

SIEMENS



Operating Instructions

SINAMICS

G130 components

Converter built-in units 75 kW - 800 kW

Edition

12/2018

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SINAMICS G130 Components

Operating Instructions

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Firmware version V5.2




12/2018

A5E45046951A

Legal information

Warning notice system

This manual contains notices you have to observe in order to ensure your personal safety, as well as to prevent damage to property. The notices referring to your personal safety are highlighted in the manual by a safety alert symbol, notices referring only to property damage have no safety alert symbol. These notices shown below are graded according to the degree of danger.

 DANGER
indicates that death or severe personal injury will result if proper precautions are not taken.
 WARNING
indicates that death or severe personal injury may result if proper precautions are not taken.
 CAUTION
indicates that minor personal injury can result if proper precautions are not taken.
NOTICE
indicates that property damage can result if proper precautions are not taken.


If more than one degree of danger is present, the warning notice representing the highest degree of danger will be used. A notice warning of injury to persons with a safety alert symbol may also include a warning relating to property damage.

Qualified Personnel

The product/system described in this documentation may be operated only by **personnel qualified** for the specific task in accordance with the relevant documentation, in particular its warning notices and safety instructions. Qualified personnel are those who, based on their training and experience, are capable of identifying risks and avoiding potential hazards when working with these products/systems.

Proper use of Siemens products

Note the following:

 WARNING
Siemens products may only be used for the applications described in the catalog and in the relevant technical documentation. If products and components from other manufacturers are used, these must be recommended or approved by Siemens. Proper transport, storage, installation, assembly, commissioning, operation and maintenance are required to ensure that the products operate safely and without any problems. The permissible ambient conditions must be complied with. The information in the relevant documentation must be observed.

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Disclaimer of Liability

We have reviewed the contents of this publication to ensure consistency with the hardware and software described. Since variance cannot be precluded entirely, we cannot guarantee full consistency. However, the information in this publication is reviewed regularly and any necessary corrections are included in subsequent editions.

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Safety information

1.1 General safety instructions



WARNING

Electric shock and danger to life due to other energy sources

Touching live components can result in death or serious injury.

- Only work on electrical equipment if you are appropriately qualified.
- Always observe the country-specific safety rules for all work.

Generally, the following steps apply when establishing safety:

1. Prepare for disconnection. Notify all those who will be affected by the procedure.
2. Isolate the drive system from the power supply and take measures to prevent it being switched back on again.
3. Wait until the discharge time specified on the warning labels has elapsed.
4. Check that there is no voltage between any of the power connections, and between any of the power connections and the protective conductor connection.
5. Check that every auxiliary circuit is de-energized.
6. Ensure that the motors cannot move.
7. Identify all other dangerous energy sources, e.g. compressed air, hydraulic systems or water. Switch the energy sources to a safe state.
8. Check that the correct drive system is completely locked.

After you have completed the work, restore the operational readiness by following the above steps in the reverse order.




WARNING

Electric shock due to connection to an unsuitable power supply


When equipment is connected to an unsuitable power supply, exposed components may carry a hazardous voltage that might result in serious injury or death.

- Only use power supplies that provide SELV (Safety Extra Low Voltage) or PELV (Protective Extra Low Voltage) output voltages for all connections and terminals of the electronics modules.




 WARNING
Electric shock due to equipment damage
Improper handling may cause damage to equipment. For damaged devices, hazardous voltages can be present at the enclosure or at exposed components; if touched, this can result in death or severe injury.
<ul style="list-style-type: none">• Ensure compliance with the limit values specified in the technical data during transport, storage and operation.• Do not use any damaged devices.




 WARNING
Electric shock due to unconnected cable shield
Hazardous touch voltages can occur through capacitive cross-coupling due to unconnected cable shields.
<ul style="list-style-type: none">• Connect cable shields and unused conductors of power cables (e.g. brake conductors) at least on one side to the grounded housing potential.




 WARNING
Electric shock if there is no ground connection
For missing or incorrectly implemented protective conductor connection for devices with protection class I, high voltages can be present at open, exposed parts, which when touched, can result in death or severe injury.
<ul style="list-style-type: none">• Ground the device in compliance with the applicable regulations.



 WARNING
Arcing when a plug connection is opened during operation
Opening a plug connection when a system is in operation can result in arcing that may cause serious injury or death.
<ul style="list-style-type: none">• Only open plug connections when the equipment is in a voltage-free state, unless it has been explicitly stated that they can be opened in operation.



 WARNING
Electric shock due to residual charges in power components
Because of the capacitors, a hazardous voltage is present for up to 5 minutes after the power supply has been switched off. Contact with live parts can result in death or serious injury.
<ul style="list-style-type: none">• Wait for 5 minutes before you check that the unit really is in a no-voltage condition and start work.

NOTICE**Property damage due to loose power connections**

Insufficient tightening torques or vibration can result in loose power connections. This can result in damage due to fire, device defects or malfunctions.

- Tighten all power connections to the prescribed torque.
- Check all power connections at regular intervals, particularly after equipment has been transported.

 **WARNING****Spread of fire from built-in devices**

In the event of fire outbreak, the enclosures of built-in devices cannot prevent the escape of fire and smoke. This can result in serious personal injury or property damage.

- Install built-in units in a suitable metal cabinet in such a way that personnel are protected against fire and smoke, or take other appropriate measures to protect personnel.
- Ensure that smoke can only escape via controlled and monitored paths.

 **WARNING****Active implant malfunctions due to electromagnetic fields**

Converters generate electromagnetic fields (EMF) during operation. People with active implants in the immediate vicinity of this equipment are at particular risk.

- As the operator of an EMF-emitting installation, assess the individual risks of persons with active implants. The following clearances are usually adequate:
 - No clearance to closed control cabinets and shielded MOTION-CONNECT supply cables
 - Forearm length (approx. 35 cm clearance) to distributed drive systems and open control cabinets

 **WARNING****Unexpected movement of machines caused by radio devices or mobile phones**

When radio devices or mobile phones with a transmission power > 1 W are used in the immediate vicinity of components, they may cause the equipment to malfunction. Malfunctions may impair the functional safety of machines and can therefore put people in danger or lead to property damage.

- If you come closer than around 2 m to such components, switch off any radio devices or mobile phones.
- Use the "SIEMENS Industry Online Support App" only on equipment that has already been switched off.

 **WARNING**

Motor fire in the event of insulation overload

There is a greater load on the motor insulation as a result of a ground fault in an IT system. If the insulation fails, it is possible that death or severe injury can occur as a result of smoke and fire.

- Use a monitoring device that signals an insulation fault.
- Correct the fault as quickly as possible so the motor insulation is not overloaded.

 **WARNING**

Fire due to inadequate ventilation clearances

Inadequate ventilation clearances can cause overheating of components with subsequent fire and smoke. This can cause severe injury or even death. This can also result in increased downtime and reduced service lives for devices/systems.

- Ensure compliance with the specified minimum clearance as ventilation clearance for the respective component.

 **WARNING**

Unrecognized dangers due to missing or illegible warning labels

Dangers might not be recognized if warning labels are missing or illegible. Unrecognized dangers may cause accidents resulting in serious injury or death.

- Check that the warning labels are complete based on the documentation.
- Attach any missing warning labels to the components, where necessary in the national language.
- Replace illegible warning labels.

NOTICE

Device damage caused by incorrect voltage/insulation tests

Incorrect voltage/insulation tests can damage the device.

- Before carrying out a voltage/insulation check of the system/machine, disconnect the devices as all converters and motors have been subject to a high-voltage test by the manufacturer, and therefore it is not necessary to perform an additional test within the system/machine.

 WARNING**Unexpected movement of machines caused by inactive safety functions**

Inactive or non-adapted safety functions can trigger unexpected machine movements that may result in serious injury or death.

- Observe the information in the appropriate product documentation before commissioning.
- Carry out a safety inspection for functions relevant to safety on the entire system, including all safety-related components.
- Ensure that the safety functions used in your drives and automation tasks are adjusted and activated through appropriate parameterizing.
- Perform a function test.
- Only put your plant into live operation once you have absolutely guaranteed that the functions relevant to safety are operating correctly.

Note**Important safety notices for Safety Integrated functions**

If you want to use Safety Integrated functions, you must observe the safety notices in the Safety Integrated manuals.

1.2 Handling electrostatic sensitive devices (ESD)

Electrostatic sensitive devices (ESD) are individual components, integrated circuits, modules or devices that may be damaged by either electric fields or electrostatic discharge.



NOTICE

Damage through electric fields or electrostatic discharge

Electric fields or electrostatic discharge can cause malfunctions through damaged individual components, integrated circuits, modules or devices.

- Only pack, store, transport and send electronic components, modules or devices in their original packaging or in other suitable materials, e.g. conductive foam rubber or aluminum foil.
- Only touch components, modules and devices when you are grounded by one of the following methods:
 - Wearing an ESD wrist strap
 - Wearing ESD shoes or ESD grounding straps in ESD areas with conductive flooring
- Only place electronic components, modules or devices on conductive surfaces (table with ESD surface, conductive ESD foam, ESD packaging, ESD transport container).

The necessary ESD protective measures are clearly illustrated in the following diagram:

- a = conductive floor surface
- b = ESD table
- c = ESD shoes
- d = ESD overall
- e = ESD wristband
- f = cabinet ground connection
- g = contact with conductive flooring

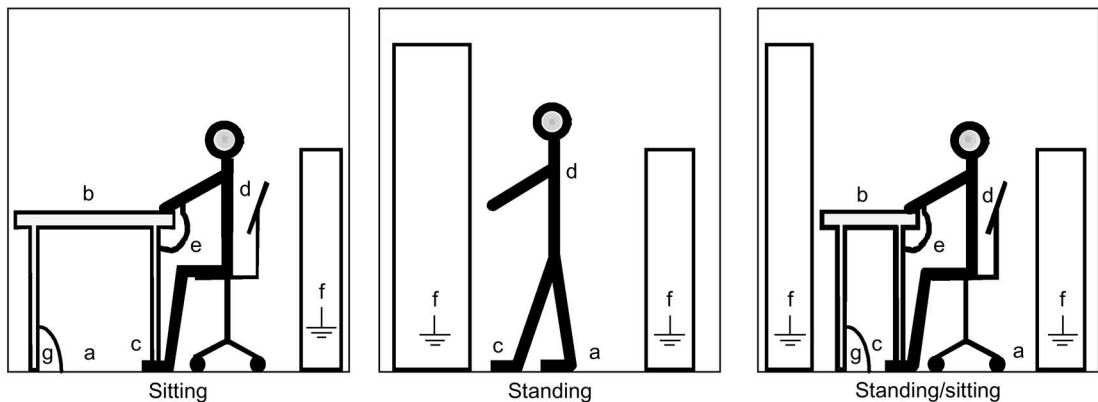


Figure 1-1 ESD protective measures

1.3 Industrial security

Note

Industrial Security

Siemens provides products and solutions with industrial security functions that support the secure operation of plants, systems, machines and networks.

In order to protect plants, systems, machines and networks against cyber threats, it is necessary to implement – and continuously maintain – a holistic, state-of-the-art Industrial Security concept. Siemens products and solutions only represent one component of such a concept.

The customer is solely responsible for preventing unauthorized access to its plants, systems, machines and networks. Systems, machines and components should only be connected to the company's network or the internet if and to the extent necessary and with appropriate security measures (e.g. use of firewalls and network segmentation) in place.

Additionally, Siemens' guidance on appropriate security measures should be taken into account. For more information about Industrial Security, please visit:

Industrial Security (<http://www.siemens.com/industrialsecurity>).

Siemens' products and solutions undergo continuous development to make them more secure. Siemens strongly recommends to apply product updates as soon as available and to always use the latest product versions. Use of product versions that are no longer supported, and failure to apply latest updates may increase customer's exposure to cyber threats.

To stay informed about product updates, subscribe to the Siemens Industrial Security RSS Feed at:

Industrial Security (<http://www.siemens.com/industrialsecurity>).

Additional information is provided on the Internet:

Industrial security Configuration Manual
(<https://support.industry.siemens.com/cs/ww/en/view/108862708>)

 **WARNING**

Unsafe operating states resulting from software manipulation

Software manipulation (e.g. viruses, trojans, malware or worms) can cause unsafe operating states in your system that may lead to death, serious injury, and property damage.

- Keep the software up to date.
- Incorporate the automation and drive components into a holistic, state-of-the-art industrial security concept for the installation or machine.
- Make sure that you include all installed products into the holistic industrial security concept.
- Protect files stored on exchangeable storage media from malicious software by applying suitable protection measures, e.g. virus scanners.
- Protect the drive against unauthorized changes by activating the "Know-how protection" converter function.

1.4 Residual risks of power drive systems

When assessing the machine or system-related risk in accordance with the respective local regulations (e.g. EC Machinery Directive), the machine manufacturer or system installer must take into account the following residual risks emanating from the control and drive components of a drive system:

1. Unintentional movements of the driven machine or system components during commissioning, operation, maintenance, and repairs caused by, for example:
 - Hardware and/or software errors in the sensors, control system, actuators and connection system
 - Response times of the controller and drive
 - Operation and/or environmental conditions outside the specifications
 - Condensation/conductive pollution
 - Parameterization, programming, cabling, and installation errors
 - Use of wireless devices/mobile phones in the immediate vicinity of electronic components
 - External influences/damage
 - X-ray, ionizing radiation and cosmic radiation
2. Unusually high temperatures, including open flames, as well as the emission of light, noise, particles, gases, etc., can occur inside and outside the components under fault conditions caused by, for example:
 - Component malfunctions
 - Software errors
 - Operation and/or environmental conditions outside the specifications
 - External influences/damage
3. Hazardous shock voltages caused by, for example:
 - Component malfunctions
 - Influence of electrostatic charging
 - Induction of voltages in moving motors
 - Operation and/or environmental conditions outside the specifications
 - Condensation/conductive pollution
 - External influences/damage
4. Electrical, magnetic and electromagnetic fields generated in operation that can pose a risk to people with a pacemaker, implants or metal replacement joints, etc., if they are too close
5. Release of environmental pollutants or emissions as a result of improper operation of the system and/or failure to dispose of components safely and correctly
6. Influence of network-connected communication systems, e.g. ripple-control transmitters or data communication via the network.

For more information about residual risks of the components in a drive system, see the relevant sections in the technical user documentation.

Basic Operator Panel 20 (BOP20)

2.1 General

Description

The BOP20 Basic Operator Panel is a basic operator panel with six keys and a backlit display unit.

The BOP20 can be plugged onto the SINAMICS Control Unit and operated.

The BOP20 supports the following functions:

- Entering parameters and activating functions
- Displaying operating modes, parameters, alarms, and faults





Figure 2-1 BOP20

2.2 Installation

The following photos and captions explain how to assemble the Basic Operator Panel 20 (BOP20) on the Control Unit.

NOTICE
Damage to the interface for the BOP20 at the Control Unit through tilting
If the BOP20 is skewed when inserting or withdrawing it, this can damage the interface for the BOP20.
<ul style="list-style-type: none">• Make sure that you insert and withdraw the BOP20 straight into/out of the Control Unit and that it is not tilted up or down.

Table 2- 1 Mounting a Basic Operator Panel BOP20 using the CU320-2 DP as an example

	
1. Press the latching cams together and remove the blanking cover.	2. Insert the memory card in the slot provided.



2.2.1 Removal

Please note the following information when removing the BOP20 from the Control Unit:

1. Simultaneously press the latching cams on the BOP20.
2. Always withdraw the BOP20 straight out (without skewing it). Never withdraw the BOP20 by pulling it at its lower edge, as this could damage the interface at the rear.

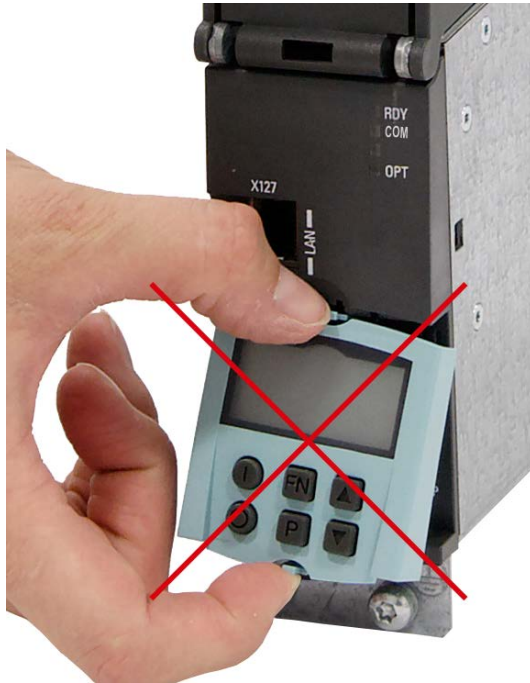


Figure 2-2 Incorrect removal of the BOP20 from a CU320-2 DP (example)

2.3 Setting parameters with the BOP20

2.3.1 BOP20 overview

Overview of displays and keys

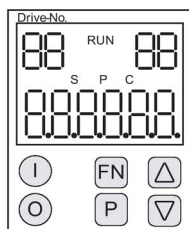


Figure 2-3 Overview of displays and keys







Information on the displays

Table 2- 2 Displays/indicators

Display	Meaning
Top left, 2 chars.	The active drive object of the BOP is displayed here. The displays and key operations always refer to this drive object.
RUN	Lit if at least one drive in the drive line-up is in the RUN state (in operation). RUN is also displayed via bit r0899.2 of the drive.
Top right, 2 chars.	The following is displayed in this field: <ul style="list-style-type: none"> • More than 6 digits: Characters that are present but cannot be seen (e.g. "r2" → 2 characters to the right are invisible, "L1" → 1 character to the left is invisible) • Faults: Selects/displays other drives with faults • Designation of BICO inputs (bi, ci) • Designation of BICO outputs (bo, co) • Source object of a BICO interconnection to a drive object other than the active one.
S	Lit if at least one parameter was changed and the value was not transferred to the non-volatile memory.
P	Lit if the parameter value does not become effective until the P key is pressed.
C	Lit if at least one parameter was changed and the calculation for consistent data management has still not been initiated.
Bottom, 6 chars.	Displays parameters, indices, faults, and alarms.

Information on the keys

Table 2- 3 Keys

Key	Name	Meaning
	ON	Switches on the drives for which the command "ON/OFF1" is to be issued from the BOP. Binector output r0019.0 is set using this key.
	OFF	Switches off the drives for which the commands "ON/OFF1", "OFF2", and "OFF3" are to be issued from the BOP. The binector outputs r0019.0, .1 and .2 are reset simultaneously when this key is pressed. After the key has been released, binector outputs r0019.0, .1 and .2 are again set to a "1" signal.
		Note: The effectiveness of these keys can be defined by parameterizing the BICO (e.g. these keys can be used to control all of the existing drives simultaneously).
	Functions	The significance of this key depends on the current display. Note: The effectiveness of this key for acknowledging faults can be defined by parameterizing the BiCo accordingly.
	Parameters	The significance of this key depends on the current display. If this key is pressed for 3 s, the "Copy RAM to ROM" function is executed. The "S" displayed on the BOP disappears.
	Raise	The keys depend on the current display and are used to either raise or lower values.
	Lower	

BOP20 functions

Name	Meaning
Backlighting	The backlighting can be set using p0007 in such a way that it switches itself off automatically after the set time if no actions are carried out.
Changeover active drive	From the point of view of the BOP, the active drive is defined using p0008 or using the "Fn" keys and "Arrow up".
Units	The units are not displayed on the BOP.
Access level	The access level for the BOP is defined using p0003. The higher the access level, the more parameters can be selected via the BOP.
Parameter filter	The parameter filter in p0004 can be used to filter the available parameters in accordance with their particular function.
Selecting the status display	Actual values and setpoints are displayed on the status display. The status display can be set using p0006.
User parameter list	The user parameter list in p0013 can be used to select access parameters.
Unplug while voltage is present	The BOP can be unplugged and plugged in again while the device is live. <ul style="list-style-type: none"> • The ON and OFF buttons have a function. Unplugging the BOP causes the drives to coast to a standstill. When the BOP is plugged in again, the drives must be switched on again. • The ON and OFF buttons have no function. Unplugging and plugging the BOP in again has no effect on the drives.
Actuating keys	The following applies to the "P" and "Fn" keys: When used in a combination with another key, "P" or "Fn" must be pressed first and then the other key.

Parameters

All drive objects

- p0005 BOP status display selection
- p0006 BOP status display mode
- p0013 BOP user-defined list
- p0971 Save drive object parameters

Drive object, Control Unit

- r0000 BOP status display
- p0003 BOP access level
- p0004 BOP parameter menu
- p0007 Backlighting display delay time
- p0008 BOP drive object selection
- p0009 Device commissioning parameter filter
- p0011 BOP password input (p0013)
- p0012 BOP password confirmation (p0013)
- r0019 CO/BO: Control word, BOP
- p0977 Save all parameters

Other drive objects (e.g. VECTOR, TM31, ...)

- p0010 Commissioning parameter filter

2.3.2 Displays/indicators and using the BOP20

Status display

The status display for each drive object can be set using p0005 and p0006. Using the status display, you can switch to the parameter display or to a different drive object. The following functions are supported:

- Changing the active drive object
 - Press the "Fn" key and "Arrow up" -> the drive object number at the top left flashes.
 - Select the required drive object using the arrow keys.
 - Confirm with the "P" key.
- Parameter display
 - Press the "P" key.
 - The required parameter can be selected using the arrow keys.
 - Press the "Fn" key -> parameter r0000 is displayed.
 - Press the "P" key -> returns to the status display.

Parameter display

The parameters are selected in the BOP20 using the number. To call up the parameter display from the status display, press the "P" key. You can search for the parameters you require using the arrow keys. To display the parameter value, press the "P" key again. You can toggle between the drive objects by pressing the "Fn" keys and the arrow keys simultaneously. You can toggle between r000 and the parameter that was last displayed by pressing the "Fn" key in the parameter display.

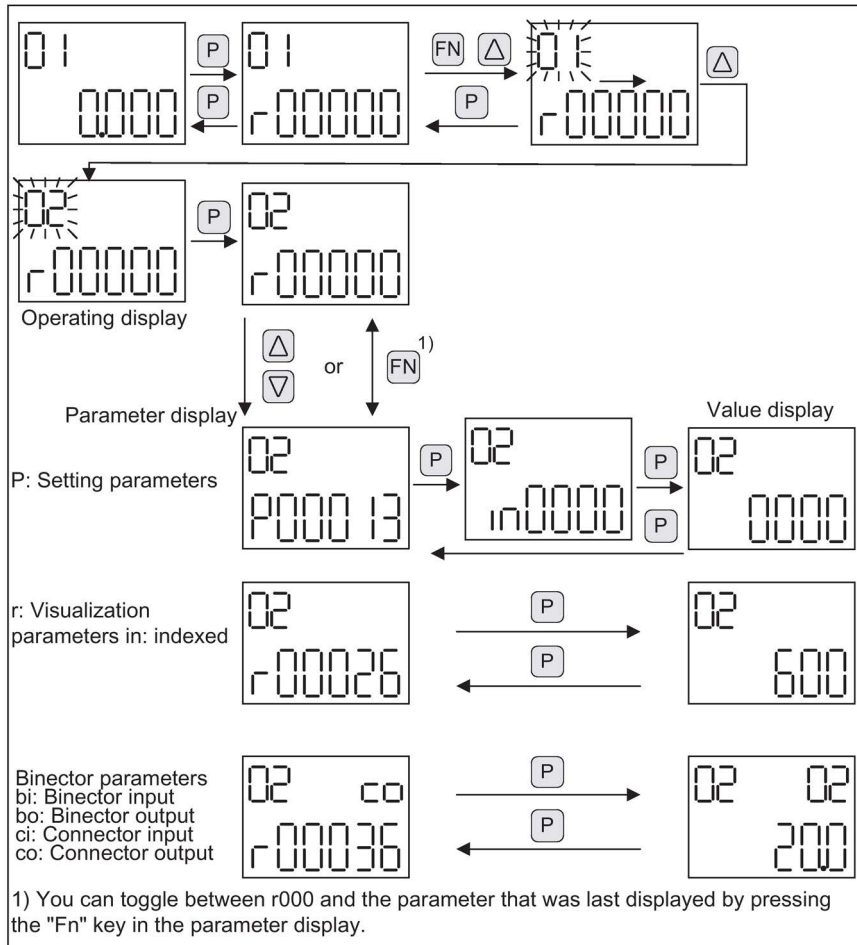


Figure 2-4 Parameter display

Value display

To switch from the parameter display to the value display, press the "P" key. In the value display, the values of the setting parameters can be increased and decreased using the arrow keys. The cursor can be selected using the "Fn" key.

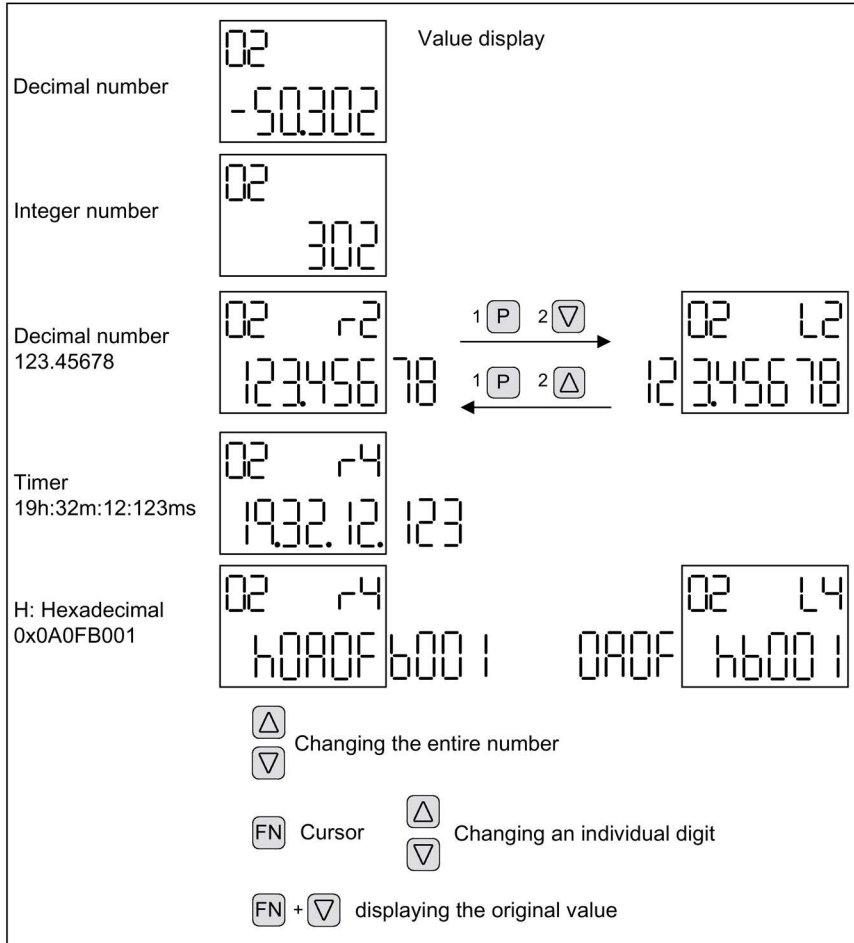


Figure 2-5 Value display

Examples

Example 1: Changing a parameter

Prerequisite: The appropriate access level is set (for this particular example, p0003 = 3).

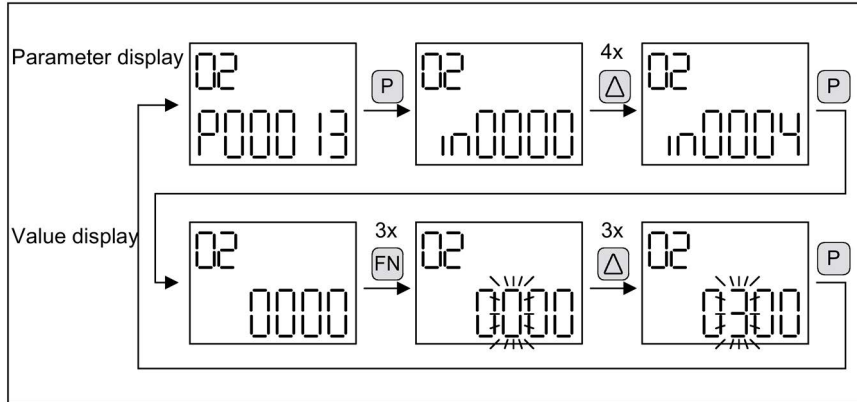


Figure 2-6 Example: Change p0013[4] from "0000" to "0300".

Example 2: Changing binector and connector input parameters

Binector output r0019.0 of the Control Unit (drive object 1) is connected to binector input p0840[0] (OFF1) of drive object 2.

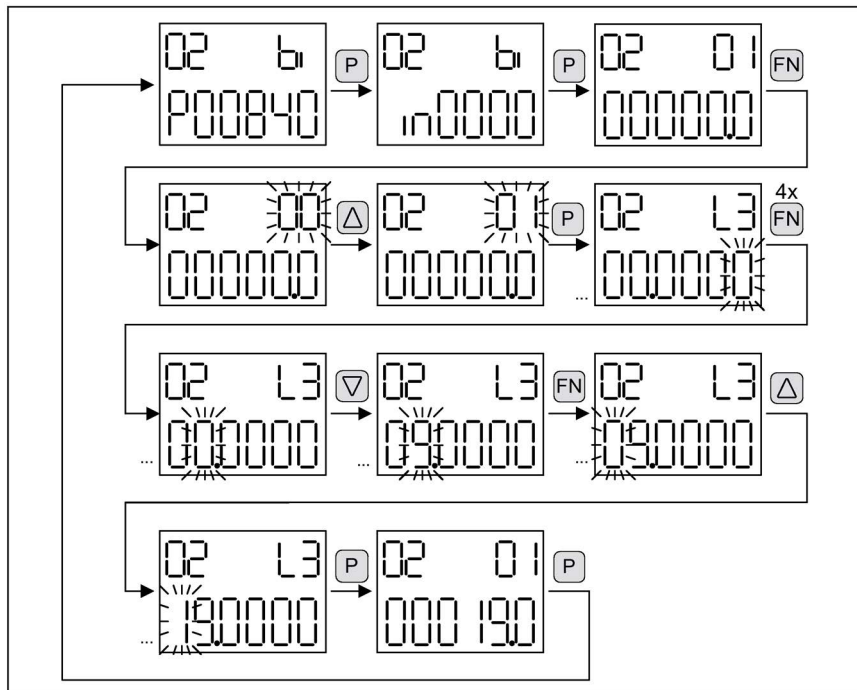


Figure 2-7 Example: Changing the indexed binector parameters

2.3.3 Fault and alarm displays

Displaying faults

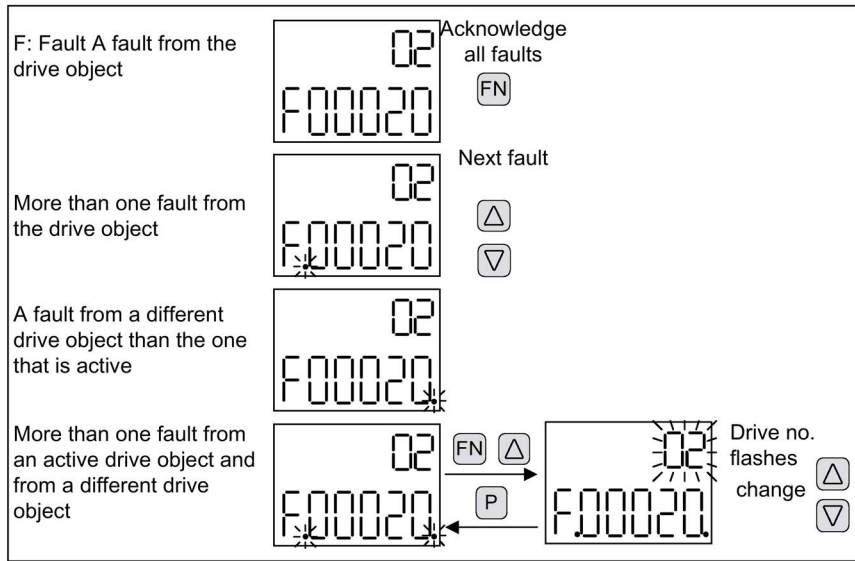


Figure 2-8 Displaying faults

Displaying alarms

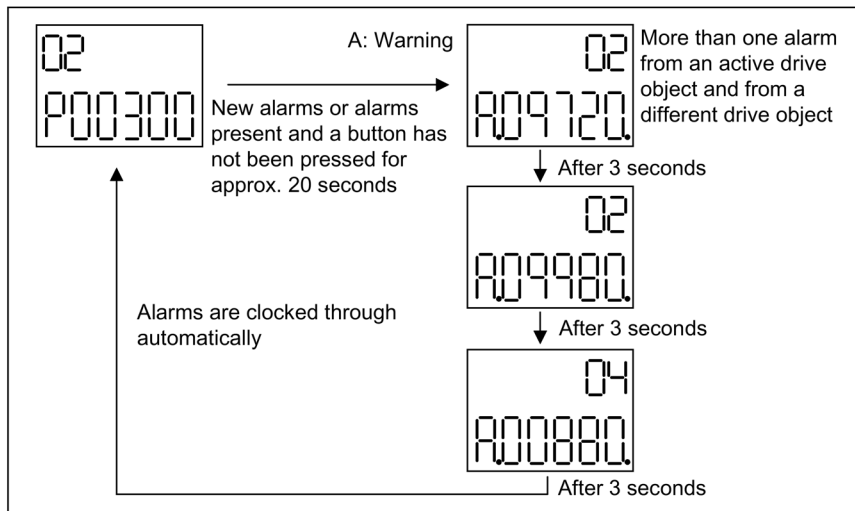


Figure 2-9 Displaying alarms

2.3.4 Controlling the drive using the BOP20

Description

When the drive is commissioned, it can be controlled via the BOP20. A control word is available on the Control Unit drive object (r0019) for this purpose, which can be interconnected with the appropriate binector inputs of the drive.

The interconnections do not function if a standard PROFIdrive telegram was selected as its interconnection cannot be disconnected.

Table 2- 4 BOP20 control word

Bit (r0019)	Signal name	1 signal	0 signal	Example, interconnection parameters
00	ON / OFF (OFF1)	ON	OFF	p0840
01	No coast down/coast down (OFF2)	No coast down	Coast down (OFF2)	p0844
02	No fast stop/fast stop (OFF3)	No fast stop	Fast stop (OFF3)	p0848
07	Acknowledge fault (0 -> 1)	Yes	No	p2102
13	Motorized potentiometer, raise	Yes	No	p1035
14	Motorized potentiometer, lower	Yes	No	p1036

Note

Simple commissioning

For simple commissioning, only bit 0 should be interconnected. When bits 0 ... 2 are interconnected, the system is switched off according to the following priority: OFF2, OFF3, OFF1.

2.3.5 Important functions via BOP20

Description

The BOP20 can be used to execute the following functions (via parameters) that help you handle your projects more efficiently:

- Restore the factory settings
- Copy from RAM to ROM
- Identification via LED
- Acknowledge error

Restore the factory settings

The factory setting of the complete device can be restored in the CU drive object.

- p0009 = 30
- p0976 = 1

Copy from RAM to ROM

You can initiate the saving of all parameters to the non-volatile memory (memory card) in the drive object CU:

- Press the "P" key for 3 seconds or
- p0977 = 1

Note

Parameter rejection with active identification

This parameter is not accepted if an identification routine (e.g. motor identification routine) has been selected on a drive.

Identification via LED

The main component of a drive object (e.g. power section) can be identified using the index of p0124. The ready LED on the module starts to flash. The index corresponds to the index in p0107; the drive object type can be identified using this parameter.

The drive objects can be identified using the following parameters:

- p0124 Power unit detection via LED
- p0144 Voltage Sensing Module detection via LED
- p0144 Sensor Module detection via LED
- p0154 DRIVE-CLiQ hub identification using LED
- p0154 Terminal Module detection via LED

Acknowledge error

All errors whose cause has been rectified can be acknowledged by pressing the Fn key.

2.4 Technical specifications

Table 2- 5 Technical specifications

Basic Operator Panel 20 (BOP20)	
Electronics power supply	3.3 V DC (provided by CU320)
Weight	0.02 kg

Advanced Operator Panel 30 (AOP30)

3.1 General

Description

The user-friendly AOP30 operator panel is an optional input/output device for SINAMICS G130 converters. The operator panel can be used for commissioning, operation and diagnostic purposes.

The AOP30 communicates with the SINAMICS drive via a serial interface (RS232) with PPI protocol. The interface is a point-to-point connection. During communication, the AOP30 is the master and the connected drive is the slave.

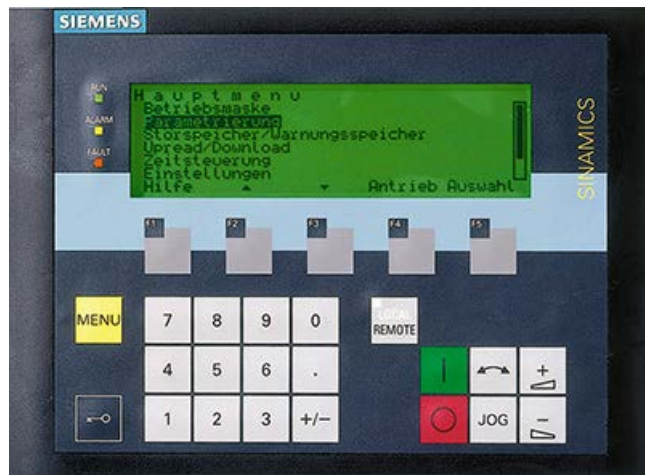


Figure 3-1 AOP30

Design

The AOP30 is an operator panel with graphic display and membrane keyboard. An RS232 interface is interface to the drive device. The device can be installed in cabinet doors (thickness: between 2 mm and 4 mm).

Features

- Display with green backlighting (resolution: 240 x 64 pixels)
- Membrane keyboard with 26 keys
- Connection for a 24 V DC power supply
- RS 232 interface
- Time and date memory powered by internal battery backup
- 4 LEDs indicate the operating status of the drive device:
 - RUN: green
 - ALARM: yellow
 - FAULT: red
 - LOCAL/REMOTE green

3.2 Mechanical installation

The following diagrams and descriptions explain the conditions and procedures involved in the mechanical installation of the AOP30 operator panel.

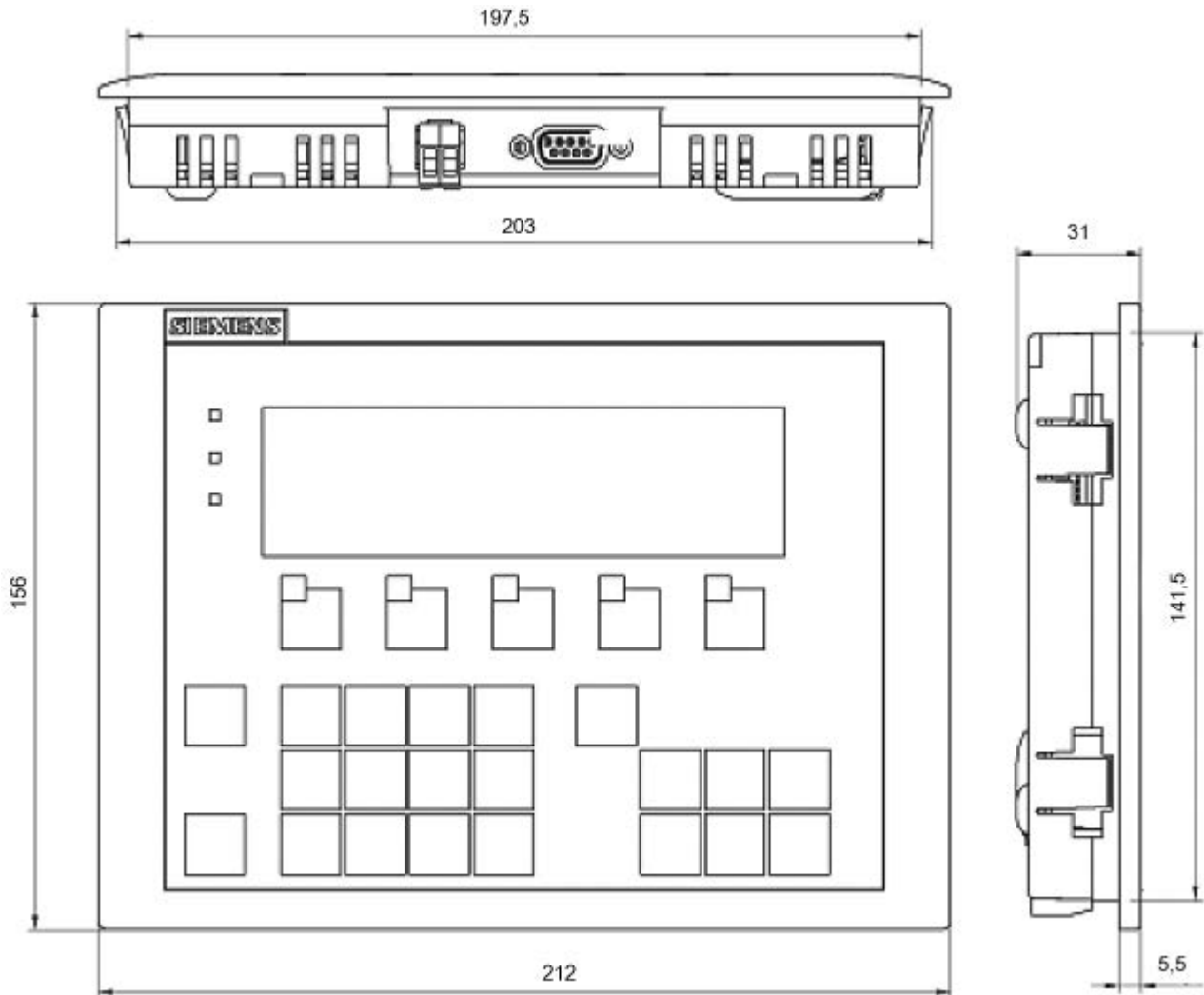


Figure 3-2 Dimension drawing of the AOP30 operator panel

Installing the operator panel (cabinet door thickness: 2 mm)

1. Cut out a 141.5 mm x 197.5 mm section in the cabinet door.
2. Fit the AOP30 operator panel in this cutout section from the outside.
3. Apply pressure to the four corners until the snap-in lugs lock into position.

Installing the operator panel (cabinet door thickness: 2 mm to 4 mm)

The following photos show the tensioning elements for the AOP30 operator panel for installation in cabinet doors (thickness: 2 mm to 4mm).

