**.

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

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

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.

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.

⁵⁾ If the drive closed-loop control is still to remain active when the line supply fails, the equipment must be provided with an external 24 V DC supply.

⁶⁾ Information regarding the correlation between the pulse frequency and max. output current/output frequency is provided in the SINAMICS Low Voltage Configuration Manual.

⁷⁾ The specified power losses are the maximum values at 100% utilization. The values are lower under normal operating conditions.

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

⁹⁾ Current required for reliably triggering protective devices.

SINAMICS S150 Converter Cabinet Units

Converter cabinet units

Technical specifications (continued)

Line voltage 500 ... 690 V 3 AC		SINAMICS S150 Converter Cabinet Units			
		6SL3710-7LG38-1AA3	6SL3710-7LG38-8AA3	6SL3710-7LG41-0AA3	6SL3710-7LG41-3AA3
Type rating					
• At I_L (50 Hz 690 V) ¹⁾	kW	800	900	1000	1200
• At I_H (50 Hz 690 V) ¹⁾	kW	710	800	900	1000
• At I_L (50 Hz 500 V) ¹⁾	kW	560	630	710	900
• At I_H (50 Hz 500 V) ¹⁾	kW	500	560	630	800
• At I_L (60 Hz 575 V) ²⁾	hp	800	900	1000	1250
• At I_H (60 Hz 575 V) ²⁾	hp	700	800	900	1000
Output current					
• Rated current $I_{rated O}$	A	810	910	1025	1270
• Base-load current I_L ³⁾	A	790	880	1000	1230
• Base-load current I_H ⁴⁾	A	724	814	917	1136
• Maximum current $I_{max O}$	A	1185	1320	1500	1845
Infeed/regenerative feedback current					
• Rated current $I_{rated I}$	A	732	821	923	1142
• Maximum current $I_{max I}$	A	1218	1367	1537	1905
Current demand, max. ⁵⁾					
• 24 V DC aux. power supply	A	Internal	Internal	Internal	Internal
Pulse frequency ⁶⁾					
• Rated frequency	kHz	1.25	1.25	1.25	1.25
• Pulse frequency, max.					
- Without current derating	kHz	1.25	1.25	1.25	1.25
- With current derating	kHz	7.5	7.5	7.5	7.5
Power loss, max. ⁷⁾					
• At 50 Hz 690 V	kW	34.45	34.65	36.15	42.25
• At 60 Hz 575 V	kW	32.75	32.85	34.25	39.25
Cooling air requirement		m ³ /s	2.6	2.6	2.6
Sound pressure level L_{pA} (1 m) at 50/60 Hz		dB	77/79	77/79	77/79
Cable length, max.					
• Shielded	m	300	300	300	300
• Unshielded	m	450	450	450	450
Degree of protection			IP20	IP20	IP20
Dimensions					
• Width	mm	2800	2800	2800	2800
• Height	mm	2000	2000	2000	2000
• Depth	mm	600	600	600	600
Weight (without options), approx.		kg	2408	2408	2408
Short-circuit current rating according to IEC ⁸⁾		kA	85	85	85
Minimum short-circuit current ⁹⁾		A	2000	2000	2500
Frame size					
• Active Interface Module		J1	J1	J1	J1
• Active Line Module		JX	JX	JX	JX
• Motor Module		JX	JX	JX	JX

Note:

The power data in hp units is based on the NEC/CEC standards for the North American market. Information about line supply connections, motor connections and cabinet grounding can be found under **Cable cross-sections and connections**.

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

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

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.

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.

⁵⁾ If the drive closed-loop control is still to remain active when the line supply fails, the equipment must be provided with an external 24 V DC supply.

⁶⁾ Information regarding the correlation between the pulse frequency and max. output current/output frequency is provided in the SINAMICS Low Voltage Configuration Manual.

⁷⁾ The specified power losses are the maximum values at 100% utilization. The values are lower under normal operating conditions.

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

⁹⁾ Current required for reliably triggering protective devices.

Characteristic curves

Derating data

SINAMICS S150 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 the cooling air flow stated in the technical specifications is ensured by the way the devices are installed in the cabinet.

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 additional information, please refer to the SINAMICS Low Voltage Engineering Manual.](#)

Degree of protection	Installation altitude above sea level m	Current derating factor (as a percentage of the rated current) for an ambient / air intake temperature of						
		20 °C	25 °C	30 °C	35 °C	40 °C	45 °C	50 °C
IP20, IP21, IP23, 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 %	80.0 %
	2001 ... 2500				96.3 %	89.8 %		
	2501 ... 3000		100 %	98.7 %	92.5 %			
	3001 ... 3500			94.7 %				
	3501 ... 4000		96.3 %	90.7 %				
	4001 ... 4500	97.5 %	92.1 %					
	4501 ... 5000	93.0 %						

SINAMICS S150 Converter Cabinet Units

Converter cabinet units

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 additional 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 S150 converter cabinet unit	Type rating at 400 V	Output current at 2 kHz	Derating factor at the pulse frequency				
			2.5 kHz	4 kHz	5 kHz	7.5 kHz	8 kHz
6SL3710-...	kW	A					
380 ... 480 V 3 AC							
7LE32-1AA3	110	210	95 %	82 %	74 %	54 %	50 %
7LE32-6AA3	132	260	95 %	83 %	74 %	54 %	50 %
7LE33-1AA3	160	310	97 %	88 %	78 %	54 %	50 %
7LE33-8AA3	200	380	96 %	87 %	77 %	54 %	50 %
7LE35-0AA3	250	490	94 %	78 %	71 %	53 %	50 %

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

SINAMICS S150 converter cabinet unit	Type rating at 400 V or 690 V	Output current at 1.25 kHz	Derating factor at the pulse frequency				
			2 kHz	2.5 kHz	4 kHz	5 kHz	7.5 kHz
6SL3710-...	kW	A					
380 ... 480 V 3 AC							
7LE36-1AA3	315	605	83 %	72 %	64 %	60 %	40 %
7LE37-5AA3	400	745	83 %	72 %	64 %	60 %	40 %
7LE38-4AA3	450	840	87 %	79 %	64 %	55 %	40 %
7LE41-0AA3	560	985	92 %	87 %	70 %	60 %	50 %
7LE41-2AA3	710	1260	92 %	87 %	70 %	60 %	50 %
7LE41-4AA3	800	1405	97 %	95 %	74 %	60 %	50 %
500 ... 690 V 3 AC							
7LG28-5AA3	75	85	93 %	89 %	71 %	60 %	40 %
7LG31-0AA3	90	100	92 %	88 %	71 %	60 %	40 %
7LG31-2AA3	110	120	92 %	88 %	71 %	60 %	40 %
7LG31-5AA3	132	150	90 %	84 %	66 %	55 %	35 %
7LG31-8AA3	160	175	92 %	87 %	70 %	60 %	40 %
7LG32-2AA3	200	215	92 %	87 %	70 %	60 %	40 %
7LG32-6AA3	250	260	92 %	88 %	71 %	60 %	40 %
7LG33-3AA3	315	330	89 %	82 %	65 %	55 %	40 %
7LG34-1AA3	400	410	89 %	82 %	65 %	55 %	35 %
7LG34-7AA3	450	465	92 %	87 %	67 %	55 %	35 %
7LG35-8AA3	560	575	91 %	85 %	64 %	50 %	35 %
7LG37-4AA3	710	735	87 %	79 %	64 %	55 %	35 %
7LG38-1AA3	800	810	97 %	95 %	71 %	55 %	35 %
7LG38-8AA3	900	910	92 %	87 %	67 %	55 %	33 %
7LG41-0AA3	1000	1025	91 %	86 %	64 %	50 %	30 %
7LG41-3AA3	1200	1270	87 %	79 %	55 %	40 %	25 %

The following table lists the maximum achievable output frequency as a function of the pulse frequency:

Pulse frequency	Max. achievable output frequency
1.25 kHz	100 Hz
2 kHz	160 Hz
2.5 kHz	200 Hz
≥4 kHz	300 Hz

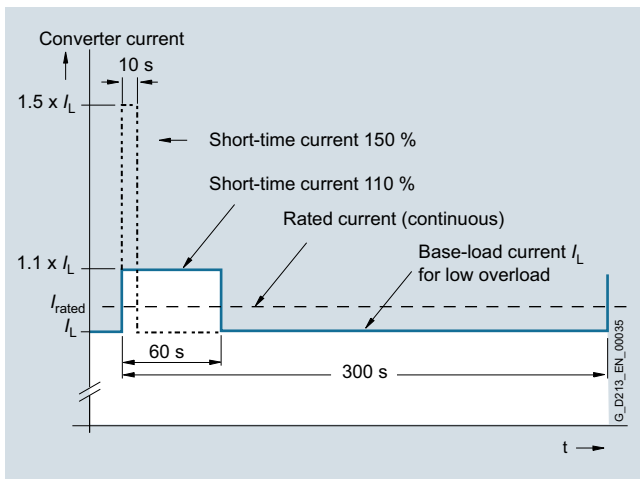
Characteristic curves (continued)**Overload capability**

The SINAMICS S150 converter cabinet units are equipped with an overload reserve to deal with breakaway torques, for example. If larger surge loads occur, this must be taken into account in the configuration. For drives with overload requirements, the appropriate base load current must, therefore, be used as a basis for the required load.

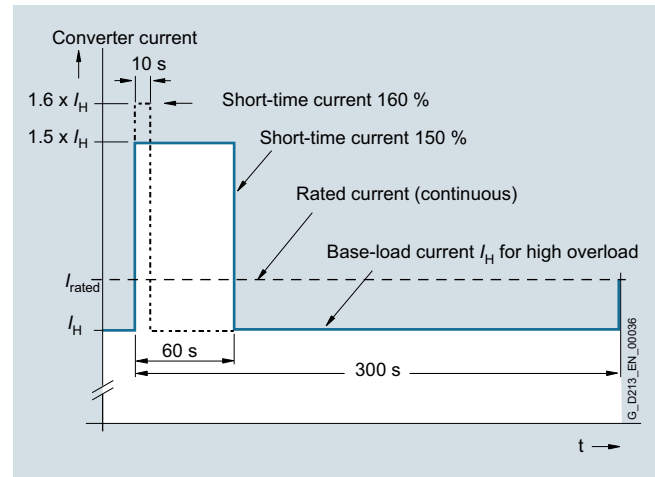
The criterion for overload is that the drive is operated with its base load current before and after the overload occurs on the basis of a duty cycle duration of 300 s.

For temporary, periodic duty cycles with high variations of load within the duty cycle, the relevant sections of the SINAMICS Low Voltage Engineering Manual must be observed.

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



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



SINAMICS S150 Converter Cabinet Units

Converter cabinet units

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:

**6SL3710-7LE32-1AA3-Z
M07+D60+...**

See also ordering examples.

Available options	Order code
Input side	
Use in the first environment according to EN 618003, Category C2 (TN-TT line supplies with grounded neutral point)	L00
Infeed module one level lower	L04
Surge suppression	L21
Main switch incl. fuses or circuit breakers	L26
Line filter monitoring	L40
EMC shielding busbar (cable connection from below) ¹⁾	M70
Output side	
dv/dt filter plus Voltage Peak Limiter	L07
Motor reactor	L08
dv/dt filter plus Voltage Peak Limiter	L10
Sine-wave filter (only for the voltage range 380 to 480 V, up to 200 kW)	L15
EMC shielding busbar (cable connection from below) ¹⁾	M70
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	L59
EMERGENCY STOP category 1, 24 V DC	L60
Thermistor motor protection (alarm)	L83
Thermistor motor protection (trip)	L84
Pt100 evaluation unit	L86
Insulation monitoring	L87
Additional touch protection	M60
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	M13
Motor connection from above	M78
Crane transport assembly (top-mounted)	M90
Safety Integrated	
Safety license for 1 axis	K01
Second 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
Safe Brake Adapter SBA, 230 V AC	K88

Available options	Order code
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
SMC10 Sensor Module Cabinet-Mounted	K46
SMC20 Sensor Module Cabinet-Mounted	K48
SMC30 Sensor Module Cabinet-Mounted	K50
VSM10 Voltage Sensing Module	K51
CU320-2 PN Control Unit	K95
Connection for external auxiliary equipment	L19
Cabinet lighting with service socket	L50
Cabinet anti-condensation heating	L55
25/125 kW braking unit for line voltages of 380 ... 480 V (110 ... 132 kW) and 660 ... 690 V (75 ... 132 kW)	L61
50/250 kW braking unit for line voltages of 380 ... 480 V (160 ... 800 kW) and 660 ... 690 V (160 ... 1200 kW)	L62
25/125 kW braking unit for line voltages of 500 ... 600 V (110 ... 132 kW)	L64
50/250 kW braking unit for line voltages of 500 ... 600 V (160 ... 1200 kW)	L65
Marking of all control cable wire ends	M91
Special cabinet paint finish ²⁾	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: One issue	B43
Documentation, production flowchart: Updated every two weeks	B44
Documentation, production flowchart: Updated every month	B45
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
Documentation in Russian	D56
Documentation in English / French	D58
Documentation in English / Spanish	D60
Documentation in Italian	D72
Documentation in English	D76
Documentation in French	D77
Documentation in Spanish	D78
Documentation in English / Italian	D80
Documentation in Chinese	D84
Documentation in English / Chinese	D91
Documentation in English / Portuguese (Brazil)	D93
Documentation in English / Russian	D94

¹⁾ This option is listed for the input- and output-side options, but is only required once.

²⁾ The order code **Y..** requires data in plain text.

Options (continued)

Available options	Order code
Rating plate data (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/Portuguese (Brazil)	T83
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 cert. from American Bureau of Shipping (ABS)	E61
Individual cert. from Chinese Certification Society (CCS)	E71

Available options	Order code
Converter acceptance in presence of customer	
Visual acceptance	F03
Function test without 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 motor	F72
Function test with test bay motor under no-load conditions	F74
Insulation test	F76

Option selection matrix

Certain options can mutually exclude one another (options that are not involved, are also not shown).