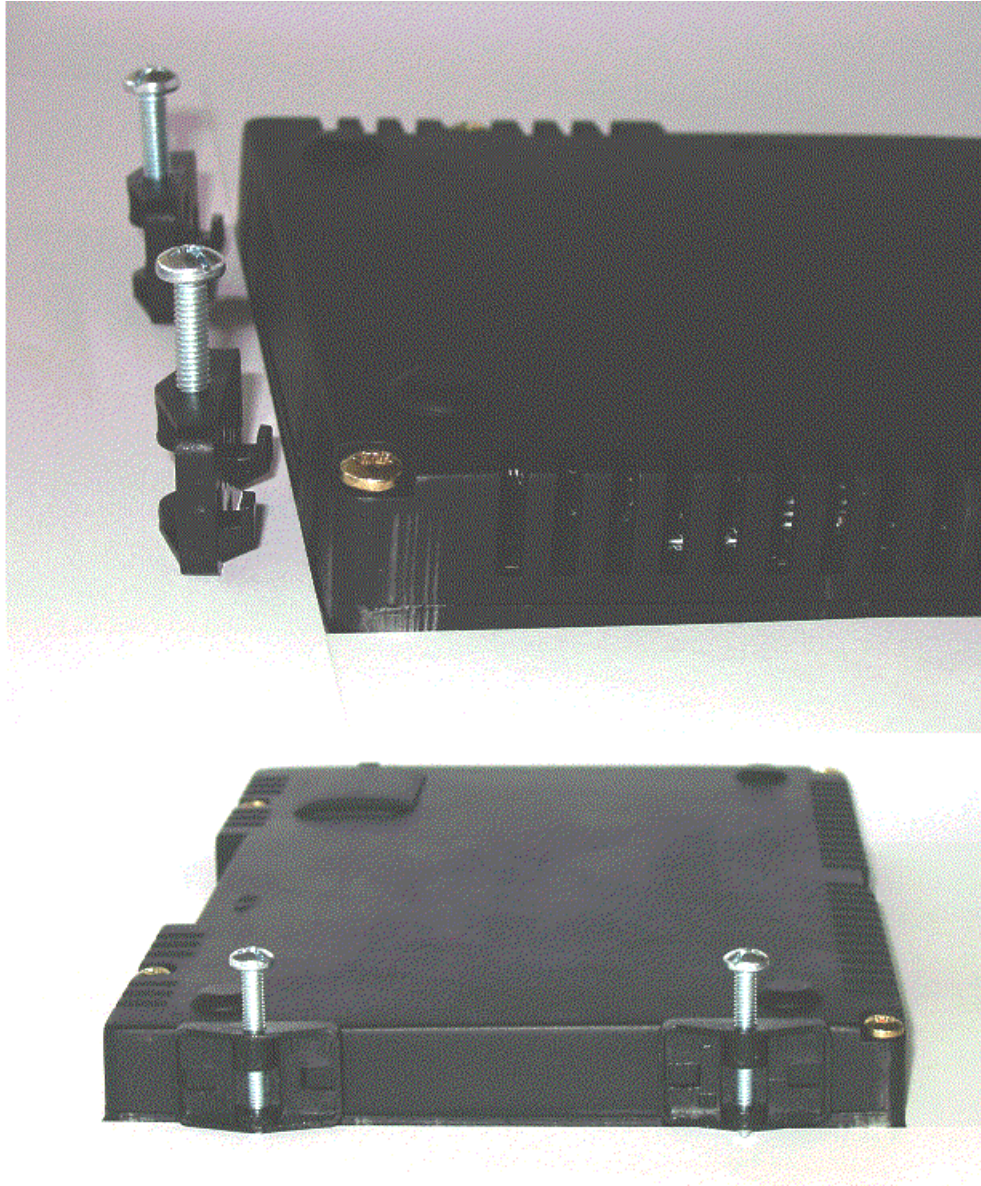


Figure 3-3 Tensioning elements for the AOP30 operator panel for installation in cabinet doors (thickness: 2 mm to 4 mm)

1. Cut out a 141.5 mm x 197.5 mm section in the cabinet door.
2. Fit the AOP30 operator panel in this cutout section from the outside.
3. Hook the tensioning elements into the openings provided.
4. Tighten the screws by hand to secure the tensioning elements.

NOTICE

Device damage caused by screws being tightened excessively

The excessive tightening of the screws used to fix the tension jack can cause damage to the operator panel housing!

- Tighten the screws used to fix the tension jack only hand-tight.

3.3 Connection

Interfaces

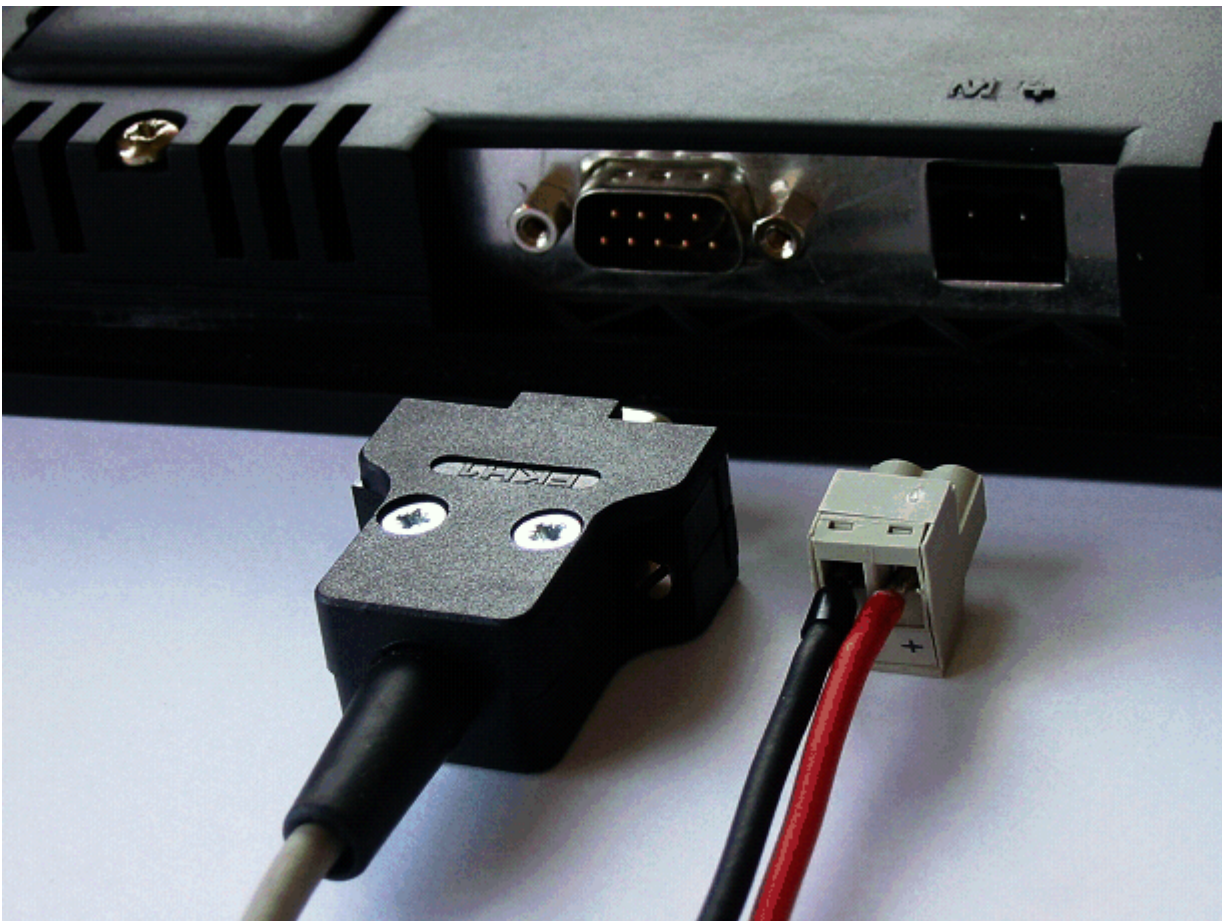


Figure 3-4 AOP30 interfaces

X524: Power supply

Table 3- 1 Power supply terminals

Terminal	Designation	Technical specifications
+	P24	24 VDC power supply
M	M	Ground

Max. connectable cross-section: 2.5 mm²

Note

Connectable voltage supply

Only a protective extra-low voltage of Class DVC A, (PELV) acc. to EN 61800-5-1 must be connected to the power supply.

X540: serial interface (RS232)

Table 3- 2 Serial interface (RS232) X540

Pin	Designation	Technical specifications
2	RxD	Receive data
3	TxD	Transmit data
5	Ground	Ground reference

Connector type: 9-pin SUB D socket

Note

Maximum cable lengths

The maximum cable length is 10 m.

To ensure noise-free communication, you are advised to use a shielded cable and connect the cable shield to both connector housings.

NOTICE

Device damage caused by interchanged poles of the connected power supply

In the operator panel electronic circuitry, a connected cable shield may possibly be connected to the signal and P24 ground. If the power supply is connected with incorrect polarity, the P24 supply via the shield and signal ground will short-circuit. This can cause device damage.

- Connect the correct poles of the power supply.

Connection

The AOP30 is connected as follows:

1. Connect the power supply cable to the interface for the electronic power supply (X524).
2. Connect the standard cable to the serial RS232 interface (X540) of the Control Unit.

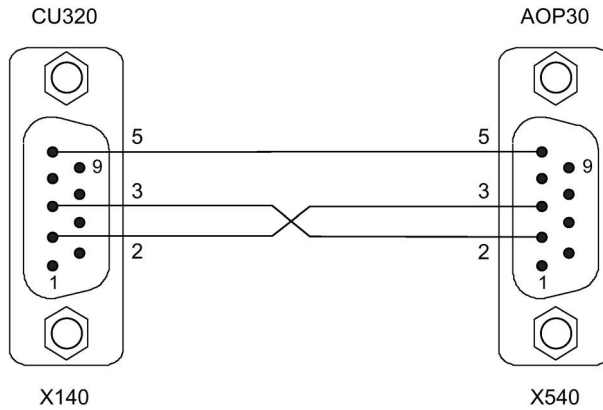


Figure 3-5 Signal cable between the Control Unit and AOP30

Note

Assignment of the connecting cable

The connection cable to AOP30 may only contain the three contacts which are shown in the drawing; a completely allocated cable may not be used.

3.4 Control via the operator panel

3.4.1 Operator panel (AOP30) overview and menu structure

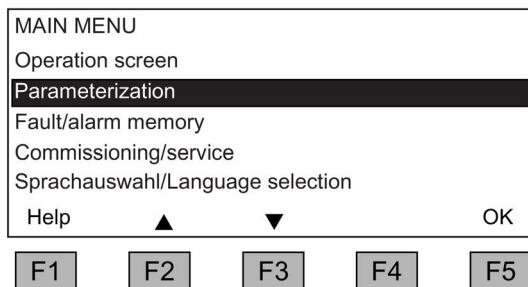
Description

The operator panel can be used for the following activities:

- Parameterization (commissioning)
- Monitoring status variables
- Controlling the drive
- Diagnosing faults and alarms

All the functions can be accessed via a menu.

Your starting point is the main menu, which you can always call up using the yellow MENU key:



Dialog screen for the main menu:
It can be accessed at any time with the "MENU" key.

Press "F2" or "F3" to navigate through the menu options in the main menu.

Note

AOP reset

If the AOP no longer reacts, you can trigger an AOP reset by simultaneously pressing the key and OFF buttons (longer than two seconds) and then releasing the OFF button.

Menu structure of the operator panel

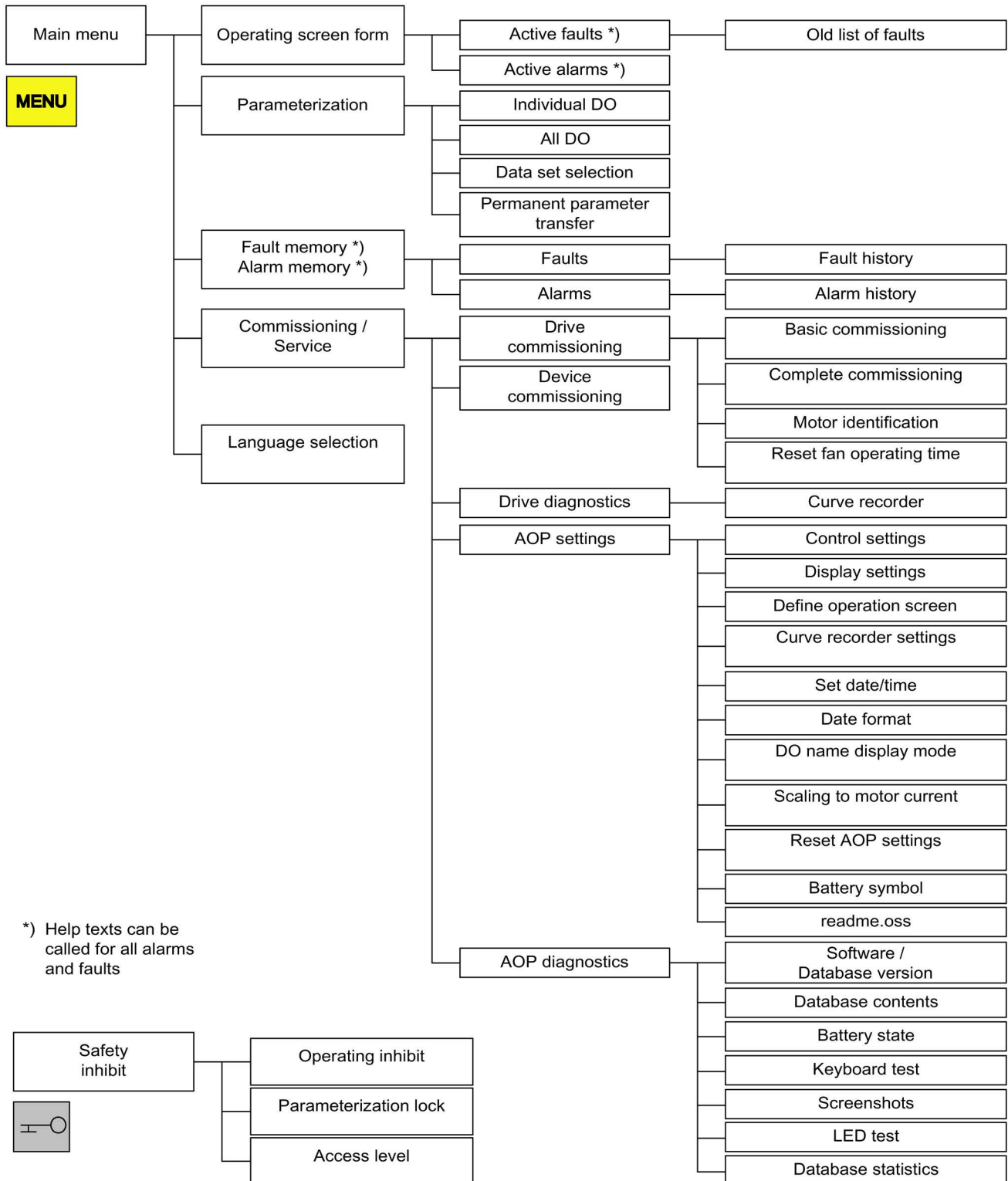


Figure 3-6 Menu structure of the operator panel

3.4.2 Menu: Operation screen

Description

The operation screen displays the most important status variables for the drive unit:

In the delivery condition, it displays the operating state of the drive, the direction of rotation, the time, as well as four drive variables (parameters) numerically and two in the form of a bar display for continuous monitoring.

There are two ways to reach the operation screen:

1. After the power supply has been switched on and the system has ramped up.
2. By pressing the MENU key and F5 "OK"

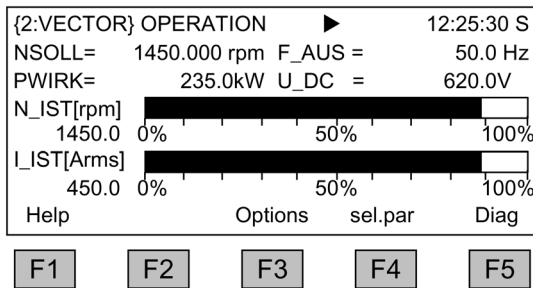


Figure 3-7 Operation screen

If a fault occurs, the system automatically displays the fault screen (see "Faults and alarms").

In LOCAL control mode, you can choose to enter the setpoint numerically (F2: setpoint).

With F3 "Extras", screen2 and CDS data set (see section CDS setting via AOP (Page 61)) can be selected.

The individual parameters of the operation screen can be selected using F4 "Sel. par." The corresponding parameter number of the short identifier is displayed using F1 "Help+" and a description of the parameter can be called up.

Settings

When you choose Commissioning / service → AOP settings → Define operation screen, you can adjust the display type and the values displayed as required (see "AOP settings").

3.4.3 Menu: Parameterization

You can adjust the device settings in the Parameterization menu.

The drive software is modular. The individual modules are called DOs ("drive objects").

The following DOs are available in the SINAMICS G130:

- CU: General parameters for the Control Unit
- VECTOR: Drive control
- TM31: The TM31 terminal module (optional)
- TM150: the TM150 temperature sensor module (optional)

Parameters with identical functions may exist with the same parameter number in more than one DO (e.g. p0002).

The AOP30 is used for operating devices that comprise more than one drive so that attention is focused on one drive (i.e. the "current" drive). The switchover is made in the main menu. The corresponding function key is labeled "Drive."

This drive determines the following:

- Operation screen
- Fault and alarm displays
- The controller (ON, OFF, ...) of a drive

Depending on your requirements, you can choose between two AOP display types:

1. All parameters

All the parameters present in the device are listed here. The DO to which the currently selected parameter belongs is displayed in curly brackets in the top left of the screen.

2. DO selection

In this display, you can pre-select a DO Only the parameters for this DO are then listed. (The expert list display in STARTER only uses this DO view)

In both cases, the set access level governs which parameters are displayed. You can set the access level in the menu for inhibit functions, which can be called up using the key button.

The parameters for access levels 1 and 2 are sufficient for simple applications.

At access level 3 ("Expert"), you can change the structure of the function by interconnecting BICO parameters.

In the Data set selection menu, you can choose which of the data sets chosen is currently DISPLAYED on the operator panel.

Data set parameters are indicated by a "c", "d", "m", "e", or "p" between the parameter number and parameter designator.

When a data set parameter is changed, the data set selection dialog appears.

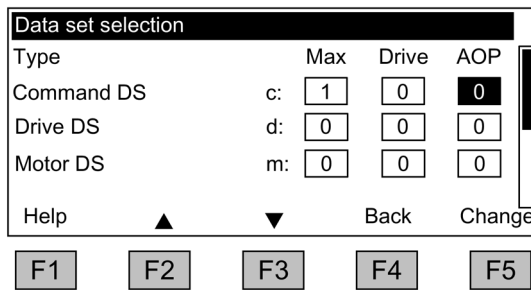


Figure 3-8 Data set selection

Explanation of the operator control dialog

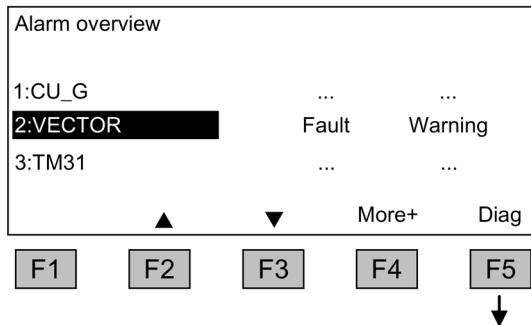
- "Max" shows the maximum number of data sets parameterized (and thereby available for selection) in the drive.
- "Drive" indicates which data set is currently active in the drive.
- "AOP" indicates which particular data set is currently being displayed in the operator panel.

3.4.4 Menu: Fault/alarm memory

When you select the menu, a screen appears containing an overview of faults and alarms that are present.

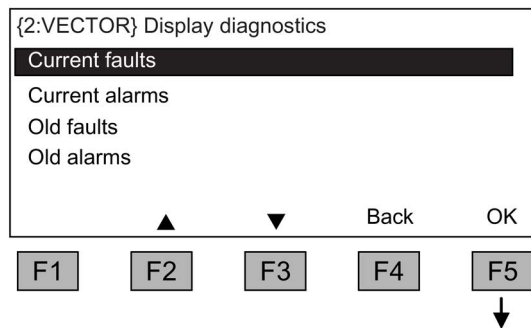
For each drive object, the system indicates whether any faults or alarms are present. ("Fault" or "Alarm" appears next to the relevant drive object).

In the graphic below, you can see that at least one active fault/alarm is present for the "VECTOR" drive object. No faults/alarms are indicated for the other drive objects.



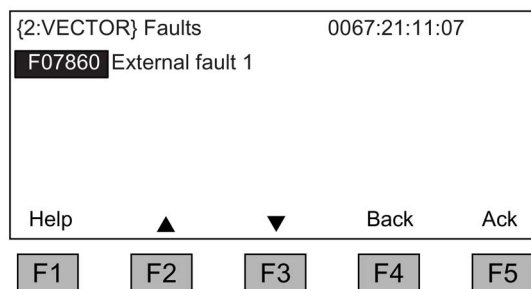
Fault/alarm memory

When you navigate to the line with active alarms/faults and then press the F5 <Diag> key, the system displays a screen in which you have to select the current or old alarms/faults.

**Display diagnosis**

When you navigate to the required line and then press the F5 <OK> key, the corresponding faults/alarms are displayed.

The list of current faults is selected here as an example.

**Display of current faults**

A maximum of eight current faults are displayed along with their fault number and name of the fault.

To display additional help regarding the cause of the problem and how to solve it, choose F1 <Help>.

To acknowledge the faults, choose F5 <Ack.>. If a fault cannot be acknowledged, the fault remains.

3.4.5 Menu commissioning / service

3.4.5.1 Drive commissioning

This option enables you to re-commission the drive from the main menu.

Basic Commissioning

Only the basic commissioning parameters are queried and stored permanently.

Complete commissioning

Complete commissioning with motor and encoder data entry is carried out. Following this, key motor parameters are recalculated from the motor data. The parameter values calculated during previous commissioning are lost.

In a subsequent motor identification procedure, the calculated values are overwritten.

Motor identification

The selection screen for motor identification appears.

Reset fan operating time

The actual operating hours of the fan in the power unit is displayed.

After a fan replacement, the operating hours counter for monitoring the fan operating time must be reset.

3.4.5.2 Device commissioning

Device commissioning

In this menu, you can enter the device commissioning status directly. This is the only way that you can reset parameters to the factory setting for example.

3.4.5.3 Drive diagnostics

Curve recorder

The curve recorder provides a slow trace function, which monitors a signal trend. A signal selected via a parameter is shown in the form of a curve.

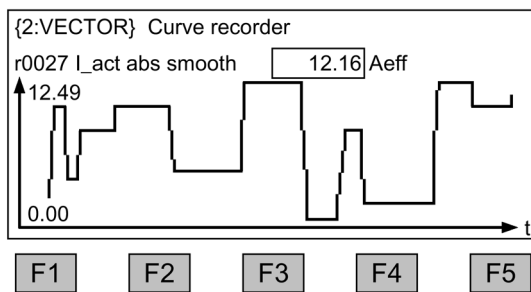


Figure 3-9 Curve recorder

The curve recorder-relevant settings are changed by pressing the F5 key or via the "Commissioning / Service – AOP settings - Curve recorder-relevant settings" menu.

The value of the parameter selected in the curve recorder-relevant settings is output on the display in addition to the curve and updated every 0.5 ... 24.5 seconds (parameterizable). With a slowly running time basis (as of 20 minutes/figure), the time basis value flashes in the header in the 1 s-cycle alternately with the text "slow X".

Assignment of the function keys F1 to F5 is not normally displayed so that the space can be fully utilized to display the curve. Pressing a function key shows the key assignments. If no further key is pressed within 5 seconds, the labeling will disappear again.

The curve can be scaled automatically or manually. This is selected with key F3 "scale+" - F2 "Auto/Manual" followed by confirmation with F5 "OK."

- **Auto**

The scaling of the curve changes dynamically, it is oriented to the maximum value (for example, 12.49) and minimum value (for example, 0.00) visible in the display at the actual point in time. Scaling can be changed step-by-step by pressing buttons F2 and F3. If measured value noise is shown with an excessively high resolution as a result of the automatic scaling, then the resolution can be reduced in four steps by pressing button F2. As a result, the automatic scaling is deactivated. However, if the measured value leaves the display area, then this is extended. Automatic scaling can be reselected by pressing button F3.

- **Manually**

After selecting manual scaling and confirmation with "OK", a window opens in which the maximum and minimum limits for scaling can be set.

{2:VECTOR} curve recorder
r0027 I_act abs smooth

Max: 150.00
Min: 0.00 accept

Help ▲ ► Back OK

F1 F2 F3 F4 F5

Figure 3-10 Curve recorder - manual scaling

After setting and applying the limits, you switch to the curve recorder and manual scaling is used.

If the current measured values are outside the displayable range, the range will automatically be extended.

Note

Changing the parameter for the curve recorder in manual scaling

When the parameter for the curve recorder is changed the following occurs with manual scaling:

- If the current parameter has lower values than the currently set scaling, the scaling will be retained.
 - If the current parameter has higher values than the currently set scaling, the scaling will be adjusted automatically.
-

Help on the curve recorder can be opened with key F1.

The curve recorder is exited by pressing the MENU button.

Note

No recording of data

The values displayed in the recorder are not recorded and saved, they are only used for display until the screen form is exited.

3.4.5.4 AOP settings

Control settings

This defines the settings for the control keys in LOCAL mode (see "Operation / Control via the operator panel / Operation via the operator panel").

Display settings

In this menu, you set the lighting, brightness, and contrast for the display.

Define operation screen

In this menu, you can switch between five operation screens. You can set the parameters to be displayed.

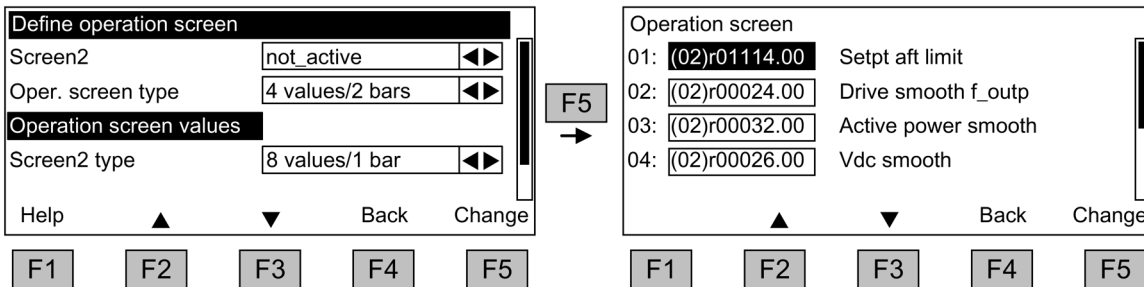


Figure 3-11 Define operation screen

The following screenshot shows how entries are assigned to the screen positions:

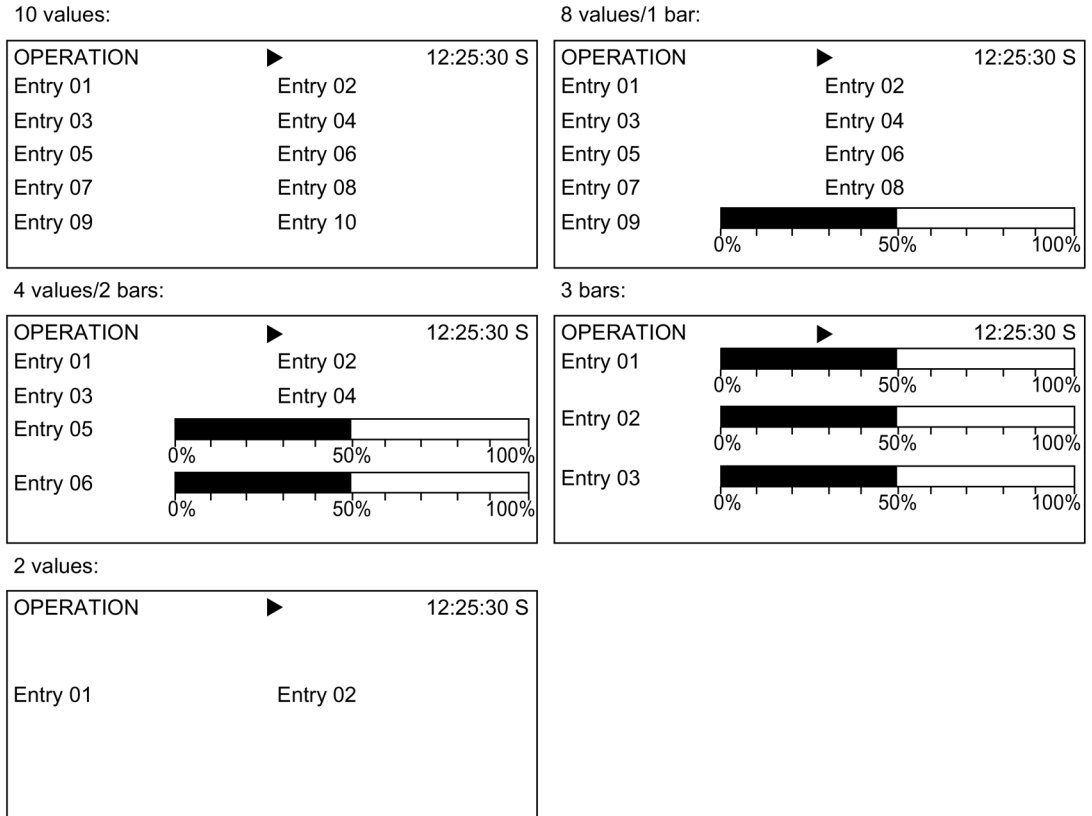


Figure 3-12 Layout of entries on the operation screen

Lists of signals for the operating screen form

The following tables list some of the main signals for the operation screen along with the associated reference variables and default settings for fast commissioning.

VECTOR object

Table 3- 3 List of signals for the operation screen - VECTOR object

Signal		Parameter	Short name	Unit	Scaling (100 %=...) See table below
Factory setting (entry no.)					
Speed setpoint upstream of ramp-function generator	(1)	r1114	NSETP	1/min	p2000
Output frequency	(2)	r0024	F_OUT	Hz	Reference frequency
Power smoothed	(3)	r0032	PACTV	kW	r2004
DC link voltage smoothed	(4)	r0026	U_DC	V	p2001
Actual speed value smoothed	(5)	r0021	N_ACT	1/min	p2000
Absolute actual current, smoothed	(6)	r0027	I_IST	A	p2002
Motor temperature	(7)	r0035 ¹⁾	T_MOT	°C	p2006
Converter temperature	(8)	r0037	T_LT	°C	p2006
Actual torque smoothed	(9)	r0031	M_ACT	Nm	p2003
Converter output voltage smoothed	(10)	r0025	C_OUT	V	p2001
For diagnostic purposes					
Speed setpoint smoothed		r0020	NSETP	1/min	p2000
Control factor smoothed		r0028	AUSST	%	Reference modulation depth
Field-producing current component		r0029	IDACT	A	p2002
Torque-producing current component		r0030	IQACT	A	p2002
Converter overload Degree of thermal overload		r0036	LT12T	%	100 % = Shutdown
Speed actual value motor encoder		r0061	N_ACT	1/min	p2000
Speed setpoint after the filter		r0062	NSETP	1/min	p2000
Actual speed smoothed		r0063	N_ACT	1/min	p2000
Control deviation		r0064	NDIFF	1/min	p2000
Slip frequency		r0065	FSCHL	Hz	Reference frequency
Output frequency		r0066	F_OUT	Hz	Reference frequency
Output voltage		r0072	UACT	V	p2001
Control factor		r0074	AUSST	%	Reference modulation depth
Torque-generating actual current		r0078	IQACT	A	p2002
Actual torque value		r0080	M_ACT	Nm	p2003
For further diagnostic purposes					
Fixed speed setpoint effective		r1024		1/min	p2000
Active motorized potentiometer setpoint		r1050		1/min	p2000
Resulting speed setpoint		r1119	NSETP	1/min	p2000
Speed controller output		r1508	NREGY	Nm	p2003
I component of speed controller		r1482	NREGI	Nm	p2003
PROFIBUS setpoint		r2050	PBSOL	1/min	p2000

¹⁾ If a temperature sensor has not been installed, a value of -200 °C is displayed.

Normalization for VECTOR object

Table 3- 4 Normalization for VECTOR object

Size	Scaling parameter	Default for quick commissioning
Reference speed	100% = p2000	p2000 = Maximum speed (p1082)
Reference voltage	100% = p2001	p2001 = 1000 V
Reference current	100% = p2002	p2002 = Current limit (p0640)
Reference torque	100% = p2003	p2003 = 2 x rated motor torque
Reference power	100% = r2004	r2004 = (p2003 x p2000 x π) / 30
Reference frequency	100% = p2000/60	
Reference modulation depth	100 % = Maximum output voltage without overload	
Reference flux	100 % = Rated motor flux	
Reference temperature	100% = p2006	p2006 = 100°C

TM31 object

Table 3- 5 List of signals for the operation screen – TM31 object

Signal	Parameter	Short name	Unit	Scaling (100 % = ...)
Analog input 0 [V, mA]	r4052[0]	AI_UI	V, mA	V: 100 V / mA: 100 mA
Analog input 1 [V, mA]	r4052[1]	AI_UI	V, mA	V: 100 V / mA: 100 mA
Analog input 0, scaled	r4055[0]	AI_%	%	as set in p200x
Analog input 1, scaled	r4055[1]	AI_%	%	as set in p200x

Curve recorder settings

In this menu, the following settings can be made:

Parameter selection

You can select here the parameter whose signal is to be displayed in the form of a trend curve in the curve recorder.

Interpolation (factory setting: No), serves for the better display of rapidly changing quantities.

- **No:** Only the measured values are displayed as points, without a connecting line between the points.
- **1:** The measured values are connected with a vertical line.
- **2:** The measured values are connected with a line, offset at the center.

Time base (factory setting: 2 minutes/screen)

The rate of the signal acquisition in minutes per screen is set. The value can be changed in integer multiples of 2. If an odd value is entered, the value will be rounded up. After changing the time basis the recording is started again.

Background recording (factory setting: No)

- **YES:** Values are still recorded, even if the display screen is exited. When the screen is entered again, the recorded prehistory is displayed.
- **NO:** The recording is stopped when the curve recorder is exited.

Y scale mode (factory setting: Auto), specifies the representation of the trend

- **Auto:** Scaling is done automatically (making the best possible use of the display height).
- **Manual:** Scaling is done manually by entering the range limits MIN/MAX. If, in this mode, values that are outside the defined window occur, the limit is automatically adapted for the display so that actual measured values can always be recorded.

Setting the date/time (for date stamping of error messages)

In this menu, you set the date and time.

You can also set whether and/or how the AOP and drive unit are to be synchronized. Synchronization of the AOP with the drive enables error messages to be date- and time-stamped.

Note

Display format for the time

The drive unit displays the time in parameter r3102 in the UTC format (days/milliseconds since 1970-01-01).

Under "Additional settings", settings for synchronization can be made:

Synchronization (factory setting: None)

- **None**
The times for the AOP and drive unit are not synchronized.
- **AOP -> Drive**
 - If you activate this option, the AOP and drive unit are synchronized immediately whereby the current AOP time is transferred to the drive unit.
 - The current AOP time is transferred to the drive unit every time the AOP is started.
 - Depending on the set synchronization interval, the current AOP time is transferred to the drive unit.

Note

Flashing "S"

If the AOP detects a difference between RAM and ROM during synchronization to the drive unit, this is indicated by a flashing "S" at the top right in the display or, if operator input and/or parameter assignment has been disabled, by a flashing key symbol.

• **Drive -> AOP**

- If you activate this option, the AOP and drive unit are synchronized immediately whereby the current drive unit time is transferred to the AOP.
 - The current drive unit time is transferred to the AOP every time the AOP is started.
 - Depending on the set synchronization interval, the current drive unit time is transferred to the AOP.
-

Note

Time-of-day master

The time in the drive must be set by a clock master (e.g. SIMATIC).

Synchronization interval

The interval for time synchronization is set from 1 hour (factory setting) to 99 hours.

For the interval, the time in the AOP from the time of the last change of the interval is decisive.

Daylight saving (factory setting: No)

- **No**
The time does not automatically change over to daylight-saving time.
- **Yes**
Selection is only possible if synchronization is set to "None" or "AOP -> Drive".
The time is then automatically set to summer or winter time.
After the changeover - for synchronization "AOP -> Drive" - synchronization is immediately carried out, irrespective of the synchronization interval set.

Changes to the synchronization must be saved with "Save".

Date format

In this menu, the date format can be set:

- **DD.MM.YYYY**: European date format
- **MM/DD/YYYY**: North American date format

DO name display mode

In this menu, you can toggle the display of the DO-name between the standard abbreviation (e.g., VECTOR) and a DO-name of your choice (e.g. motor_1).

User-defined DO name (factory setting: No)

- **Yes:** The "User-defined DO-name" stored in parameter p0199 is displayed instead of the standard DO abbreviation.
- **No:** The standard DO abbreviation is displayed.

Scaling to motor current

In this menu, the reference variable for the bar-type display of parameter r0027 (absolute actual current value smoothed) can be changed over in the operating screen forms.

Scaling to motor current (factory setting: No)

- **Yes:** The bar display of parameter r0027 in the operating screen form is displayed with reference to parameter p0305 (rated motor current).
- **No:** The bar display of parameter r0027 in the operating screen form is displayed with reference to parameter p2002 (reference current).

Reset AOP settings

When you choose this menu option, the AOP factory settings for the following are restored:

- Language
- Display (brightness, contrast)
- Operating screen
- Control settings

Note

Restoring the factory setting

When you reset parameters, all settings that are different to the factory settings are reset immediately. This may cause the cabinet unit to switch to a different, unwanted operational status.

For this reason, you should always take great care when resetting parameters.

Battery symbol

In this menu, the battery symbol can be activated so that it is displayed in the operating screen form. When the display is activated, then the battery symbol is shown instead of the time of day seconds display. It displays the battery voltage in 20 % steps. If the display was received in the last 20 %, then the battery symbol flashes in order to indicate that the battery must be replaced.

Battery symbol (factory setting: NO)

- **Yes:** The battery symbol is shown at the top right of the operating screen form - at the time of day seconds display.
- **No:** The battery symbol is not displayed in the operating screen form.

readme.oss

Notes are displayed in this menu that describe complying with regulations when using any embedded OSS software components.

3.4.5.5 AOP diagnostics

Software/database version

You can use this menu to display the firmware and database versions.

The database version must be compatible with the drive software status (you can check this in parameter r0018).

Database contents

For service purposes, the contents of the database are displayed in the screen form.

Battery status

In this menu, you can display the battery voltage numerically (in Volts) or as a bar display. The battery ensures that the data in the database and the current time are retained.

When the battery voltage is represented as a percentage, a battery voltage of ≤ 2.30 V is equal to 0%, and a voltage of ≥ 3 V to 100%.

The data is secure up to a battery voltage of 2.30 V.

- If the battery voltage is ≤ 2.45 V, the message "Battery weak - replace soon" is displayed in the status bar.
- If the battery voltage is ≤ 2.30 V, the system displays the following message: "Battery defect - replace immed."
- If the time and/or database are not available after the system has been switched off for a prolonged period due to the voltage being too low, the loss is established by means of a CRC check when the system is switched on again. This triggers a message instructing the user to replace the battery and then load the database and/or set the time.

For instructions on how to change the battery, see "Maintenance and servicing".

Keyboard test

In this screen, you can check whether the keys are functioning properly. Keys that you press are represented on a symbolic keyboard on the display. You can press the keys in any order. You cannot exit the screen (F4 – "back") until you have pressed each key at least once.

Note

Exit keyboard test

Alternatively, you can exit the keyboard test screen by pressing any key and holding it down.

Screenshots

A screenshot is created by simultaneously pressing keys "1" and "+/-" - and then the display flashes 2 times, one after the other. A maximum of 8 screenshots can be managed.

The list of the saved screenshots is displayed in the "Screenshots" menu item.

The screenshot is selected from the list and is displayed by pressing F5.

While the screenshot is being displayed, the identifier and the time stamp are displayed flashing in the title line every 5 seconds.

By pressing any function key F1 ... F5, the function key assignment is displayed for 5 seconds.

- The display is exited by pressing F4 and the list of screenshots is redisplayed.
- By pressing the F5 key once and then pressing F5 "Clear" again to confirm, the displayed screenshot will be deleted and the list of screenshots will be displayed again.

To clear all of the screenshots, in the list of screenshots, press F5 for longer than 1 second - and confirm the following prompt with "Yes".

If there are gaps in the list of screenshots, then they are populated with new screenshots from the top to the bottom. When the list is full, then the oldest chronological entry in the list is overwritten.

Note

Battery buffering

The screenshots are saved to the memory, buffered by a battery - and are also available after the power supply has been switched-off and switched-on again.

When the AOP30 is switched off and the battery is too weak - or when changing the batteries - a buffer time of approximately 30 minutes applies.

LED test

In this screen, you can check that the four LEDs are functioning properly.

Database statistics

For service purposes, the database statistics are displayed in the screen form.

3.4.6 Sprachauswahl/Language selection

The operator panel downloads the texts for the different languages from the drive.

You can change the language of the operator panel via the "Sprachauswahl/Language selection" menu.

Note

Additional languages for the display

Languages in addition to the current available languages in the display are available on request.

3.4.7 Operation via the operator panel (LOCAL mode)

You activate the control keys by switching to LOCAL mode. If the green LED in the LOCAL/REMOTE key does not light up, the key is not active.

Note

OFF in REMOTE

If the "OFF in REMOTE" function is activated, the LED in the LOCAL-REMOTE key flashes.

For LOCAL master control, all of the supplementary setpoints are deactivated.

After the master control has been transferred to the operator panel, the BICO interconnections at bit 0 to bit 10 of the control word of the sequence control are not effective (refer to function diagram 2501).

Note

Message "Other device has master control"

If STARTER has master control, then when pressing the LOCAL-REMOTE button, the "Other device has master control" message is displayed, and the master control transfer is rejected.

3.4.7.1 LOCAL/REMOTE key



Activating the LOCAL mode: Press the LOCAL key

LOCAL mode: LED lights up

REMOTE mode: LED does not light up: the ON, OFF, JOG, direction reversal, faster, and slower keys are not active.

Settings: MENU – Commissioning/Service – AOP Settings – Control Settings

Save LOCAL mode (factory setting: yes)

- **Yes:** The "LOCAL" or "REMOTE" operating mode is saved when the power supply is switched off and restored when the power supply is switched back on.
- **No:** "LOCAL" or "REMOTE" operating mode is not saved. "REMOTE" is active when the supply voltage is switched back on.

OFF in REMOTE (factory setting: No)

- **Yes:** The OFF key functions in REMOTE mode even if the drive is being controlled by external sources (fieldbus, customer terminal block, NAMUR terminal block).
WARNING This function is not an EMERGENCY STOP function!
- **No:** The OFF key only functions in LOCAL mode.

LOCAL/REMOTE also during operation (factory setting: No)

- **Yes:** You can switch between LOCAL and REMOTE when the drive is switched on (motor is running).
- **No:** Before the system switches to LOCAL, a check is carried out to determine whether the drive is in the operational status. If so, the system does not switch to local and outputs the error message "Local mode during operation not possible". Before the system switches to REMOTE, the drive is switched off and the setpoint is set to 0.

3.4.7.2 ON key / OFF key



ON key: always active in LOCAL when the operator input inhibit is deactivated.

OFF key: in the factory setting, acts as OFF1 = ramp-down along the deceleration ramp (p1121); when n = 0: Voltage disconnection (only if there is a main contactor)
The OFF key is effective in the LOCAL mode and when the "OFF in REMOTE" function is active.