✓	Possible combination
–	Combination not possible

Electrical options

	L07	L08	L10	L15	L57	L59	L60	L61/ L64	L62/ L65	L87	K82	M78
L07		–	–	–	✓	✓	✓	✓	✓	✓	✓	–
L08	–		–	–	✓	✓	✓	✓	✓	✓	✓	–
L10	–	–		–	✓	✓	✓	✓	✓	✓	✓	–
L15	–	–	–		✓	✓	✓	✓	✓	✓	✓	–
L57	✓	✓	✓	✓		–	–	✓	✓	✓	✓	✓
L59	✓	✓	✓	✓	–		–	✓	✓	✓	✓	✓
L60	✓	✓	✓	✓	–	–		✓	✓	✓	✓	✓
L61/L64	✓	✓	✓	✓	✓	✓	✓		–	✓	✓	✓
L62/L65	✓	✓	✓	✓	✓	✓	✓	–		✓	✓	✓
L87	✓	✓	✓	✓	✓	✓	✓	✓	✓		– ¹⁾	✓
K82	✓	✓	✓	✓	✓	✓	✓	✓	✓	– ¹⁾		✓
M78	–	–	–	–	✓	✓	✓	✓	✓	✓	✓	

Mechanical/electrical options

	M06	M07	M13	M21	M23	M43	M54	M60	M66	M70	M78
M06		–	✓	✓	✓	✓	✓	✓	✓	✓	✓
M07	–		✓	✓	✓	✓	✓	✓	✓	✓	✓
M13	✓	✓		–	✓	✓	✓	✓	✓	– ²⁾	✓
M21	✓	✓	–		–	–	–	– ³⁾	–	✓	–
M23	✓	✓	✓	–		–	–	–	–	✓	✓
M43	✓	✓	✓	–	–		–	–	–	✓	✓
M54	✓	✓	✓	–	–	–		–	✓	✓	✓
M60	✓	✓	–	– ³⁾	–	–	–		✓	✓	–
M66	✓	✓	✓	–	–	–	✓	✓		✓	–
M70	✓	✓	– ²⁾	✓	✓	✓	✓	✓	✓		– ²⁾
M78	✓	✓	✓	–	✓	✓	✓	–	–	– ²⁾	

¹⁾ A combination of **L87** and **K82** is available on request.

²⁾ If the line connection (option **M13**) and the motor connection (option **M78**) are from above, the EMC shield bus is not required in the lower cabinet area.

³⁾ Can only be selected for converters in the voltage range 400 V to 250 kW and 690 V to 315 kW. The **M60** option is fitted as standard for higher outputs.

SINAMICS S150 Converter Cabinet Units

Converter cabinet units

Options (continued)

Other options

	G20	G33	G62	K46	K48	K50	K51	K52
G20		–	–	✓	✓	✓	✓	✓
G33	–		–	✓	✓	✓	✓	✓
G62	–	–		✓	✓	✓	✓	✓
K46	✓	✓	✓		–	–	–	–
K48	✓	✓	✓	–		–	–	–
K50	✓	✓	✓	–	–		–	✓
K51	✓	✓	✓	–	–	–		–
K52	✓	✓	✓	–	–	✓	–	

Documentation

	D00	D02	D14	D56	D58	D60	D72	D76	D77	D78	D80	D84	D91	D93	D94	D99
D00		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	–
D02	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	–
D14	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	–
D56	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	–	–
D58	✓	✓	✓	✓		–	✓	–	–	✓	–	✓	–	–	–	–
D60	✓	✓	✓	✓	–		✓	–	✓	–	–	✓	–	–	–	–
D72	✓	✓	✓	✓	✓	✓		✓	✓	✓	–	✓	✓	✓	✓	–
D76	✓	✓	✓	✓	–	–	✓		✓	✓	–	✓	–	–	–	–
D77	✓	✓	✓	✓	–	✓	✓	✓		✓	✓	✓	✓	✓	✓	–
D78	✓	✓	✓	✓	✓	–	✓	✓	✓		✓	✓	✓	✓	✓	–
D80	✓	✓	✓	✓	–	–	–	–	✓	✓		✓	–	–	–	–
D84	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		–	✓	✓	–
D91	✓	✓	✓	✓	–	–	✓	–	✓	✓	–	–		–	–	–
D93	✓	✓	✓	✓	–	–	✓	–	✓	✓	–	✓	–		–	–
D94	✓	✓	✓	–	–	–	✓	–	✓	✓	–	✓	–	–		–
D99	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	

Rating plate data

	T58	T60	T80	T83	T85	T91
T58		–	–	–	–	–
T60	–		–	–	–	–
T80	–	–		–	–	–
T83	–	–	–		–	–
T85	–	–	–	–		–
T91	–	–	–	–	–	

Options (continued)**Ordering examples****Example 1***Task:*

A drive system is required for a vehicle test stand to perform exhaust gas analysis which can simulate driving profiles and cycles as encountered in everyday traffic situations. This means for the drive system that the dynamometer must be operated both in the motoring as well as regenerating modes.

A drive with regenerative feedback into the line supply is required as regenerative operation is the predominant operating mode and dynamic switching operations are required.

The max. regenerative power is 200 kW. The drive converter must have degree of protection IP54 as a result of the environmental conditions. An installation altitude of < 1000 m and 45 °C as the maximum ambient temperature can be assumed. The windings must be equipped with Pt100 resistance thermometers and monitored by the drive converter for alarm and trip. A switch disconnecter must be provided to disconnect the converter from the 400 V power supply. In addition, the cabinet is to have a special paint finish in RAL 3002.

Solution:

Taking into account the derating factors for degree of protection IP54 and the increased ambient temperature of 45 °C, a converter with a minimum power rating of 223 kW should be configured.

A converter with a power rating of at least 250 kW and options **M54** (degree of protection IP54), **L26** (main switch including fuses), **L86** (Pt100 evaluation unit) and **Y09** (special paint finish) is selected.

The ordering data are as follows:

6SL3710-7LE35-0AA3-Z
M54+L26+L86+Y09

Cabinet color RAL 3002

Example 2*Task:*

A drive system is required for a conveyor belt in a brown-coal open-cast mine that is capable of both motor and generator operation. Since the conveyor belt must be capable of starting after a fault when loaded with bulk material, and it is possible for peak loads to occur where 1.5 times the power is required for up to 60 s, the drive system must be designed according to the overload requirements of such a case. The drive converter is installed in a climate-controlled container as a result of the environmental conditions typical of an open-cast mine. The installation altitude is 320 m above sea level and the maximum ambient temperature in the container is 35 °C. The drive is powered through a converter transformer from the medium-voltage system. The drive is connected to an isolated-neutral system and must have insulation monitoring. A motor with separately-driven fan is selected here as the motor is subject to a high load torque when starting and in the lower range. The fan supply voltage is 690 V and must be drawn from the drive converter. The required motor power is 420 kW.

Solution:

Since the converter is installed in an air-conditioned container, it can be designed with degree of protection IP20. The ambient temperature of 35 °C does not necessitate any additional derating. However, due to the specified overload conditions, the base load current I_{FH} (for high overload) must be applied. This results in a power of approx. 520 kW for the drive converter. The converter with article no. 6SL3710-7LG35-8AA3 must be selected.

Option **L87** (insulation monitoring) must be selected for insulation monitoring.

Option **L19** (connection for external auxiliaries) must be selected for the controlled outgoing feeder to power the separately driven fan.

The ordering data are as follows:

6SL3710-7LG35-8AA3-Z
L19+L87

SINAMICS S150 Converter Cabinet Units

Description of the options

Options

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.