Settings: MENU – Commissioning / Service – AOP Settings – Control Settings

Red OFF key acts as: (Factory setting: OFF1)

- **OFF1:** Ramp-down along the down ramp (p1121)
- **OFF2:** Immediate pulse inhibit, motor coasts down
- **OFF3:** Ramp-down along the quick stop ramp (p1135)

3.4.7.3 Switching between clockwise and counter-clockwise rotation



Settings: MENU – Commissioning/Service – AOP Settings – Control Settings

Switching between CCW/CW (factory setting: no)

- **Yes:** Switching between CW/CCW rotation by means of the CW/CCW key possible in LOCAL mode
- **No:** The CW/CCW key has no effect in LOCAL mode

For safety reasons, the CW/CCW key is disabled in the factory setting (pumps and fans must normally only be operated in one direction).

In the operation status in LOCAL mode, the current direction of rotation is indicated by an arrow next to the operating mode.

Note

Activation of CCW/CW changeover

You have to make additional settings when switching between CW/CCW rotation.

3.4.7.4 Jog



Settings: MENU – Commissioning/Service – AOP settings – Control settings

JOG key active (factory setting: No)

- **Yes:** The jog key is effective in the LOCAL mode in the state "ready to power-up" (not in "operation"). The speed that is set in parameter p1058 is approached.
- **No:** The JOG key has no effect in the LOCAL mode

3.4.7.5 Increase setpoint / decrease setpoint



You can use the Increase and Decrease keys to enter the setpoint with a resolution of 1% of the maximum speed.

You can also enter the setpoint numerically. To do so, press F2 in the operation screen. The system displays an field for entering the required speed. Enter the required value using the numeric keypad. Press F5 "OK" to confirm the setpoint.

When you enter values numerically, you can enter any speed between the minimum speed (p1080) and the maximum speed (p1082).

Setpoint entry in LOCAL mode is unipolar. You can change the direction of rotation by pressing the key that allows you to switch between CW/CCW rotation.

- CW rotation and "Increase key" mean:
The displayed setpoint is positive and the output frequency is increased.
- CCW rotation and "Increase key" mean:
The displayed setpoint is negative and the output frequency is increased.

3.4.7.6 AOP setpoint

Settings: MENU – Commissioning/Service – AOP Settings – Control Settings

Save AOP setpoint (factory setting: no)

- **Yes:** In LOCAL mode, the last setpoint (once you have released the INCREASE or DECREASE key or confirmed a numeric entry) is saved. The next time you switch the system on in LOCAL mode, the saved value is selected. This is also the case if you switched to REMOTE in the meantime or the power supply was switched off. When the system is switched from REMOTE to LOCAL mode while the drive is switched on (motor is running), the actual value that was last present is set as the output value for the motorized potentiometer setpoint and saved. If the system is switched from REMOTE to LOCAL mode while the drive is switched off, the motorized potentiometer setpoint that was last saved is used.
- **No:** On power-up in LOCAL mode, the speed is always set to the value entered under "AOP starting setpoint". When the system is switched from REMOTE to LOCAL mode while the drive is switched on (motor is running), the actual value that was last present is set as the output value for the AOP setpoint.

AOP setpoint ramp-up time (factory setting: 10 s)

AOP setpoint ramp-down time (factory setting: 10 s)

- **Recommendation:** set as ramp-up/ramp-down time (p1120/p1121). Changing the ramp-up/ramp-down times does not affect the settings for parameters p1120 and p1121 because this is an AOP-specific setting.

AOP starting setpoint (factory setting: 0.000 rpm)

The AOP starting setpoint is the speed setpoint which is active when the drive is switched on (with AOP30 - "ON" key). This setpoint is valid on condition that the system setting "Save setpoint" is set to "NO".

Note

Internal ramp-function generator

The internal drive ramp-function generator is always active.

3.4.7.7 Lock AOP LOCAL mode

Settings: MENU – Commissioning/Service – AOP settings – Control settings

Save AOP local mode (factory setting: no)

- **Yes:** Deactivates the "Control via operator panel" function, thereby disabling the LOCAL/REMOTE key.
- **No:** Activates the LOCAL/REMOTE key.

Note

Lock LOCAL

LOCAL functionality can also be inhibited on the drive by means of the p0806 parameter (BI: Inhibit master control).

3.4.7.8 Acknowledge error from the AOP

Settings: MENU – Commissioning / Service – AOP Settings – Control Settings

Acknowledging faults at the AOP (factory setting: Yes)

- **Yes:** Faults can be acknowledged via the AOP.
- **No:** Faults cannot be acknowledged via the AOP.

3.4.7.9 CDS setting via AOP

Settings: MENU – Commissioning/Service – AOP settings – Control settings

CDS changeover via AOP (factory setting: No)

- **Yes:** In the LOCAL mode, in the operating screen form the active CDS can be changed by one. This is helpful, if operation via an AOP would not be possible due to the fact that a standard telegram is active.
When CDS0 or 2 is active, "CDS+1" switches to CDS1 or CDS3.
When CDS1 or 3 is active, "CDS-1" switches to CDS0 or CDS2.
- **No:** In the LOCAL mode, in the operating screen form the active CDS cannot be changed by one.

3.4.7.10 Operator input inhibit / parameterization inhibit



To prevent users from accidentally actuating the control keys and changing parameters, you can activate an operator input / parameters disable using a key pushbutton. Two key icons appear in the top right of the display when these inhibit functions are enabled.

Table 3- 6 Display of operator input/parameters disable

Inhibit type	Online operation	Offline operation
No inhibit		
Operator input inhibit		
Parameters disable		
Operator input inhibit + parameters disable		

Settings

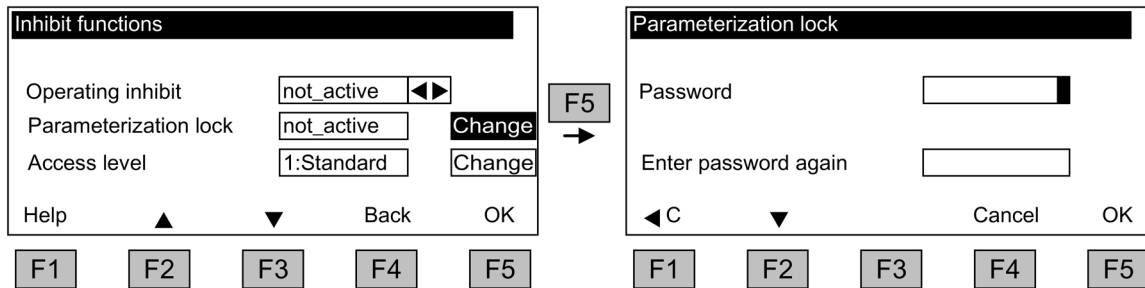


Figure 3-13 Set inhibit functions

The "Operator input inhibit" setting can be changed directly via <F5> "Change" once you have selected the selection field.

When "Parameterization inhibit" is activated, you have to enter a numeric password (repeat this entry). You must also enter this password when deactivating "Parameterization inhibit".

Operator input inhibit (factory setting: not active)

- **Active:** The parameters can still be viewed, but a parameter value cannot be saved (message: "Note: operator input inhibit active"). The OFF key (red) is enabled. The LOCAL, REMOTE, ON (green), JOG, CW/CCW, INCREASE, and DECREASE keys are disabled.

Parameterization inhibit (factory setting: not active)

- **Active:** Parameters cannot be changed unless a password is entered. The parameterization process is the same as with the operator input inhibit. If you try and change parameters, the message "Note: Parameterization inhibit active" is displayed. All the control keys can, however, still be actuated.

Access level (factory setting: Expert):

The different parameters required for this complex application are filtered so that they can be displayed as clearly as possible. You select them according to the access level.

An expert level, which must only be used by expert personnel, is required for certain actions.

Note

Copy from RAM to ROM

When the operator input inhibit or parameterization inhibit is activated, a "Copy from RAM to ROM" is automatically executed to back the parameter settings up in non-volatile memory on the memory card.

3.4.8 Faults and alarms

Indicating faults and alarms

If a fault occurs, the drive displays the fault and/or alarm on the operator panel. Faults are indicated by the red "FAULT" LED and a fault screen is automatically displayed. You can use the F1 Help function to call up information about the cause of the fault and how to remedy it. You can use F5 Ack. to acknowledge a stored fault.

Alarms are indicated by means of the yellow "ALARM" LED. The system also displays a note in the status bar providing information on the cause.

What is a fault?

A fault is a message from the drive indicating an error or other exceptional (unwanted) status that causes the drive to shutdown. This could be caused by a fault within the converter or an external fault triggered, for example, by the winding temperature monitor for the motor. The faults are displayed and can be reported to a higher-level control system via PROFIBUS. In the factory default setting, the message "converter fault" is also sent to a relay output. Once you have rectified the cause of the fault, you have to acknowledge the fault message.

What is an alarm?

An alarm is the response to a fault condition identified by the drive. It does not result in the drive being switched off and does not have to be acknowledged. Alarms are "self acknowledging", that is, they are reset automatically when the cause of the alarm has been eliminated.

Fault and alarm displays

Every fault and alarm is entered in the fault/alarm buffer along with time the error occurred. The time stamp refers to the system time (r2114).

You can call up an overview screen that displays the current status of faults and/or alarms for every drive object in the system by choosing MENU – Fault memory / alarm memory.

A context menu featuring the "Back" and "Quit" options appears when you press F4 "Next". The function required can be selected using F2 and F3 and executed by pressing F5 "OK". The "Acknowledge" function sends an acknowledgement signal to each drive object. The red FAULT LED extinguishes once all the faults have been acknowledged.

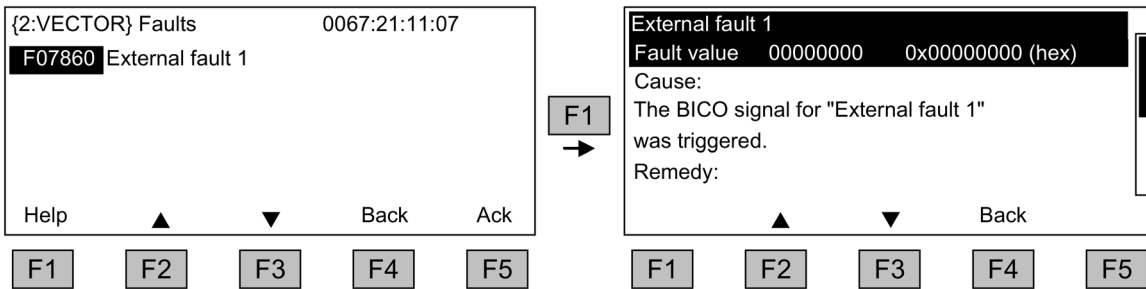


Figure 3-14 Fault screen

You can use F5 Ack. to acknowledge a stored fault.

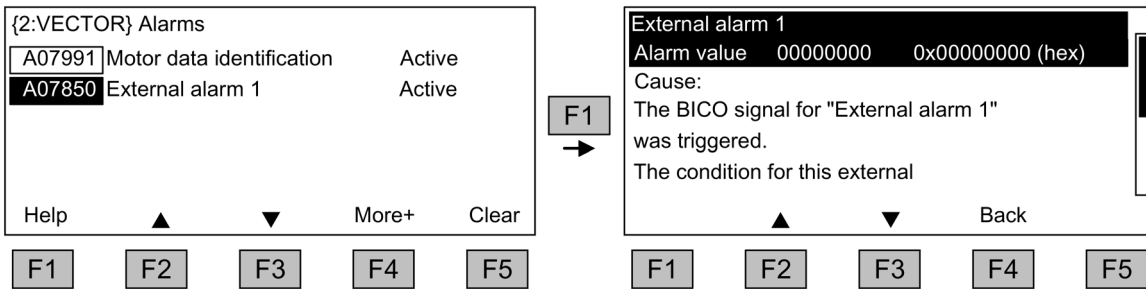


Figure 3-15 Alarm screen

Alarms that are no longer active are removed from the alarm memory with F5 Clear.

3.4.9 Saving the parameters permanently

Description

If parameters are changed using the operator panel (confirm with OK in the Parameter editor), the new values are initially stored in the volatile memory (RAM) of the drive. An "S" flashes in the top right of the AOP display until they are saved to a permanent memory. This indicates that at least 1 parameter has been changed and not yet stored permanently.

Two methods are available for permanently saving parameters that have been changed:

- To store the parameters permanently, choose <MENU> <Parameterization> <OK> <Permanent parameter transfer>.
- When confirming a parameter setting with OK, press the OK key for more than 1 s. The system displays a message asking you whether the setting is to be saved in the EEPROM.
If you press "Yes", the system saves the setting in the EEPROM. If you press "No", the setting is not saved permanently and the "S" starts flashing to indicate this fact.

For both options, **all** changes that have not yet been saved permanently are stored in the EEPROM.

3.4.10 Parameterization errors

If a fault occurs when reading or writing parameters, a popup window containing the cause of the problem is displayed.

The system displays:

Parameter write error (d)pxxxx.yy:0xnn

and a plain-text explanation of the type of parameterization error.

1. Disconnect the 24 V DC power supply cable.
2. Disconnect the communication cable on the operator panel.
3. Open the cover of the battery compartment.
4. Remove the old battery.
5. Insert the new battery.
6. Carry out any other work by reversing the sequence.

Table 3- 7 Technical specifications of the backup battery

Type	CR2032 3 V lithium battery
Manufacturer	Maxell, Sony, Panasonic
Nominal capacity	220 mAh
Self-discharge at 20 °C	1 %/year
Service life (in backup mode)	> 1 year at 70 °C; >1.5 years at 20 °C
Service life (in operation)	> 2 years

Note**Replace battery within one minute**

The battery must be replaced within one minute to ensure that no AOP settings are lost.

Note**Battery disposal**

The battery must be disposed of in accordance with the applicable country-specific guidelines and regulations.

3.5.2 Downloading new operator panel firmware from the PC

Description

Firmware might need to be loaded to the AOP if the AOP functionality needs to be upgraded.

If, once the drive has powered up, the memory card is found to contain a newer version of the firmware, a message will appear on the AOP30 prompting you to load the new firmware. You should click "YES" in response to this prompt.

The firmware will then be loaded automatically on the operator panel and the following dialog screen will appear.

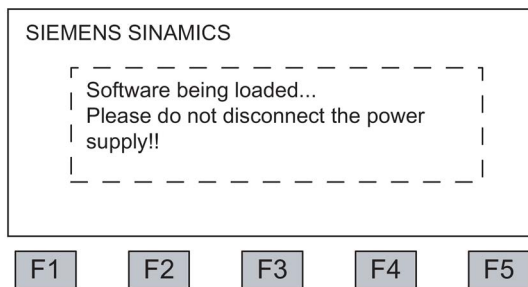


Figure 3-17 Dialog screen: loading firmware

If the firmware cannot be loaded successfully, it can be loaded using the following manual method.

The load program LOAD_AOP30 and the firmware file can be found on the CD.

Loading the firmware

1. Establish the RS232 connection from the PC to the AOP30.
2. Provide the supply voltage (24 VDC).
3. Start the LOAD_AOP30 program on the PC.
4. Choose the PC interface (COM1, COM2).
5. Choose and open the firmware (AOP30.H86).
6. Follow the instructions in the status window of the program and connect the power supply for the AOP30 while pressing the red key (O).
7. The load procedure is started automatically.
8. Switch the power on (switch the power supply off and then back on).

3.6 Technical specifications

Table 3- 8 Technical specifications

Power supply	24 V DC (20.4 V to 28.8 V)
Current requirements - Without backlighting - With maximum backlighting	<100 mA <200 mA
Data interface	RS232 interface, PPI protocol
Back-up battery	3 V lithium CR2032
Operating temperature	0 to 55°C
Storage and transport temperature	-25 to +70°C
Degree of protection	IP20 (inside cabinet) IP55 (outside cabinet)
Certification	cULus CE
Product standard	EN 61800-5-1
Dimensions	Information on this can be found in the "Mechanical installation" section
Weight	0.55 kg

Line filter

4.1 General

Description

The line filters limit the conducted interference emitted by the converter units to permissible values.

To reduce emissions, the Power Modules are equipped as standard with a line filter in accordance with the limit values defined in category C3 (environment 2). The additional line filter described here is available for use in Category C2 (first and second environment).

In conjunction with line reactors, line filters limit the conducted interference emitted by the Power Modules to the limit values defined in product standard EN 61800-3. Provided that the system has been set up in accordance with the EMC installation guidelines, the limit values at the installation location will be in accordance with the requirements for environment 1.



Figure 4-1 Line filter

 **WARNING**

Non-observance of the fundamental safety instructions and residual risks

The non-observance of the fundamental safety instructions and residual risks stated in Chapter 1 can result in accidents with severe injuries or death.

- Adhere to the fundamental safety instructions.
- When assessing the risk, take into account residual risks.

 **CAUTION**

Burns resulting from high surface temperature

The line filter can become very hot. You can get seriously burnt when touching the surface.

- Mount the line filter so that contact is not possible. If this is not possible, attach a clearly visible and understandable warning notice at hazardous positions.
- To prevent adjacent components from suffering damage due to these high temperatures, maintain a clearance of 100 mm on all sides of the line filter.

NOTICE

Line filter damage by connecting to impermissible line supplies

The line filters are only suitable for direct connection to TN or TT systems with grounded neutral point. Line filters are designed for connection to systems with a continuous level to voltage harmonics in accordance with EN 61000-2-4, Class 3. Connection of the line filter to other line systems may result in damage.

- Only connect the line filter to TN or TT systems with grounded neutral point and a continuous level to voltage harmonics in accordance with EN 61000-2-4, Class 3.

NOTICE

Line filter damage due to interchanged connections

The line filter will be damaged if the input and output connections are interchanged.

- Connect the incoming line cable to LINE L1, L2, L3.
- Connect the outgoing cable to the line reactor to LOAD L1', L2', L3'.



! WARNING

Fire due to inadequate ventilation clearances

Inadequate ventilation clearances can cause overheating of components with subsequent fire and smoke. This can cause serious injury or even death. This can also result in increased failures and shorter service lives for devices/systems.

- For this reason, maintain the 100 mm clearances above and below the line filter.

! WARNING

High leakage currents when the protective conductor in the line feeder cable is interrupted

The drive components conduct a high leakage current via the protective conductor. Touching conductive parts when the protective conductor is interrupted can result in death or serious injury.

- Ensure that the external protective conductor satisfies at least one of the following conditions:
 - It has been installed so that it is protected against mechanical damage. ¹⁾
 - For an individual core, it has a cross-section of at least 10 mm² Cu.
 - If it is a conductor of a multi-conductor cable, it has a cross-section of at least 2.5 mm² Cu.
 - It has a second protective conductor in parallel with the same cross-section.
 - It complies with the local regulations for equipment with increased leakage current.
- ¹⁾ Cables laid within control cabinets or closed machine housings are considered to be adequately protected against mechanical damage.

NOTICE

Destruction or damage to additional loads as a result of undesirable line harmonics

Line harmonics can occur if line filters that differ from those listed in this manual are used. These can disturb or damage other loads connected to the line supply.

- Only use line filters that are listed in this manual.

NOTICE

Destruction or damage to components by incorrectly connecting the line filter

When incorrectly connecting the line filter, these components can be destroyed or damaged.

- Only connect the Line Module to the SINAMICS line filter via the associated line reactor.
- Connect additional loads upstream of the SINAMICS line filter (if required, via a separate line filter).

Note

Motor cable length exceeded

When the maximum motor cable length of 100 m is exceeded, it can no longer be guaranteed that Class C2/C3 is maintained; for very long motor cables this can mean that the line-side or motor-side power components can overheat.

Additional information is provided in the Low Voltage Engineering Manual.

Note

Disconnect the line filter for a high-voltage test

If a high-voltage test is conducted with alternating voltage in the system, the existing line filters must be disconnected in order to obtain accurate measurements.

The connection clip to the interference suppression capacitor in the Power Module must also be removed for a high-voltage test with direct voltage.

Assignment of line filter and Power Module

Table 4- 1 Assignment of line filter and Power Module

Power Module	Unit rating of the Power Module	Suitable line filter
Line voltage 3-phase 380 – 480 VAC		
6SL3310-1GE32-1AA3	110 kW	6SL3000-0BE32-5AA0
6SL3310-1GE32-6AA3	132 kW	6SL3000-0BE34-4AA0
6SL3310-1GE33-1AA3	160 kW	6SL3000-0BE34-4AA0
6SL3310-1GE33-8AA3	200 kW	6SL3000-0BE34-4AA0
6SL3310-1GE35-0AA3	250 kW	6SL3000-0BE36-0AA0
6SL3310-1GE36-1AA3	315 kW	6SL3000-0BE41-2AA0
6SL3310-1GE37-5AA3	400 kW	6SL3000-0BE41-2AA0
6SL3310-1GE38-4AA3	450 kW	6SL3000-0BE41-2AA0
6SL3310-1GE41-0AA3	560 kW	6SL3000-0BE41-2AA0
Line voltage 3-phase 500 – 600 VAC		
6SL3310-1GF31-8AA3	110 kW	6SL3000-0BG32-5AA0
6SL3310-1GF32-2AA3	132 kW	6SL3000-0BG32-5AA0
6SL3310-1GF32-6AA3	160 kW	6SL3000-0BG34-4AA0
6SL3310-1GF33-3AA3	200 kW	6SL3000-0BG34-4AA0
6SL3310-1GF34-1AA3	250 kW	6SL3000-0BG34-4AA0
6SL3310-1GF34-7AA3	315 kW	6SL3000-0BG36-0AA0
6SL3310-1GF35-8AA3	400 kW	6SL3000-0BG41-2AA0
6SL3310-1GF37-4AA3	500 kW	6SL3000-0BG41-2AA0
6SL3310-1GF38-1AA3	560 kW	6SL3000-0BG41-2AA0

Power Module	Unit rating of the Power Module	Suitable line filter
Line voltage 3-phase 660 – 690 VAC		
6SL3310-1GH28-5AA3	75 kW	6SL3000-0BG32-5AA0
6SL3310-1GH31-0AA3	90 kW	6SL3000-0BG32-5AA0
6SL3310-1GH31-2AA3	110 kW	6SL3000-0BG32-5AA0
6SL3310-1GH31-5AA3	132 kW	6SL3000-0BG32-5AA0
6SL3310-1GH31-8AA3	160 kW	6SL3000-0BG32-5AA0
6SL3310-1GH32-2AA3	200 kW	6SL3000-0BG32-5AA0
6SL3310-1GH32-6AA3	250 kW	6SL3000-0BG34-4AA0
6SL3310-1GH33-3AA3	315 kW	6SL3000-0BG34-4AA0
6SL3310-1GH34-1AA3	400 kW	6SL3000-0BG34-4AA0
6SL3310-1GH34-7AA3	450 kW	6SL3000-0BG36-0AA0
6SL3310-1GH35-8AA3	560 kW	6SL3000-0BG41-2AA0
6SL3310-1GH37-4AA3	710 kW	6SL3000-0BG41-2AA0
6SL3310-1GH38-1AA3	800 kW	6SL3000-0BG41-2AA0

4.2 Mechanical installation

When the line filter is installed in a cabinet, it must be positioned directly beside the Power Module.

The line reactor must be positioned between the line filter and Power Module. Cabling must be kept as short as possible.

To prevent interference being injected into the interference-suppressed line cable (this can, in some cases, nullify the effects of the line filter), the line cable to the line filter must be routed separately from other cables.

The housing of the Power Module and line filter must be connected with low resistance for high-frequency interference currents. This can be achieved by installing the Power Module and line filter on the same mounting plate. The Power Module and line filter must be connected to the mounting plate with the greatest possible surface area. The best solution here is to use a metallic, bare, oil-free mounting plate (e.g. made of stainless steel or galvanized sheet-steel) because the entire contact surface establishes the electrical contact.

If a painted mounting plate is used, the screw positions for the Power Module and line filter must free of paint to ensure electrical contact with the mounting plate.

The motor must always be connected using a shielded cable. The shield must be applied to the motor and Power Module with the greatest possible surface area.

The ground wire for the motor must be fed directly back to the Power Module.

Dimension drawing

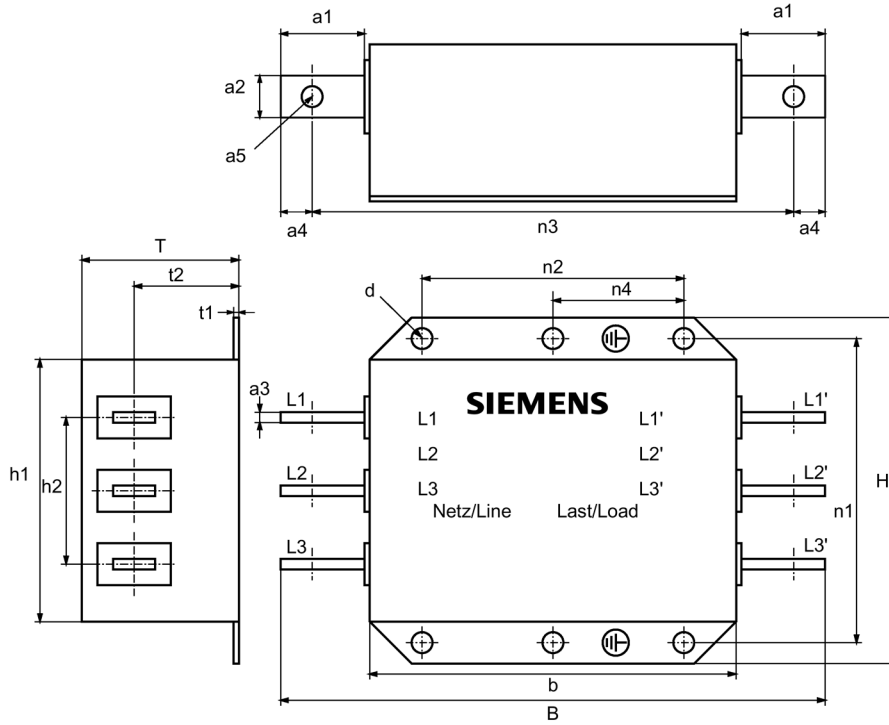


Figure 4-2 Dimension drawing, line filter

Table 4-2 Dimensions of the line filter (all data in mm)

6SL3000-	OBE32-5AA0 OBG32-5AA0	OBE34-4AA0 OBG34-4AA0	OBE36-0AA0 OBG36-0AA0	OBE41-2AA0 OBG41-2AA0
W	360	360	400	425
H	240	240	265	265
D	116	116	140	145
a1	40	40	40	50
a2	25	25	25	50
a3	5	5	8	10
a4	15	15	15	20
a5	11	11	11	14
b	270	270	310	300
h1	200	200	215	215
h2	100	100	120	142
t1	2	2	3	2.5
t2	78.2	78.2	90	91
n1 ¹⁾	220	220	240	240
n2 ¹⁾	210	210	250	255
n3	330	330	370	385
n4	-	-	125	127.5
d	9	9	12	12

¹⁾ Lengths n1 and n2 correspond to the drill hole spacing

4.3 Electrical installation

Connection

When connecting the line filter and line reactor, you must take into account the following conditions to ensure that they function correctly:

- Use shielded control cables. The shield must be connected at both ends.
- With analog control cables, connecting the shield at both ends can result in coupled-in noise. To prevent this, the shield must only be connected at one end on the Power Module.
- Control cables must be routed separately from power cables. Power cables are motor cables or connecting cables from the DC link of the Power Module (terminals DCPA/DCNA) to other components (e.g. Braking Module). In particular, you must ensure that control cables and power cables are not routed in parallel in a joint cable raceway, even if all the cables are shielded.
- You must use shielded motor cables. The shield for the motor cable must be attached to the shield plate and motor housing.
- The ground wire for the motor must be fed directly back to the Power Module.

Connection overview

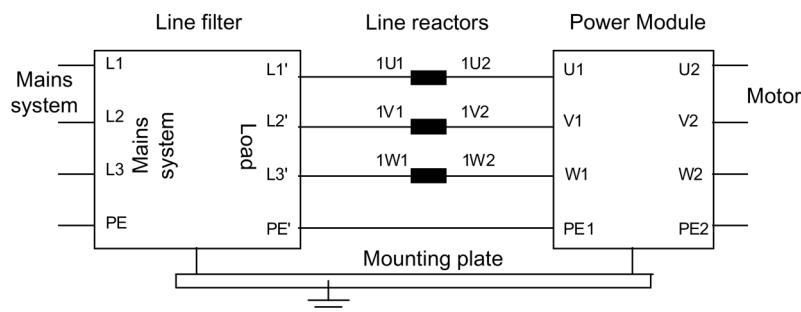


Figure 4-3 Connecting the line filter, line reactor, and Power Module

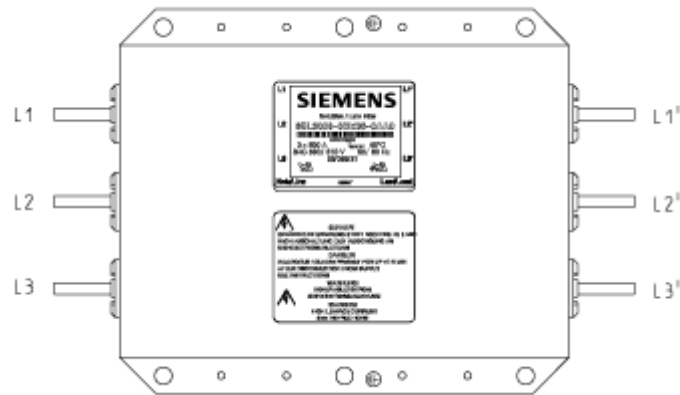


Figure 4-4 Connection overview of the line filter

4.4 Maintenance and servicing

The line filter can neither be maintained nor serviced. In the case of a fault, the line filter must be completely replaced.

4.5 Technical specifications

General technical data

Table 4- 3 General technical data

Line frequency	47 ... 63 Hz		
Product standard	EN 61800-5-1		
Overload capacity	1.60 x I _R for 3 s followed by 1.36 x I _R for 60 s followed by 1.00 x I _R for 240 s		
Ambient conditions	Storage	Transport	Operation
Ambient temperature	-25 ... +70 °C	-25 ... +70 °C	0 ... +50 °C
Relative air humidity ¹⁾ (condensation not permissible) corresponds to class	5 ... 95% 1K4 according to EN 60721-3-1	5 ... 95% at 40 °C 2K3 according to EN 60721-3-2	5 ... 95% 3K3 according to EN 60721-3-3
Mechanical strength	Storage	Transport	Operation
Vibrational load ¹⁾ - Displacement - Acceleration corresponds to class	1.5 mm at 5 ... 9 Hz 5 m/s ² at > 9 ... 200 Hz 1M2 to EN 60721-3-1	3.5 mm at 5 ... 9 Hz 10 m/s ² at > 9 ... 200 Hz 2M2 to EN 60721-3-2	0.075 mm at 10 ... 58 Hz 10 m/s ² at >58 ... 200 Hz -
Shock load ¹⁾ - Acceleration corresponds to class	40 m/s ² at 22 ms 1M2 to EN 60721-3-1	100 m/s ² at 11 ms 2M2 to EN 60721-3-2	100 m/s ² at 11 ms 3M4 to EN 60721-3-3

Deviations from the specified classes are shown in *italics*.

¹⁾ The EN standards specified are the European editions of the international IEC standards with the same designations.

Detailed technical data

Table 4- 4 Technical data for line filters 3 AC 380 V ... 480 V

Article number	6SL3000-	0BE32-5AA0	0BE34-4AA0	0BE36-0AA0	0BE41-2AA0
Rated voltage	V	380 V 3 AC -10 % to 480 V 3 AC +10% (-15% < 1 min)			
Rated current I _R	A	250	440	600	1200
Power loss	kW	0.015	0.047	0.053	0.119
Line/load connection L1, L2, L3, L1', L2', L3'		M10 connecting lugs	M10 connecting lugs	M10 connecting lugs	M12 connecting lugs
PE connection		M8	M8	M10	M10
Degree of protection		IP00	IP00	IP00	IP00
Dimensions					
Width	mm	360	360	400	425
Height	mm	240	240	265	265
Depth	mm	116	116	140	145
Weight	kg	12.3	12.3	19.0	25.8

4.5 Technical specifications

Table 4- 5 Technical data for line filters 3 AC 500 V ... 600 V

Article number	6SL3000-	0BG32-5AA0	0BG34-4AA0	0BG36-0AA0	0BG41-2AA0
Rated voltage	V	3 AC 500 -10 % to 3 AC 600 +10 % (-15 % < 1 min)			
Rated current I _R	A	250	440	600	1200
Power loss	kW	0.015	0.047	0.053	0.119
Line/load connection L1, L2, L3, L1', L2', L3'		M10 connecting lugs	M10 connecting lugs	M10 connecting lugs	M12 connecting lugs
PE connection		M8	M8	M10	M10
Degree of protection		IP00	IP00	IP00	IP00
Dimensions					
Width	mm	360	360	400	425
Height	mm	240	240	265	265
Depth	mm	116	116	140	145
Weight	kg	12.3	12.3	19.0	25.2

Table 4- 6 Technical data for line filters 3 AC 660 V ... 690 V

Article number	6SL3000-	0BG32-5AA0	0BG34-4AA0	0BG36-0AA0	0BG41-2AA0
Rated voltage	V	3 AC 660 -10 % to 3 AC 690 +10 % (-15 % < 1 min)			
Rated current I _R	A	250	440	600	1200
Power loss	kW	0.015	0.047	0.053	0.119
Line/load connection L1, L2, L3, L1', L2', L3'		M10 connecting lugs	M10 connecting lugs	M10 connecting lugs	M12 connecting lugs
PE connection		M8	M8	M10	M10
Degree of protection		IP00	IP00	IP00	IP00
Dimensions					
Width	mm	360	360	400	425
Height	mm	240	240	265	265
Depth	mm	116	116	140	145
Weight	kg	12.3	12.3	19.0	25.2

Line reactors

5.1 General

Description

Line reactors limit low-frequency line-side harmonics to permissible values.

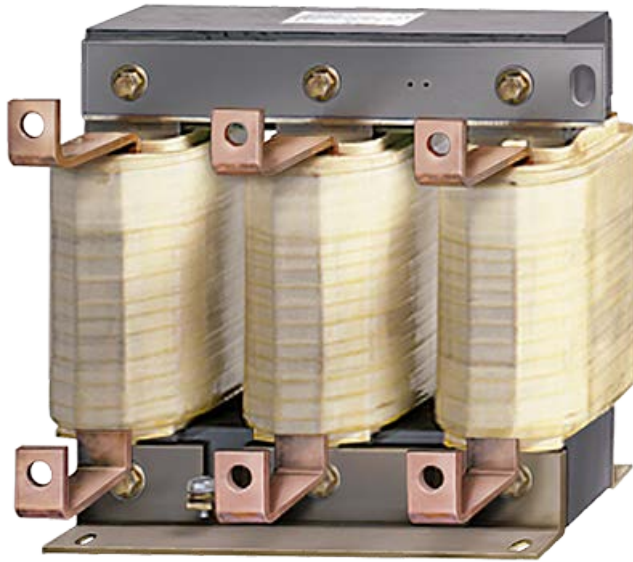


Figure 5-1 Line reactor

WARNING

Non-observance of the fundamental safety instructions and residual risks

The non-observance of the fundamental safety instructions and residual risks stated in Chapter 1 can result in accidents with severe injuries or death.

- Adhere to the fundamental safety instructions.
- When assessing the risk, take into account residual risks.

 **CAUTION**

Burns resulting from high surface temperature

The line reactors can become very hot. You can get seriously burnt when touching the surface.

- Mount the line reactors so that contact is not possible. If this is not possible, attach clearly visible and understandable warning notices at hazardous positions.
- To prevent adjacent components from suffering damage due to these high temperatures, maintain a clearance of 100 mm on all sides of the line reactors.

NOTICE

Damage of the system caused by the use of inappropriate and not approved line reactors

Inappropriate and not approved line reactors can damage the Line Modules.

Line harmonics that damage/disturb other loads connected to the same line supply can also occur.

- Only use line reactors listed in this manual.

Note

Malfunctions through magnetic fields

Reactors produce magnetic fields that can disturb or damage components and cables.

- Arrange the components and cables at a suitable distance (at least 200 mm) or shield the magnetic fields appropriately.

Note

Length of connection cables

The connection cables between line reactor and Line Module, as well as between line reactor and line filter, must be kept as short as possible (max. 5 m).

You must use shielded connection cables, whose cable shields are attached at both ends.

Shielding can only be omitted if the following conditions are met:

- The cables do not exceed 1 m in length.
- The cables are laid flush with the rear metal wall of the control cabinet.
- The cables are laid in a way that keeps them physically separate from signal cables.

Do not route any cables near the line reactor. If this cannot be avoided, observe a minimum distance of 200 mm.

Assignment of line reactor and Power Module

Table 5- 1 Assignment of line reactor and Power Module

Power Module	Unit rating of the Power Module	Suitable line reactor
Line voltage 3-phase 380 – 480 VAC		
6SL3310-1GE32-1AA3	110 kW	6SL3000-0CE32-3AA0
6SL3310-1GE32-6AA3	132 kW	6SL3000-0CE32-8AA0
6SL3310-1GE33-1AA3	160 kW	6SL3000-0CE33-3AA0
6SL3310-1GE33-8AA3	200 kW	6SL3000-0CE35-1AA0
6SL3310-1GE35-0AA3	250 kW	6SL3000-0CE35-1AA0
6SL3310-1GE36-1AA3	315 kW	6SL3000-0CE36-3AA0
6SL3310-1GE37-5AA3	400 kW	6SL3000-0CE37-7AA0
6SL3310-1GE38-4AA3	450 kW	6SL3000-0CE38-7AA0
6SL3310-1GE41-0AA3	560 kW	6SL3000-0CE41-0AA0
Line voltage 3-phase 500 – 600 VAC		
6SL3310-1GF31-8AA3	110 kW	6SL3000-0CH32-2AA0
6SL3310-1GF32-2AA3	132 kW	6SL3000-0CH32-2AA0
6SL3310-1GF32-6AA3	160 kW	6SL3000-0CH32-7AA0
6SL3310-1GF33-3AA3	200 kW	6SL3000-0CH33-4AA0
6SL3310-1GF34-1AA3	250 kW	6SL3000-0CH34-8AA0
6SL3310-1GF34-7AA3	315 kW	6SL3000-0CH34-8AA0
6SL3310-1GF35-8AA3	400 kW	6SL3000-0CH36-0AA0
6SL3310-1GF37-4AA3	500 kW	6SL3000-0CH38-4AA0
6SL3310-1GF38-1AA3	560 kW	6SL3000-0CH38-4AA0
Line voltage 3-phase 660 – 690 VAC		
6SL3310-1GH28-5AA3	85 kW	6SL3000-0CH31-1AA0
6SL3310-1GH31-0AA3	90 kW	6SL3000-0CH31-1AA0
6SL3310-1GH31-2AA3	110 kW	6SL3000-0CH31-6AA0
6SL3310-1GH31-5AA3	132 kW	6SL3000-0CH31-6AA0
6SL3310-1GH31-8AA3	160 kW	6SL3000-0CH32-2AA0
6SL3310-1GH32-2AA3	200 kW	6SL3000-0CH32-2AA0
6SL3310-1GH32-6AA3	250 kW	6SL3000-0CH32-7AA0
6SL3310-1GH33-3AA3	315 kW	6SL3000-0CH33-4AA0
6SL3310-1GH34-1AA3	400 kW	6SL3000-0CH34-8AA0
6SL3310-1GH34-7AA3	450 kW	6SL3000-0CH34-8AA0
6SL3310-1GH35-8AA3	560 kW	6SL3000-0CH36-0AA0
6SL3310-1GH37-4AA3	710 kW	6SL3000-0CH38-4AA0
6SL3310-1GH38-1AA3	800 kW	6SL3000-0CH38-4AA0

5.2 Mechanical installation

Dimension drawing

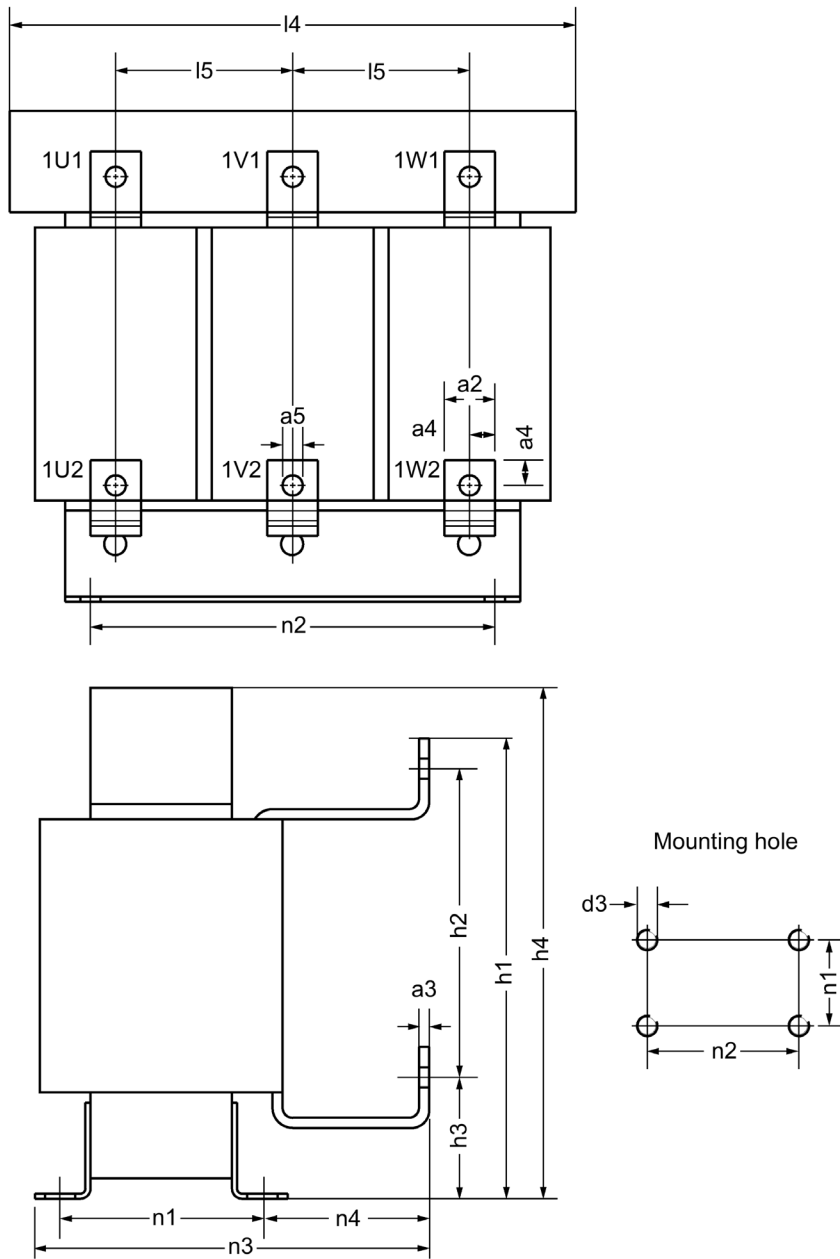


Figure 5-2 Dimension drawing of line reactor

Table 5- 2 Dimensions of line reactor, 380 V – 480 V 3 AC (all values in mm)

6SL3000-	0CE32-3AA0 0CE32-8AA0 0CE33-3AA0	0CE35-1AA0 0CE36-3AA0 0CE37-7AA0	0CE38-7AA0	0CE41-0AA0
a2	25	30	40	50
a3	5	6	8	8
a4	12.5	15	20	25
a5	11	14	14	14
l4	270	300	350	350
l5	88	100	120	120
h1	-	-	392	397
h2	150	180	252	252
h3	60	60	120	120
h4	248	269	321	321
n1 ¹⁾	101	118	138	138
n2 ¹⁾	200	224	264	264
n3	200	212.5	211.5	211.5
n4	84.5	81	60	60
d3	M8	M8	M8	M8

¹⁾ Lengths n1 and n2 correspond to the drill hole spacing

Table 5- 3 Dimensions of line reactor, 500 V – 600 V 3 AC (all values in mm)

6SL3000-	0CH32-2AA0 0CH32-7AA0 0CH33-4AA0	0CH34-8AA0 0CH36-0AA0	0CH38-4AA0
a2	25	30	40
a3	5	6	8
a4	12.5	15	20
a5	11	14	14
l4	270	350	410
l5	88	120	135
h1	-	-	392
h2	150	198	252
h3	60	75	120
h4	248	321	385
n1 ¹⁾	101	138	141
n2 ¹⁾	200	264	316
n3	200	232.5	224
n4	84.5	81	56.5
d3	M8	M8	M10

¹⁾ Lengths n1 and n2 correspond to the drill hole spacing

Table 5- 4 Dimensions of line reactor, 660 V – 690 V 3 AC (all values in mm)

6SL3000-	0CH31-1AA0 0CH31-6AA0 0CH32-2AA0 0CH32-7AA0 0CH33-4AA0	0CH34-8AA0 0CH36-0AA0	0CH38-4AA0
a2	25	30	40
a3	5	6	8
a4	12.5	15	20
a5	11	14	14
l4	270	350	410
l5	88	120	135
h1	-	-	392
h2	150	198	252
h3	60	75	120
h4	248	321	385
n1 ¹⁾	101	138	141
n2 ¹⁾	200	264	316
n3	200	232.5	224
n4	84.5	81	56.5
d3	M8	M8	M10
¹⁾ Lengths n1 and n2 correspond to the drill hole spacing			

5.3 Electrical installation

Connection

When connecting the line filter and line reactor, you must take into account the following conditions to ensure that they function correctly:

- Use shielded control cables. The shield must be connected at both ends.
- With analog control cables, connecting the shield at both ends can result in coupled-in noise. To prevent this, the shield must only be connected at one end on the Power Module.
- Control cables must be routed separately from power cables. Power cables are motor cables or connecting cables from the DC link of the Power Module (terminals DCPA/DCNA) to other components (e.g. Braking Module). In particular, you must ensure that control cables and power cables are not routed in parallel in a joint cable raceway, even if all the cables are shielded.
- You must use shielded motor cables. The shield for the motor cable must be attached to the shield plate and motor housing.
- The ground wire for the motor must be fed directly back to the Power Module.