Not permissible with options	Reason
L45, L57, L59, L60	A Category 0 EMERGENCY OFF is already provided in the NAMUR version. The forced line supply disconnection is connected at terminal -X2: 17, 18.
L83, L84	The B00 option already provides a PTC thermistor evaluation unit as standard (trip).
L19	Alternatively, option B03 can be selected. This provides a reduced scope for external auxiliaries.
L87	The insulation monitor monitors the complete electrically coupled network. An insulation monitor must therefore be provided on site.
G60	The B00 option already provides a Terminal Module TM31 as a standard feature.

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

B00

NAMUR terminal block

The terminal block is designed according to the requirements and directives of the standards association for measurement and control in the chemical industry (NAMUR recommendation NE37). I.e. terminals are specifically assigned to particular device functions. 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 -X2:	Meaning	Default	Remarks
10	DI	ON (dynamic) / ON/OFF (static)	The effective mode can be encoded using a wire jumper at terminal -400: 9; 10 codable
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 -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 -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. Exceeding the limit value causes a shutdown. The associated PTC sensor is connected to terminal -X3: 90, 91.

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

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 PELV. (Terminal assignments as for option **B00**, 24 V supply at terminals -X1:1, 2, 3 is not required)

Notice:

The option **B02** must always be combined with **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 -X1:	Meaning
1, 2, 3, PE	Outgoing feeder for external auxiliary equipment

Notice:

Option **B03** must always be combined with **B00**.

B43, B44, B45**Production flowcharts**

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

Option	Description
B43	Documentation - Production flowchart: One issue
B44	Documentation - Production flowchart: Updated every two weeks
B45	Documentation - Production flowchart: Updated every month

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

Option **D02** can be used to order documents such as circuit diagrams, terminal diagrams, layout diagrams, and dimension drawings in DXF format, e.g. for further processing in AutoCAD systems.

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 dimension drawings are required in advance for the purpose of system engineering (integration of drive into higher-level systems, interface definition, installation, building planning, etc.), it is possible to order a draft copy of the documentation when ordering the converter cabinet units. 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.

Documentation relating to the order is sent to the buyer by e-mail. The recipient's e-mail address must be specified with the order for this purpose. In the e-mail, the recipient will also receive a link (Internet address) for downloading general, non-order-specific documentation such as the Operating Instructions, Equipment Manual and Commissioning Instructions.

D58, D60, D80, D91, D93, D94**Documentation as language package**

If a documentation option is not selected, the relevant documentation is supplied as standard in English/German. When one of the options specified in the table is selected, the standard documentation language will be changed from English / German to the language combination provided by the option.

Order code	Language
D58	English/French
D60	English/Spanish
D80	English/Italian
D91	English/Chinese
D93	English/Portuguese (Brazil)
D94	English/Russian

D00, D56, D72, D76, D77, D78, D84**Documentation in a single language**

The documentation is also available in a single language, for example, to be able to order other language combinations.

If a further language is required for standard documentation in English/German, the option **D74** (documentation in English/German) must also be ordered in addition to that language.

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

E11 to E71**Individual certification**

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

- **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 cert. from American Bureau of Shipping (ABS)
- **E71** Individual cert. from Chinese Classification Society (CCS)

Note:

Several individual certificates can be combined.

SINAMICS S150 Converter Cabinet Units

Description of the options

Options (continued)

F03, F71, F72, F74, F75, F76, F77, F97 Converter acceptance inspections

Order code	Description
F03	<p>Visual acceptance</p> <p>The inspection includes the following:</p> <ul style="list-style-type: none"> • 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 <p>The tests are carried out with the converter de-energized.</p>
F71 (witnessed by customer) F72 (not witnessed by customer)	<p>Function test without connected motor</p> <p>After the visual acceptance with the converter switched off, the converter is connected to rated voltage.</p> <p>No current at the converter output end.</p> <p>The inspection includes the following:</p> <ul style="list-style-type: none"> • 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 (not witnessed by customer) F75 (witnessed by customer)	<p>Function test with test bay motor under no-load conditions</p> <p>After the visual acceptance with the converter switched off, the converter is connected to rated voltage.</p> <p>A small current flows at the converter output end in order to operate the test bay motor under no-load conditions.</p> <p>The inspection includes the following:</p> <ul style="list-style-type: none"> • 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 with test bay motor under no-load conditions • Submission of the acceptance report
F76 (not witnessed by customer) F77 (witnessed by customer)	<p>Insulation test</p> <p>The inspection includes the following:</p> <ul style="list-style-type: none"> • High-voltage test • Measurement of the insulation resistance • Submission of the acceptance report
F97	<p>Customer-specific acceptance inspections (on request)</p> <p>If acceptance inspections that are not covered by the options F03, F71, F75, or F77 are required, customer-specific acceptance inspections/supplementary tests can be ordered using order code F97 on request and following technical clarification.</p>

G20 **CBC10 Communication Board**

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

The CBC10 Communication Board is used to connect the CU320-2 Control Unit and thus the SINAMICS S150 to the CAN (Controller Area Network) protocol. The associated driver software fulfills the standards of the following CANopen specification of the CiA organization (CAN in Automation):

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

The CBC10 Communication Board plugs 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.

It cannot be combined with option **G33**.

[Description of the CBC10 Communication Board → SINAMICS S120 chassis format units → System components → Supplementary system components.](#)

G33 **CBE20 Communication Board**

The CBE20 Communication Board can be used to connect the SINAMICS S150 to a PROFINET IO or Ethernet/IP network via a CU320-2 Control Unit. The CBE Communication Board plugs into the option slot on the CU320-2 Control Unit.

It cannot be combined with option **G20**.

Note:

Only one communication interface can be used in isochronous operation when the Communication Board CBE20 is used in a Control Unit CU320-2.

- CU320-2 DP: Either the DP interface of the Control Unit or the PN interfaces of the CBE20
- CU320-2 PN: Either the internal PN interfaces or the external PN interfaces of the CBE20

[Description of the CBE20 Communication Board → SINAMICS S120 chassis format units → System components → Supplementary system components.](#)

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.

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

[Description of the TM150 Terminal Module → SINAMICS S120 chassis format units → System components → Supplementary system components.](#)

Options (continued)**G60****TM31 Terminal Module**

The TM31 Terminal Module is used to expand the customer terminal.

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 is already preset with various factory settings, which can then be selected when commissioning the system.

[Description of the TM31 Terminal Module](#) → [SINAMICS S120 chassis format units](#) → [System components](#) → [Supplementary system components](#).

For additional information, please refer to the [SINAMICS Low Voltage Engineering Manual](#).

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**.

G62**TB30 Terminal Board**

The TB30 Terminal Board supports the addition of digital inputs/digital outputs and analog inputs/analog outputs to the Control Unit. The TB30 Terminal Board plugs into the option slot on the Control Unit.

The following are located on the TB30 Terminal Board:

- Power supply for digital inputs/digital outputs
- 4 digital inputs
- 4 digital outputs
- 2 analog inputs
- 2 analog outputs

[Description of the TB30 Terminal Board](#) → [SINAMICS S120 chassis format units](#) → [System components](#) → [Supplementary system components](#).

K01**Safety license for 1 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

K46**SMC10 Sensor Module Cabinet-Mounted**

The SMC10 Sensor Module Cabinet-Mounted can be used to simultaneously sense the speed and the rotor position angle. The signals received from the resolver are converted here and made available to the closed-loop controller via the DRIVE-CLiQ interface for evaluation purposes.

The following encoder signals can be evaluated:

- 2-pole resolver
- Multi-pole resolver

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

[Description of the SMC10 Sensor Module Cabinet-Mounted](#) → [SINAMICS S120 chassis format units](#) → [System components](#) → [Encoder system interface](#).

K48**SMC20 Sensor Module Cabinet-Mounted**

The SMC20 Sensor Module Cabinet-Mounted can be used to simultaneously sense the speed and position. The signals received from the incremental encoder are converted here and made available to the closed-loop controller via the DRIVE-CLiQ interface for evaluation purposes.

The following encoder signals can be evaluated:

- Incremental encoder sin/cos $1 V_{pp}$
- Absolute encoder EnDat 2.1
- SSI encoder with incremental signals sin/cos $1 V_{pp}$

The motor temperature can also be detected using KTY84-130 or PTC/Pt100 thermistors.

[Description of the SMC20 Sensor Module Cabinet-Mounted](#) → [SINAMICS S120 chassis format units](#) → [System components](#) → [Encoder system interface](#).

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.

[Description of the SMC30 Sensor Module Cabinet-Mounted](#) → [SINAMICS S120 chassis format units](#) → [System components](#) → [Encoder system interface](#).

SINAMICS S150 Converter Cabinet Units

Description of the options

Options (continued)

K51

VSM10 Voltage Sensing Module

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.

Description of the VSM10 Voltage Sensing Module → SINAMICS S120 chassis format units → System components → Supplementary system components.

K52

Second SMC30 Sensor Module Cabinet-Mounted

With option **K50**, the cabinet unit contains an SMC30 Sensor Module Cabinet-Mounted. An additional SMC30 (Option **K52**) Sensor Module enables reliable actual-value acquisition when using Safety Integrated extended functions (requires a license: Option **K01**).

Detailed and comprehensive instructions and information for the Safety Integrated functions can be found in the associated Function Manual.

K82

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

The terminal module controls the Safety Integrated Basic Functions Safe Torque Off (STO) and Safe Stop 1 (SS1) (time-controlled) over a wide voltage range from 24 V to 240 V DC/AC (terminology as defined in IEC 61800-5-2).

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 Terminal Module TM54F is a terminal expansion module with safe digital inputs and outputs to control the Safety Integrated functions.

The TM54F is directly connected to a Control Unit via DRIVE-CLiQ. Each Control Unit can be precisely assigned to one TM54F.

Note:

It is not permissible to connect Motor Modules or Line Modules to a TM54F.

The TM54F provides 4 fail-safe digital outputs and 10 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.

Description of the TM54F Terminal Module → SINAMICS S120 chassis format units → System components → Supplementary system components.

K88

SBA Safe Brake Adapter, 230 V AC

The Safe Brake Control (SBC) is a safety function that is used in safety-relevant applications, for example in presses or rolling mills. 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 Safe Brake Adapter is already installed in the cabinet unit in the factory. A source of power is connected to terminal -X12 on the Safe Brake Adapter. For control, a connection is established between the Safe Brake Adapter and the Control Interface Module in the factory using a cable harness.

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

Description of the SBA Safe Brake Adapter → SINAMICS S120 chassis format units → System components → Supplementary system components.

K95

CU320-2 PN Control Unit (PROFINET)

Instead of the CU320-2 DP (PROFIBUS) Control Unit provided as standard, the drive is delivered with a CU320-2 PN Control Unit (PROFINET), including a CompactFlash card.

Description of the CU320-2 Control Unit → SINAMICS S120 chassis format units → System components → Control Units.

L00

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

To limit interference emission, the converter includes as standard a radio interference suppression filter according to the EMC product standard EN 61800-3, Category C3 (use in the industrial environment or in the second environment).

By using the optionally available line filter (option **L00**), up to a motor cable length of 300 m on grounded line supplies, the converters are suitable for use according to Category C2 (residential area or first environment).

However, complying with the limit values in the standard means that all of the relevant installation specifications regarding grounding and shielding must be strictly observed.

Notes on this are provided in the SINAMICS Low Voltage Configuration Manual as well as in the appropriate operating instructions.

Options (continued)**L04****Infeed module one level lower**

With this option, an infeed (Active Line Module/Active Interface Module) rated one power level lower than the Motor Module (inverter) is used.

For instance, this option is suitable for the following applications:

- When the Motor Module is operated at pulse frequencies greater than the rated pulse frequency, which means that the output power is reduced (current derating as a function of the pulse frequency).
- When the rated power is demanded when generating, and the system losses are covered by the Motor Module.
- When using motors with a higher efficiency and/or a lower power factor when compared to typical standard induction motors.
- The maximum current of the Motor Module is demanded below the maximum power of the unit, e.g. drives with a high breakaway torque.

When using option **L04**, the following restrictions must always be taken into consideration:

- The rated output current of the Motor Module is only available as long as the infeed (Active Line Module) is not loaded with the rated power.
- For line undervoltage conditions, the output power is reduced linearly with the line voltage.
- The unit should be operated with a system power factor $\cos \varphi = 1$ (this is the factory setting) and should only provide the active power. Additional compensation of reactive power from the power system is not advisable.

Option **L04** is available for the following cabinet units:

SINAMICS S150 converter cabinet unit	Type rating at 400 V	Permissible currents		
		Output	Input Standard	With option L04
6SL3710-...	kW	A	A	A
Line voltage 380 ... 480 V 3 AC				
7LE33-1AA3	160	310	310	260
7LE35-0AA3	250	490	490	380
7LE36-1AA3	315	605	605	490
7LE37-5AA3	400	745	745	605
7LE41-0AA3	560	985	985	840

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 $< 1600 \text{ V}/\mu\text{s}$ and the typical voltage peaks to the following values in accordance with the limit value curve A according to IEC 60034-25: 2007:

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

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.

The power losses stated in Section System components → Motor-side components → dv/dt filter compact plus VPL can be used to determine the total losses for engineering purposes.

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 ($> 100 \text{ m}$ shielded, $> 150 \text{ m}$ unshielded), the dv/dt filter plus VPL (option **L10**) should be used.

Notice:

- Operation with output frequencies $< 10 \text{ Hz}$ is permissible for max. 5 min.
- The maximum permissible output frequency is 150 Hz.

When using dv/dt filters, restrictions regarding permissible pulse frequencies must be observed.

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

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.

The power losses stated in Section System components → Motor-side components → Motor reactors can be used to determine the total losses for engineering purposes.

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)

SINAMICS S150 Converter Cabinet Units

Description of the options

Options (continued)

L10

dv/dt filter plus Voltage Peak Limiter

dv/dt filter plus VPL (**V**oltage **P**eak **L**imiter) limit the voltage rate-of-rise dv/dt to values < 500 V/μs and the typical voltage peaks to the following values 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 power, option **L10** can be accommodated in the converter cabinet unit or an additional cabinet is required with a width of 400 mm or 600 mm.

Voltage range	Installation of the dv/dt filter plus VPL		
	in the converter (without supplementary cabinet)	in the supplementary cabinet	
		400 mm wide	600 mm wide
380 ... 480 V	110 ... 250 kW	315 ... 450 kW	560 ... 800 kW
500 ... 690 V	75 ... 315 kW	400 ... 560 kW	710 ... 1200 kW

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 power losses stated in Section System components → Motor-side components → dv/dt filter plus VPL can be used to determine the total losses for engineering purposes.