Connection overview

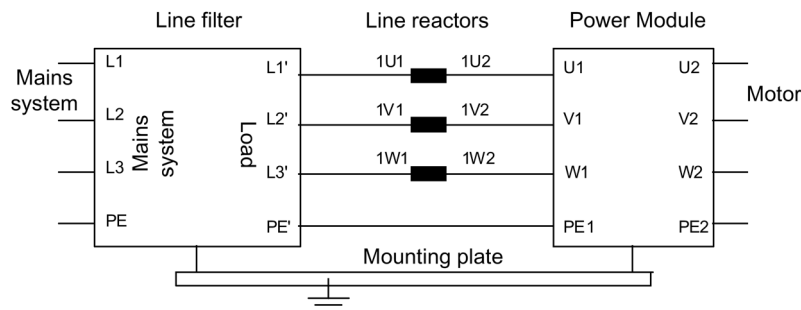


Figure 5-3 Connecting the line filter, line reactor, and Power Module

5.4 Maintenance and servicing

The line reactor can neither be maintained nor serviced. In the case of a fault, the line reactor must be completely replaced.

5.5 Technical specifications

General technical data

Table 5- 5 General technical data

Line frequency	47 ... 63 Hz		
Product standard	EN 61800-5-1		
Ambient conditions	Storage	Transport	Operation
Ambient temperature	-25 ... +70 °C	-25 ... +70 °C	0 ... +50 °C
Relative air humidity ¹⁾ (condensation not permissible) corresponds to class	5 ... <i>95%</i> 1K4 according to EN 60721-3-1	5 ... 95% at 40 °C 2K3 according to EN 60721-3-2	5 ... <i>95%</i> 3K3 according to EN 60721-3-3
Mechanical strength	Storage	Transport	Operation
Vibrational load ¹⁾ - Displacement - Acceleration corresponds to class	1.5 mm at 5 ... 9 Hz 5 m/s ² at > 9 ... 200 Hz 1M2 to EN 60721-3-1	3.5 mm at 5 ... 9 Hz 10 m/s ² at > 9 ... 200 Hz 2M2 to EN 60721-3-2	0.075 mm at 10 ... 58 Hz 10 m/s ² at >58 ... 200 Hz -
Shock load ¹⁾ - Acceleration corresponds to class	40 m/s ² at 22 ms 1M2 to EN 60721-3-1	100 m/s ² at 11 ms 2M2 to EN 60721-3-2	100 m/s ² at 11 ms 3M4 to EN 60721-3-3

Deviations from the specified classes are shown in *italics*.

¹⁾The EN standards specified are the European editions of the international IEC standards with the same designations.

Detailed technical data

Table 5- 6 Technical data for line reactors 3 AC 380 V ... 480 V, part 1

Article number	6SL3000-	0CE32-3AA0	0CE32-8AA0	0CE33-3AA0	0CE35-1AA0
Suitable for Power Module	6SL3310-	1GE32-1AA3	1GE32-6AA3	1GE33-1AA3	1GE33-8AA3
Unit rating of the Power Module	kW	110	132	160	200
Rated voltage	V	3 AC 380 -10% to 3 AC 480 +10% (-15% < 1 min)			
I _{thmax}	A	224	278	331	508
Power loss	kW	0.274	0.247	0.267	0.365
Line/load connection 1U1, 1V1, 1W1, 1U2, 1V2, 1W2		M10 connecting lugs	M10 connecting lugs	M10 connecting lugs	M12 connecting lugs
Degree of protection		IP00	IP00	IP00	IP00
Dimensions					
Width	mm	270	270	270	300
Height	mm	248	248	248	269
Depth	mm	200	200	200	212.5
Weight	kg	24.5	26.0	27.8	38.0

Table 5- 7 Technical data for line reactors 3 AC 380 V ... 480 V, part 2

Article number	6SL3000-	0CE35-1AA0	0CE36-3AA0	0CE37-7AA0	0CE38-7AA0
Suitable for Power Module	6SL3310-	1GE35-0AA3	1GE36-1AA3	1GE37-5AA3	1GE38-4AA3
Unit rating of the Power Module	kW	250	315	400	450
Rated voltage	V	3 AC 380 –10% to 3 AC 480 +10% (-15% < 1 min)			
I_{thmax}	A	508	628	773	871
Power loss	kW	0.365	0.368	0.351	0.458
Line/load connection 1U1, 1V1, 1W1, 1U2, 1V2, 1W2		M12 connecting lugs	M12 connecting lugs	M12 connecting lugs	M12 connecting lugs
Degree of protection		IP00	IP00	IP00	IP00
Dimensions					
Width	mm	300	300	300	350
Height	mm	269	269	269	321
Depth	mm	212.5	212.5	212.5	211.5
Weight	kg	38.0	41.4	51.3	63.2

Table 5- 8 Technical data for line reactors 3 AC 380 V ... 480 V, part 3

Article number	6SL3000-	0CE41-0AA0			
Suitable for Power Module	6SL3310-	1GE41-0AA3			
Unit rating of the Power Module	kW	560			
Rated voltage	V	3 AC 380 –10% to 3 AC 480 +10% (-15% < 1 min)			
I_{thmax}	A	1060			
Power loss	kW	0.498			
Line/load connection 1U1, 1V1, 1W1, 1U2, 1V2, 1W2		M12 connecting lugs			
Degree of protection		IP00			
Dimensions					
Width	mm	350			
Height	mm	321			
Depth	mm	211.5			
Weight	kg	69.6			

5.5 Technical specifications

Table 5- 9 Technical data for line reactors 3 AC 500 V ... 600 V, part 1

Article number	6SL3000-	0CH32-2AA0	0CH32-7AA0	0CH33-4AA0	0CH34-8AA0
Suitable for Power Module	6SL3310-	1GF31-8AA3 1GF32-2AA3	1GF32-6AA3	1GF33-3AA3	1GF34-1AA3 1GF34-7AA3
Unit rating of the Power Module	kW	110 132	160	200	250 315
Rated voltage	V	3 AC 500 -10% to 3 AC 600 +10% (-15% < 1 min)			
I_{thmax}	A	230	270	342	482
Power loss	kW	0.275	0.277	0.270	0.48
Line/load connection 1U1, 1V1, 1W1, 1U2, 1V2, 1W2		M10 connecting lugs	M10 connecting lugs	M10 connecting lugs	M12 connecting lugs
Degree of protection		IP00	IP00	IP00	IP00
Dimensions					
Width	mm	270	270	270	350
Height	mm	248	248	248	321
Depth	mm	200	200	200	232.5
Weight	kg	31.1	27.9	38.9	55.6

Table 5- 10 Technical data for line reactors 3 AC 500 V ... 600 V, part 2

Article number	6SL3000-	0CH36-0AA0	0CH38-4AA0		
Suitable for Power Module	6SL3310-	1GF35-8AA3	1GF37-4AA3 1GF38-1AA3		
Unit rating of the Power Module	kW	400	500 560		
Rated voltage	V	3 AC 500 -10% to 3 AC 600 +10% (-15% < 1 min)			
I_{thmax}	A	597	840		
Power loss	kW	0.485	0.618		
Line/load connection 1U1, 1V1, 1W1, 1U2, 1V2, 1W2		M12 connecting lugs	M12 connecting lugs		
Degree of protection		IP00	IP00		
Dimensions					
Width	mm	350	410		
Height	mm	321	385		
Depth	mm	232.5	224		
Weight	kg	63.8	98		

Table 5- 11 Technical data for line reactors 3 AC 660 V ... 690 V, part 1


Article number	6SL3000-	0CH31-1AA0	0CH31-6AA0	0CH32-2AA0	0CH32-7AA0
Suitable for Power Module	6SL3310-	1GH28-5AA3 1GH31-0AA3	1GH31-2AA3 1GH31-5AA3	1GH31-8AA3 1GH32-2AA3	1GH32-6AA3
Unit rating of the Power Module	kW	75 90	110 132	160 200	250
Rated voltage	V	3 AC 660 –10% to 3 AC 690 +10% (-15% < 1 min)			
I_{thmax}	A	107	164	230	270
Power loss	kW	0.252	0.281	0.275	0.277
Line/load connection 1U1, 1V1, 1W1, 1U2, 1V2, 1W2		M10 connecting lugs	M10 connecting lugs	M10 connecting lugs	M10 connecting lugs
Degree of protection		IP00	IP00	IP00	IP00
Dimensions					
Width	mm	270	270	270	270
Height	mm	248	248	248	248
Depth	mm	200	200	200	200
Weight	kg	24.4	25.9	31.1	27.9


Table 5- 12 Technical data for line reactors 3 AC 660 V ... 690 V, part 2


Article number	6SL3000-	0CH33-4AA0	0CH34-8AA0	0CH36-0AA0	0CH38-4AA0
Suitable for Power Module	6SL3310-	1GH33-3AA3	1GH34-1AA3 1GH34-7AA3	1GH35-8AA3	1GH37-4AA3 1GH38-1AA3
Unit rating of the Power Module	kW	315	400 450	560	710 800
Rated voltage	V	3 AC 660 –10% to 3 AC 690 +10% (-15% < 1 min)			
I_{thmax}	A	342	482	597	840
Power loss	kW	0.270	0.478	0.485	0.618
Line/load connection 1U1, 1V1, 1W1, 1U2, 1V2, 1W2		M10 connecting lugs	M12 connecting lugs	M12 connecting lugs	M12 connecting lugs
Degree of protection		IP00	IP00	IP00	IP00
Dimensions					
Width	mm	270	350	350	410
Height	mm	248	321	321	385
Depth	mm	200	232.5	232.5	224
Weight	kg	38.9	55.6	63.8	98


Braking Module / braking resistor

6.1 General

 WARNING
<p>Non-observance of the fundamental safety instructions and residual risks</p> <p>The non-observance of the fundamental safety instructions and residual risks stated in Chapter 1 can result in accidents with severe injuries or death.</p> <ul style="list-style-type: none"> • Adhere to the fundamental safety instructions. • When assessing the risk, take into account residual risks.

 WARNING
<p>Fire and device damage as a result of ground fault/short-circuit</p> <p>Inadequate installation of the cables to the braking resistor can result in a ground fault/short-circuit and place persons at risk as a result of the associated smoke and fire.</p> <ul style="list-style-type: none"> • Comply with local installation regulations that enable this fault to be ruled out. • Protect the cables from mechanical damage. • In addition, apply one of the following measures: <ul style="list-style-type: none"> – Use cables with double insulation. – Maintain adequate clearance, e.g. by using spacers. – Lay the cables in separate cable ducts or conduits.

 WARNING
<p>Fire due to overheating when the total length of the connecting cables is exceeded</p> <p>Excessively long Braking Module connection cables can cause components to overheat with the associated risk of fire and smoke.</p> <ul style="list-style-type: none"> • The Braking Module connecting cables may not be longer than 100 m.

 WARNING
<p>Fire through overheating due to insufficient ventilation clearances</p> <p>Inadequate ventilation clearances can cause overheating with a risk for personnel through smoke development and fire. This can also result in increased failures and reduced service lives of braking resistors.</p> <ul style="list-style-type: none"> • It is essential that you maintain a ventilation clearance of 200 mm on all sides of the component with ventilation grilles.

NOTICE

Material damage due to loose power connections

Insufficient tightening torques or vibration can result in faulty electrical connections. This can cause fire damage or malfunctions.

- Tighten all power connections with the specified tightening torques, e.g. line supply connection, motor connection, DC-link connections.
- Check the tightening torques of all power connections at regular intervals and tighten them when required. This applies in particular after transport.

NOTICE

Damage through the use of non-released braking resistors

Braking resistors can be damaged when using braking resistors other than those specified in this manual.

- Only use braking resistors released by Siemens.

6.1.1 Braking Module

Description

A Braking Module (and an external braking resistor) is required in certain cases when the drive is to be braked or brought to a standstill (e.g. EMERGENCY STOP category 1). The Braking Module contains the power electronics and the associated Control Unit. The supply voltage for the electronics is drawn from the DC link.

During operation, the DC-link energy is converted to heat loss in an external braking resistor.

The Braking Module functions independently of the converter closed-loop controller. In the case of Power Modules with frame sizes HX and JX, it is possible to operate several Braking Modules in parallel in order to enhance performance. In this case, each Braking Module must be fitted with its own braking resistor.

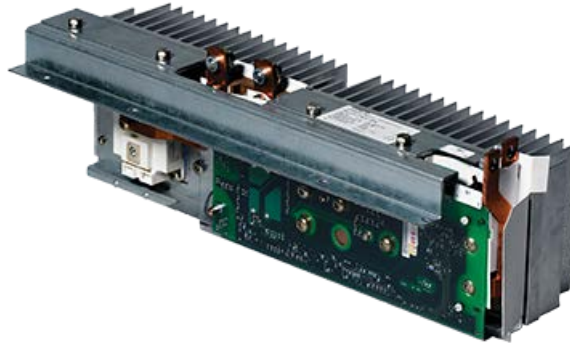


Figure 6-1 Braking Module

Structure

The Braking Module is inserted in a slot inside the Power Module, the fan of which ensures forced cooling. The Braking Module is connected to the DC link by means of the busbar sets and flexible cables, which are supplied as standard.

6.1 General

Assignment of Braking Module and Power Module

Table 6- 1 Assignment of Braking Module and Power Module

Power Module	Unit rating of the Power Module	Suitable Braking Module	Rated power output of the Braking Module	Suitable brake resistance
Line voltage 3-phase 380 – 480 VAC				
6SL3310-1GE32-1AA3	110 kW	6SL3300-1AE31-3AA0	25 kW	6SL3000-1BE31-3AA0
6SL3310-1GE32-6AA3	132 kW	6SL3300-1AE31-3AA0	25 kW	6SL3000-1BE31-3AA0
6SL3310-1GE33-1AA3	160 kW	6SL3300-1AE32-5AA0	50 kW	6SL3000-1BE32-5AA0
6SL3310-1GE33-8AA3	200 kW	6SL3300-1AE32-5AA0	50 kW	6SL3000-1BE32-5AA0
6SL3310-1GE35-0AA3	250 kW	6SL3300-1AE32-5AA0	50 kW	6SL3000-1BE32-5AA0
6SL3310-1GE36-1AA3	315 kW	6SL3300-1AE32-5BA0	50 kW	6SL3000-1BE32-5AA0
6SL3310-1GE37-5AA3	400 kW	6SL3300-1AE32-5BA0	50 kW	6SL3000-1BE32-5AA0
6SL3310-1GE38-4AA3	450 kW	6SL3300-1AE32-5BA0	50 kW	6SL3000-1BE32-5AA0
6SL3310-1GE41-0AA3	560 kW	6SL3300-1AE32-5BA0	50 kW	6SL3000-1BE32-5AA0
Line voltage 3-phase 500 – 600 VAC				
6SL3310-1GF31-8AA3	110 kW	6SL3300-1AF32-5AA0	50 kW	6SL3000-1BF32-5AA0
6SL3310-1GF32-2AA3	132 kW	6SL3300-1AF32-5AA0	50 kW	6SL3000-1BF32-5AA0
6SL3310-1GF32-6AA3	160 kW	6SL3300-1AF32-5AA0	50 kW	6SL3000-1BF32-5AA0
6SL3310-1GF33-3AA3	200 kW	6SL3300-1AF32-5AA0	50 kW	6SL3000-1BF32-5AA0
6SL3310-1GF34-1AA3	250 kW	6SL3300-1AF32-5BA0	50 kW	6SL3000-1BF32-5AA0
6SL3310-1GF34-7AA3	315 kW	6SL3300-1AF32-5BA0	50 kW	6SL3000-1BF32-5AA0
6SL3310-1GF35-8AA3	400 kW	6SL3300-1AF32-5BA0	50 kW	6SL3000-1BF32-5AA0
6SL3310-1GF37-4AA3	450 kW	6SL3300-1AF32-5BA0	50 kW	6SL3000-1BF32-5AA0
6SL3310-1GF38-1AA3	560 kW	6SL3300-1AF32-5BA0	50 kW	6SL3000-1BF32-5AA0
Line voltage 3-phase 660 – 690 VAC				
6SL3310-1GH28-5AA3	75 kW	6SL3300-1AH31-3AA0	25 kW	6SL3000-1BH31-3AA0
6SL3310-1GH31-0AA3	90 kW	6SL3300-1AH31-3AA0	25 kW	6SL3000-1BH31-3AA0
6SL3310-1GH31-2AA3	110 kW	6SL3300-1AH31-3AA0	25 kW	6SL3000-1BH31-3AA0
6SL3310-1GH31-5AA3	132 kW	6SL3300-1AH31-3AA0	25 kW	6SL3000-1BH31-3AA0
6SL3310-1GH31-8AA3	160 kW	6SL3300-1AH32-5AA0	50 kW	6SL3000-1BH32-5AA0
6SL3310-1GH32-2AA3	200 kW	6SL3300-1AH32-5AA0	50 kW	6SL3000-1BH32-5AA0
6SL3310-1GH32-6AA3	250 kW	6SL3300-1AH32-5AA0	50 kW	6SL3000-1BH32-5AA0
6SL3310-1GH33-3AA3	315 kW	6SL3300-1AH32-5AA0	50 kW	6SL3000-1BH32-5AA0
6SL3310-1GH34-1AA3	400 kW	6SL3300-1AH32-5BA0	50 kW	6SL3000-1BH32-5AA0
6SL3310-1GH34-7AA3	450 kW	6SL3300-1AH32-5BA0	50 kW	6SL3000-1BH32-5AA0
6SL3310-1GH35-8AA3	560 kW	6SL3300-1AH32-5BA0	50 kW	6SL3000-1BH32-5AA0
6SL3310-1GH37-4AA3	710 kW	6SL3300-1AH32-5BA0	50 kW	6SL3000-1BH32-5AA0
6SL3310-1GH38-1AA3	800 kW	6SL3300-1AH32-5BA0	50 kW	6SL3000-1BH32-5AA0

6.1.2 Braking resistor

Description

In converters with no regenerative feedback capability, the energy that occurs in the drive train under regenerative conditions is fed back to the DC link where it is reduced via braking resistors.

The braking resistor is connected to the Braking Module. The distance between the Braking Module and braking resistor must not exceed 100 m. This enables the resulting heat loss to be dissipated outside the switchgear room.

Resistors with rated powers of 25 kW and 50 kW are available.

To boost performance, Braking Modules and braking resistors can be connected in parallel. In this case, the Braking Modules are installed in the discharged air ducts of the Power Module. Depending on the size of the Power Module, overall up to 3 slots are available:

- Frame size FX: 1 mounting location
- Frame size GX: 1 mounting location
- Frame size HX: 2 mounting locations
- Frame size JX: 3 mounting locations

Since the braking resistors can be used in converters with a wide voltage range, the voltage can be adjusted (for example, to reduce the voltage stress on the motor and converter) by setting the response thresholds on the Braking Module.

A thermostat monitors the braking resistor for excessively high temperatures and issues a signal on a floating contact if the limit value is exceeded.



Figure 6-2 Braking resistor

6.2 Mechanical installation

6.2.1 General

Tightening torques for screw connections

The following tightening torques apply when tightening current-conducting connections (DC-link connections, motor connections, busbars, lugs) and other connections (ground connections, protective conductor connections, steel threaded connections).

Table 6- 2 Tightening torques for screw connections

Thread	Ground connections, protective conductor connections, steel threaded connections	Aluminum threaded connections, plastic, busbars, lugs
M3	1.3 Nm	0.8 Nm
M4	3 Nm	1.8 Nm
M5	6 Nm	3 Nm
M6	10 Nm	6 Nm
M8	25 Nm	13 Nm
M10	50 Nm	25 Nm
M12	88 Nm	50 Nm
M16	215 Nm	115 Nm

Note

Screw connections for protective covers

The threaded connections for the protective covers made of Makrolon may only be tightened with 2.5 Nm.

6.2.2 Braking Modules: overview

Braking Module for frame size FX

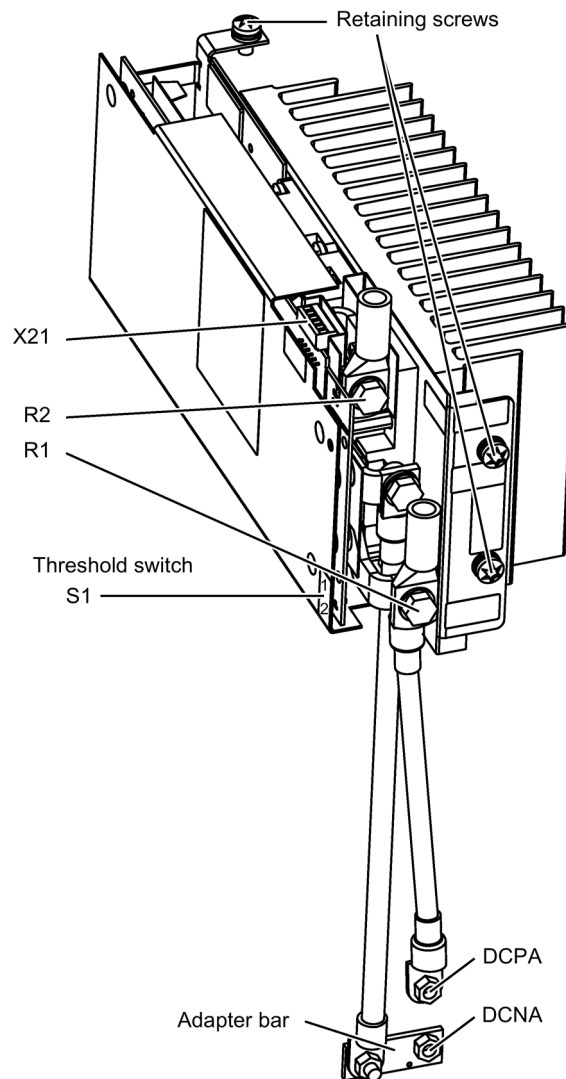


Figure 6-3 Braking Module for Power Module, frame size FX

Note

Common connection for the R1 and DCPA

With this Braking Module, the R1 and DCPA interfaces use the same connection.

Braking Module for frame size GX

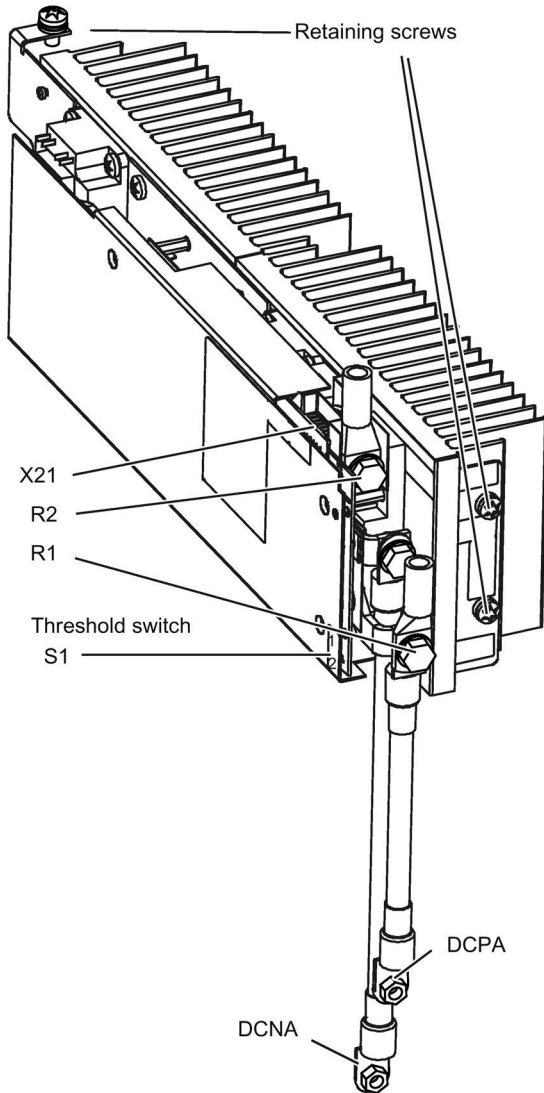


Figure 6-4 Braking Module for Power Module, (frame size GX)

Note

Common connection for the R1 and DCPA

With this Braking Module, the R1 and DCPA interfaces use the same connection.

Braking Module for frame size HX/JX

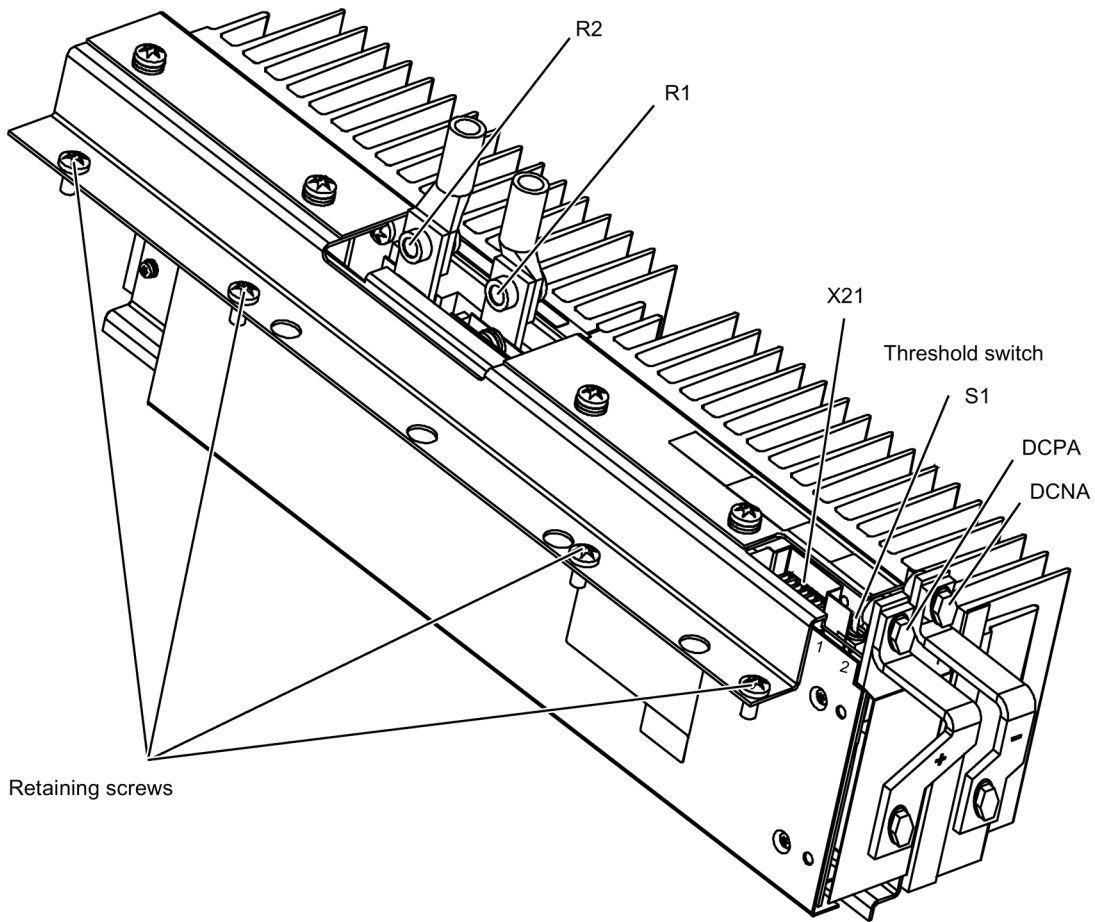


Figure 6-5 Braking Module for Power Module, frame size HX/JX

6.2.3 Installing the Braking Module

6.2.3.1 Installing the Braking Module in a Power Module, frame size FX



Figure 6-6 Installing the Braking Module in a Power Module, frame size FX – steps 1 - 3

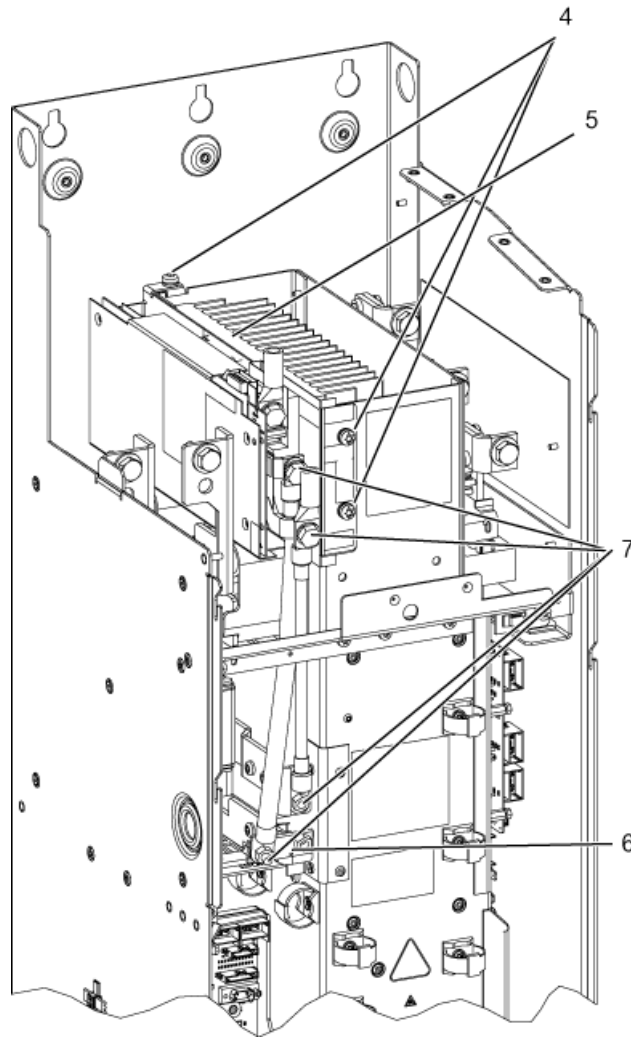


Figure 6-7 Installing the Braking Module in a Power Module, frame size FX – steps 4 - 7

Installing the Braking Module

The steps for the installation procedure are numbered in accordance with the figures in the diagrams.

1. Unscrew the 2 M6 screws from the front cover and lift off the cover.
2. Unscrew the 2 screws from the upper cover plate.
Unscrew the M6 nut on the left-hand side and remove the front cover.
3. Unscrew the 4 screws from the upper cover plate.
Unscrew the 3 screws from the rear cut-out sections and remove the rear cover.
4. Unscrew the 3 screws for the blanking plate and remove the plate.
5. Insert the Braking Module where the cover used to be and secure it using the 3 screws (from step 4).

6.2 Mechanical installation

6. Attach the adapter bar to the DCNA using a nut, so that the busbar cannot be twisted. For this purpose, a small bolt is attached to the adapter bar, which must be located on the lower side of the DCNA connection.
7. Secure the connecting cable to the DC link with 2 screws (Braking Module connection) and 2 nuts (DC-link connection).

Carry out the subsequent steps in reverse order from steps 1 – 3.

An opening above the connections for the braking resistor (R1, R2) is provided in the cover for connecting the cable to the braking resistor.

Note

Pay attention to the tightening torques

You must observe the tightening torques. Information on this can be found in the table in the "Mechanical installation" section

6.2.3.2 Installing the Braking Module in a Power Module frame size GX

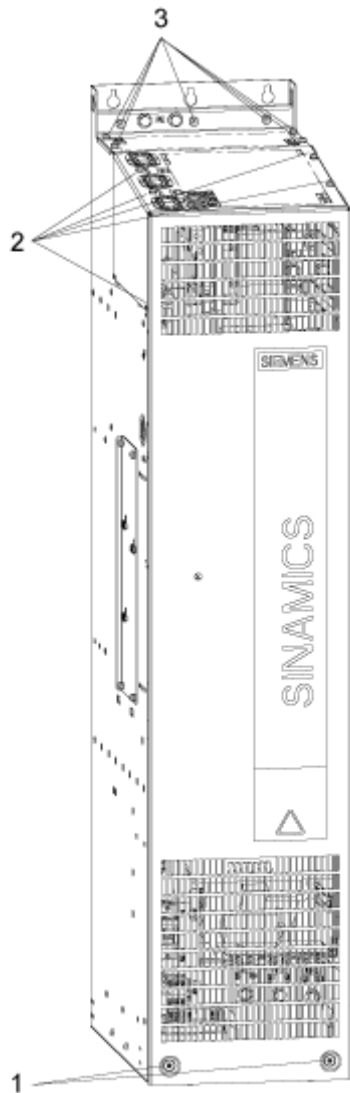


Figure 6-8 Installing the Braking Module in a Power Module frame size GX – steps 1 - 3

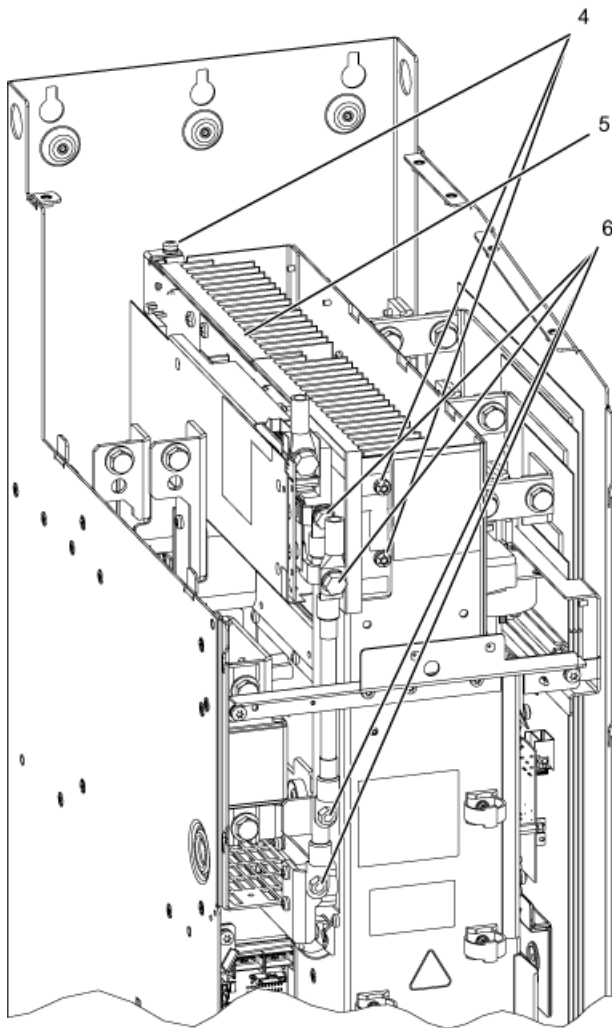


Figure 6-9 Installing the Braking Module in a Power Module frame size GX – steps 4 - 6

Installing the Braking Module

The steps for the installation procedure are numbered in accordance with the figures in the diagrams.

1. Unscrew the 2 M6 screws from the front cover and lift off the cover.
2. Unscrew the 4 screws from the upper cover plate.
Unscrew the M6 nut on the left-hand side and remove the front cover.
3. Unscrew the 4 screws from the upper cover plate.
Unscrew the 3 screws from the rear cut-out sections and remove the rear cover.
4. Unscrew the 3 screws for the blanking plate and remove the plate.
5. Insert the Braking Module where the cover used to be and secure it using the 3 screws (from step 4).
6. Secure the connecting cable to the DC link with 2 screws (Braking Module connection) and 2 nuts (DC-link connection).

Carry out the subsequent steps in reverse order from steps 1 – 3.

An opening above the connections for the braking resistor (R1, R2) is provided in the cover for connecting the cable to the braking resistor.

Note**Pay attention to the tightening torques**

You must observe the tightening torques. Information on this can be found in the table in the "Mechanical installation" section

6.2.3.3 Installing the Braking Module in a Power Module frame size HX

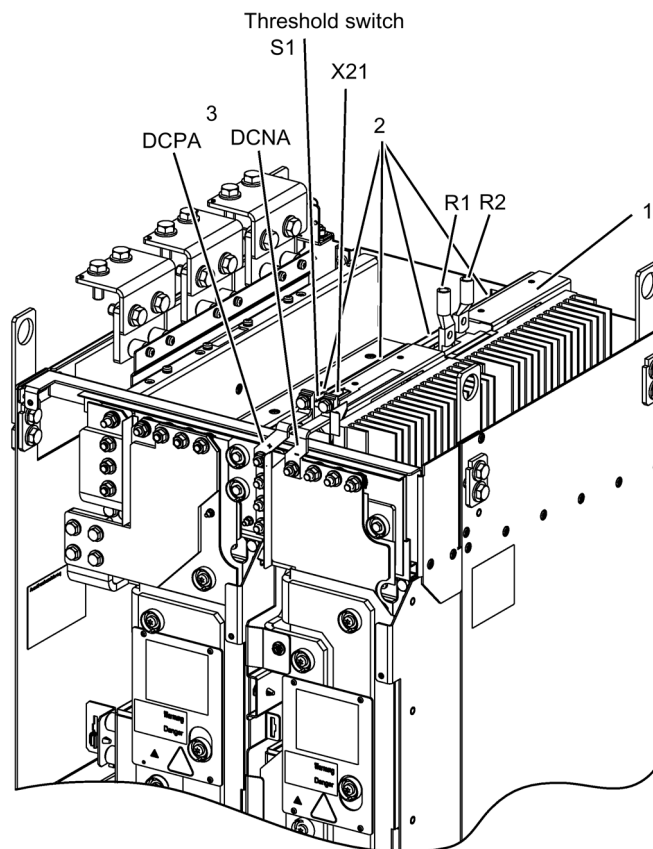


Figure 6-10 Installing the Braking Module in a Power Module frame size HX

Installing the Braking Module

The steps for the installation procedure are numbered in accordance with the figures in the diagram.

1. Insert the Braking Module.
2. Screw in the 4 retaining screws for securing the Braking Module.
3. Secure the connection clip to the DC link (DCPA/DCNA) with two screws (Braking Module connection) and two nuts (DC-link connection).

Note

Pay attention to the tightening torques

You must observe the tightening torques. Information on this can be found in the table in the "Mechanical installation" section

6.2.3.4 Installing the Braking Module in a Power Module frame size JX

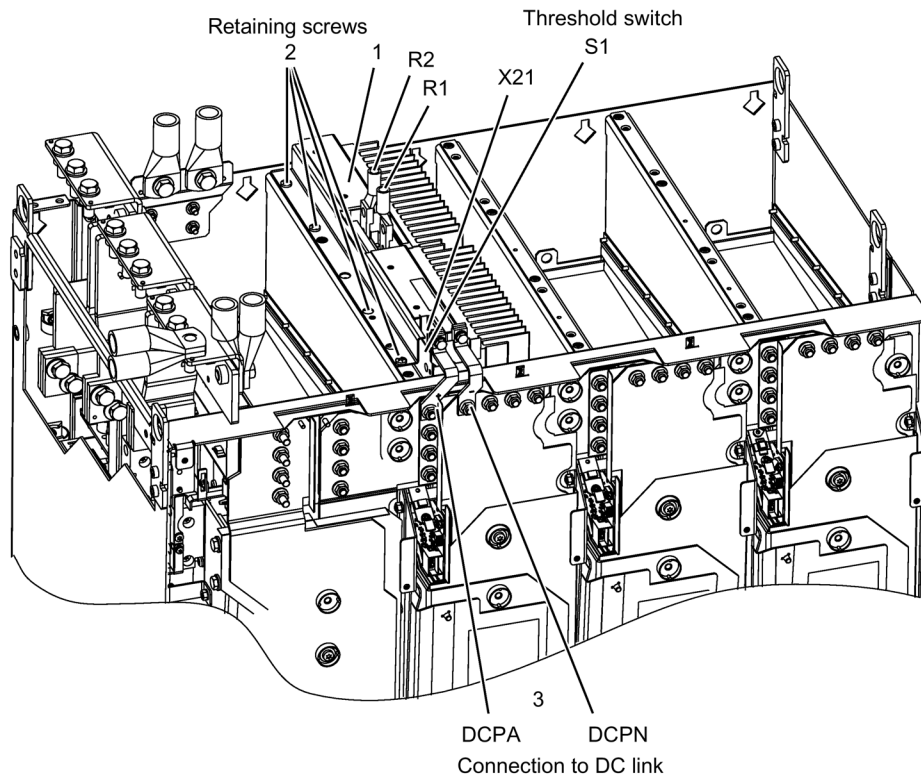


Figure 6-11 Installing the Braking Module in a Power Module frame size JX

Installing the Braking Module

The steps for the installation procedure are numbered in accordance with the figures in the diagram.