Notice:

The maximum permissible output frequency is 150 Hz.

When using dv/dt filters, restrictions regarding permissible pulse frequencies must be observed.

For additional information, please refer to the [SINAMICS Low Voltage Engineering Manual](#).

Note:

Parts of option **L10** do not have nickel-plated copper busbars.

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)

L15

Sine-wave filter

Sine-wave filters are available for converters with a power rating of up to 250 kW (380 V to 480 V). The sine-wave filter at the converter output supplies almost perfect sinusoidal voltages at the motor so that standard motors can be used without special cables or power derating. Standard cables can be used to connect the motor. The max. permissible motor cable length is limited to 300 m.

The power losses stated in Section System components → Motor-side components → Sine-wave filter can be used to determine the total losses for engineering purposes.

Note:

In conjunction with the option **L15**, the pulse frequency of the converter must be increased. This reduces the power available at the drive converter output (derating factor 0.88). The modulation depth of the output voltage decreases to approx. 85% (380 V to 480 V). The maximum output frequency is 150 Hz. It should be noted that the reduced voltage at the motor terminals compared with 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 feeder fused with max. 10 A for external auxiliary equipment (for example, separately driven motor fan).

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

The outgoing feeder can be switched inside the drive 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	-

For more information on engineering, see: <https://support.industry.siemens.com/cs/document/104961375>

Options (continued)**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 for monitoring the surge arresters are connected in series and connected to a customer interface.

Note:

Option **L21** does not include the components required to install 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 ever be used within the same electrically connected network.

Option **L21** also does not include removal in the factory of the metal bracket that makes the connection to ground of the radio interference suppression filter installed as standard. The metal bracket should therefore be removed during installation or commissioning of the converter if the device is to be operated on an ungrounded IT system.

L26**Main switch incl. fuses or circuit breakers**

Up to 800 A a switch disconnecter with fuses is available as the main switch. For currents greater than 800 A, a circuit breaker provided as standard is used to isolate the drive system from the line supply. The circuit breaker is controlled and supplied within the converter.

Terminal -X50:	Meaning
1	Checkback contact (NO contact) Main breaker/circuit breaker closed
2	Checkback contact (NC contact) Main breaker/circuit breaker closed
3	Common potential

L40**Line filter monitoring**

With option **L40**, the filter in the Active Interface Module is monitored for effectiveness against harmonic effects on the system.

The capacitance of the filter capacitors of the integrated filter is continuously calculated and compared with the installed nominal capacitance by measuring the current and voltage in the Active Interface Module. If the calculated capacity deviates by more than the set tolerance, an alarm is triggered.

L45**EMERGENCY OFF pushbutton, installed in the cabinet door**

The option **L45** only includes the EMERGENCY OFF pushbutton which 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 and/or EMERGENCY STOP functions of Category 0 or 1 can be activated in conjunction with options **L57**, **L59**, and **L60**.

Terminal -X120:	Meaning
1	Checkback contact of the EMERGENCY OFF pushbutton in the cabinet door
2	Checkback contact of the EMERGENCY OFF pushbutton in the cabinet door
3	Checkback contact of the EMERGENCY OFF pushbutton in the cabinet door ¹⁾
4	Checkback contact of the EMERGENCY OFF pushbutton in the cabinet door ¹⁾

Notice:

By pressing the EMERGENCY OFF pushbutton, the motor is stopped either uncontrolled or controlled depending on the selected stop Category 0 or 1, and the main voltage disconnected from the motor, in compliance with IEC 60204-1 (VDE 0113). 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.

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 with 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

¹⁾ For option **L57** to **L60** is preassigned in the converter.

SINAMICS S150 Converter Cabinet Units

Description of the options

Options (continued)

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 disconnecting the voltage at the converter by means of the line contactor and bypassing the microprocessor controller using a safety combination according to EN 60204-1. The motor then coasts down. When delivered, the pushbutton circuit is preset to 230 V AC. Jumpers must be appropriately set when using 24 V DC.

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 voltage is then disconnected as described for EMERGENCY OFF Category 0 (option **L57**). The pushbutton circuit is operated at 230 V AC.

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

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 voltage is then disconnected as described for EMERGENCY OFF Category 0 (option **L57**). The pushbutton circuit is operated at 24 V DC.

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

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"

L61, L62, L64, L65 **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, which can be installed in the air discharge of the chassis format power units
- A braking resistor to be mounted externally (degree of protection IP20)

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

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 directly to the terminal -X5 of the converter.

Options (continued)

The following braking units are available for SINAMICS S150 converter cabinet units:

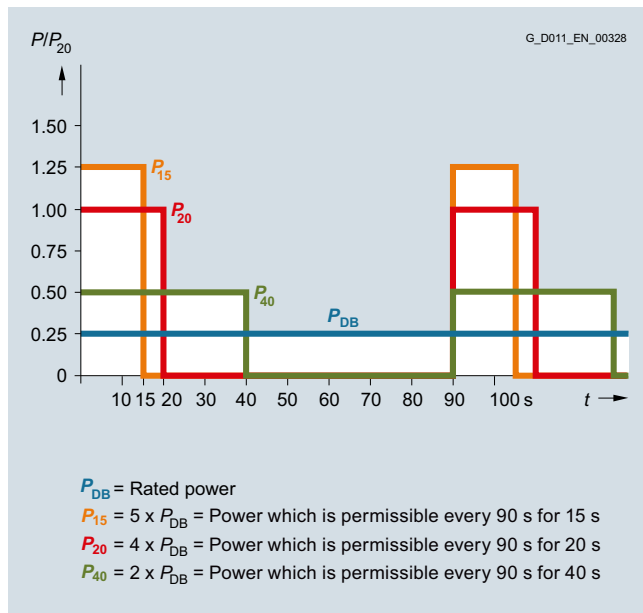
Option	SINAMICS S150 converter Type rating kW	Braking Module		
		Rated power P_{DB} kW	Rated power P_{20} kW	Peak power P_{15} kW
		380 ... 480 V 3 AC		
L61	110 ... 132	25	100	125
L62	160 ... 800	50	200	250
500 ... 600 V 3 AC				
L64	75 ... 132	25	100	125
L65	160 ... 1200	50	200	250
660 ... 690 V 3 AC				
L61	75 ... 132	25	100	125
L62	160 ... 1200	50	200	250

P_{DB} = Rated power (continuous braking power)

$P_{20} = 4 \times P_{DB}$: 20 s power referred to a braking interval of 90 s

$P_{15} = 5 \times P_{DB}$: 15 s power referred to a braking interval of 90 s

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). In this case, a Braking Module is assigned to each braking resistor.



Load diagram for Braking Modules and braking resistors

Additional notes about possible duty cycles of the braking resistors and other engineering notes are included in the SINAMICS Low Voltage Configuration Manual.

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	Meaning
-B127:	
T1	Sensor circuit connection
T2	Sensor circuit connection

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	Meaning
-B125:	
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 in a two or three-wire system. The limit values can be freely programmed for each channel.

In the factory setting, the measuring channels are subdivided into two groups, each with 3 channels. 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. The customer can also choose to integrate the outputs into the converter monitoring system.