1. Insert the Braking Module.
2. Screw in the 4 retaining screws for securing the Braking Module.
3. Secure the connection clip to the DC link (DCPA / DCNA) with 2 screws (Braking Module connection) and 2 nuts (DC-link connection).

Note

Pay attention to the tightening torques

You must observe the tightening torques. Information on this can be found in the table in the "Mechanical installation" section

6.2.4 Installing the braking resistor

The braking resistor should not be installed in the vicinity of the converter. The following points must be taken into account:

- The braking resistors are only suitable for floor mounting.
- The maximum cable length between the Braking Module and braking resistor is 100 m.
- Sufficient space must be available for dissipating the energy converted by the braking resistor.
- A sufficient distance from flammable objects must be maintained.
- The braking resistor must be installed as a free-standing unit.
- Objects must not be placed on or anywhere above the braking resistor.
- The braking resistor should not be installed underneath fire detection systems, since these could be triggered by the resulting heat.
- For outdoor installation, a hood must be provided to protect the braking resistor from precipitation (in accordance with degree of protection IP20).

 WARNING
--

Fire as a result of inadequate installation

If incorrectly installed (non-observance of the cooling clearances or inadequate clearances to flammable objects), there is the danger of fire damage with death or severe injury.

- It is essential that you maintain a cooling clearance of 200 mm on all sides of the braking resistor with ventilation grills.
- Maintain sufficient clearance to objects that can burn.



⚠ CAUTION

Burns due to a high surface temperature at the braking resistor

In operation, the braking resistor can reach high temperatures, which can cause burns if touched.

- Allow the braking resistor to cool down before starting any work.
- Use the appropriate personnel protection equipment, e.g. gloves.

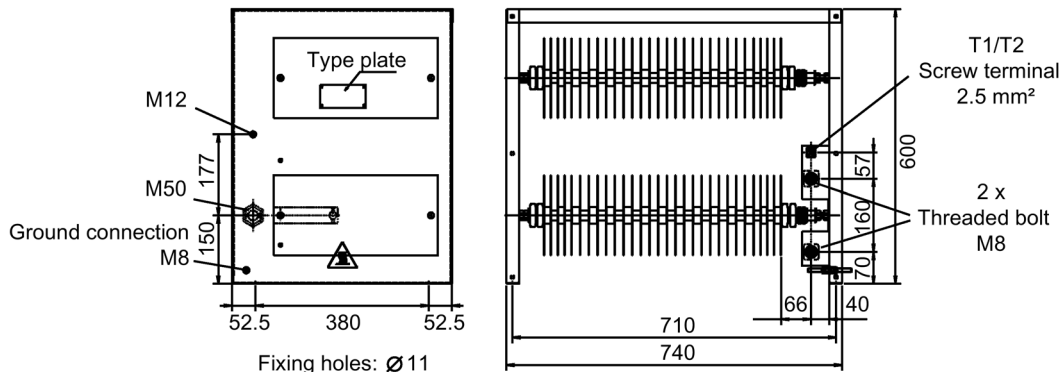


Figure 6-12 Dimension drawing for braking resistor (25 kW)

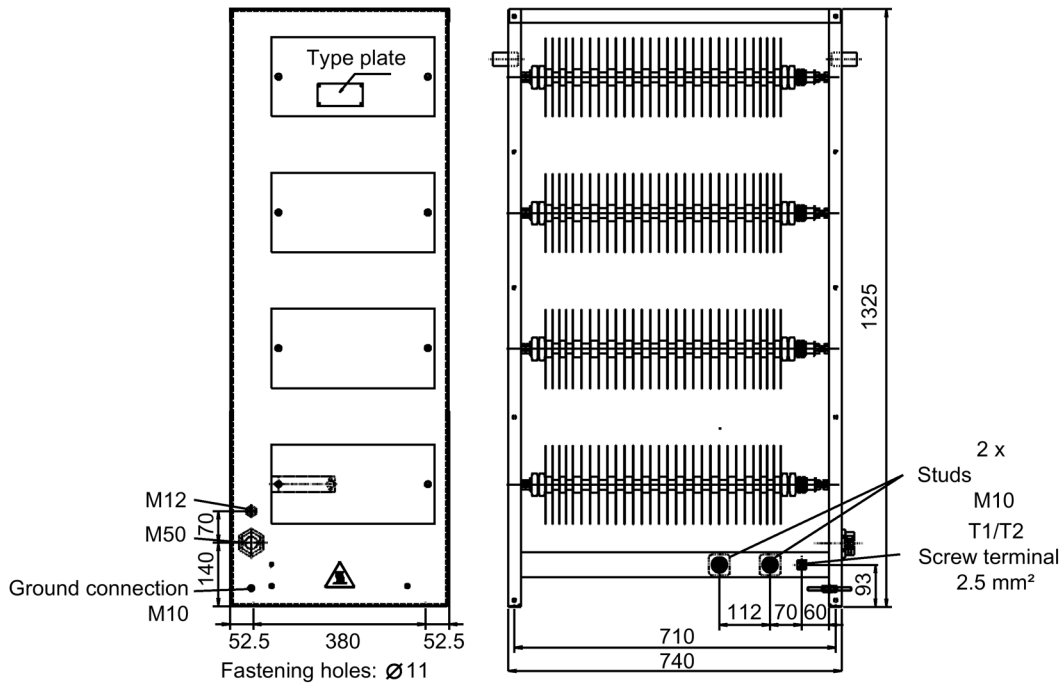


Figure 6-13 Dimension drawing for braking resistor (50 kW)

6.3 Connection

6.3.1 Cable lugs

Cable lugs

The cable connections on the devices are designed for cable lugs according to DIN 46234 or DIN 46235.

For connection of alternative cable lugs, the maximum dimensions are listed in the table below.

These cable lugs are not to exceed these dimensions, as mechanical fastening and adherence to the voltage distances is not guaranteed otherwise.

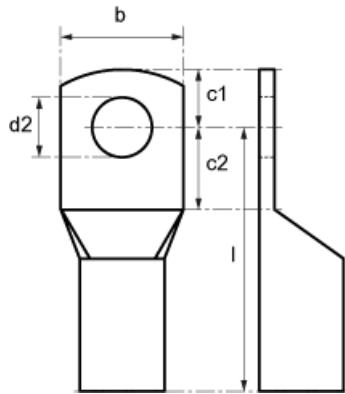


Figure 6-14 Dimensions of the cable lugs

Table 6- 3 Dimensions of the cable lugs

Screw / bolts	Connection cross-section [mm ²]	d2 [mm]	b [mm]	l [mm]	c1 [mm]	c2 [mm]
M8	70	8.4	24	55	13	10
M10	185	10.5	37	82	15	12
M10	240	13	42	92	16	13
M12	95	13	28	65	16	13
M12	185	13	37	82	16	13
M12	240	13	42	92	16	13
M16	240	17	42	92	19	16

6.3.2 Connecting the Braking Module

Interface overview

The Braking Module has the following interfaces:

- DC-link connection via flexible cables or a fixed busbar
- Braking resistor connection via flexible cables or a fixed busbar
- 1 digital input (inhibit Braking Module with high signal/acknowledge error with negative edge high -> low)
- 1 digital output (Braking Module defective / high signal = no fault)
- PE/protective conductor connection

Connection overview

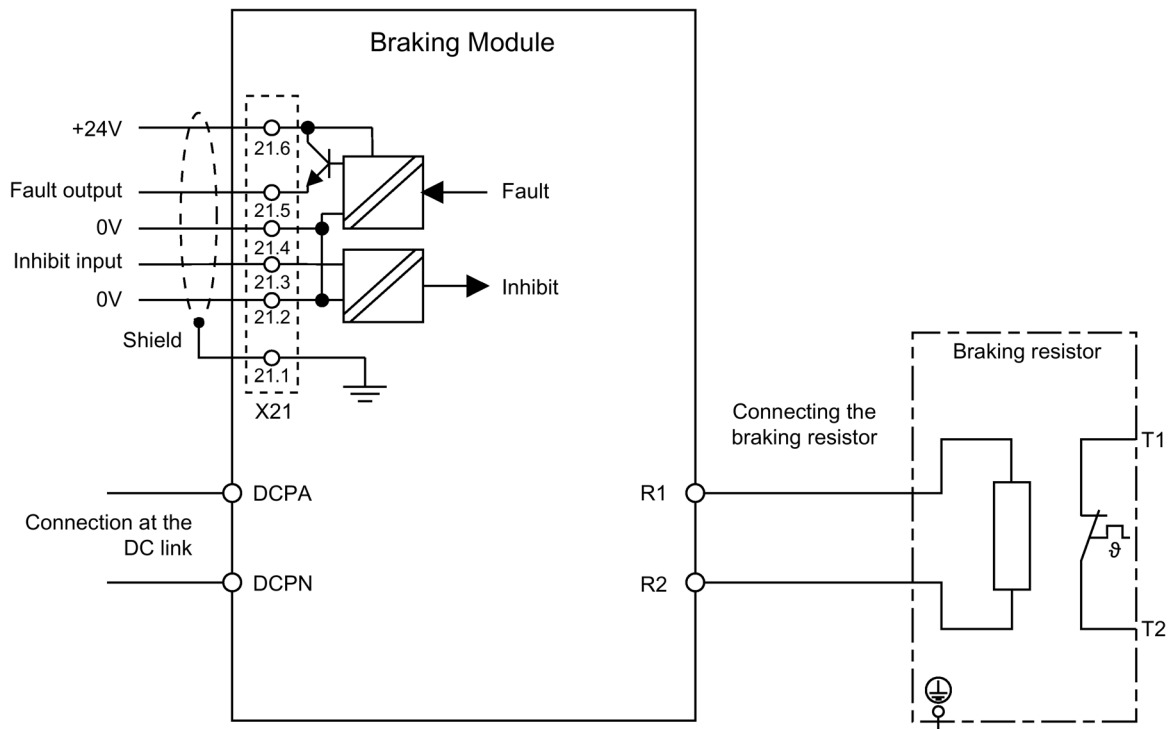


Figure 6-15 Connection overview for the Braking Module

Note

Common connection for the R1 and DCPA for sizes FX and GX

With Braking Modules for Power Modules of the sizes FX and GX, the interfaces R1 and DCPA are implemented via a shared connection.

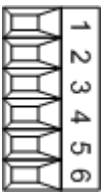
Braking resistor connection

Table 6- 4 Braking resistor connection

Terminal	Designation
R1	Braking resistor connection R+
R2	Braking resistor connection R-
Recommended connection cross-sections: For 25/125 kW: 35 mm ² , for 50/250 kW: 50 mm ²	

Digital inputs/outputs X21

Table 6- 5 Terminal block X21

Connector	Terminal	Designation ¹⁾	Technical specifications
	1	Shield	Shield connection for terminals 2 ... 6
	2	0 V	High level: +15 V to 30 V Current consumption: 2 mA to 15 mA
	3	DI inhibit input	Low level: -3 V to 5 V
	4	0 V	High signal: No fault Low signal: Fault present
	5	DO fault output	Voltage: 24 VDC Load current: 0.5 A to 0.6 A
	6	+24 V	Voltage: +18 V to +30 V Typical current consumption (induced current consumption): 10 mA at 24 VDC
Max. connectable cross-section 1.5 mm ²			

¹⁾ DI: digital input; DO: Digital output

Note

Position of the terminals

When the Braking Module is installed, the individual terminals on its X21 terminal block are positioned as follows: terminal "1" is at the rear, terminal "6" at the front.

Note

Signal characteristics of terminal X21.3

Applying a high signal to terminal X21.3 inhibits the Braking Module. With a falling edge, pending fault codes are acknowledged.

Note

The Braking Module requires DC-link voltage so that the "No fault" message can be issued correctly.

6.3 Connection

Recommended connection for terminal strip X21

The signals of terminal strip X21 can be freely used corresponding to the line-side requirements.

In connection with the system components used and the default settings of the command sources during commissioning, the following recommendations for the wiring of the signals apply.

- X21:2 to CU X132:14 (mass)
- X21:3 on CU X132:9 (DO12 = acknowledge fault)
- X21:5 on CU X132:1 (DI4 = external fault 3)
- X21:6 on CU X132:13 (DO15 = P24V)

Parameterization

Table 6- 6 Parameterization

Sink			Source		
Parameters	Description	DO	Parameters	Description	DO
p1240	Vdc controller or Vdc monitoring configuration	Vector	0	Inhibit Vdc ctrl	
p2108	Ext. fault_3	Vector	r0722.4	DI 4 (X132.1)	CU
p3111	BI: External fault 3 enable	Vector	r0899.2	Operation enabled	Vector
p0728.12	Sets CU input or output: DI/DO 12 (X132.9)	CU	1	Sets DI/DO12 as output (corresponds to the default setting after commissioning and selection of p0700)	
p0742	BI: CU signal source for terminal DI/DO 12 (X132.9)	CU	r2138.7	Acknowledges the fault (corresponds to the default setting after commissioning and selection of p0700)	Vector

Note

Fault acknowledged with r2138.7 for the recommended wiring

If, during operation, an "Acknowledge fault" signal is initiated via terminal X21.3 in the braking chopper, without there being a fault in the Braking Module, then this initiates an external fault 3.

You can prevent this response by applying the following measures:

- Link the "Acknowledge fault" signal with status bit 3 "Fault active" of status word ZSW1 (r2139.3).
- If a fault is not active, then do not initiate an "Acknowledge fault" signal.

Threshold switch

The response threshold at which the Braking Module is activated and the DC-link voltage generated during braking are specified in the following table.


 WARNING
Electric shock when operating the threshold switch
Operating the threshold switch when a voltage is present can cause death or serious injury.
<ul style="list-style-type: none"> • Only operate the threshold switch when the Power Module is switched off and the DC-link capacitors are discharged.

Table 6- 7 Response thresholds of the Braking Modules

Voltage	Response threshold	Switch position	Comment
3-phase 380 ... 480 VAC	673 V	1	774 V is the default factory setting. For line voltages of between 3-phase 380 and 400 VAC, the response threshold can be set to 673 V to reduce the voltage stress on the motor and converter. This does, however, reduce the possible braking power with the square of the voltage $(673/774)^2 = 0.75$. The maximum possible braking power is, therefore, 75%.
	774 V	2	
3-phase 500 ... 600 VAC	841 V	1	967 V is the default factory setting. With a supply voltage of 3-phase 500 VAC, the response threshold can be set to 841 V to reduce the voltage stress on the motor and converter. This does, however, reduce the possible braking power with the square of the voltage $(841/967)^2 = 0.75$. The maximum possible braking power is, therefore, 75%.
	967 V	2	
3-phase 660 ... 690 VAC	1070 V	1	1158 V is the default factory setting. With a supply voltage of 3-phase 660 VAC, the response threshold can be set to 1070 V to reduce the voltage stress on the motor and converter. This does, however, reduce the possible braking power with the square of the voltage $(1070/1158)^2 = 0.85$. The maximum possible braking power is, therefore, 85 %.
	1158 V	2	

Note

Positions of the threshold switches

The switch positions of the threshold switches of the Braking Modules are positioned on the panel as follows:

- Braking Modules for frame sizes FX and GX: position "1" is up; position "2" is down
 - Braking Modules for frame sizes HX and JX: position "1" is back; position "2" is front
-

Note

"Overvoltage" fault

Even when the response threshold is set to a low value, the DC-link voltage can still reach the maximum voltage value (hardware shutdown threshold), thus triggering the "Overvoltage" fault. This can occur, for example, in cases where there is too much regenerative energy for the available braking power.

To prevent the DC-link voltage from exceeding the threshold, the Vdc-max controller must be enabled (p1240) and the device supply voltage set accordingly (p0210).


6.3.3 Connecting the braking resistor



Electric shock caused by the connected voltage and residual charge of the DC link capacitors on the braking module

Contact with live connections on the Braking Module can result in death or serious injury.

- Only connect the Braking Module after the Power Module has been disconnected from the power supply.
- Only connect the Braking Module after 5 minutes have elapsed. Measure the voltage before starting work on the DCP and DCN DC-link terminals.

 WARNING
<p>Fire caused by ground fault / short-circuit for non-protected connections to the braking resistor</p> <p>Inadequate installation of the cables to the braking resistor can result in a ground fault/short-circuit and place persons at risk as a result of the associated smoke and fire.</p> <ul style="list-style-type: none"> • Comply with local installation regulations that enable this fault to be ruled out. • Protect the cables from mechanical damage. • In addition, apply one of the following measures: <ul style="list-style-type: none"> – Use cables with double insulation. – Maintain adequate clearance, e.g. by using spacers. – Lay the cables in separate cable ducts or conduits.

NOTICE
<p>Material damage when exceeding the maximum permitted cable length</p> <p>Exceeding the maximum permitted cable length to the braking resistor can cause material damage in the event of component failure.</p> <ul style="list-style-type: none"> • The braking resistor connecting cables may not be longer than 100 m.

Recommended connection cross-sections:

- For 25/125 kW: 35 mm²
- For 50/250 kW: 50 mm²

Thermostatic switch

A thermostatic switch is installed to protect the braking resistor against overload. Its floating contacts must be integrated in the fault chain on site.

Table 6- 8 Thermostatic switch connection

Terminal	Description of function	Technical specifications
T1	Thermostatic switch connection	Voltage: 240 VAC Load current: Max. 10 A
T2	Thermostatic switch connection	

Max. connectable cross-section: 2.5 mm²

Integration of the thermostatic switch as release for switch-off via OFF2

The thermostatic switch must be connected to a free digital input of the SINAMICS G130 so that the converter is safely disconnected from the power supply if the braking resistor overheats. A digital input on the TM31 Terminal Module, on the TB30 Terminal Board or on the Control Unit can be used for this.

Subsequently the digital input must be used as release for a switch-off with OFF2. External fault 2). The interconnection can be made with the STARTER or via the AOP30.

Table 6- 9 Parameterizing the connection of the thermostatic switch at digital input 16 at the CU320-2 Control Unit

Sink			Source		
Parameter	Description	DO	Parameter	Description	DO
p2107	BI: External fault 2	Vector	r0722.16	CU digital inputs DI 16 (X122.5 / X120.3)	CU

Table 6- 10 Parameterizing the connection of the thermostatic switch at digital input 11 at Terminal Module TM31

Sink			Source		
Parameter	Description	DO	Parameter	Description	DO
p2107	BI: External fault 2	Vector	r4022.11	TM31 digital inputs DI/DO 11 (X541.5)	TM31

6.3.4 Disabling the Vdc-max controller

The Vdc-max controller must be switched off (p1240 = 0) when a brake chopper is used.

6.4 Maintenance and servicing

Maintenance and servicing are not carried out for the Braking Module and braking resistor. If a fault occurs, the Braking Module and/or braking resistor must be replaced.

6.5 Technical specifications

General technical data

Table 6- 11 General technical data

Product standard	EN 61800-5-1		
Ambient conditions	Storage	Transport	Operation
Ambient temperature	-25 ... +70 °C	-25 ... +70 °C	0 ... +50 °C
Relative air humidity ¹⁾ (condensation not permissible) corresponds to class	5 ... 95 % 1K4 acc. to EN 60721-3-1	5 ... 95% at 40 °C 2K3 to EN 60721-3-2	5 ... 95 % 3K3 to EN 60721-3-3
Mechanical strength	Storage	Transport	Operation
Vibrational load ¹⁾ - Displacement - Acceleration corresponds to class	1.5 mm at 5 ... 9 Hz 5 m/s ² at > 9 ... 200 Hz 1M2 to EN 60721-3-1	3.5 mm at 5 ... 9 Hz 10 m/s ² at > 9 ... 200 Hz 2M2 to EN 60721-3-2	0.075 mm at 10 ... 58 Hz 10 m/s ² at >58 ... 200 Hz -
Shock load ¹⁾ - Acceleration corresponds to class	40 m/s ² at 22 ms 1M2 to EN 60721-3-1	100 m/s ² at 11 ms 2M2 to EN 60721-3-2	100 m/s ² at 11 ms 3M4 to EN 60721-3-3

Deviations from the specified classes are shown in *italics*.

¹⁾ The EN standards specified are the European editions of the international IEC standards with the same designations.

Detailed technical specifications for the Braking Module

Table 6- 12 Technical specifications of Braking Module, 380 V – 480 V 3 AC

Braking Module 6SL3300-	1AE31-3AA0	1AE32-5AA0	1AE32-5BA0
P _{DB} power (rated power)	25 kW	50 kW	50 kW
P ₁₅ power	125 kW	250 kW	250 kW
P ₂₀ power	100 kW	200 kW	200 kW
P ₄₀ power	50 kW	100 kW	100 kW
Variable response thresholds	774 V (673 V)	774 V (673 V)	774 V (673 V)
Digital input			
Voltage	-3 V to 30 V		
Low level (an open digital input is interpreted as "low")	-3 V to 5 V		
High level	15 V to 30 V		
Typical current consumption (at 24 V DC)	10 mA		
Max. connectable cross-section	1.5 mm ²		
Digital output (continuously short-circuit proof)			
Voltage	24 V DC		
Max. load current of the digital output	500 mA		
Max. connectable cross-section	1.5 mm ²		
Version in acc. with:	UL and IEC	UL and IEC	UL and IEC
R1/R2 connection	M8 screw	M8 screw	M8 screw
Max. connection cross-section R1/R2	35 mm ²	50 mm ²	50 mm ²
Suitable for installation in a Power Module with frame size	FX	GX	HX/JX
Weight, approx.	3.6 kg	7.3 kg	7.5 kg

Table 6- 13 Technical specifications of Braking Module, 500 V – 600 V 3 AC

Braking Module 6SL3300-	1AF32-5AA0	1AF32-5BA0
P _{DB} power (rated power)	50 kW	50 kW
P ₁₅ power	250 kW	250 kW
P ₂₀ power	200 kW	200 kW
P ₄₀ power	100 kW	100 kW
Variable response thresholds	967 V (841 V)	967 V (841 V)
Digital input		
Voltage	-3 V to 30 V	
Low level (an open digital input is interpreted as "low")	-3 V to 5 V	
High level	15 V to 30 V	
Typical current consumption (at 24 V DC)	10 mA	
Max. connectable cross-section	1.5 mm ²	
Digital output (continuously short-circuit proof)		
Voltage	24 V DC	
Max. load current of the digital output	500 mA	
Max. connectable cross-section	1.5 mm ²	
Version in acc. with:	UL and IEC	UL and IEC
R1/R2 connection	M8 screw	M8 screw
Max. connection cross-section R1/R2	50 mm ²	50 mm ²
Suitable for installation in a Power Module with frame size	GX	HX/JX
Weight, approx.	7.3 kg	7.5 kg

6.5 Technical specifications

Table 6- 14 Technical specifications of Braking Module, 660 V – 690 V 3 AC

Braking Module 6SL3300-	1AH31-3AA0	1AH32-5AA0	1AH32-5BA0
P _{DB} power (rated power)	25 kW	50 kW	50 kW
P ₁₅ power	125 kW	250 kW	250 kW
P ₂₀ power	100 kW	200 kW	200 kW
P ₄₀ power	50 kW	100 kW	100 kW
Variable response thresholds	1,153 V (1,070 V)	1,153 V (1,070 V)	1,153 V (1,070 V)
Digital input			
Voltage	-3 V to 30 V		
Low level (an open digital input is interpreted as "low")	-3 V to 5 V		
High level	15 V to 30 V		
Typical current consumption (at 24 V DC)	10 mA		
Max. connectable cross-section	1.5 mm ²		
Digital output (continuously short-circuit proof)			
Voltage	24 V DC		
Max. load current of the digital output	500 mA		
Max. connectable cross-section	1.5 mm ²		
Version in acc. with:	IEC	IEC	IEC
R1/R2 connection	M8 screw	M8 screw	M8 screw
Max. connection cross-section R1/R2	35 mm ²	50 mm ²	50 mm ²
Suitable for installation in a Power Module with frame size	FX	GX	HX/JX
Weight, approx.	3.6 kg	7.3 kg	7.5 kg

Detailed technical specifications for the braking resistor

Table 6- 15 Technical specifications of braking resistor, 380 V – 480 V 3 AC

Braking resistor	6SL3000-1BE31-3AA0	6SL3000-1BE32-5AA0
P _{DB} power (rated power)	25 kW	50 kW
P ₁₅ power	125 kW	250 kW
P ₂₀ power	100 kW	200 kW
P ₄₀ power	50 kW	100 kW
Resistance	4,4 Ω (± 7.5%)	2.2 Ω (± 7.5%)
Maximum current	189 A	378 A
Max. connectable cross-section	50 mm ²	70 mm ²
Cable entry	Via M50 cable gland	Via M50 cable gland
Power connection	Via M8 bolt-type screw terminal	Via M10 bolt-type screw terminal
Degree of protection	IP20	IP20
Width x height x depth	740 x 605 x 485 mm	810 x 1325 x 485 mm
Weight, approx.	50 kg	120 kg

Table 6- 16 Technical specifications of braking resistor, 500 V – 600 V 3 AC

Braking resistor	6SL3000-1BF31-3AA0	6SL3000-1BF32-5AA0
P _{DB} power (rated power)	25 kW	50 kW
P ₁₅ power	125 kW	250 kW
P ₂₀ power	100 kW	200 kW
P ₄₀ power	50 kW	100 kW
Resistance	6.8 Ω (±7.5%)	3.4 Ω (± 7.5%)
Maximum current	153 A	306 A
Max. connectable cross-section	50 mm ²	70 mm ²
Cable entry	Via M50 cable gland	Via M50 cable gland
Power connection	Via M8 bolt-type screw terminal	Via M10 bolt-type screw terminal
Degree of protection	IP20	IP20
Width x height x depth	740 x 605 x 485 mm	810 x 1325 x 485 mm
Weight, approx.	50 kg	120 kg

Table 6- 17 Technical specifications of braking resistor, 660 V – 690 V 3 AC

Braking resistor	6SL3000-1BH31-3AA0	6SL3000-1BH32-5AA0
P _{DB} power (rated power)	25 kW	50 kW
P ₁₅ power	125 kW	250 kW
P ₂₀ power	100 kW	200 kW
P ₄₀ power	50 kW	100 kW
Resistance	9.8 Ω (±7.5%)	4.9 Ω (± 7.5%)
Maximum current	127 A	255 A
Max. connectable cross-section	50 mm ²	70 mm ²
Cable entry	Via M50 cable gland	Via M50 cable gland
Power connection	Via M8 bolt-type screw terminal	Via M10 bolt-type screw terminal
Degree of protection	IP20	IP20
Width x height x depth	740 x 605 x 485 mm	810 x 1325 x 485 mm
Weight, approx.	50 kg	120 kg

Duty cycle

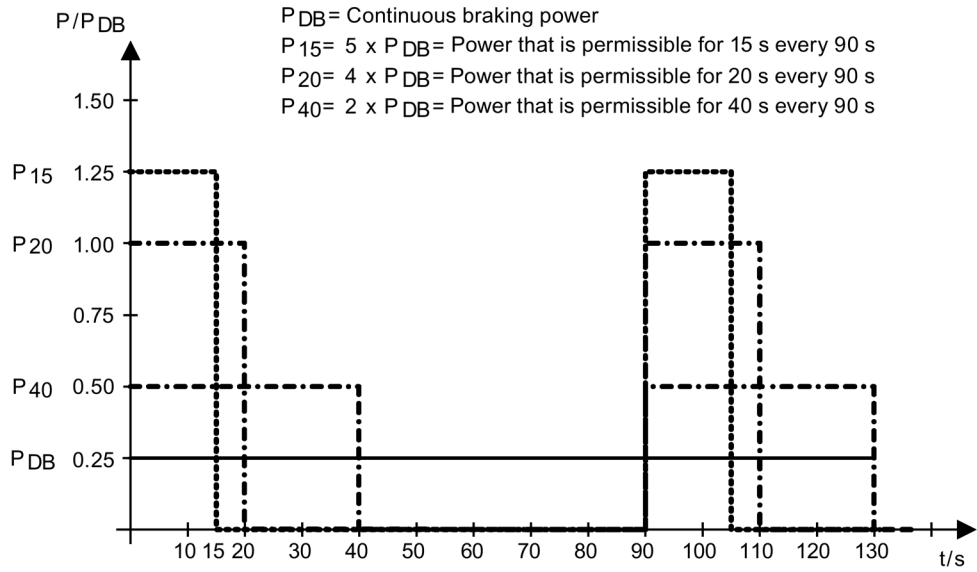


Figure 6-16 Duty cycles for braking resistors

Sine-wave filter

7.1 General

Description

The sine-wave filter limits the voltage gradient and the capacitive charge/discharge currents which usually occur with inverter operation. It also prevents additional noise caused by the pulse frequency. The service life of the motor is as long as that attained with direct mains operation.

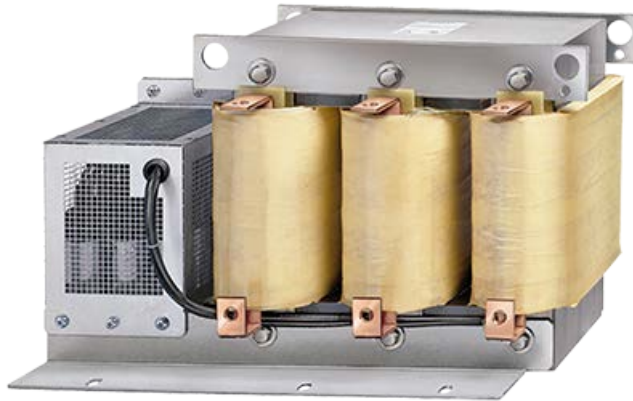


Figure 7-1 Sine-wave filter

WARNING

Non-observance of the fundamental safety instructions and residual risks

The non-observance of the fundamental safety instructions and residual risks stated in Chapter 1 can result in accidents with severe injuries or death.

- Adhere to the fundamental safety instructions.
- When assessing the risk, take into account residual risks.

WARNING

Fire through overheating due to insufficient ventilation clearances

Inadequate ventilation clearances can cause overheating with a risk for personnel through smoke development and fire. Furthermore, an increased number of failures and shorter service life of the components can occur.

- Maintain 100 mm ventilation clearances above and to the side of the component.

 **CAUTION**

Burns resulting from high surface temperature of the sine-wave filter

The surface temperature of the sine-wave filters can exceed 80 °C. You can get seriously burnt when touching the surface.

- Mount the sine-wave filter so that it cannot be touched. If this is not possible, attach a clearly visible and understandable warning notice at hazardous positions.

NOTICE

Sine-wave filter damage due to interchanged connections

Interchanging the input and output connections will damage the sine-wave filter.

- Connect the incoming cable from the Power Modules to 1U1, 1V1, 1W1.
- Connect the outgoing cable to the load at 1U2, 1V2, 1W2.

NOTICE

Damage to the Motor Module by using components that have not been released

When using components that have not been released, damage or malfunctions can occur at the devices or the system itself.

- Only use sine-wave filters that SIEMENS has released for SINAMICS.

NOTICE

Risk of damaging the sine-wave filter by exceeding the maximum output frequency

The maximum permissible output frequency when sine-wave filters are used is 115 Hz or 150 Hz. The sine-wave filter can be damaged if the output frequency is exceeded.

- Operate the sine-wave filter with a maximum output frequency of 115 Hz or 150 Hz.

NOTICE

Damage to the sine-wave filter if it is not activated during commissioning

The sine-wave filter may be damaged if it is not activated during commissioning.

- Activate the sine-wave filter during commissioning via parameter p0230 = 3.

NOTICE
Damage to the sine-wave filter if a motor is not connected
Sine-wave filters, which are operated without a motor being connected, can be damaged or destroyed.
<ul style="list-style-type: none"> • Never operate a sine-wave filter connected to the Power Module without a connected motor.

Note**Cable lengths**

Keep the connecting cables to the Power Module as short as possible (max. 5 m).

Assignment of sine-wave filter and Power Module

Table 7- 1 Assignment of sine-wave filter and Power Module

Power Module	Unit rating of the Power Module	Suitable sine-wave filter
Line voltage 3 AC 380 ... 480 V		
6SL3310-1GE32-1AA3	110 kW	6SL3000-2CE32-3AA0
6SL3310-1GE32-6AA3	132 kW	6SL3000-2CE32-3AA0
6SL3310-1GE33-1AA3	160 kW	6SL3000-2CE32-8AA0
6SL3310-1GE33-8AA3	200 kW	6SL3000-2CE33-3AA0
6SL3310-1GE35-0AA3	250 kW	6SL3000-2CE34-1AA0
Line voltage 3 AC 500 ... 600 V		
6SL3310-1GF31-8AA3	110 kW	6SL3000-2CF31-7AA0
6SL3310-1GF32-2AA3	132 kW	6SL3000-2CF31-7AA0

Restrictions

The following restrictions must be taken into account when a sine-wave filter is used:

- The output frequency is limited to max. 115 Hz (at 500 – 600 V) and 150 Hz (at 380 - 480 V).
- The modulation type is permanently set to space-vector modulation without overmodulation.
- The maximum output voltage is limited to approx. 85% of the input voltage.
- Maximum permissible motor cable lengths:
 - Unshielded cable: max. 450 m
 - Shielded cable: max. 300 m
- During commissioning, the pulse frequency rises to double the factory setting. This induces current derating, which must be applied to the built-in units' rated currents listed in the technical specifications.

Note

If a filter cannot be parameterized (p0230 ≠ 3) during commissioning, then no provision is made for this SIEMENS sine-wave filter for the SINAMICS G130.

Table 7- 2 Technical specifications for sine-wave filters with SINAMICS G130

Article number SINAMICS G130	Voltage [V]	Pulse frequency [kHz]	Output current [A] ¹⁾
6SL3310-1GE32-1AA3	3-phase 380 – 480 VAC	4	172 A
6SL3310-1GE32-6AA3	3-phase 380 – 480 VAC	4	216 A
6SL3310-1GE33-1AA3	3-phase 380 – 480 VAC	4	273 A
6SL3310-1GE33-8AA3	3-phase 380 – 480 VAC	4	331 A
6SL3310-1GE35-0AA3	3-phase 380 – 480 VAC	4	382 A
6SL3310-1GF31-8AA3	3-phase 500 – 600 VAC	2.5	152 A
6SL3310-1GF32-2AA3	3-phase 500 – 600 VAC	2.5	187 A

¹⁾ The values apply to operation with a sine-wave filter and do not correspond with the rated current on the type plate.

Commissioning

When commissioning using the STARTER or AOP30, the sine-wave filter must be activated by means of appropriate selection screenforms or dialog boxes (p0230 = 3), see Chapter "Commissioning" in the SINAMICS G130 Operating Instructions.

The following parameters are changed automatically during commissioning.

Table 7- 3 Parameter settings for sine-wave filters with SINAMICS G130

Parameters	Name	Setting
p0230	Drive filter type, motor side	3: Siemens sine-wave filter
p0233	Power unit motor reactor	Filter inductance
p0234	Power unit sine-wave filter capacitance	Filter capacitance
p0290	Power unit overload response	Disable pulse frequency reduction
p1082	Maximum speed	Fmax filter / pole pair number
p1800	Pulse frequency	Nominal pulse frequency of the filter (see previous table)
p1802	Modulator mode	Space-vector modulation without overmodulation
p1909	Motor data identification, control word	Rs measurement only

Note

Activate the factory settings

When the factory settings are restored, parameter p0230 is reset.
The parameter must be reset if the system is commissioned again.

7.2 Mechanical installation

Dimension drawing

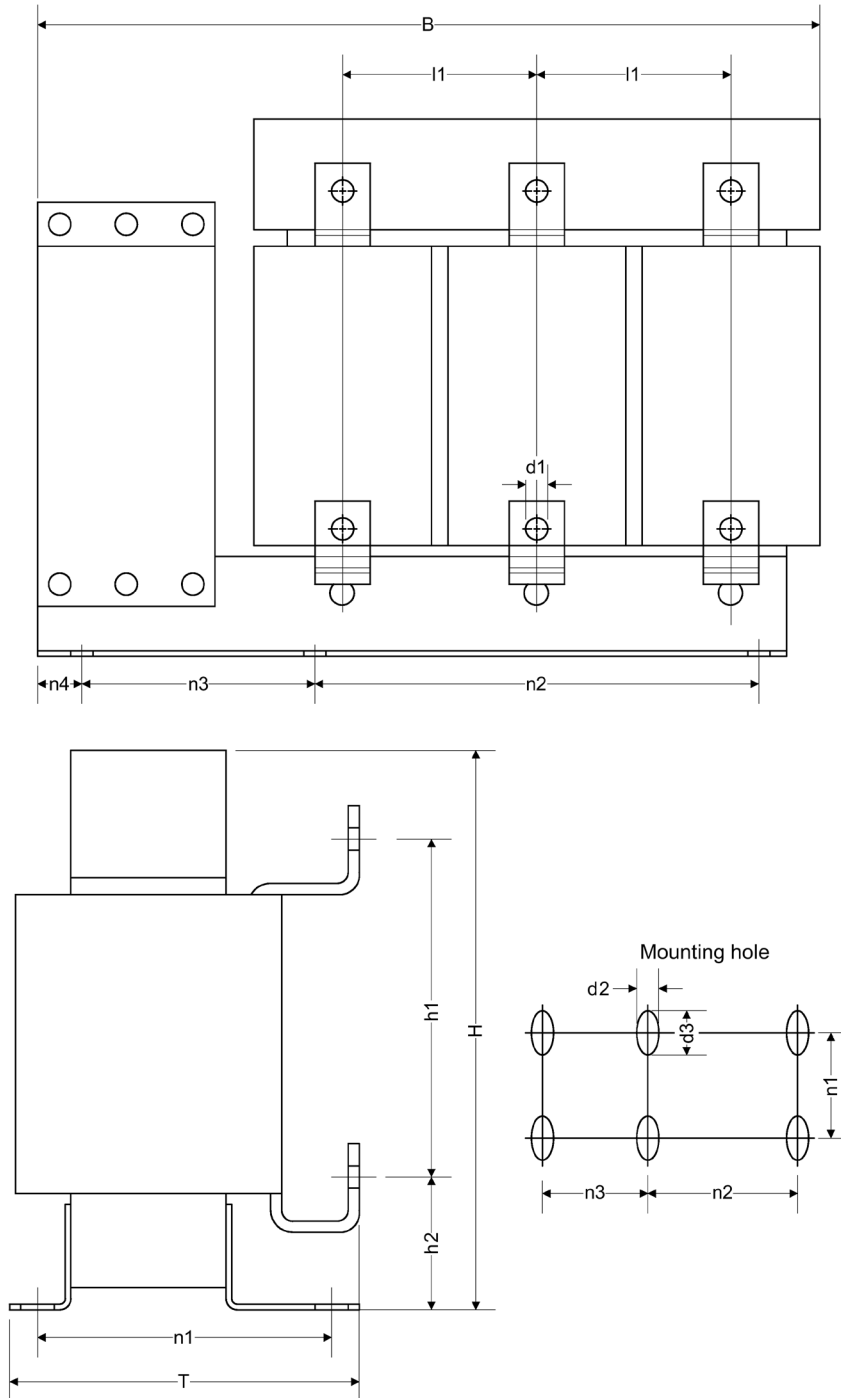


Figure 7-2 Dimension drawing, sine-wave filter

Table 7- 4 Dimensions of the sine-wave filter (all values in mm)

6SL3000-	2CE32-3AA0	2CE32-8AA0	2CE33-3AA0	2CE34-1AA0	2CF31-7AA0
B	620	620	620	620	620
H	300	300	370	370	370
T	320	320	360	360	360
l1	140	140	140	140	140
h1	180	180	220	220	220
h2	65	65	65	65	65
n1 ¹⁾	280	280	320	320	320
n2 ¹⁾	150	150	150	150	150
n3 ¹⁾	225	225	225	225	225
n4	105	105	105	105	105
d1	12	12	12	12	12
d2	11	11	11	11	11
d3	22	22	22	22	22

¹⁾ The lengths n1, n2 and n3 correspond to the drill hole spacing

7.3 Electrical installation

Connection

When connecting the sine-wave filter, you must take into account the following conditions to ensure that the filter functions correctly:

- With analog control cables, connecting the shield at both ends can result in coupled-in noise. To prevent this, the shield must only be connected at one end on the Power Module.
- Control cables must be routed separately from power cables. Power cables are motor cables or connecting cables from the DC link of the Power Module (terminals DCPA/DCNA) to other components (e.g. Braking Module). In particular, you must ensure that control cables and power cables are not routed in parallel in a joint cable raceway, even if all the cables are shielded.
- The cross-sections of the connection cables to 1U1, 1V1, 1W1 and to 1U2, 1V2, 1W2 must be identical, and must be dimensioned appropriately for the current-carrying capacity and routing method (see Chapter "Technical Specifications" in the SINAMICS G130 Operating Instructions).
- You must use shielded motor cables. The shield for the motor cable must be attached to the shield plate and motor housing.
- The ground wire for the motor must be fed directly back to the Power Module.

7.4 Maintenance and servicing

The sine-wave filter can neither be maintained nor serviced. In the case of a fault, the sine-wave filter must be completely replaced.

7.5 Technical specifications

General technical data

Table 7- 5 General technical data

Output frequency	380 V - 480 V 3 AC: 0 ... 150 Hz 500 V - 600 V 3 AC: 0 ... 115 Hz		
Product standard	EN 61800-5-1		
Ambient conditions	Storage ²⁾	Transport ²⁾	Operation
Ambient temperature	-25 ... +70 °C	-25 ... +70 °C	0 ... +50 °C
Relative air humidity ¹⁾ (condensation not permissible) corresponds to class	5 ... <i>95%</i> 1K4 according to EN 60721-3-1	5 ... 95% at 40 °C 2K3 according to EN 60721-3-2	5 ... <i>95%</i> 3K3 according to EN 60721-3-3
Mechanical strength	Storage ²⁾	Transport ²⁾	Operation
Vibrational load ¹⁾ - Displacement - Acceleration corresponds to class	1.5 mm at 5 ... 9 Hz 5 m/s ² at > 9 ... 200 Hz 1M2 to EN 60721-3-1	3.5 mm at 5 ... 9 Hz 10 m/s ² at > 9 ... 200 Hz 2M2 to EN 60721-3-2	0.075 mm at 10 ... 58 Hz 10 m/s ² at >58 ... 200 Hz -
Shock load ¹⁾ - Acceleration corresponds to class	40 m/s ² at 22 ms 1M2 to EN 60721-3-1	100 m/s ² at 11 ms 2M2 to EN 60721-3-2	100 m/s ² at 11 ms 3M4 to EN 60721-3-3

Deviations from the specified classes are shown in *italics*.

¹⁾ The EN standards specified are the European editions of the international IEC standards with the same designations.

²⁾ In transport packaging

Detailed technical data

Table 7- 6 Technical data for sine-wave filters, 3 AC 380 V ... 480 V

Article number	6SL3000-	2CE32-3AA0	2CE32-3AA0	2CE32-8AA0	2CE33-3AA0	2CE34-1AA0
Suitable for Power Module	6SL3310-	1GE32-1AA3	1GE32-6AA3	1GE33-1AA3	1GE33-8AA3	1GE35-0AA3
Rated current (unit rating) of the Power Module at a 4 kHz pulse frequency		170 A (90 kW)	215 A (110 kW)	270 A (132 kW)	330 A (160 kW)	380 A (200 kW)
Output current at a 4 kHz pulse frequency	A	225	225	276	333	408
Power loss						
- at 50 Hz	kW	0.35	0.35	0.4	0.245	0.38
- at 150 Hz	kW	0.6	0.6	0.69	0.53	0.7
Connections						
- to the Power Module		M10	M10	M10	M10	M10
- load		M10	M10	M10	M10	M10
- PE		M10	M10	M10	M10	M10
Max. permissible cable length between sine-wave filter and motor	m	300 (shielded) 450 (unshielded)				
Degree of protection		IP00	IP00	IP00	IP00	IP00
Dimensions						
Width	mm	620	620	620	620	620
Height	mm	300	300	300	370	370
Depth	mm	320	320	320	360	360
Weight	kg	124	124	127	136	198

7.5 Technical specifications

Table 7- 7 Technical data for sine-wave filters, 3 AC 500 V ... 600 V

Article number	6SL3000-	2CF31-7AA0	2CF31-7AA0			
Suitable for Power Module	6SL3310-	1GF31-8AA3	1GF32-2AA3			
Rated current (unit rating) of the Power Module at a 2.5 kHz pulse frequency		152 A (90 kW)	187 A (110 kW)			
Output current at a 2.5 kHz pulse frequency	A	188	188			
Power loss - at 50 Hz - at 115 Hz	kW kW	0.364 0.8	0.364 0.8			
Connections - to the Power Module - load - PE		M10 M10 M10	M10 M10 M10			
Max. permissible cable length between sine-wave filter and motor	m	300 (shielded) 450 (unshielded)				
Degree of protection		IP00	IP00			
Dimensions						
Width	mm	620	620			
Height	mm	370	370			
Depth	mm	360	360			
Weight	kg	210	210			

Motor reactors

8.1 General

Description

Motor reactors reduce the voltage load on the motor windings by reducing the voltage gradients at the motor terminals that occur during converter operation. At the same time, the capacitive charge/discharge currents that occur at the converter output when long motor cables are used are reduced.

The maximum output frequency when a motor reactor is used is 150 Hz.

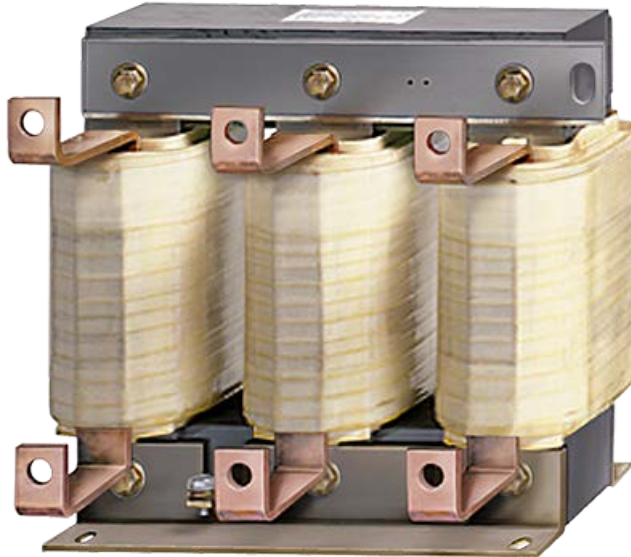


Figure 8-1 Motor reactor

WARNING

Non-observance of the fundamental safety instructions and residual risks

The non-observance of the fundamental safety instructions and residual risks stated in Chapter 1 can result in accidents with severe injuries or death.

- Adhere to the fundamental safety instructions.
- When assessing the risk, take into account residual risks.

 **WARNING**

Fire through overheating due to insufficient ventilation clearances

Inadequate ventilation clearances can cause overheating with a risk for personnel through smoke development and fire. Furthermore, an increased number of failures and shorter service life of the components can occur.

- Maintain 100 mm ventilation clearances above and to the side of the component.

 **CAUTION**

Burns resulting from high surface temperature of the motor reactor

The surface temperature of the motor reactors can exceed 80 °C. You can get seriously burnt when touching the surface.

- Mount the motor reactor so that it cannot be touched. If this is not possible, attach a clearly visible and understandable warning notice at hazardous positions.

NOTICE

Damage to the Motor Module by using components that have not been released

When using components that have not been released, damage or malfunctions can occur at the devices or the system itself.

- Only use motor reactors that SIEMENS has released for SINAMICS.

NOTICE

Risk of damaging the motor reactor by exceeding the maximum output frequency

The maximum permissible output frequency when a motor reactor is used is 150 Hz. The motor reactor can be damaged if the output frequency is exceeded.

- Operate the motor reactor with a maximum output frequency of 150 Hz.

NOTICE

Damage to the motor reactor if the maximum pulse frequency is exceeded

The maximum permissible pulse frequency when a motor reactor is used is 2.5 kHz or 4 kHz. The motor reactor can be damaged if the pulse frequency is exceeded.

- When using the motor reactor, operate the Motor Module with a maximum pulse frequency of 2.5 kHz or 4 kHz.

NOTICE
Damage to the motor reactor if it is not activated during commissioning
The motor reactor may be damaged if it is not activated during commissioning.
<ul style="list-style-type: none"> • Activate the motor reactor during commissioning via parameter p0230 = 1.

Note**Cable lengths**

Keep the connecting cables to the Power Module as short as possible (max. 5 m).

Assignment of motor reactor and Power Module

Table 8- 1 Assignment of motor reactor and Power Module

Power Module	Unit rating of the Power Module	Suitable motor reactor
Line voltage 3 AC 380 – 480 V		
6SL3310-1GE32-1AA3	110 kW	6SL3000-2BE32-1AA0
6SL3310-1GE32-6AA3	132 kW	6SL3000-2BE32-6AA0
6SL3310-1GE33-1AA3	160 kW	6SL3000-2BE33-2AA0
6SL3310-1GE33-8AA3	200 kW	6SL3000-2BE33-8AA0
6SL3310-1GE35-0AA3	250 kW	6SL3000-2BE35-0AA0
6SL3310-1GE36-1AA3	315 kW	6SL3000-2AE36-1AA0
6SL3310-1GE37-5AA3	400 kW	6SL3000-2AE38-4AA0
6SL3310-1GE38-4AA3	450 kW	6SL3000-2AE38-4AA0
6SL3310-1GE41-0AA3	560 kW	6SL3000-2AE41-0AA0
Line voltage 3 AC 500 – 600 V		
6SL3310-1GF31-8AA3	110 kW	6SL3000-2AH31-8AA0
6SL3310-1GF32-2AA3	132 kW	6SL3000-2AH32-4AA0
6SL3310-1GF32-6AA3	160 kW	6SL3000-2AH32-6AA0
6SL3310-1GF33-3AA3	200 kW	6SL3000-2AH33-6AA0
6SL3310-1GF34-1AA3	250 kW	6SL3000-2AH34-5AA0
6SL3310-1GF34-7AA3	315 kW	6SL3000-2AH34-7AA0
6SL3310-1GF35-8AA3	400 kW	6SL3000-2AH35-8AA0
6SL3310-1GF37-4AA3	500 kW	6SL3000-2AH38-1AA0
6SL3310-1GF38-1AA3	560 kW	6SL3000-2AH38-1AA0

Power Module	Unit rating of the Power Module	Suitable motor reactor
Line voltage 3 AC 660 – 690 V		
6SL3310-1GH28-5AA3	75 kW	6SL3000-2AH31-0AA0
6SL3310-1GH31-0AA3	90 kW	6SL3000-2AH31-0AA0
6SL3310-1GH31-2AA3	110 kW	6SL3000-2AH31-5AA0
6SL3310-1GH31-5AA3	132 kW	6SL3000-2AH31-5AA0
6SL3310-1GH31-8AA3	160 kW	6SL3000-2AH31-8AA0
6SL3310-1GH32-2AA3	200 kW	6SL3000-2AH32-4AA0
6SL3310-1GH32-6AA3	250 kW	6SL3000-2AH32-6AA0
6SL3310-1GH33-3AA3	315 kW	6SL3000-2AH33-6AA0
6SL3310-1GH34-1AA3	400 kW	6SL3000-2AH34-5AA0
6SL3310-1GH34-7AA3	450 kW	6SL3000-2AH34-7AA0
6SL3310-1GH35-8AA3	560 kW	6SL3000-2AH35-8AA0
6SL3310-1GH37-4AA3	710 kW	6SL3000-2AH38-1AA0
6SL3310-1GH38-1AA3	800 kW	6SL3000-2AH38-1AA0

Using a motor reactor and dv/dt filter to limit the voltage gradient and transients

IGBT converter switching frequencies result in high voltage gradients (dv/dt) at the converter output. If long motor cables are used, this leads to an additional current load on the converter due to capacitive charge/discharge currents. The high voltage gradients, and the resulting transients at the motor terminals, cause the motors' electrical winding load to increase as compared with direct on-line operation. In conjunction with the connected cable capacitances, the motor reactors with their adapted inductances reduce the capacitive charge/discharge currents in the motor cables and, as a function of these motor cables, limit the voltage gradient (dv/dt) and the transients \hat{U}_{LL} at the motor terminals.

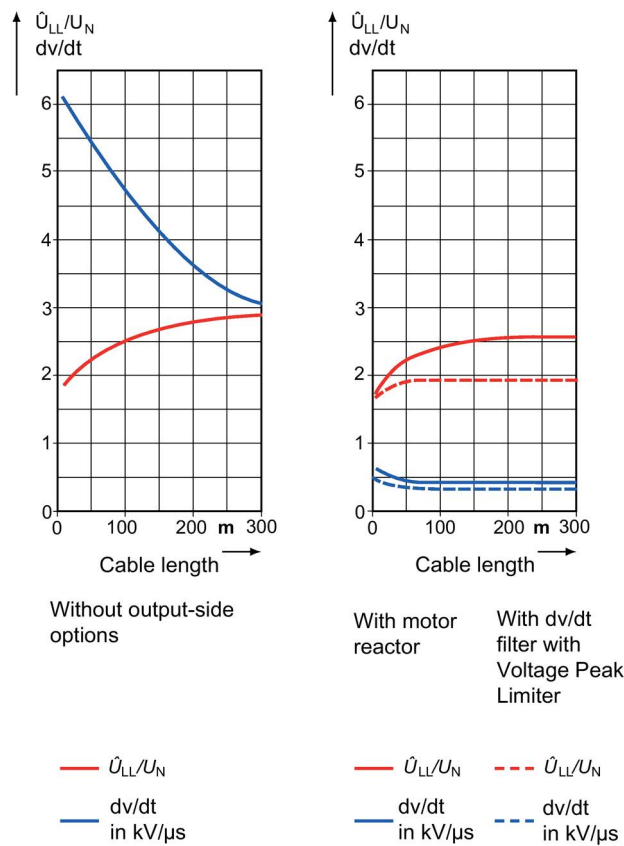


Figure 8-2 Using a motor reactor and dv/dt filter to limit the voltage gradient and transients

8.2 Mechanical installation

Dimension drawing

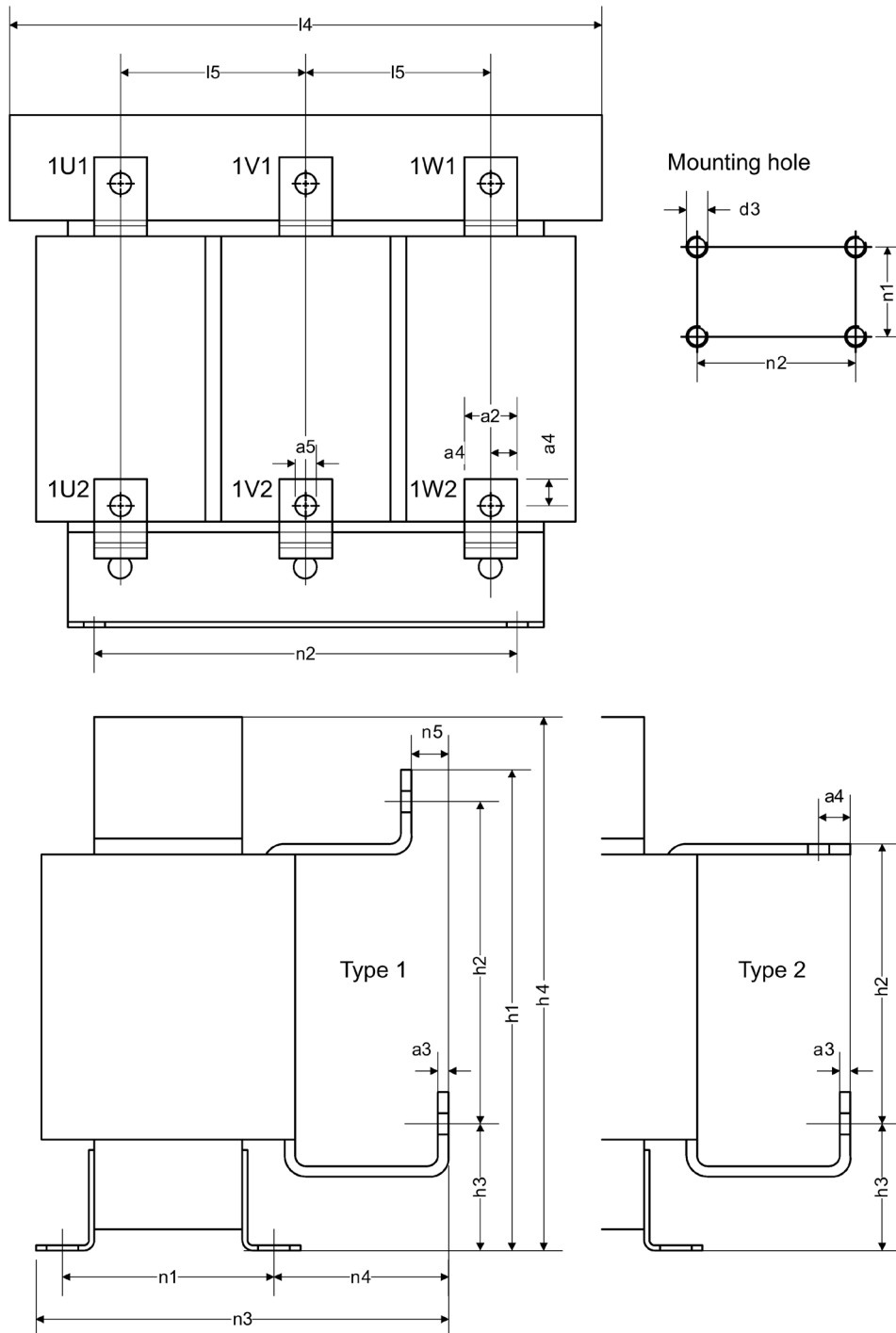


Figure 8-3 Dimension drawing, motor reactor

Table 8- 2 Dimensions of motor reactor, 380 V – 480 V 3 AC, part 1 (all specifications in mm)

6SL3000-	2BE32-1AA0	2BE32-6AA0	2BE33-2AA0	2BE33-8AA0
Connection type	Type 1	Type 1	Type 1	Type 1
a2	25	25	25	25
a3	5	5	5	5
a4	12.5	12.5	12.5	12.5
a5	11	11	11	11
l4	300	300	300	300
l5	100	100	100	100
h1	-	-	-	-
h2	194	227	194	194
h3	60	60	60	60
h4	285	315	285	285
n1 ¹⁾	163	183	163	183
n2 ¹⁾	224	224	224	224
n3	257	277	257	277
n4	79	79	79	79
n5	-	-	-	-
d3	M8	M8	M8	M8
1) Lengths n1 and n2 correspond to the drill hole spacing				

Table 8- 3 Dimensions of motor reactor, 380 V – 480 V 3 AC, part 2 (all specifications in mm)

6SL3000-	2BE35-0AA0	2AE36-1AA0	2AE38-4AA0	2AE41-0AA0
Connection type	Type 2	Type 1	Type 1	Type 1
a2	30	40	40	40
a3	6	8	8	8
a4	15	20	20	20
a5	14	14	14	14
l4	300	410	410	410
l5	100	140	140	140
h1	-	392	392	392
h2	245	252	252	252
h3	60	120	120	120
h4	365	385	385	385
n1 ¹⁾	183	191	191	206
n2 ¹⁾	224	316	316	316
n3	277	292	292	302
n4	79	84.5	84.5	79.5
n5	-	30	30	-
d3	M10	M10	M10	M10
1) Lengths n1 and n2 correspond to the drill hole spacing				

Table 8- 4 Dimensions of motor reactor, 500 V – 600 V 3 AC, part 1 (all specifications in mm)

6SL3000-	2AH31-8AA0	2AH32-4AA0	2AH32-6AA0	2AH33-6AA0
Connection type	Type 1	Type 1	Type 1	Type 1
a2	25	25	25	25
a3	5	5	5	5
a4	12.5	12.5	12.5	12.5
a5	11	11	11	11
l4	300	300	300	300
l5	100	100	100	100
h1	-	-	-	-
h2	194	194	194	194
h3	60	60	60	60
h4	285	285	285	285
n1 ¹⁾	118	118	118	118
n2 ¹⁾	224	224	224	224
n3	212	212	212	212
n4	79	79	79	79
n5	-	-	-	-
d3	M8	M8	M8	M8

¹⁾ Lengths n1 and n2 correspond to the drill hole spacing

Table 8- 5 Dimensions of motor reactor, 500 V – 600 V 3 AC, part 2 (all specifications in mm)

6SL3000-	2AH34-5AA0	2AH34-7AA0	2AH35-8AA0	2AH38-1AA0
Connection type	Type 1	Type 1	Type 1	Type 1
a2	30	40	40	40
a3	6	8	8	8
a4	15	20	20	20
a5	14	14	14	14
l4	350	410	410	410
l5	120	140	140	140
h1	-	392	392	392
h2	235	252	252	252
h3	60	120	120	120
h4	330	385	385	385
n1 ¹⁾	138	141	141	183
n2 ¹⁾	264	316	316	316
n3	215	292	292	279
n4	63	134.5	134.5	79.5
n5	-	30	30	-
d3	M8	M10	M10	M10

¹⁾ Lengths n1 and n2 correspond to the drill hole spacing

Table 8- 6 Dimensions of motor reactor, 660 V – 690 V 3 AC, part 1 (all specifications in mm)

6SL3000-	2AH31-0AA0	2AH31-5AA0	2AH31-8AA0	2AH32-4AA0	2AH32-6AA0
Connection type	Type 1	Type 1	Type 1	Type 1	Type 1
a2	25	25	25	25	25
a3	5	5	5	5	5
a4	12.5	12.5	12.5	12.5	12.5
a5	11	11	11	11	11
l4	270	270	300	300	300
l5	88	88	100	100	100
h1	-	-	-	-	-
h2	150	150	194	194	194
h3	60	60	60	60	60
h4	248	248	285	285	285
n1 ¹⁾	103	103	118	118	118
n2 ¹⁾	200	200	224	224	224
n3	200	200	212	212	212
n4	82	82	79	79	79
n5	-	-	-	-	-
d3	M8	M8	M8	M8	M10

¹⁾ Lengths n1 and n2 correspond to the drill hole spacing

Table 8- 7 Dimensions of motor reactor, 660 V – 690 V 3 AC, part 2 (all specifications in mm)

6SL3000-	2AH33-6AA0	2AH34-5AA0	2AH34-7AA0	2AH35-8AA0	2AH38-1AA0
Connection type	Type 1	Type 1	Type 1	Type 1	Type 1
a2	25	30	40	40	40
a3	5	6	8	8	8
a4	12.5	15	20	20	20
a5	11	14	14	14	14
l4	300	350	410	410	410
l5	100	120	140	140	140
h1	-	-	392	392	392
h2	194	235	252	252	252
h3	60	60	120	120	120
h4	285	330	385	385	385
n1 ¹⁾	118	138	141	141	183
n2 ¹⁾	224	264	316	316	316
n3	212	215	292	292	279
n4	79	63	134.5	134.5	79.5
n5	-	-	30	30	-
d3	M8	M8	M10	M10	M10

¹⁾ Lengths n1 and n2 correspond to the drill hole spacing

8.3 Electrical installation

Connection

When connecting the motor reactor, you must take into account the following conditions to ensure that it functions correctly:

- With analog control cables, connecting the shield at both ends can result in coupled-in noise. To prevent this, the shield must only be connected at one end on the Power Module.
- Control cables must be routed separately from power cables. Power cables are motor cables or connecting cables from the DC link of the Power Module (terminals DCPA/DCNA) to other components (e.g. Braking Module). In particular, you must ensure that control cables and power cables are not routed in parallel in a joint cable raceway, even if all the cables are shielded.
- You must use shielded motor cables. The shield for the motor cable must be attached to the shield plate and motor housing.
- The ground wire for the motor must be fed directly back to the Power Module.

Connection overview

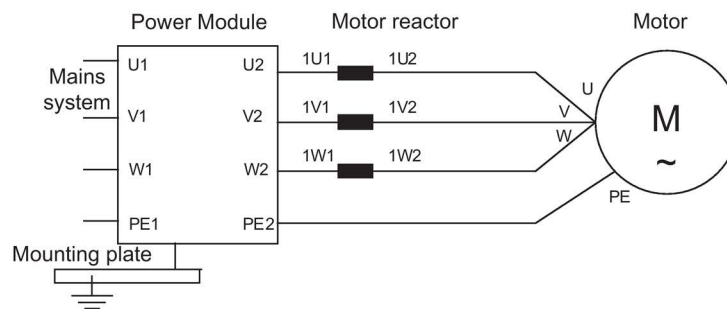


Figure 8-4 Connecting the motor reactor and Power Module

8.4 Maintenance and servicing

The motor reactor can neither be maintained nor serviced. In the case of a fault, the motor reactor must be completely replaced.

8.5 Technical specifications

General technical data

Table 8- 8 General technical data

Output frequency	0 ... 150 Hz		
Product standard	EN 61800-5-1		
Ambient conditions	Storage	Transport	Operation
Ambient temperature	-25 ... +70 °C	-25 ... +70 °C	0 ... +50 °C
Relative air humidity ¹⁾ (condensation not permissible) corresponds to class	5 ... <i>95%</i> 1K4 according to EN 60721-3-1	5 ... 95% at 40 °C 2K3 according to EN 60721-3-2	5 ... <i>95%</i> 3K3 according to EN 60721-3-3
Mechanical strength	Storage	Transport	Operation
Vibrational load ¹⁾ - Displacement - Acceleration corresponds to class	1.5 mm at <i>5 ... 9 Hz</i> 5 m/s ² at > 9 ... 200 Hz 1M2 to EN 60721-3-1	3.5 mm at <i>5 ... 9 Hz</i> 10 m/s ² at > 9 ... 200 Hz 2M2 to EN 60721-3-2	0.075 mm at 10 ... 58 Hz 10 m/s ² at >58 ... 200 Hz -
Shock load ¹⁾ - Acceleration corresponds to class	40 m/s ² at 22 ms 1M2 to EN 60721-3-1	100 m/s ² at 11 ms 2M2 to EN 60721-3-2	100 m/s ² at 11 ms 3M4 to EN 60721-3-3

Deviations from the specified classes are shown in *italics*.

¹⁾ The EN standards specified are the European editions of the international IEC standards with the same designations.

Detailed technical data

Table 8- 9 Technical data for motor reactors, 3 AC 380 V ... 480 V, part 1

Article number	6SL3000-	2BE32-1AA0	2BE32-6AA0	2BE33-2AA0	2BE33-8AA0
Suitable for Power Module	6SL3310-	1GE32-1AA3	1GE32-6AA3	1GE33-1AA3	1GE33-8AA3
Rated current	A	210	260	310	380
Power loss					
- at 50 Hz	kW	0.436	0.454	0.422	0.447
- at 150 Hz	kW	0.486	0.5	0.47	0.5
Connections					
- to the power module (1U1, 1V1, 1W1)		M10	M10	M10	M10
- Load (1U2, 1V2, 1W2)		M10	M10	M10	M10
- PE		M8	M8	M8	M8
Max. permissible cable length between motor reactor and motor	m	300 (shielded) 450 (unshielded)			
Degree of protection		IP00	IP00	IP00	IP00
Dimensions					
Width	mm	300	300	300	300
Height	mm	285	315	285	285
Depth	mm	257	277	257	277
Weight	kg	66	66	66	73

Table 8- 10 Technical data for motor reactors, 3 AC 380 V ... 480 V, part 2

Article number	6SL3000-	2BE35-0AA0	2AE36-1AA0	2AE38-4AA0	2AE38-4AA0
Suitable for Power Module	6SL3310-	1GE35-0AA3	1GE36-1AA3	1GE37-5AA3	1GE38-4AA3
Rated current	A	490	605	840	840
Power loss					
- at 50 Hz	kW	0.448	0.798	0.75	0.834
- at 150 Hz	kW	0.5	0.9	0.84	0.943
Connections					
- to the power module (1U1, 1V1, 1W1)		M12	M12	M12	M12
- Load (1U2, 1V2, 1W2)		M12	M12	M12	M12
- PE		M8	M10	M10	M10
Max. permissible cable length between motor reactor and motor	m	300 (shielded) 450 (unshielded)			
Degree of protection		IP00	IP00	IP00	IP00
Dimensions					
Width	mm	300	410	410	410
Height	mm	365	392	392	392
Depth	mm	277	292	292	292
Weight	kg	100	130	140	140

Table 8- 11 Technical data for motor reactors, 3 AC 380 V ... 480 V, part 3

Article number	6SL3000-	2AE41-0AA0			
Suitable for Power Module	6SL3310-	1GE41-0AA3			
Rated current	A	985			
Power loss					
- at 50 Hz	kW	0.939			
- at 150 Hz	kW	1.062			
Connections					
- to the power module (1U1, 1V1, 1W1)		M12			
- Load (1U2, 1V2, 1W2)		M12			
- PE		M10			
Max. permissible cable length between motor reactor and motor	m	300 (shielded) 450 (unshielded)			
Degree of protection		IP00			
Dimensions					
Width	mm	410			
Height	mm	392			
Depth	mm	302			
Weight	kg	146			

Table 8- 12 Technical data for motor reactors, 3 AC 500 V ... 600 V, part 1

Article number	6SL3000-	2AH31-8AA0	2AH32-4AA0	2AH32-6AA0	2AH33-6AA0
Suitable for Power Module	6SL3310-	1GF31-8AA3	1GF32-2AA3	1GF32-6AA3	1GF33-3AA3
Rated current	A	175	215	260	330
Power loss					
- at 50 Hz	kW	0.357	0.376	0.389	0.4
- at 150 Hz	kW	0.403	0.425	0.441	0.454
Connections					
- to the power module (1U1, 1V1, 1W1)		M10	M10	M10	M10
- Load (1U2, 1V2, 1W2)		M10	M10	M10	M10
- PE		M6	M6	M6	M6
Max. permissible cable length between motor reactor and motor	m	300 (shielded) 450 (unshielded)			
Degree of protection		IP00	IP00	IP00	IP00
Dimensions					
Width	mm	300	300	300	300
Height	mm	285	285	285	285
Depth	mm	212	212	212	212
Weight	kg	34	34	40	46

8.5 Technical specifications

Table 8- 13 Technical data for motor reactors, 3 AC 500 V ... 600 V, part 2

Article number	6SL3000-	2AH34-5AA0	2AH34-7AA0	2AH35-8AA0	2AH38-1AA0
Suitable for Power Module	6SL3310-	1GF34-1AA03	1GF34-7AA3	1GF35-8AA3	1GF37-4AA3
Rated current	A	410	465	575	810
Power loss					
- at 50 Hz	kW	0.481	0.631	0.705	0.79
- at 150 Hz	kW	0.545	0.723	0.801	0.91
Connections					
- to the power module (1U1, 1V1, 1W1)		M12	M12	M12	M12
- Load (1U2, 1V2, 1W2)		M12	M12	M12	M12
- PE		M8	M8	M8	M8
Max. permissible cable length between motor reactor and motor	m	300 (shielded) 450 (unshielded)			
Degree of protection		IP00	IP00	IP00	IP00
Dimensions					
Width	mm	350	410	410	410
Height	mm	330	392	392	392
Depth	mm	215	292	292	279
Weight	kg	68	80	80	146

Table 8- 14 Technical data for motor reactors, 3 AC 500 V ... 600 V, part 3

Article number	6SL3000-	2AH38-1AA0			
Suitable for Power Module	6SL3310-	1GF38-1AA3			
Rated current	A	810			
Power loss					
- at 50 Hz	kW	0.877			
- at 150 Hz	kW	1.003			
Connections					
- to the power module (1U1, 1V1, 1W1)		M12			
- Load (1U2, 1V2, 1W2)		M12			
- PE		M8			
Max. permissible cable length between motor reactor and motor	m	300 (shielded) 450 (unshielded)			
Degree of protection		IP00			
Dimensions					
Width	mm	410			
Height	mm	392			
Depth	mm	279			
Weight	kg	146			

Table 8- 15 Technical data for motor reactors, 3 AC 660 V ... 690 V, part 1

Article number	6SL3000-	2AH31-0AA0	2AH31-0AA0	2AH31-5AA0	2AH31-5AA0
Suitable for Power Module	6SL3310-	1GH28-5AA3	1GH31-0AA3	1GH31-2AA3	1GH31-5AA3
Rated current	A	100	100	150	150
Power loss					
- at 50 Hz	kW	0.215	0.269	0.237	0.296
- at 150 Hz	kW	0.26	0.3	0.26	0.332
Connections					
- to the power module (1U1, 1V1, 1W1)		M10	M10	M10	M10
- Load (1U2, 1V2, 1W2)		M10	M10	M10	M10
- PE		M6	M6	M6	M6
Max. permissible cable length between motor reactor and motor	m	300 (shielded) 450 (unshielded)			
Degree of protection		IP00	IP00	IP00	IP00
Dimensions					
Width	mm	270	270	270	270
Height	mm	248	248	248	248
Depth	mm	200	200	200	200
Weight	kg	25	25	25.8	25.8

Table 8- 16 Technical data for motor reactors, 3 AC 660 V ... 690 V, part 2

Article number	6SL3000-	2AH31-8AA0	2AH32-4AA0	2AH32-6AA0	2AH33-6AA0
Suitable for Power Module	6SL3310-	1GH31-8AA3	1GH32-2AA3	1GH32-6AA3	1GH33-3AA3
Rated current	A	175	215	260	330
Power loss					
- at 50 Hz	kW	0.357	0.376	0.389	0.4
- at 150 Hz	kW	0.403	0.425	0.441	0.454
Connections					
- to the power module (1U1, 1V1, 1W1)		M10	M10	M10	M10
- Load (1U2, 1V2, 1W2)		M10	M10	M10	M10
- PE		M6	M6	M6	M6
Max. permissible cable length between motor reactor and motor	m	300 (shielded) 450 (unshielded)			
Degree of protection		IP00	IP00	IP00	IP00
Dimensions					
Width	mm	300	300	300	300
Height	mm	285	285	285	285
Depth	mm	212	212	212	212
Weight	kg	34	34	40	46

8.5 Technical specifications

Table 8- 17 Technical data for motor reactors, 3 AC 660 V ... 690 V, part 3

Article number	6SL3000-	2AH34-5AA0	2AH34-7AA0	2AH35-8AA0	2AH38-1AA0
Suitable for Power Module	6SL3310-	1GH34-1AA3	1GH34-7AA3	1GH35-8AA3	1GH37-4AA3
Rated current	A	410	465	575	810
Power loss					
- at 50 Hz	kW	0.481	0.631	0.705	0.78
- at 150 Hz	kW	0.545	0.723	0.801	0.91
Connections					
- to the power module (1U1, 1V1, 1W1)		M12	M12	M12	M12
- Load (1U2, 1V2, 1W2)		M12	M12	M12	M12
- PE		M8	M8	M8	M8
Max. permissible cable length between motor reactor and motor	m	300 (shielded) 450 (unshielded)			
Degree of protection		IP00	IP00	IP00	IP00
Dimensions					
Width	mm	350	410	410	410
Height	mm	330	392	392	392
Depth	mm	215	292	292	279
Weight	kg	68	80	80	146

Table 8- 18 Technical data for motor reactors, 3 AC 660 V ... 690 V, part 4

Article number	6SL3000-	2AH38-1AA0			
Suitable for Power Module	6SL3310-	1GH38-1AA3			
Rated current	A	810			
Power loss					
- at 50 Hz	kW	0.877			
- at 150 Hz	kW	1.003			
Connections					
- to the power module (1U1, 1V1, 1W1)		M12			
- Load (1U2, 1V2, 1W2)		M12			
- PE		M8			
Max. permissible cable length between motor reactor and motor	m	300 (shielded) 450 (unshielded)			
Degree of protection		IP00			
Dimensions					
Width	mm	410			
Height	mm	392			
Depth	mm	279			
Weight	kg	146			

du/dt filter plus Voltage Peak Limiter

9.1 General

Description

The dv/dt filter plus voltage peak limiter comprises two components: the dv/dt reactor and the Voltage Peak Limiter, which cuts off the voltage peaks and returns the energy to the DC link.

The dv/dt filters plus Voltage Peak Limiter must be used for motors for which the proof voltage of the insulation system is unknown or insufficient.

dv/dt filters plus Voltage Peak Limiters limit the rate of voltage rise to values $< 500 \text{ V}/\mu\text{s}$ and the typical voltage peaks with rated line voltages to the values below:

$< 1000 \text{ V}$ at $U_{\text{line}} < 575 \text{ V}$

$< 1250 \text{ V}$ at $660 \text{ V} < U_{\text{line}} < 690 \text{ V}$.

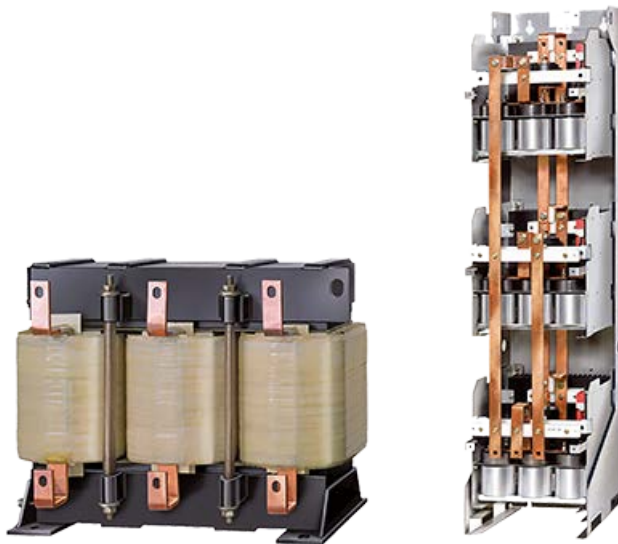


Figure 9-1 Du/dt filter plus Voltage Peak Limiter

 **WARNING**

Non-observance of the fundamental safety instructions and residual risks

The non-observance of the fundamental safety instructions and residual risks stated in Chapter 1 can result in accidents with severe injuries or death.

- Adhere to the fundamental safety instructions.
- When assessing the risk, take into account residual risks.

 **WARNING**

Fire through overheating due to insufficient ventilation clearances

Inadequate ventilation clearances can cause overheating with a risk for personnel through smoke development and fire. Furthermore, an increased number of failures and shorter service life of the components can occur.

- Ensure 100 mm ventilation clearances above and below the component.

 **CAUTION**

Burns resulting from high surface temperature of the dv/dt reactor

The surface temperature of the dv/dt reactors may exceed 80 °C. You can get seriously burnt when touching the surface.

- Mount the dv/dt reactor so that it cannot be touched. If this is not possible, attach a clearly visible and understandable warning notice at hazardous positions.

NOTICE

Damage to the Voltage Peak Limiter due to interchanged connections

The Voltage Peak Limiter will be damaged if the input and output connections are interchanged.

- Connect the incoming cable from the DC link of the Power Module to DCPS, DCNS.
- Connect the outgoing cable for the dv/dt reactor to 1U2, 1V2, 1W2.

NOTICE

Damage to the dv/dt filter by using components that have not been released

When using components that have not been released, damage or malfunctions can occur at the devices or the system itself.

- Only use dv/dt filters that SIEMENS has released for operation with SINAMICS.

NOTICE

Damage to the dv/dt filter by exceeding the maximum output frequency

The maximum permissible output frequency when using a dv/dt filter is 150 Hz. The dv/dt filter can be damaged if the output frequency is exceeded.

- Operate the dv/dt filter with a maximum output frequency of 150 Hz.

NOTICE

Damage to the dv/dt filter by exceeding the maximum pulse frequency

The maximum permissible pulse frequency when using a dv/dt filter is 2.5 kHz or 4 kHz. The dv/dt filter can be damaged if the pulse frequency is exceeded.

- When using the dv/dt filter, operate the Power Module with a maximum pulse frequency of 2.5 kHz or 4 kHz.

NOTICE

Damage to the dv/dt filter if it is not activated during commissioning

The dv/dt filter may be damaged if it is not activated during commissioning.

- Activate the dv/dt filter during commissioning via parameter p0230 = 2.

NOTICE

Damage to the dv/dt filter if a motor is not connected

dv/dt filters which are operated without a motor being connected can be damaged or destroyed.

- Never operate a dv/dt filter connected to the Power Module without a connected motor.

Note

Cable lengths

Keep the connecting cables to the Power Module as short as possible (max. 5 m).

Assignment of dv/dt filter plus Voltage Peak Limiter and Power Module

Table 9- 1 Assignment of dv/dt filter plus Voltage Peak Limiter and Power Module

Power Module	Unit rating of the Power Module	Matching dv/dt filter plus Voltage Peak Limiter
Line voltage 3 AC 380 ... 480 V		
6SL3310-1GE32-1AA3	110 kW	6SL3000-2DE32-6AA0
6SL3310-1GE32-6AA3	132 kW	6SL3000-2DE32-6AA0
6SL3310-1GE33-1AA3	160 kW	6SL3000-2DE35-0AA0
6SL3310-1GE33-8AA3	200 kW	6SL3000-2DE35-0AA0
6SL3310-1GE35-0AA3	250 kW	6SL3000-2DE35-0AA0
6SL3310-1GE36-1AA3	315 kW	6SL3000-2DE38-4AA0
6SL3310-1GE37-5AA3	400 kW	6SL3000-2DE38-4AA0
6SL3310-1GE38-4AA3	450 kW	6SL3000-2DE38-4AA0
6SL3310-1GE41-0AA3	560 kW	6SL3000-2DE41-4AA0
Line voltage 3 AC 500 ... 600 V		
6SL3310-1GF31-8AA3	110 kW	6SL3000-2DH32-2AA0
6SL3310-1GF32-2AA3	132 kW	6SL3000-2DH32-2AA0
6SL3310-1GF32-6AA3	160 kW	6SL3000-2DH33-3AA0
6SL3310-1GF33-3AA3	200 kW	6SL3000-2DH33-3AA0
6SL3310-1GF34-1AA3	250 kW	6SL3000-2DH34-1AA0
6SL3310-1GF34-7AA3	315 kW	6SL3000-2DH35-8AA0
6SL3310-1GF35-8AA3	400 kW	6SL3000-2DH35-8AA0
6SL3310-1GF37-4AA3	500 kW	6SL3000-2DH38-1AA0
6SL3310-1GF38-1AA3	560 kW	6SL3000-2DH38-1AA0
Line voltage 3 AC 660 ... 690 V		
6SL3310-1GH28-5AA3	75 kW	6SL3000-2DH31-0AA0
6SL3310-1GH31-0AA3	90 kW	6SL3000-2DH31-0AA0
6SL3310-1GH31-2AA3	110 kW	6SL3000-2DH31-5AA0
6SL3310-1GH31-5AA3	132 kW	6SL3000-2DH31-5AA0
6SL3310-1GH31-8AA3	160 kW	6SL3000-2DH32-2AA0
6SL3310-1GH32-2AA3	200 kW	6SL3000-2DH32-2AA0
6SL3310-1GH32-6AA3	250 kW	6SL3000-2DH33-3AA0
6SL3310-1GH33-3AA3	315 kW	6SL3000-2DH33-3AA0
6SL3310-1GH34-1AA3	400 kW	6SL3000-2DH34-1AA0
6SL3310-1GH34-7AA3	450 kW	6SL3000-2DH35-8AA0
6SL3310-1GH35-8AA3	560 kW	6SL3000-2DH35-8AA0
6SL3310-1GH37-4AA3	710 kW	6SL3000-2DH38-1AA0
6SL3310-1GH38-1AA3	800 kW	6SL3000-2DH38-1AA0

Table 9- 2 Max. pulse frequency when a dv/dt filter is used in units with a rated pulse frequency of 2 kHz

Article no. 6SL3310-...	Power [kW]	Output current for a pulse frequency of 2 kHz [A]	Max. pulse frequency when a dv/dt filter is used
Line voltage 3 AC 380 V ... 480 V			
1GE32-1AA3	110	210	4 kHz
1GE32-6AA3	132	260	4 kHz
1GE33-1AA3	160	310	4 kHz
1GE33-8AA3	200	380	4 kHz
1GE35-0AA3	250	490	4 kHz

Table 9- 3 Max. pulse frequency when a dv/dt filter is used in units with a rated pulse frequency of 1.25 kHz

Article no. 6SL3310-...	Power [kW]	Output current for a pulse frequency of 1.25 kHz [A]	Max. pulse frequency when a dv/dt filter is used
Line voltage 3 AC 380 V ... 480 V			
1GE36-1AA3	315	605	2.5 kHz
1GE37-5AA3	400	745	2.5 kHz
1GE38-4AA3	450	840	2.5 kHz
1GE41-0AA3	560	985	2.5 kHz
Line voltage 3 AC 500 V ... 600 V			
1GF31-8AA3	110	175	2.5 kHz
1GF32-2AA3	132	215	2.5 kHz
1GF32-6AA3	160	260	2.5 kHz
1GF33-3AA3	200	330	2.5 kHz
1GF34-1AA3	250	410	2.5 kHz
1GF34-7AA3	315	465	2.5 kHz
1GF35-8AA3	400	575	2.5 kHz
1GF37-4AA3	450	735	2.5 kHz
1GF38-1AA3	560	810	2.5 kHz
Line voltage 3 AC 660 V ... 690 V			
1GH28-5AA3	75	85	2.5 kHz
1GH31-0AA3	90	100	2.5 kHz
1GH31-2AA3	110	120	2.5 kHz
1GH31-5AA3	132	150	2.5 kHz
1GH31-8AA3	160	175	2.5 kHz
1GH32-2AA3	200	215	2.5 kHz
1GH32-6AA3	250	260	2.5 kHz
1GH33-3AA3	315	330	2.5 kHz
1GH34-1AA3	400	410	2.5 kHz
1GH34-7AA3	450	465	2.5 kHz
1GH35-8AA3	560	575	2.5 kHz
1GH37-4AA3	710	735	2.5 kHz
1GH38-1AA3	800	810	2.5 kHz

9.1 General

Components

The article numbers of the individual components (dv/dt reactor and Voltage Peak Limiter) are listed in the following table:

Table 9- 4 dv/dt filter plus Voltage Peak Limiter, article number of the individual components

dv/dt filter plus Voltage Peak Limiter	dv/dt reactor	Voltage Peak Limiter
Line voltage 3 AC 380 V ... 480 V		
6SL3000-2DE32-6AA0	6SL3000-2DE32-6CA0	6SL3000-2DE32-6BA0
6SL3000-2DE35-0AA0	6SL3000-2DE35-0CA0	6SL3000-2DE35-0BA0
6SL3000-2DE38-4AA0	6SL3000-2DE38-4CA0	6SL3000-2DE38-4BA0
6SL3000-2DE41-4AA0	2 x 6SL3000-2DE41-4DA0	6SL3000-2DE41-4BA0
Line voltage 3 AC 500 V ... 600 V and 3 AC 660 V ... 690 V		
6SL3000-2DH31-0AA0	6SL3000-2DH31-0CA0	6SL3000-2DH31-0BA0
6SL3000-2DH31-5AA0	6SL3000-2DH31-5CA0	6SL3000-2DH31-5BA0
6SL3000-2DH32-2AA0	6SL3000-2DH32-2CA0	6SL3000-2DH32-2BA0
6SL3000-2DH33-3AA0	6SL3000-2DH33-3CA0	6SL3000-2DH33-3BA0
6SL3000-2DH34-1AA0	6SL3000-2DH34-1CA0	6SL3000-2DH34-1BA0
6SL3000-2DH35-8AA0	6SL3000-2DH35-8CA0	6SL3000-2DH35-8BA0
6SL3000-2DH38-1AA0	2 x 6SL3000-2DH38-1DA0	6SL3000-2DH38-1BA0

Limiting the rate of voltage rise and the voltage peaks by means of the motor reactor and dv/dt filter plus Voltage Peak Limiter

IGBT converter switching frequencies result in high voltage gradients (dv/dt) at the converter output. If long motor cables are used, this leads to an additional current load on the converter due to capacitive charge/discharge currents. The high voltage gradients, and the resulting transients at the motor terminals, cause the motors' electrical winding load to increase as compared with direct on-line operation.