SINAMICS S150 Converter Cabinet Units

Description of the options

Options (continued)

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.

Notice:

The cable compartment is painted as standard with RAL 7035. If a special color is requested for the cabinet (option **Y09**), the cable marshalling 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.

Note:

The control cables are still connected from below. Option **M13** eliminates the lugs, provided as standard, to connect the line supply from below.

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.

Notice:

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

The covers provided with option **M60** are also included in the scope of supply.

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.

Notice:

The top covers or canopies are painted in RAL 7035 as standard. If a special color is requested for the cabinet (option **Y09**), the roof sections or drip protection panel are also painted in this color.

M23

Degree of protection IP23

Converter cabinet units with degree of protection IP23 are supplied with additional roof sections as well as plastic ventilation grilles and a filter medium in the air inlet and outlet. This increases the cabinet height by 400 mm. The covers provided with option **M60** are also included in the scope of supply. The filter medium must be maintained according to the local environmental conditions.

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

Notice:

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

M43

Degree of protection IP43

Converter cabinet units with IP43 degree of protection are supplied with additional roof sections as well as plastic ventilation grilles and a wire mesh in the air inlet and outlet. This increases the cabinet height by 400 mm. The covers provided with option **M60** are also included in the scope of supply. They are an integral component of the internal cabinet air guidance system and are adapted accordingly.

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

Notice:

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

Options (continued)**M54****Degree of protection IP54**

Converter cabinet units with IP54 degree of protection are supplied with additional roof sections as well as plastic ventilation grilles and a filter medium in the air inlet and outlet. This increases the cabinet height by 400 mm. The covers provided with option **M60** are also included in the scope of supply. They are an integral component of the internal cabinet air guidance system and are adapted accordingly. The filters must be maintained according to the local environmental conditions.

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

Notice:

- The roof sections are painted in RAL 7035 as standard. If a special color is requested for the cabinet (option **Y09**), the roof section is also painted in this color. The molded plastic parts (e.g. ventilation grilles) are in RAL 7035 and cannot be painted.
- For units with IP54 degree of protection, it is important to observe the derating factor for output currents in relation to ambient temperature and installation altitude.

M60**Additional touch protection**

The converter cabinet units are designed as standard according to BGV A3. Option **M60** provides additional covers (outside arm's reach) in the vicinity of the AC busbars and above the power unit (can only be selected as an option with converters up to 250 kW in the 400 V range and with converters up to 315 kW in the 690 V range with degrees of protection IP20 and IP21; otherwise supplied as standard).

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
- China 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 secure the converter to the ship's hull, a welding frame (5 mm high) is supplied separately.

Note:

Combination with options **M21**, **M23**, and **L55** is not possible. Individual certification is additionally required if the converter is used for a safety-related drive on the ship (see options **E11** to **E71**).

M70**EMC shield bus (cable connection from below)**

The EMC shield bus is used to connect shielded line and motor supply cables. With the options **M13** and **M78**, the EMC shielding busbar is already included as standard for the connection busbars underneath the roof section.

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. 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.

Note:

The control cables are still connected from below. Option **M78** eliminates the lugs, provided as standard, to connect the motor from below.

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.

Notice:

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

The covers provided with option **M60** are also included in the scope of supply.

Note:

Option **M78** cannot be combined with the following options:

- **L07** (dv/dt filter compact plus VPL)
- **L08** (motor reactor)
- **L10** (dv/dt filter plus VPL)
- **L15** (sine-wave filter)

SINAMICS S150 Converter Cabinet Units

Description of the options

Options (continued)

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.

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, T83, T85, T91

Rating plate data

The type plate is provided in English/German as standard. A rating plate in another language combination can be selected by specifying the following option order codes.

Option	Rating plate language
T58	English/French
T60	English/Spanish
T80	English/Italian
T83	English/Portuguese (Brazil)
T85	English/Russian
T91	English/Chinese

Y09

Special cabinet paint finish

The converter cabinet units are delivered in RAL 7035 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.

Notice:

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

Y31

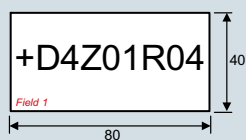
One-line label for system identification, 40 × 80 mm

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.

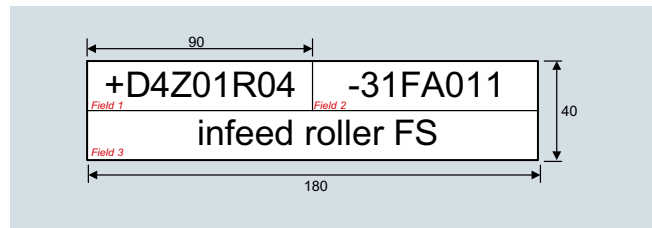
Dimensions H × W: 40 × 180 mm

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.

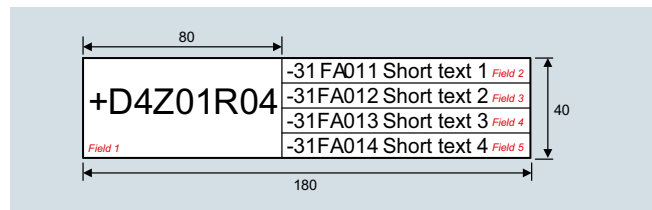
Field 1: Max. 9 characters, font size 10 mm

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



Overview

The fuses specified below are the recommended types for protecting the unit on the low-voltage distribution panel. If option **L26** was selected for SINAMICS S150 with rated input currents <800 A, then the semiconductor protection is already integrated in the unit. For units of >800 A, this function is performed by the circuit breaker provided as standard.

In this case, a 3NA fuse can be used in the distribution board. If option **L26** has not been selected for units <800 A, we strongly advise that 3NE fuses are used ¹⁾.

Catalog LV 10 contains additional information on the listed fuses.

Type rating at 400 V or 690 V		SINAMICS S150 converter 6SL3710-...	Cable protection fuse in systems with a fuse switch disconnecter			Cable protection fuse (incl. semiconductor protection) in systems without fuse switch disconnecter		
At I_L , 50 Hz 400 V, 500 V or 690 V	At I_L , 60 Hz 460 V or 575 V		Article No.	Rated current A	Size according to DIN 43620-1	Article No.	Rated current A	Size according to DIN 43620-1
kW	hp							
Line voltage 380 ... 480 V 3 AC								
110	150	7LE32-1AA3	3NA3252	315	2	3NE1230-2	315	1
132	200	7LE32-6AA3	3NA3254	355	2	3NE1331-2	350	2
160	250	7LE33-1AA3	3NA3365	500	3	3NE1334-2	500	2
200	300	7LE33-8AA3	3NA3365	500	3	3NE1334-2	500	2
250	400	7LE35-0AA3	3NA3372	630	3	3NE1436-2	630	3
315	500	7LE36-1AA3	3NA3475	800	4	3NE1438-2	800	3
400	600	7LE37-5AA3	3NA3475	800	4	3NE1448-2	850	3
450	700	7LE38-4AA3	–	–	–	Circuit breaker included as standard		
560	800	7LE41-0AA3	–	–	–	Circuit breaker included as standard		
710	1000	7LE41-2AA3	–	–	–	Circuit breaker included as standard		
800	1000	7LE41-4AA3	–	–	–	Circuit breaker included as standard		
Line voltage 500 ... 690 V 3 AC								
75	75	7LG28-5AA3	3NA3132-6	125	1	3NE1022-2	125	00
90	75	7LG31-0AA3	3NA3132-6	125	1	3NE1022-2	125	00
110	100	7LG31-2AA3	3NA3136-6	160	1	3NE1224-2	160	1
132	150	7LG31-5AA3	3NA3240-6	200	2	3NE1225-2	200	1
160	150	7LG31-8AA3	3NA3244-6	250	2	3NE1227-2	250	1
200	200	7LG32-2AA3	3NA3252-6	315	2	3NE1230-2	315	1
250	250	7LG32-6AA3	3NA3354-6	355	3	3NE1331-2	350	2
315	300	7LG33-3AA3	3NA3365-6	500	3	3NE1334-2	500	2
400	400	7LG34-1AA3	3NA3365-6	500	3	3NE1334-2	500	2
450	450	7LG34-7AA3	3NA3352-6	2 × 315	2	3NE1435-2	560	3
560	600	7LG35-8AA3	3NA3354-6	2 × 355	3	3NE1447-2	670	3
710	700	7LG37-4AA3	3NA3365-6	2 × 500	3	3NE1448-2	850	3
800	800	7LG38-1AA3	–	–	–	Circuit breaker included as standard		
900	900	7LG38-8AA3	–	–	–	Circuit breaker included as standard		
1000	1000	7LG41-0AA3	–	–	–	Circuit breaker included as standard		
1200	1250	7LG41-3AA3	–	–	–	Circuit breaker included as standard		

¹⁾ The double function fuses (3NE1.) with duty 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.

- Super fast
- Lower arc voltage
- Improved current limiting (lower let-through values).

SINAMICS S150 Converter Cabinet Units

Cable cross-sections and connections

Overview

The following tables list the recommended and maximum connectable line and motor-side cable cross sections and connections for a single connection.

The recommended cross-sections are based on the specified fuses. They are valid for a 3-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 ambi-

ent temperature of 40 °C and individual routing. In conditions (cable routing, cable bundling, ambient temperature) that deviate from this the corresponding correction factors according to IEC 60364-5-52 must be considered.

For additional information, please refer to the [SINAMICS Low Voltage Engineering Manual](#).

Type rating at 400 V or 690 V	SINAMICS S150 converter cabinet unit	Line supply connection			Motor connection			Cabinet grounding	
		Recommended cross-section ¹⁾	Maximum conductor cross-section	M12 fixing screw (Number of holes)	Recommended cross-section ¹⁾	Maximum conductor cross-section	M12 fixing screw (Number of holes)	M12 fixing screw (Number of holes)	Remarks
kW	6SL3710-...	mm ²	mm ²		mm ²	mm ²			
380 ... 480 V 3 AC									
110	7LE32-1AA3	2 × 70	4 × 240	(2)	2 × 50	2 × 150	(2)	(2)	
132	7LE32-6AA3	2 × 95	4 × 240	(2)	2 × 70	2 × 150	(2)	(2)	
160	7LE33-1AA3	2 × 120	4 × 240	(2)	2 × 95	2 × 150	(2)	(2)	
200	7LE33-8AA3	2 × 120	4 × 240	(2)	2 × 95	2 × 150	(2)	(2)	
250	7LE35-0AA3	2 × 185	4 × 240	(2)	2 × 150	2 × 240	(2)	(2)	
315	7LE36-1AA3	2 × 240	4 × 240	(2)	2 × 185	4 × 240	(2)	(2)	
400	7LE37-5AA3	3 × 185	4 × 240	(2)	2 × 240	4 × 240	(2)	(10)	Cu bar
450	7LE38-4AA3	4 × 150	8 × 240	(4)	3 × 185	4 × 240	(2)	(16)	Cu bar
560	7LE41-0AA3	4 × 185	8 × 240	(4)	4 × 185	6 × 240	(3)	(18)	Cu bar
710	7LE41-2AA3	4 × 240	8 × 240	(4)	4 × 240	6 × 240	(3)	(18)	Cu bar
800	7LE41-4AA3	6 × 185	8 × 240	(4)	6 × 185	6 × 240	(3)	(18)	Cu bar
500 ... 690 V 3 AC									
75	7LG28-5AA3	50	4 × 240	(2)	35	2 × 70	(2)	(2)	
90	7LG31-0AA3	50	4 × 240	(2)	50	2 × 150	(2)	(2)	
110	7LG31-2AA3	70	4 × 240	(2)	70	2 × 150	(2)	(2)	
132	7LG31-5AA3	95	4 × 240	(2)	70	2 × 150	(2)	(2)	
160	7LG31-8AA3	120	4 × 240	(2)	95	2 × 150	(2)	(2)	
200	7LG32-2AA3	2 × 70	4 × 240	(2)	120	2 × 150	(2)	(2)	
250	7LG32-6AA3	2 × 95	4 × 240	(2)	2 × 70	2 × 185	(2)	(2)	
315	7LG33-3AA3	2 × 120	4 × 240	(2)	2 × 95	2 × 240	(2)	(2)	
400	7LG34-1AA3	2 × 185	4 × 240	(2)	2 × 120	4 × 240	(2)	(2)	
450	7LG34-7AA3	2 × 185	4 × 240	(2)	2 × 150	4 × 240	(2)	(2)	
560	7LG35-8AA3	2 × 240	4 × 240	(2)	2 × 185	4 × 240	(2)	(2)	
710	7LG37-4AA3	3 × 185	8 × 240	(4)	3 × 150	6 × 240	(3)	(18)	Cu bar
800	7LG38-1AA3	4 × 150	8 × 240	(4)	3 × 185	6 × 240	(3)	(18)	Cu bar
900	7LG38-8AA3	4 × 150	8 × 240	(4)	4 × 150	6 × 240	(3)	(18)	Cu bar
1000	7LG41-0AA3	4 × 185	8 × 240	(4)	4 × 185	6 × 240	(3)	(18)	Cu bar
1200	7LG41-3AA3	4 × 240	8 × 240	(4)	4 × 240	6 × 240	(3)	(18)	Cu bar

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.

Overview (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-wire three-phase cables, the summed ampere-turns over the cable outer diameter are equal to zero. They can easily be routed in conductive, metal cable ducts or racks without any significant currents (ground current or leakage current) being induced in these conductive, metal connections. The danger of induced leakage currents and thus of increased cable sheath losses is significantly higher 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.

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

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

¹⁾ A maximum of 9 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 protective conductor when a fault occurs, then the protective 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 mm ²	Minimum cross-section, external protective conductor mm ²
up to 16	Minimum cross-section of line conductor
16 ... 35	16
from 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 small protective conductor cross sections used in accordance with the table above, no inadmissible touch voltages occur with this grounding system. However, from experience gained with different grounding constellations, we recommend that the ground cable from the motor return directly to the converter. For EMC reasons and to avoid bearing currents, for large power ratings, it is preferable to use symmetrical 3-conductor, three-phase cables instead of four-conductor cables. For 3-conductor cables, the protective or PE conductor must be routed separately or arranged symmetrically in the motor cable. 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 additional information, 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. As a result of this fact, we recommend that the cross-section of the protective conductor to ground the cabinets is the same as for the outer (main) conductor.