The dv/dt filter plus Voltage Peak Limiter limits the rate of voltage rise to values $< 500 \text{ V}/\mu\text{s}$ and the typical voltage peaks \hat{U}_{LL} to the following values (with motor cable lengths of $\leq 150 \text{ m}$):

- $< 1000 \text{ V}$ at $U_{line} \leq 575 \text{ V}$
- $< 1250 \text{ V}$ at $660 \text{ V} \leq U_{line} \leq 690 \text{ V}$

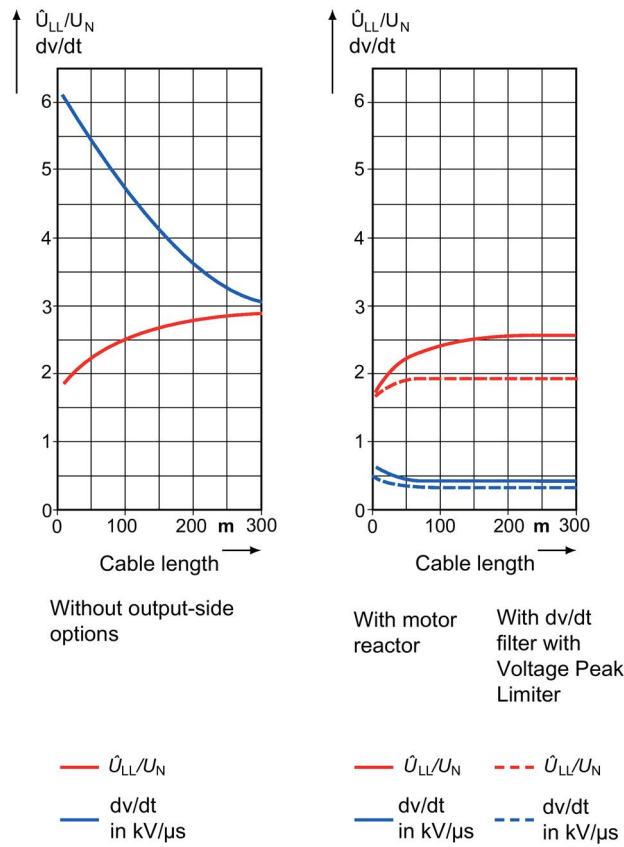


Figure 9-2 Limiting the rate of voltage rise and the voltage peaks by means of the motor reactor and dv/dt filter plus Voltage Peak Limiter

9.2 Mechanical installation

When the dv/dt filter plus Voltage Peak Limiter is installed in a cabinet, it must be positioned near the Power Module.

Dimension drawing

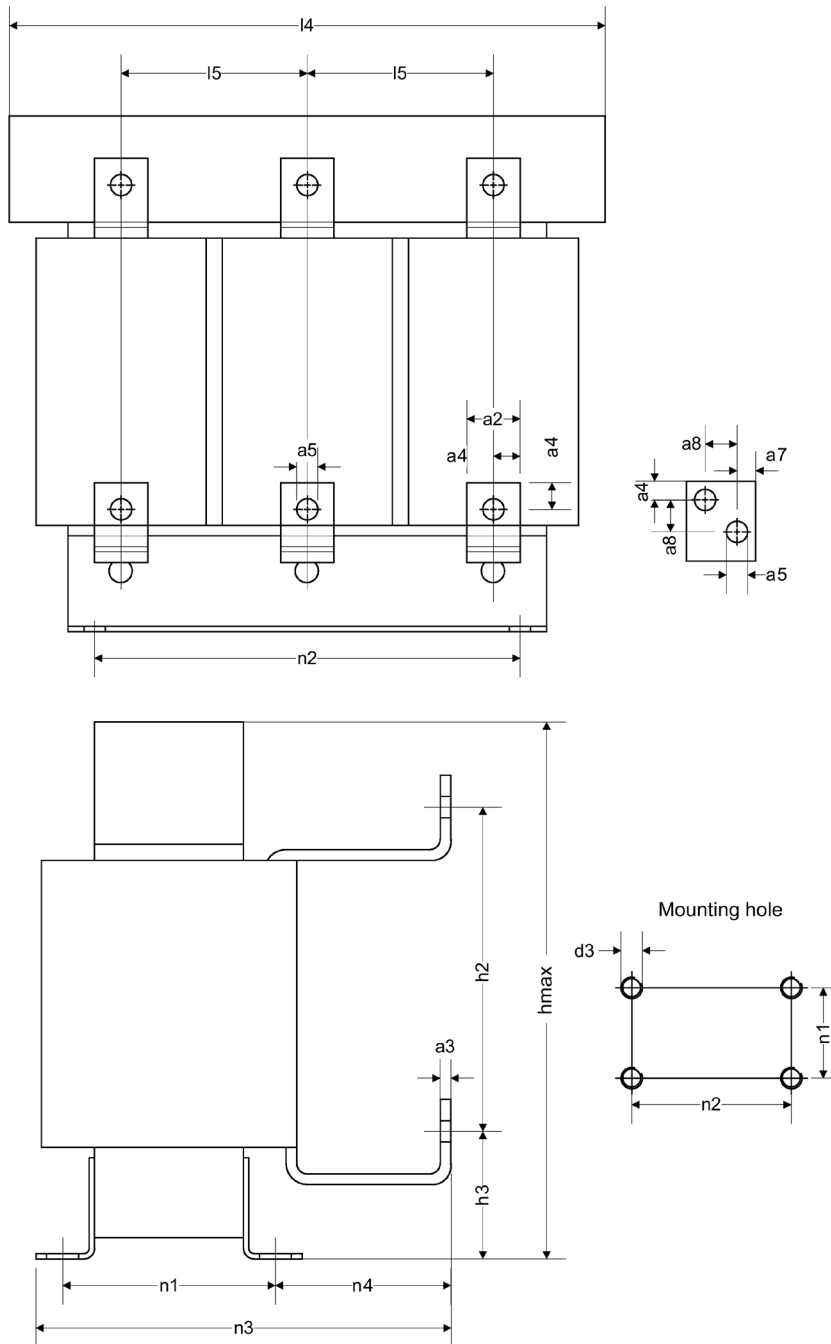


Figure 9-3 Dimension drawing, dv/dt reactor

Table 9- 5 Dimensions of du/dt reactor, line voltage 3 AC 380 V - 480 V (all values in mm)

6SL3000-	2DE32-6CA0	2DE35-0CA0	2DE38-4CA0	2DE41-4DA0
a2	25	30	40	60
a3	5	6	8	10
a4	14	17	22	19
a5	10.5 x 14	14 x 18	14 x 18	14 x 18
a6	7	9	11	11
a7	-	-	-	17
a8	-	-	-	26
l4	410	460	460	445
l5	135	152.5	152.5	145
hmax	370	370	385	385
h2	258	240	280	250
h3	76	83	78	121
n1 ¹⁾	141	182	212	212
n2 ¹⁾	316	356	356	341
n3	229	275	312	312
n4	72	71	78	78
d3	M10 (12 x 18)	M12 (15 x 22)	M12 (15 x 22)	M12 (15 x 22)

¹⁾ Lengths n1 and n2 correspond to the drill hole spacing

Table 9- 6 Dimensions of dv/dt reactor, line voltage 3-phase 500 - 600 VAC and 660 - 690 VAC, Part 1 (all values in mm)

6SL3000-	2DH31-0CA0	2DH31-5CA0	2DH32-2CA0	2DH33-3CA0
a2	25	25	25	25
a3	6	6	5	5
a4	14	14	14	14
a5	10.5 x 14	10.5 x 14	10.5 x 14	10.5 x 14
a6	7	7	7	9
a7	-	-	-	-
a8	-	-	-	-
l4	350	350	460	460
l5	120	120	152.5	152.5
hmax	320	320	360	360
h2	215	215	240	240
h3	70	70	86	86
n1 ¹⁾	138	138	155	212
n2 ¹⁾	264	264	356	356
n3	227	227	275	275
n4	74	74	101	42
d3	M8	M8	M12 (15 x 22)	M12 (15 x 22)

¹⁾ Lengths n1 and n2 correspond to the drill hole spacing

9.2 Mechanical installation

Table 9- 7 Dimensions of dv/dt reactor, line voltage 3-phase 500 - 600 VAC and 660 - 690 VAC, Part 2 (all values in mm)

6SL3000-	2DH34-1CA0	2DH35-8CA0	2DH38-1DA0	
a2	30	40	50	
a3	6	8	8	
a4	17	22	16	
a5	14 x 18	14 x 18	14 x 18	
a6	11	11	11	
a7	-	-	14	
a8	-	-	22	
l4	460	460	445	
l5	152.5	152.5	145	
hmax	385	385	385	
h2	280	280	255	
h3	83	78	114	
n1 ¹⁾	212	212	212	
n2 ¹⁾	356	356	341	
n3	312	312	312	
n4	78	78	78	
d3	M12 (15 x 22)	M12 (15 x 22)	M12 (15 x 22)	

¹⁾ Lengths n1 and n2 correspond to the drill hole spacing

Dimension drawing of the Voltage Peak Limiter

Table 9- 8 Assigning Voltage Peak Limiters to dimension drawings

Voltage Peak Limiter	Dimension drawing type
Line voltage 3-phase 380 – 480 VAC	
6SL3000-2DE32-6BA0	Type 1
6SL3000-2DE35-0BA0	Type 2
6SL3000-2DE38-4BA0	Type 3
6SL3000-2DE41-4BA0	Type 3
Line voltage 3-phase 500 - 600 VAC and 660 - 690 VAC	
6SL3000-2DH31-0BA0	Type 1
6SL3000-2DH31-5BA0	Type 1
6SL3000-2DH32-2BA0	Type 2
6SL3000-2DH33-3BA0	Type 2
6SL3000-2DH34-1BA0	Type 3
6SL3000-2DH35-8BA0	Type 3
6SL3000-2DH38-1BA0	Type 3

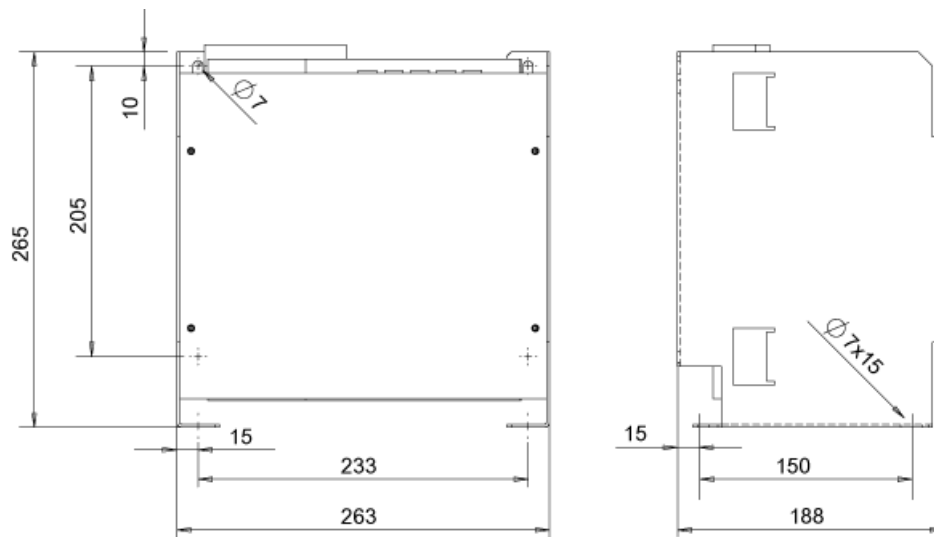


Figure 9-4 Dimension drawing of the Voltage Peak Limiter, type 1

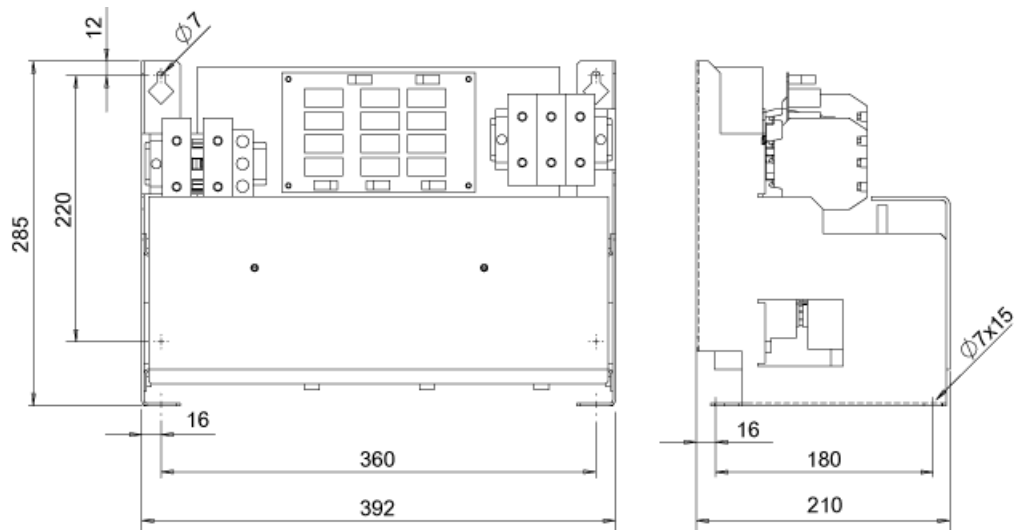


Figure 9-5 Dimension drawing of the Voltage Peak Limiter, type 2

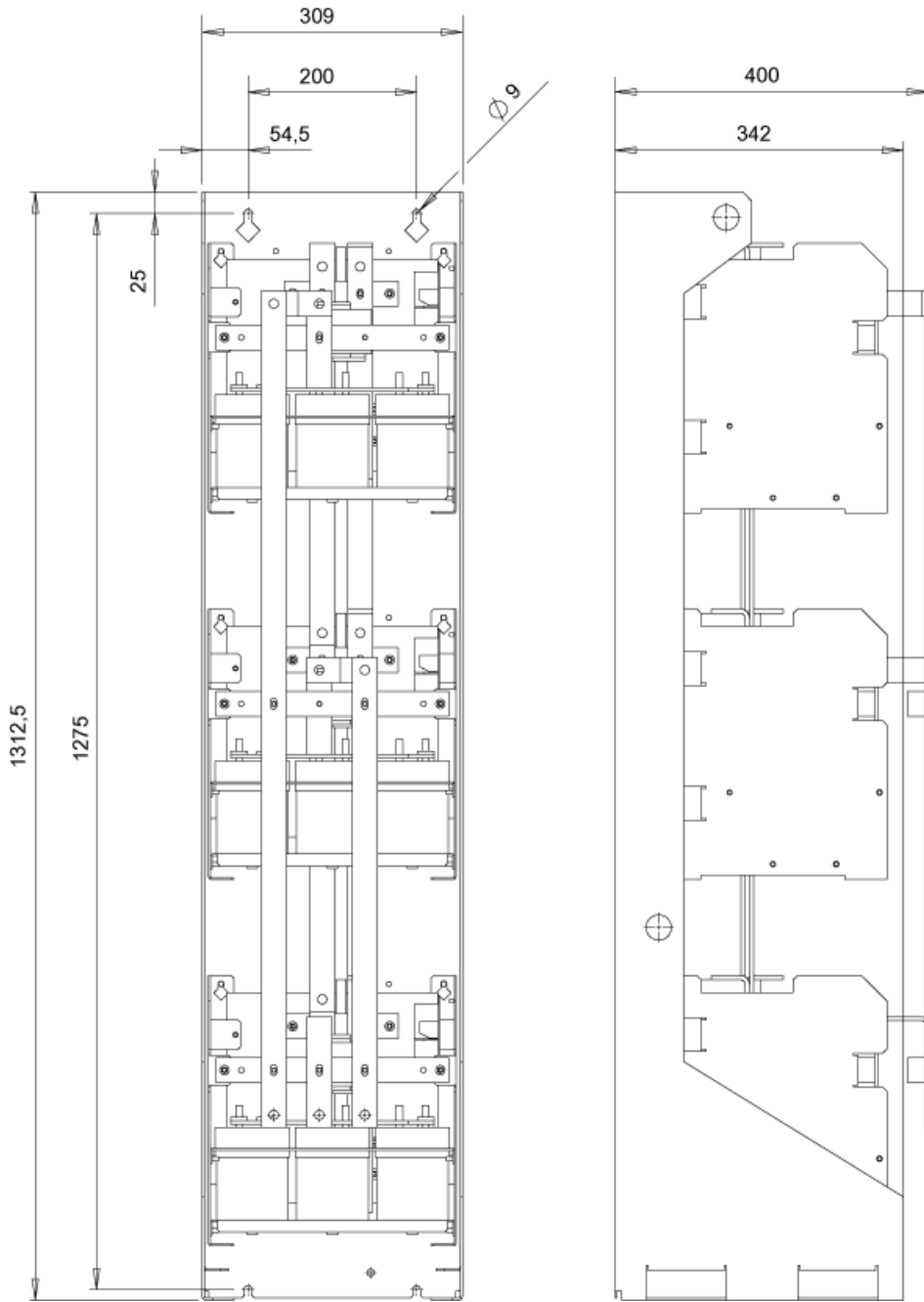


Figure 9-6 Dimension drawing of the Voltage Peak Limiter, type 3

9.3 Electrical installation

Interface overview

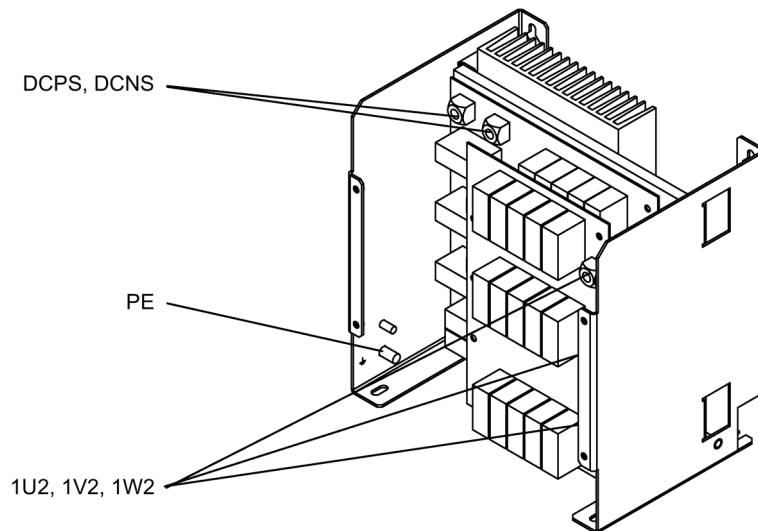


Figure 9-7 Interface overview, Voltage Peak Limiter, type 1

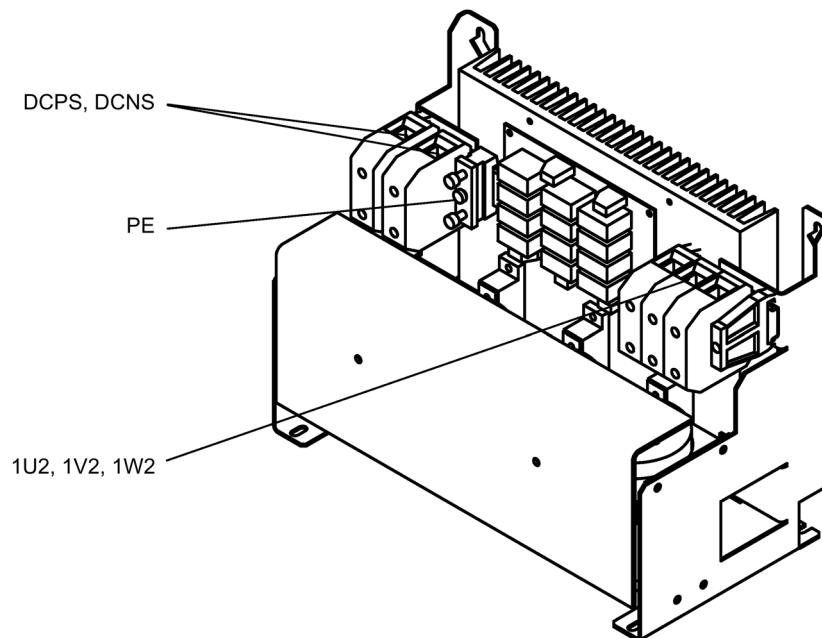


Figure 9-8 Interface overview, Voltage Peak Limiter, type 2

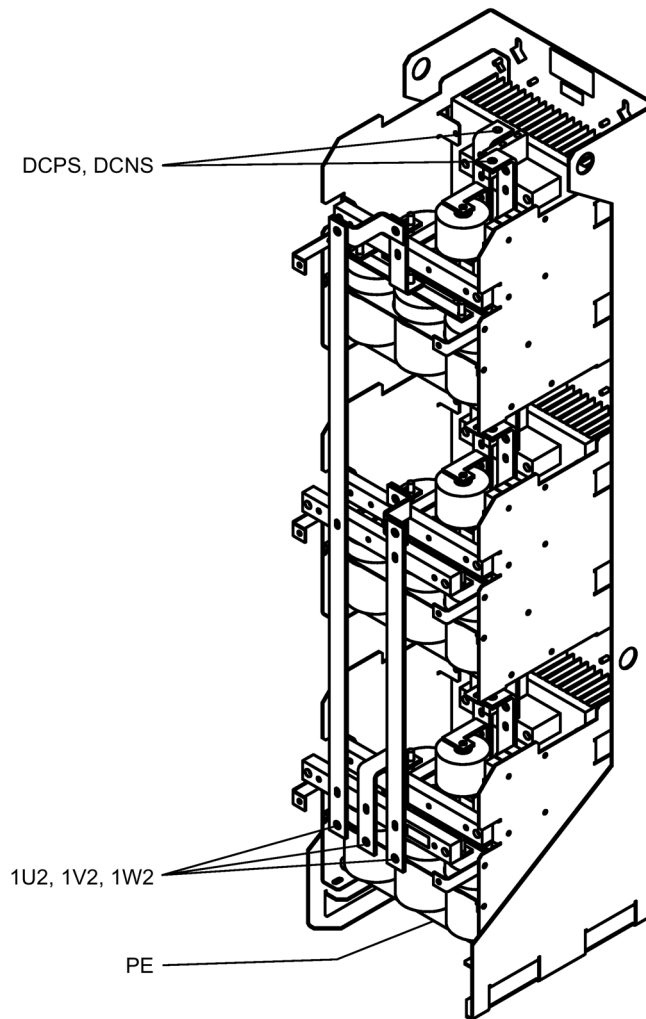


Figure 9-9 Interface overview, Voltage Peak Limiter, type 3

Connection

When connecting the dv/dt reactor and Voltage Peak Limiter, you must take into account the following conditions to ensure that it functions correctly:

- Control cables must be routed separately from power cables. Power cables are the motor cable or the connecting cables from the DC link of the Power Module (terminals DCPS/DCNS) to the Voltage Peak Limiter. In particular, you must ensure that control cables and power cables are not routed in parallel in a joint cable raceway, even if all the cables are shielded.
- It is recommended to use shielded motor cables. If a shielded motor cable is used, its shield should be in face-to-face contact with the shield plate and motor housing.
- The ground wire for the motor must be fed directly back to the Power Module.

Connection overview

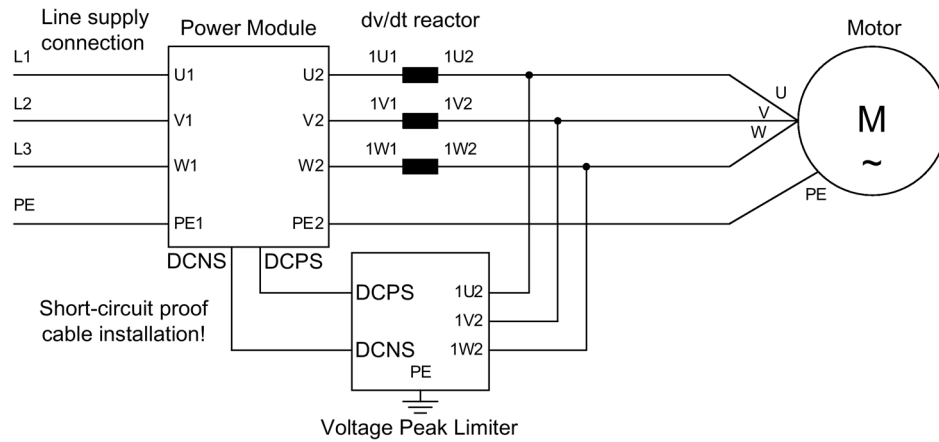


Figure 9-10 Connecting a dv/dt filter plus Voltage Peak Limiter for versions with one dv/dt reactor

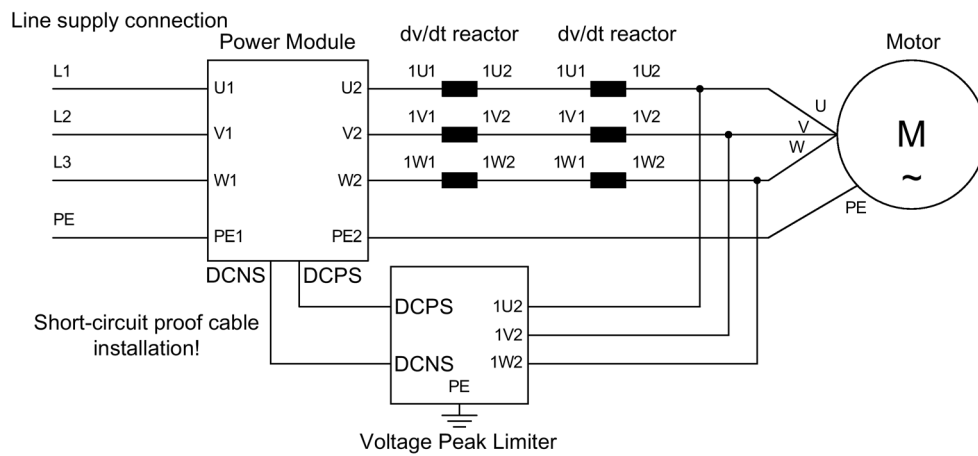



Figure 9-11 Connecting a dv/dt filter plus Voltage Peak Limiter for versions with two dv/dt reactors

Cable cross-sections

Table 9- 9 Cable cross-sections for connections between the dv/dt filter plus Voltage Peak Limiter and Power Module

dv/dt filter plus Voltage Peak Limiter	Connection to the DC link (DCPS/DCNS) [mm ²]	Connection between dv/dt reactor and Voltage Peak Limiter (1U2, 1V2, 1W2) [mm ²]
Line voltage 3-phase 380 – 480 VAC		
6SL3000-2DE32-6AA0	35	10
6SL3000-2DE35-0AA0	70	16
6SL3000-2DE38-4AA0	2 x 50	50
6SL3000-2DE41-4AA0	2 x 120	120
Line voltage 3-phase 500 - 600 VAC and 660 - 690 VAC		
6SL3000-2DH31-0AA0	16	6
6SL3000-2DH31-5AA0	16	6
6SL3000-2DH32-2AA0	70	16
6SL3000-2DH33-3AA0	70	16
6SL3000-2DH34-1AA0	120	35
6SL3000-2DH35-8AA0	120	35
6SL3000-2DH38-1AA0	2 x 70	70

<p> WARNING</p> <p>Fire and device damage as a result of ground fault/short-circuit</p> <p>Inadequate installation of the cables to the Power Module DC link can result in a ground fault/short-circuit and place persons at risk as a result of the associated smoke and fire.</p> <ul style="list-style-type: none"> • Comply with local installation regulations that enable this fault to be ruled out. • Protect the cables from mechanical damage. • In addition, apply one of the following measures: <ul style="list-style-type: none"> – Use cables with double insulation. – Maintain adequate clearance, e.g. by using spacers. – Lay the cables in separate cable ducts or conduits.
--

Note
Maximum cable lengths

The connections should be kept as short as possible.
 The maximum cable length for the specified connections is 5 m in each case.

9.4 Maintenance and servicing

Maintenance and servicing are not carried out for the dv/dt reactor and the Voltage Peak Limiter. In the case of an error, full replacement of the dv/dt filter is necessary.

9.5 Technical specifications

General technical data

Table 9- 10 General technical data

Output frequency	0 ... 150 Hz		
Product standard	EN 61800-5-1		
Ambient conditions	Storage	Transport	Operation
Ambient temperature	-25 ... +70 °C	-25 ... +70 °C	0 ... +50 °C
Relative air humidity ¹⁾ (condensation not permissible) corresponds to class	5 ... <i>95%</i> 1K4 according to EN 60721-3-1	5 ... 95% at 40 °C 2K3 according to EN 60721-3-2	5 ... <i>95%</i> 3K3 according to EN 60721-3-3
Mechanical strength	Storage	Transport	Operation
Vibrational load ¹⁾ - Displacement - Acceleration corresponds to class	1.5 mm at 5 to 9 Hz 5 m/s ² at > 9 to 200 Hz 1M2 to EN 60721-3-1	3.5 mm at 5 to 9 Hz 10 m/s ² at > 9 to 200 Hz 2M2 to EN 60721-3-2	0.075 mm at 10 to 58 Hz 10 m/s ² at >58 to 200 Hz -
Shock load ¹⁾ - Acceleration corresponds to class	40 m/s ² at 22 ms 1M2 to EN 60721-3-1	100 m/s ² at 11 ms 2M2 to EN 60721-3-2	100 m/s ² at 11 ms 3M4 to EN 60721-3-3

Deviations from the specified classes are shown in *italics*.

¹⁾ The EN standards specified are the European editions of the international IEC standards with the same designations.

Detailed technical data

Table 9- 11 Technical data for the dv/dt filter plus Voltage Peak Limiter, 3 AC 380 V ... 480 V

Article number	6SL3000-	2DE32-6AA0	2DE35-0AA0	2DE38-4AA0	2DE41-4AA0 ¹
Suitable for Power Module	6SL3310-	1GE32-1AA3 1GE32-6AA3	1GE33-1AA3 1GE33-8AA3 1GE35-0AA3	1GE36-1AA3 1GE37-5AA3 1GE38-4AA3	1GE41-0AA3
Unit rating of the Power Module	kW	110 132	160 200 250	315 400 450	560
I _{thmax}	A	260	490	840	1405
Degree of protection		IP00	IP00	IP00	IP00
dv/dt reactor					
Power loss					
- at 50 Hz	kW	0.701	0.874	1.106	1.111
- at 60 Hz	kW	0.729	0.904	1.115	1.154
- at 150 Hz	kW	0.78	0.963	1.226	1.23
Connections					
- to the Power Module		M10	M12	M12	2 x M12
- Load		M10	M12	M12	2 x M12
- PE		M6	M6	M6	M6
Max. permissible cable length between dv/dt reactor and motor	m	300 (shielded) 450 (unshielded)			
Dimensions					
Width	mm	410	460	460	445
Height	mm	370	370	385	385
Depth	mm	229	275	312	312
Weight, approx.	kg	66	122	149	158
Voltage Peak Limiter					
Power loss					
- at 50 Hz	kW	0.029	0.042	0.077	0.134
- at 60 Hz	kW	0.027	0.039	0.072	0.125
- at 150 Hz	kW	0.025	0.036	0.066	0.114
Connections					
- to the dv/dt reactor		M8	Terminal 70 mm ²	M8	M10
- DC		M8	Terminal 70 mm ²	M8	M10
- PE		M8	Terminal 35 mm ²	M8	M8
Dimensions					
Width	mm	263	392	309	309
Height	mm	265	285	1312.5	1312.5
Depth	mm	188	210	400	400
Weight, approx.	kg	6	16	48	72

¹⁾ Two dv/dt reactors are required for these dv/dt filters. The technical data provided applies to one dv/dt reactor.

Note

Cable lengths for versions with 2 dv/dt reactors

For versions with two dv/dt reactors, the cable lengths specified in the table do not change.

Table 9- 12 Technical data for the dv/dt filter plus Voltage Peak Limiter, 3 AC 500 V ... 600 V, part 1

Article number	6SL3000-	2DH32-2AA0	2DH33-3AA0	2DH34-1AA0	2DH35-8AA0
Suitable for Power Module	6SL3310-	1GF31-8AA3 1GF32-2AA3	1GF32-6AA3 1GF33-3AA3	1GF34-1AA3	1GF34-7AA3 1GF35-8AA3
Unit rating of the Power Module	kW	110 132	160 200	250	315 400
I_{thmax}	A	215	330	410	575
Degree of protection		IP00	IP00	IP00	IP00
dv/dt reactor					
Power loss					
- at 50 Hz	kW	0.578	0.595	0.786	0.862
- at 60 Hz	kW	0.604	0.62	0.826	0.902
- at 150 Hz	kW	0.645	0.661	0.884	0.964
Connections					
- to the Power Module		M10	M10	M12	M12
- Load		M10	M10	M12	M12
- PE		M6	M6	M6	M6
Max. permissible cable length between dv/dt reactor and motor	m	300 (shielded) 450 (unshielded)			
Dimensions					
Width	mm	460	460	460	460
Height	mm	360	360	385	385
Depth	mm	275	275	312	312
Weight, approx.	kg	83	135	147	172
Voltage peak limiter					
Power loss					
- at 50 Hz	kW	0.032	0.042	0.051	0.063
- at 60 Hz	kW	0.03	0.039	0.048	0.059
- at 150 Hz	kW	0.027	0.036	0.043	0.054
Connections					
- to the dv/dt reactor		Terminal 70 mm ²	Terminal 70 mm ²	M8	M8
- DC		Terminal 70 mm ²	Terminal 70 mm ²	M8	M8
- PE		Terminal 35 mm ²	Terminal 35 mm ²	M8	M8
Dimensions					
Width	mm	392	392	309	309
Height	mm	285	285	1312.5	1312.5
Depth	mm	210	210	400	400
Weight, approx.	kg	16	16	48	48

9.5 Technical specifications

Table 9- 13 Technical data for the dv/dt filter plus Voltage Peak Limiter, 3 AC 500 V ... 600 V, part 2

Article number	6SL3000-	2DH38-1AA0 ¹			
Suitable for Power Module	6SL3310-	1GF37-4AA3 1GF38-1AA3			
Unit rating of the Power Module	kW	500 560			
I _{thmax}	A	810			
Degree of protection		IP00			
dv/dt reactor					
Power loss					
- at 50 Hz	kW	0.828			
- at 60 Hz	kW	0.867			
- at 150 Hz	kW	0.927			
Connections					
- to the Power Module		2 x M12			
- Load		2 x M12			
- PE		M6			
Max. permissible cable length between dv/dt reactor and motor	m	300 (shielded) 450 (unshielded)			
Dimensions					
Width	mm	445			
Height	mm	385			
Depth	mm	312			
Weight, approx.	kg	160			
Voltage peak limiter					
Power loss					
- at 50 Hz	kW	0.106			
- at 60 Hz	kW	0.1			
- at 150 Hz	kW	0.091			
Connections					
- to the dv/dt reactor		M10			
- DC		M10			
- PE		M8			
Dimensions					
Width	mm	309			
Height	mm	1312.5			
Depth	mm	400			
Weight, approx.	kg	72			
1) Two dv/dt reactors are required for these dv/dt filters. The technical data provided applies to one dv/dt reactor.					

Note

Cable lengths for versions with 2 dv/dt reactors

For versions with two dV/dt reactors, the cable lengths specified in the table do not change.

Table 9- 14 Technical data for the dv/dt filter plus Voltage Peak Limiter, 3 AC 660 V ... 690 V, part 1

Article number	6SL3000-	2DH31-0AA0	2DH31-5AA0	2DH32-2AA0	2DH33-3AA0
Suitable for Power Module	6SL3310-	1GH28-5AA3 1GH31-0AA3	1GH31-2AA3 1GH31-5AA3	1GH31-8AA3 1GH32-2AA3	1GH32-6AA3 1GH33-3AA3
Unit rating of the Power Module	kW	75 90	110 132	160 200	250 315
I_{thmax}	A	100	150	215	330
Degree of protection		IP00	IP00	IP00	IP00
dv/dt reactor					
Power loss					
- at 50 Hz	kW	0.49	0.389	0.578	0.595
- at 60 Hz	kW	0.508	0.408	0.604	0.62
- at 150 Hz	kW	0.541	0.436	0.645	0.661
Connections					
- to the Power Module		M10	M10	M10	M10
- Load		M10	M10	M10	M10
- PE		M6	M6	M6	M6
Max. permissible cable length between dv/dt reactor and motor	m	300 (shielded) 450 (unshielded)			
Dimensions					
Width	mm	350	350	460	460
Height	mm	320	320	360	360
Depth	mm	227	227	275	275
Weight, approx.	kg	48	50	83	135
Voltage Peak Limiter					
Power loss					
- at 50 Hz	kW	0.016	0.020	0.032	0.042
- at 60 Hz	kW	0.015	0.019	0.03	0.039
- at 150 Hz	kW	0.013	0.018	0.027	0.036
Connections				Terminals:	Terminals:
- to the dv/dt reactor		M8	M8	70 mm ²	70 mm ²
- DC		M8	M8	70 mm ²	70 mm ²
- PE		M8	M8	35 mm ²	35 mm ²
Dimensions					
Width	mm	263	263	392	392
Height	mm	265	265	285	285
Depth	mm	188	188	210	210
Weight, approx.	kg	6	6	16	16

9.5 Technical specifications

Table 9- 15 Technical data for the dv/dt filter plus Voltage Peak Limiter, 3 AC 660 V ... 690 V, part 2

Article number	6SL3000-	2DH34-1AA0	2DH35-8AA0	2DH38-1AA0 ¹	
Suitable for Power Module	6SL3310-	1GH34-1AA3	1GH34-7AA3 1GH35-8AA3	1GH37-4AA3 1GH38-1AA3	
Unit rating of the Power Module	kW	400	450 560	710 800	
I _{thmax}	A	410	575	810	
Degree of protection		IP00	IP00	IP00	
dv/dt reactor					
Power loss					
- at 50 Hz	kW	0.786	0.862	0.828	
- at 60 Hz	kW	0.826	0.902	0.867	
- at 150 Hz	kW	0.884	0.964	0.927	
Connections					
- to the Power Module		M12	M12	2 x M12	
- Load		M12	M12	2 x M12	
- PE		M6	M6	M6	
Max. permissible cable length between dv/dt reactor and motor	m	300 (shielded) 450 (unshielded)			
Dimensions					
Width	mm	460	460	445	
Height	mm	385	385	385	
Depth	mm	312	312	312	
Weight, approx.	kg	147	172	160	
Voltage peak limiter					
Power loss					
- at 50 Hz	kW	0.051	0.063	0.106	
- at 60 Hz	kW	0.048	0.059	0.1	
- at 150 Hz	kW	0.043	0.054	0.091	
Connections					
- to the dv/dt reactor		M8	M8	M10	
- DC		M8	M8	M10	
- PE		M8	M8	M8	
Dimensions					
Width	mm	309	309	309	
Height	mm	1312.5	1312.5	1312.5	
Depth	mm	400	400	400	
Weight, approx.	kg	48	48	72	
1) Two dv/dt reactors are required for these dv/dt filters. The technical data provided applies to one dv/dt reactor.					

Note

Cable lengths for versions with 2 dv/dt reactors

For versions with two dv/dt reactors, the cable lengths specified in the table do not change.

du/dt filter compact plus Voltage Peak Limiter

10.1 General

Description

The dv/dt filter compact plus Voltage Peak Limiter comprises two components: the dv/dt reactor and the voltage-limiting network (Voltage Peak Limiter), which cuts off the voltage peaks and feeds back the energy into the DC link. The dv/dt filter compact plus Voltage Peak Limiter is designed for use with motors for which the voltage strength of the insulation system is unknown or insufficient.

dv/dt filters compact plus Voltage Peak Limiters limit the voltage rate of rise dv/dt to values $< 1600 \text{ V}/\mu\text{s}$ - and the typical voltage peaks to the following values according to limit value curve A acc. to IEC 60034-25:2007:

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

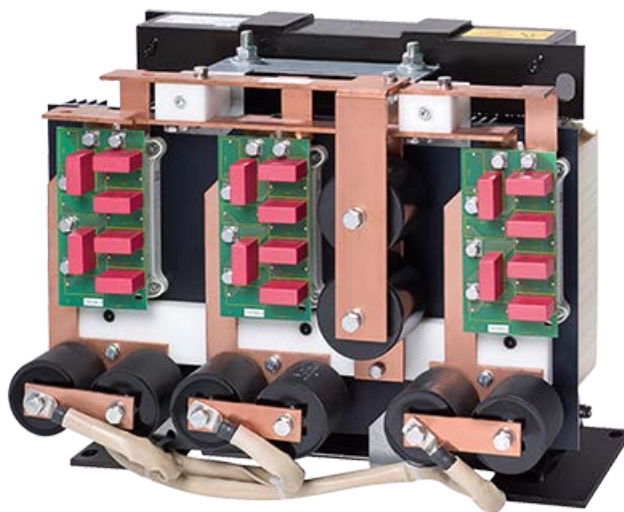


Figure 10-1 Du/dt filter compact plus Voltage Peak Limiter

 **WARNING**

Non-observance of the fundamental safety instructions and residual risks

The non-observance of the fundamental safety instructions and residual risks stated in Chapter 1 can result in accidents with severe injuries or death.

- Adhere to the fundamental safety instructions.
- When assessing the risk, take into account residual risks.

 **WARNING**

Fire through overheating due to insufficient ventilation clearances

Inadequate ventilation clearances can cause overheating with a risk for personnel through smoke development and fire. Furthermore, an increased number of failures and shorter service life of the components can occur.

- Ensure 100 mm ventilation clearances above and below the component.
- Always mount the dv/dt filters compact plus Voltage Peak Limiter in a vertical, upright position to enable cooling air to flow through the heat sink on the Voltage Peak Limiter from the bottom to the top.

 **CAUTION**

Burns due to high surface temperature of the dv/dt filter compact

The surface temperature of the dv/dt filters compact may exceed 80 °C. You can get seriously burnt when touching the surface.

- Mount the dv/dt filters compact so that they cannot be touched. If this is not possible, attach a clearly visible and understandable warning notice at hazardous positions.

NOTICE

Damage to the Voltage Peak Limiter due to interchanged connections

The Voltage Peak Limiter will be damaged if the input and output connections are interchanged on devices with the article numbers 6SL3000-2DE41-4EA0 and 6SL3000-2DG38-1EA0.

- Connect the incoming cable from the DC link of the Power Module to DCPS, DCNS.
- Connect the outgoing cable for the dv/dt reactor to 1U2, 1V2, 1W2.

NOTICE**Damage to the dv/dt filter compact by using components that have not been released**

When using components that have not been released, damage or malfunctions can occur at the devices or the system itself.

- Only use a dv/dt filter compact that SIEMENS has released for operation with SINAMICS.

NOTICE**Damage to the dv/dt filter compact by exceeding the maximum output frequency**

The maximum permissible output frequency when using a dv/dt filter compact is 150 Hz. The dv/dt filter compact can be damaged if the output frequency is exceeded.

- Operate the dv/dt filter compact with a maximum output frequency of 150 Hz.

NOTICE**Damage to the dv/dt filter compact during continuous operation with low output frequencies**

Uninterrupted duty at an output frequency less than 10 Hz can result in thermal overload and destroy the dv/dt filter.

- When using a dv/dt filter compact plus voltage peak limiter do not operate the drive continuously with an output frequency less than 10 Hz.
- You may operate the drive for a maximum load duration of five minutes at an output frequency less than 10 Hz, provided that you then select an operation with an output frequency higher than 10 Hz for a period of five minutes.

NOTICE**Damage to the dv/dt filter compact by exceeding the maximum pulse frequency**

The maximum permissible pulse frequency when using a dv/dt filter compact is 2.5 kHz or 4 kHz. The dv/dt filter compact can be damaged if the pulse frequency is exceeded.

- When using the dv/dt filter compact, operate the Power Module with a maximum pulse frequency of 2.5 kHz or 4 kHz.

10.1 General

NOTICE

Damage to the dv/dt filter compact if it is not activated during commissioning

The dv/dt filter compact may be damaged if it is not activated during commissioning.

- Activate the dv/dt filter compact during commissioning via parameter p0230 = 2.

NOTICE

Damage to the dv/dt filter compact if a motor is not connected

dv/dt filters compact which are operated without a motor being connected can be damaged or destroyed.

- Never operate a dv/dt filter compact connected to the Power Module without a connected motor.

Note

Cable lengths

Keep the connecting cables to the Power Module as short as possible (max. 5 m). Use an equivalent cable type when replacing the cables supplied.

Assignment of dv/dt filter compact plus Voltage Peak Limiter and Power Module

Table 10- 1 Assignment of dv/dt filter compact plus Voltage Peak Limiter and Power Module

Power Module	Unit rating of the Power Module	suitable dv/dt filter compact plus Voltage Peak Limiter
Line voltage 3 AC 380 ... 480 V		
6SL3310-1GE32-1AA3	110 kW	6SL3000-2DE32-6EA0
6SL3310-1GE32-6AA3	132 kW	6SL3000-2DE32-6EA0
6SL3310-1GE33-1AA3	160 kW	6SL3000-2DE35-0EA0
6SL3310-1GE33-8AA3	200 kW	6SL3000-2DE35-0EA0
6SL3310-1GE35-0AA3	250 kW	6SL3000-2DE35-0EA0
6SL3310-1GE36-1AA3	315 kW	6SL3000-2DE38-4EA0
6SL3310-1GE37-5AA3	400 kW	6SL3000-2DE38-4EA0
6SL3310-1GE38-4AA3	450 kW	6SL3000-2DE38-4EA0
6SL3310-1GE41-0AA3	560 kW	6SL3000-2DE41-4EA0

Power Module	Unit rating of the Power Module	suitable dv/dt filter compact plus Voltage Peak Limiter
Line voltage 3 AC 500 ... 600 V		
6SL3310-1GF31-8AA3	110 kW	6SL3000-2DG32-2EA0
6SL3310-1GF32-2AA3	132 kW	6SL3000-2DG32-2EA0
6SL3310-1GF32-6AA3	160 kW	6SL3000-2DG33-3EA0
6SL3310-1GF33-3AA3	200 kW	6SL3000-2DG33-3EA0
6SL3310-1GF34-1AA3	250 kW	6SL3000-2DG34-1EA0
6SL3310-1GF34-7AA3	315 kW	6SL3000-2DG35-8EA0
6SL3310-1GF35-8AA3	400 kW	6SL3000-2DG35-8EA0
6SL3310-1GF37-4AA3	500 kW	6SL3000-2DG38-1EA0
6SL3310-1GF38-1AA3	560 kW	6SL3000-2DG38-1EA0
Line voltage 3 AC 660 ... 690 V		
6SL3310-1GH28-5AA3	75 kW	6SL3000-2DG31-0EA0
6SL3310-1GH31-0AA3	90 kW	6SL3000-2DG31-0EA0
6SL3310-1GH31-2AA3	110 kW	6SL3000-2DG31-5EA0
6SL3310-1GH31-5AA3	132 kW	6SL3000-2DG31-5EA0
6SL3310-1GH31-8AA3	160 kW	6SL3000-2DG32-2EA0
6SL3310-1GH32-2AA3	200 kW	6SL3000-2DG32-2EA0
6SL3310-1GH32-6AA3	250 kW	6SL3000-2DG33-3EA0
6SL3310-1GH33-3AA3	315 kW	6SL3000-2DG33-3EA0
6SL3310-1GH34-1AA3	400 kW	6SL3000-2DG34-1EA0
6SL3310-1GH34-7AA3	450 kW	6SL3000-2DG35-8EA0
6SL3310-1GH35-8AA3	560 kW	6SL3000-2DG35-8EA0
6SL3310-1GH37-4AA3	710 kW	6SL3000-2DG38-1EA0
6SL3310-1GH38-1AA3	800 kW	6SL3000-2DG38-1EA0

Table 10- 2 Max. pulse frequency when a dv/dt filter compact plus Voltage Peak Limiter is used in units with a rated pulse frequency of 2 kHz

Article no. of the Power Module 6SL3310-...	Unit rating [kW]	Output current for a pulse frequency of 2 kHz [A]	Max. pulse frequency when a dv/dt filter compact plus Voltage Peak Limiter is used
Line voltage 3 AC 380 V ... 480 V			
1GE32-1AA3	110	210	4 kHz
1GE32-6AA3	132	260	4 kHz
1GE33-1AA3	160	310	4 kHz
1GE33-8AA3	200	380	4 kHz
1GE35-0AA3	250	490	4 kHz

10.1 General

Table 10- 3 Max. pulse frequency when a dv/dt filter compact plus Voltage Peak Limiter is used in units with a rated pulse frequency of 1.25 kHz

Article no. of the Power Module 6SL3310-...	Unit rating [kW]	Output current for a pulse frequency of 1.25 kHz [A]	Max. pulse frequency when a dv/dt filter compact plus Voltage Peak Limiter is used
Line voltage 3 AC 380 V ... 480 V			
1GE36-1AA3	315	605	2.5 kHz
1GE37-5AA3	400	745	2.5 kHz
1GE38-4AA3	450	840	2.5 kHz
1GE41-0AA3	560	985	2.5 kHz
Line voltage 3 AC 500 V ... 600 V			
1GF31-8AA3	110	175	2.5 kHz
1GF32-2AA3	132	215	2.5 kHz
1GF32-6AA3	160	260	2.5 kHz
1GF33-3AA3	200	330	2.5 kHz
1GF34-1AA3	250	410	2.5 kHz
1GF34-7AA3	315	465	2.5 kHz
1GF35-8AA3	400	575	2.5 kHz
1GF37-4AA3	450	735	2.5 kHz
1GF38-1AA3	560	810	2.5 kHz
Line voltage 3 AC 660 V ... 690 V			
1GH28-5AA3	75	85	2.5 kHz
1GH31-0AA3	90	100	2.5 kHz
1GH31-2AA3	110	120	2.5 kHz
1GH31-5AA3	132	150	2.5 kHz
1GH31-8AA3	160	175	2.5 kHz
1GH32-2AA3	200	215	2.5 kHz
1GH32-6AA3	250	260	2.5 kHz
1GH33-3AA3	315	330	2.5 kHz
1GH34-1AA3	400	410	2.5 kHz
1GH34-7AA3	450	465	2.5 kHz
1GH35-8AA3	560	575	2.5 kHz
1GH37-4AA3	710	735	2.5 kHz
1GH38-1AA3	800	810	2.5 kHz

10.2 Mechanical installation

dV/dt filter compact plus Voltage Peak Limiter, type 1

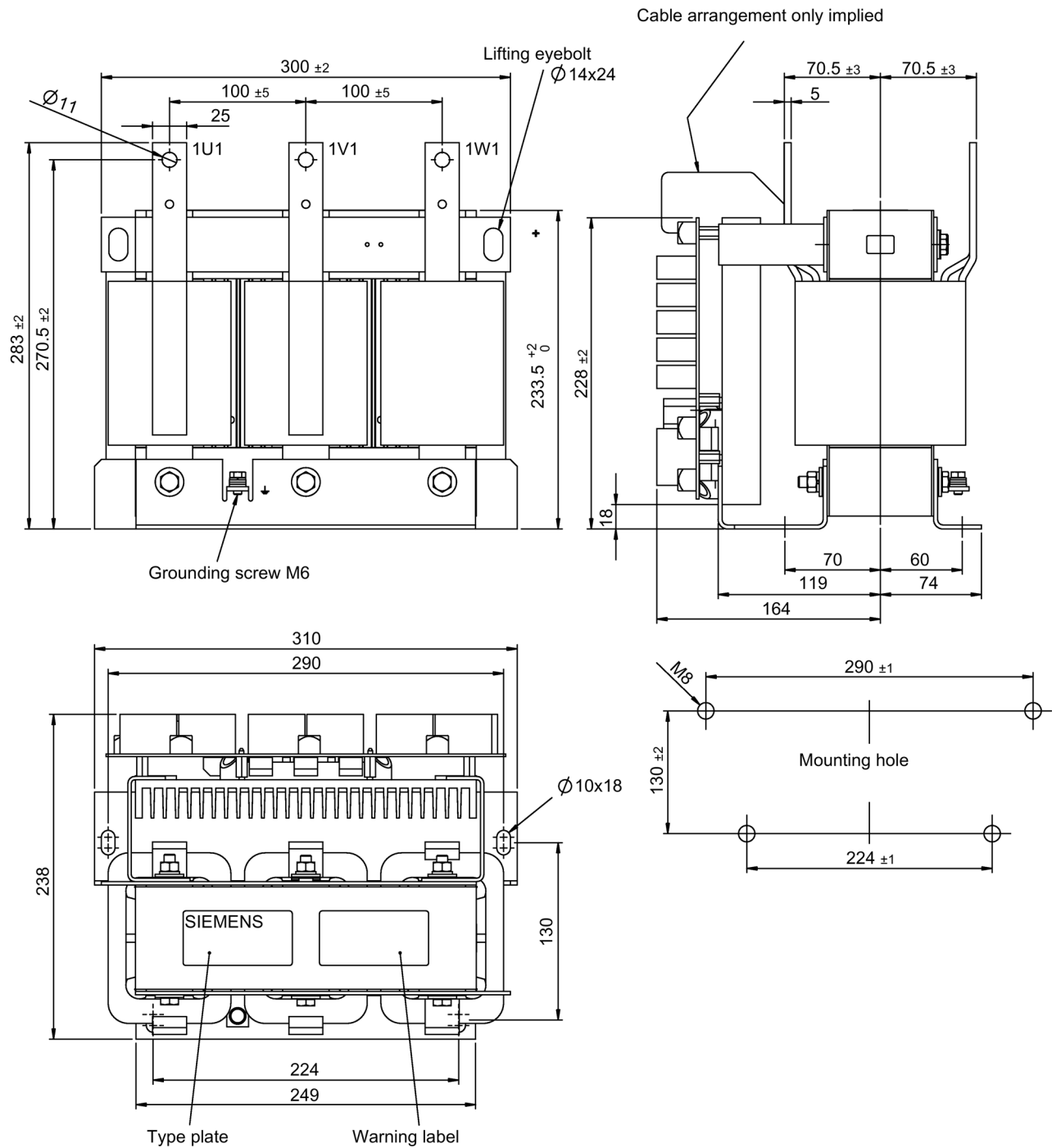


Figure 10-2 Dimension drawing of dV/dt filter compact plus Voltage Peak Limiter, type 1

dV/dt filter compact plus Voltage Peak Limiter, type 2

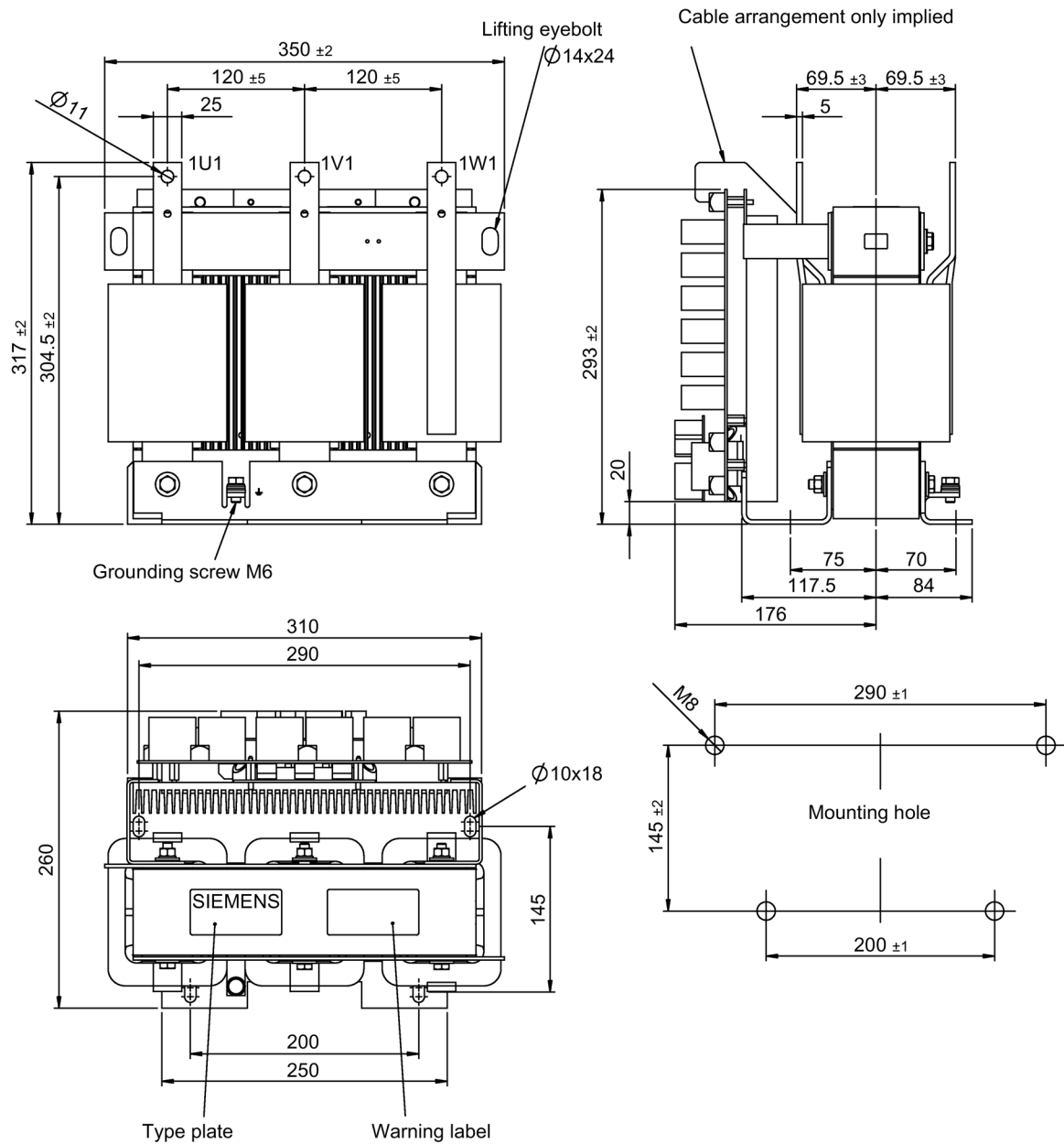


Figure 10-3 Dimension drawing of dV/dt filter compact plus Voltage Peak Limiter, type 2

dV/dt filter compact plus Voltage Peak Limiter, type 3

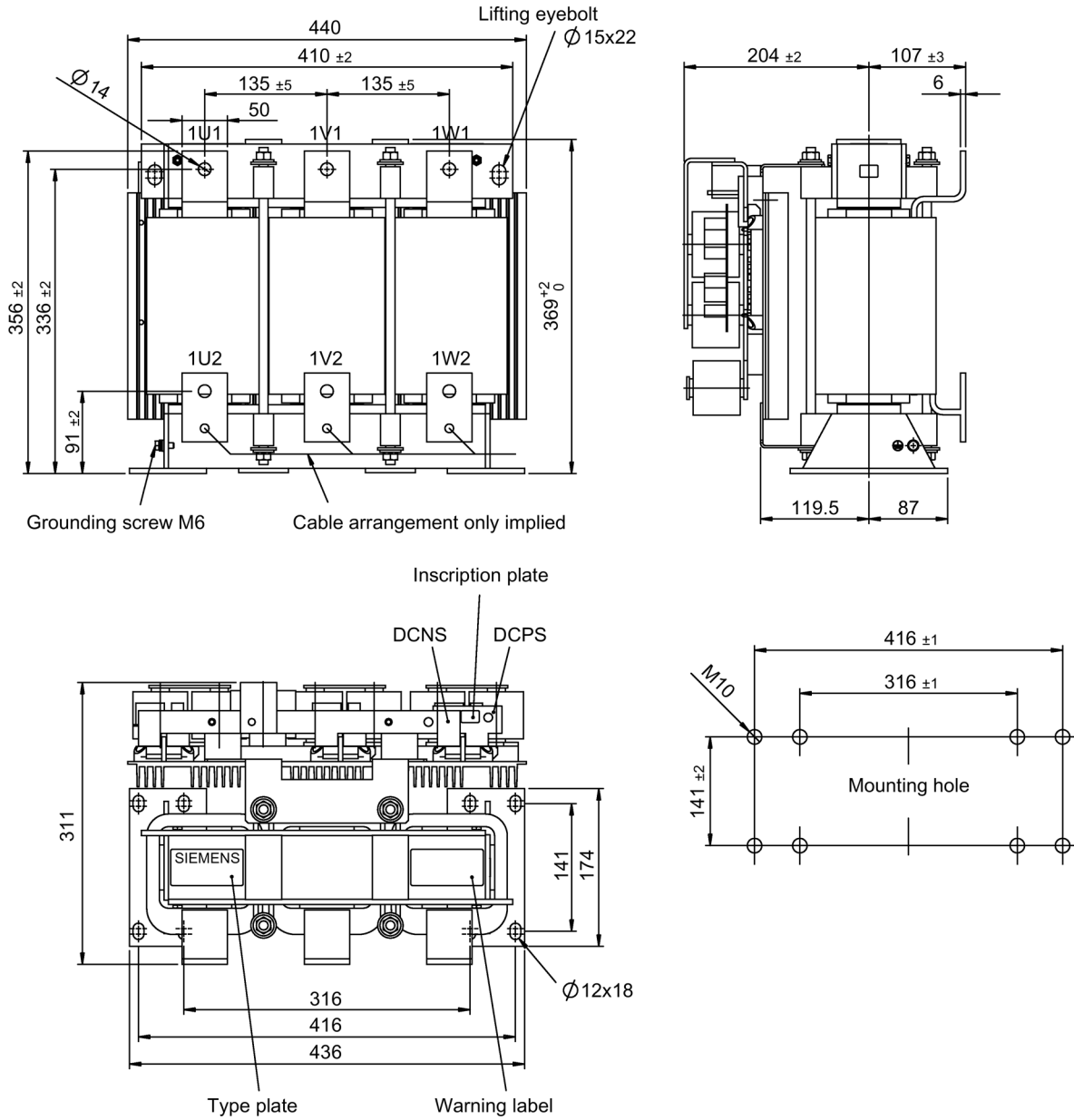


Figure 10-4 Dimension drawing of dV/dt filter compact plus Voltage Peak Limiter, type 3

dV/dt filter compact plus Voltage Peak Limiter, type 4

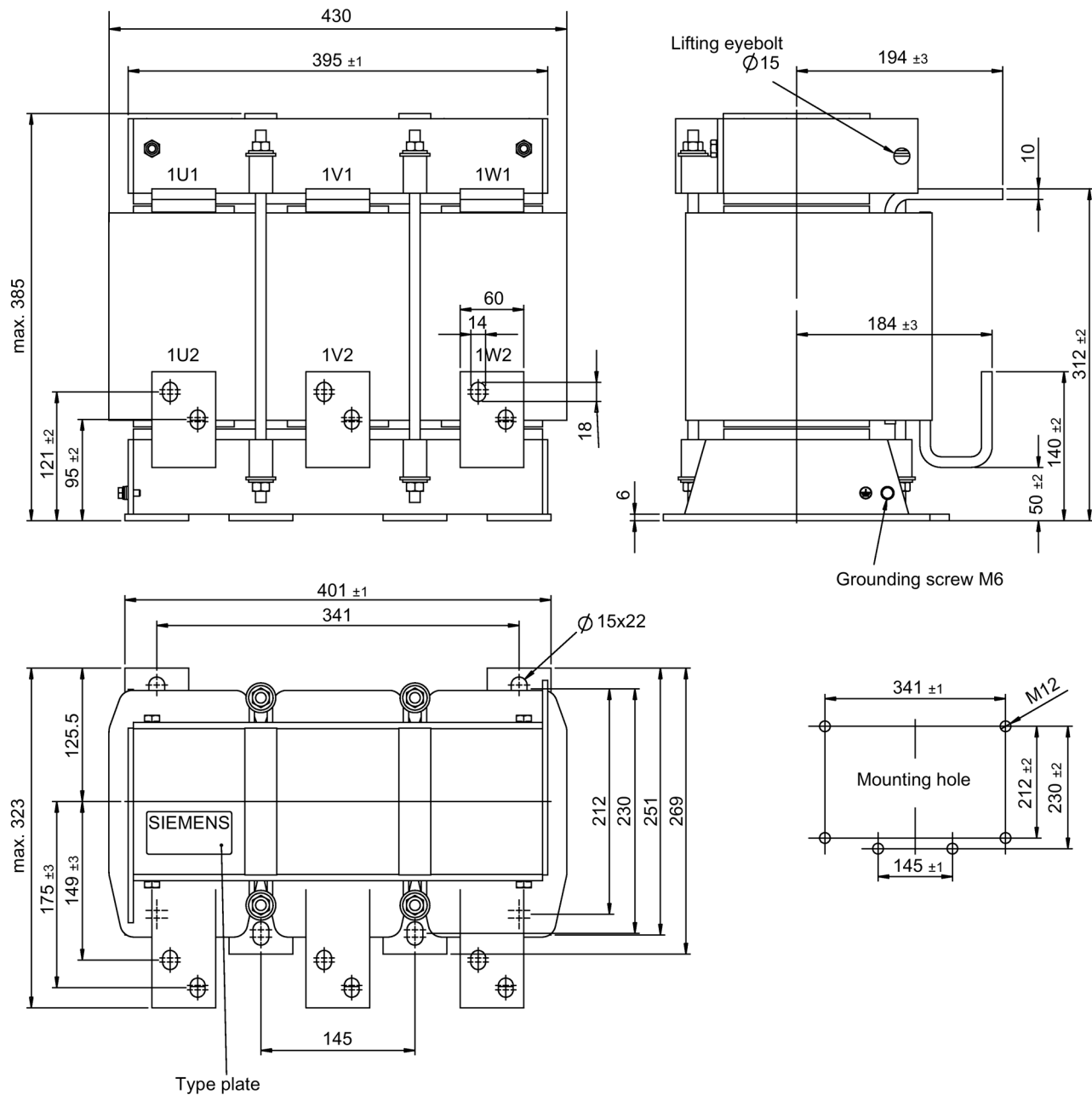


Figure 10-5 Dimension drawing for dV/dt filter compact plus Voltage Peak Limiter, Type 4: dV/dt reactor

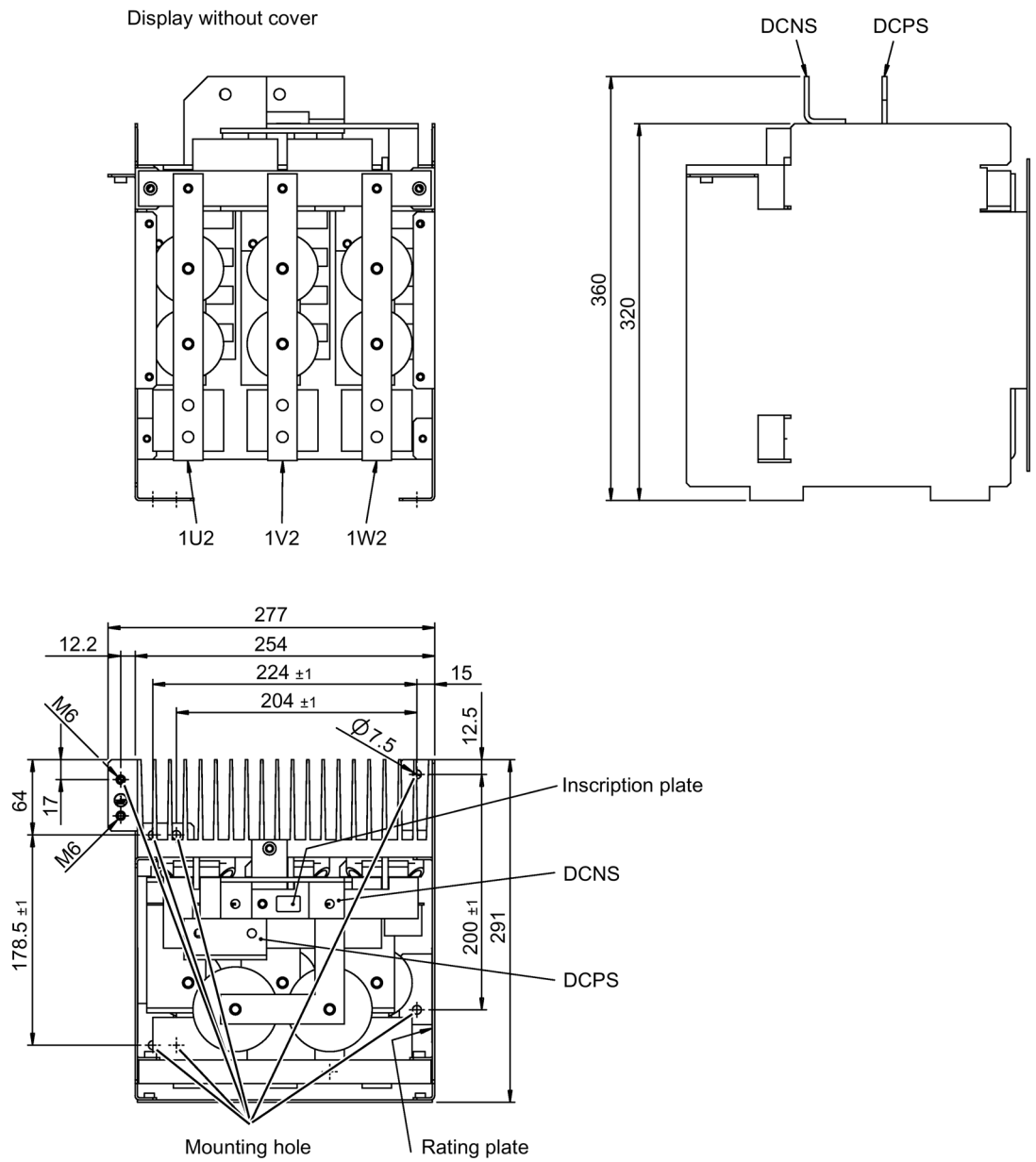


Figure 10-6 Dimension drawing for dV/dt filter compact plus Voltage Peak Limiter, Type 4: Voltage Peak Limiter

10.3 Electrical installation

Table 10- 4 Assignment of the dV/dt filter compact plus Voltage Peak Limiter to the dimension drawings

dV/dt filter compact plus Voltage Peak Limiter	Dimension drawing type
Line voltage 380 V – 480 V 3 AC	
6SL3000-2DE32-6EA0	Type 1
6SL3000-2DE35-0EA0	Type 2
6SL3000-2DE38-4EA0	Type 3
6SL3000-2DE41-4EA0	Type 4
Line voltage 500 V – 690 V 3 AC	
6SL3000-2DG31-0EA0	Type 1
6SL3000-2DG31-5EA0	Type 1
6SL3000-2DG32-2EA0	Type 2
6SL3000-2DG33-3EA0	Type 2
6SL3000-2DG34-1EA0	Type 3
6SL3000-2DG35-8EA0	Type 3
6SL3000-2DG38-1EA0	Type 4

10.3 Electrical installation

Interface overview

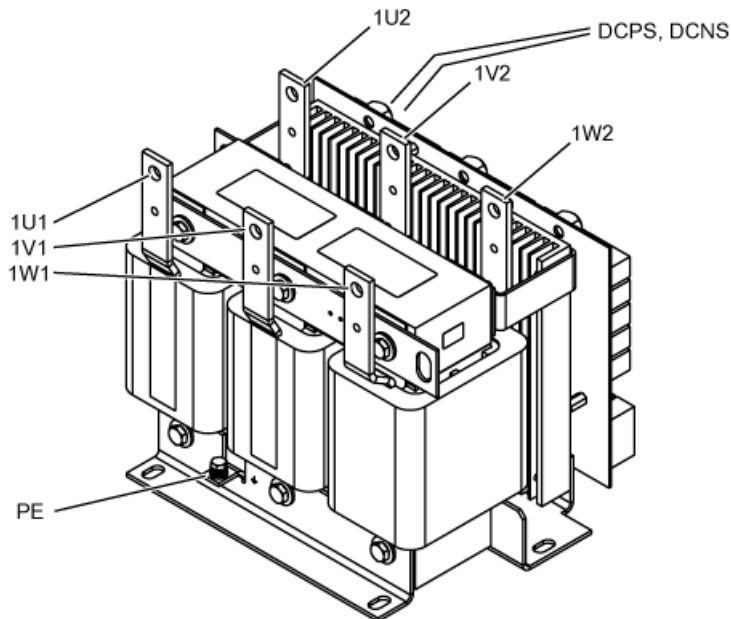


Figure 10-7 Interface overview dv/dt filter compact plus Voltage Peak Limiter, type 1

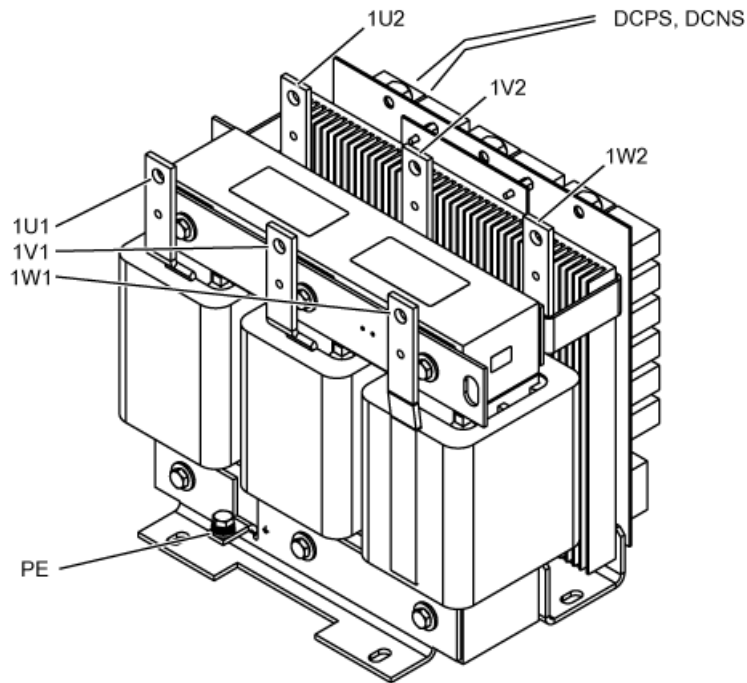


Figure 10-8 Interface overview dv/dt filter compact plus Voltage Peak Limiter, type 2

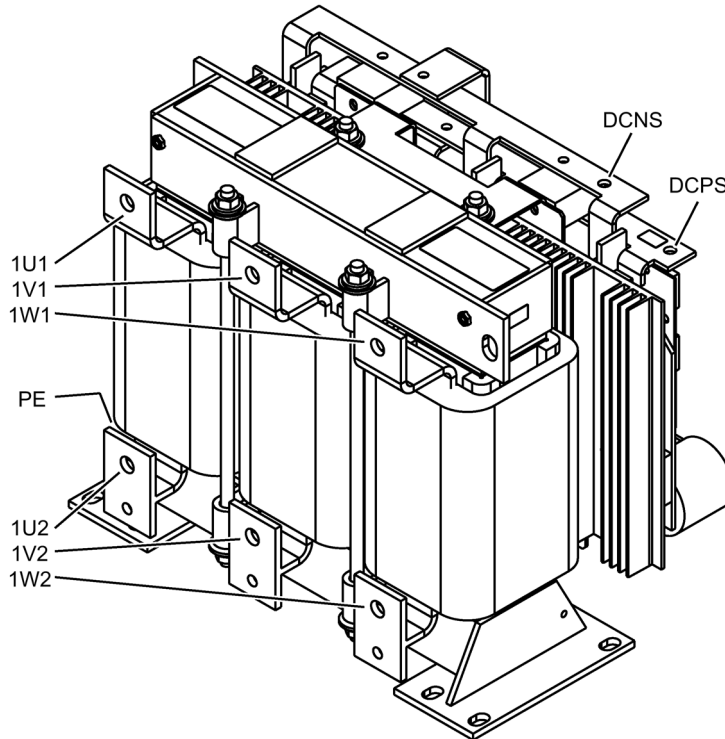


Figure 10-9 Interface overview dv/dt filter compact plus Voltage Peak Limiter, type 3

10.3 Electrical installation

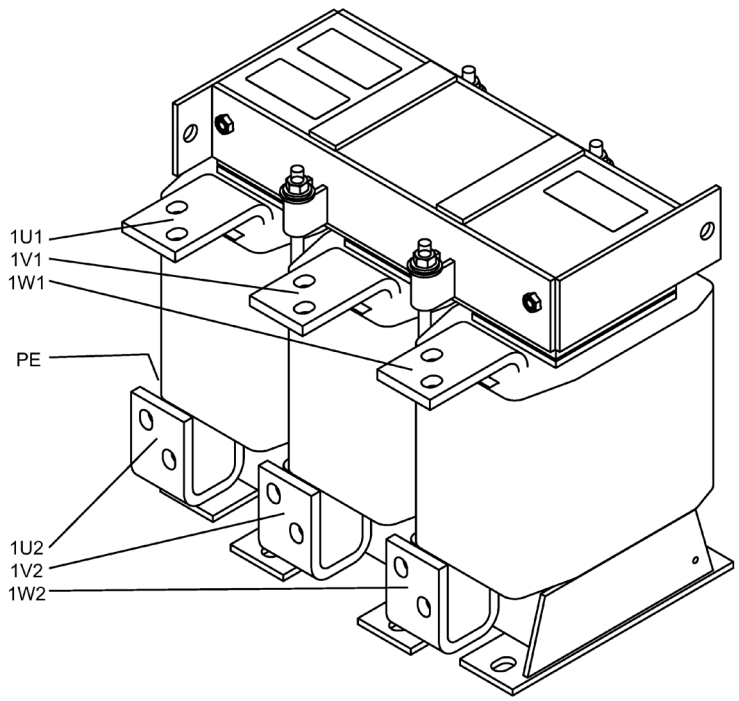


Figure 10-10 Interface overview dv/dt filter compact plus Voltage Peak Limiter - dv/dt reactor Type 4

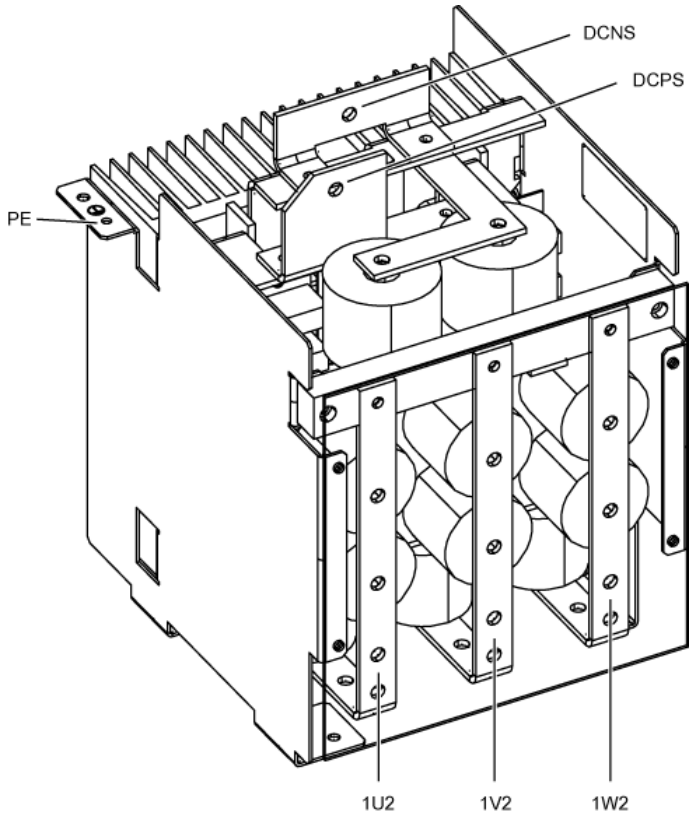


Figure 10-11 Interface overview dv/dt filter compact plus Voltage Peak Limiter - Voltage Peak Limiter, Type 4

Connection

When connecting the dv/dt filter compact plus Voltage Peak Limiter, you must take into account the following conditions to ensure that it functions correctly:

- Control cables must be routed separately from power cables. Power cables are the motor cable or the connecting cables from the DC link of the Power Module (terminals DCPS/DCNS) to the dv/dt filter compact plus Voltage Peak Limiter. In particular, you must ensure that control cables and power cables are not routed in parallel in a joint cable raceway, even if all the cables are shielded.
- You must use shielded motor cables. The shield for the motor cable must be attached to the shield plate and motor housing.
- The ground wire for the motor must be fed directly back to the Power Module.

Connection overview

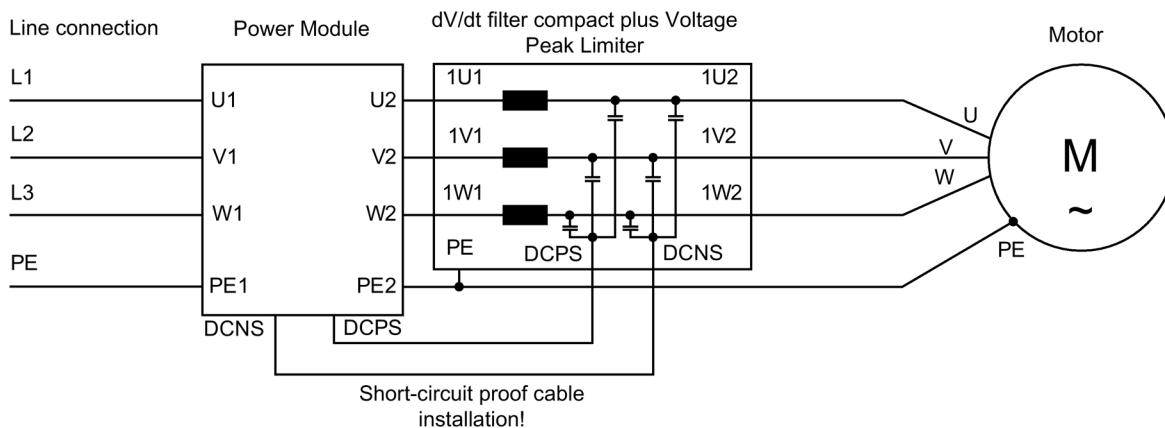


Figure 10-12 Connecting the dv/dt filter compact plus Voltage Peak Limiter - integrated unit

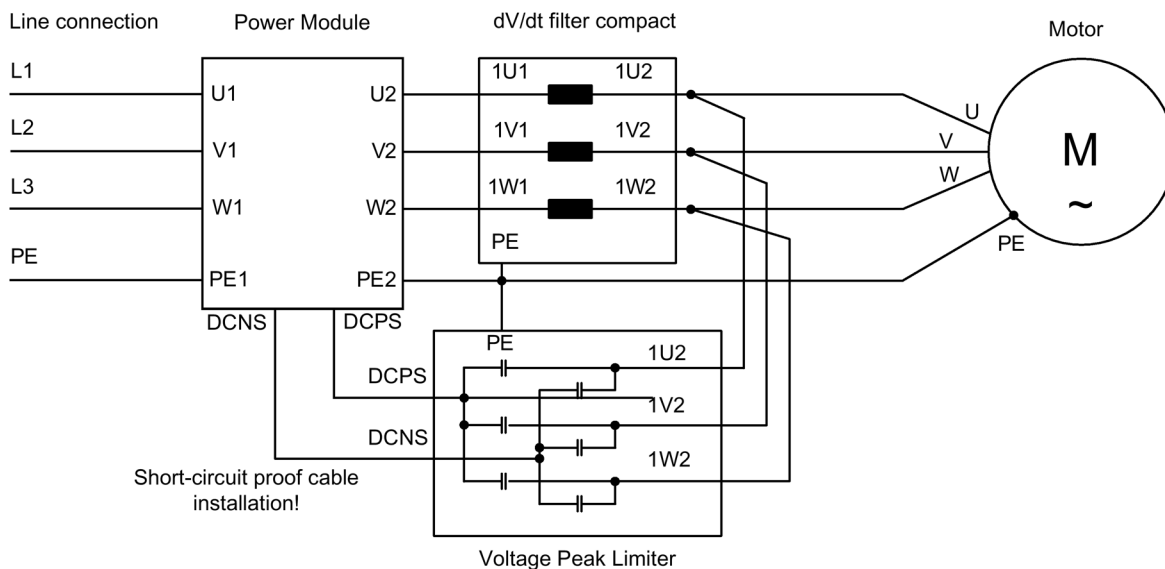


Figure 10-13 Connecting the dv/dt filter compact plus Voltage Peak Limiter - separate components

Cable cross-sections

In a dv/dt filter with separate Voltage Peak Limiter (Type 4), the connections between dv/dt reactor and Voltage Peak Limiter are already installed on the Voltage Peak Limiter.


Table 10- 5 Cable cross-sections for connections between a dv/dt filter and Power Module

dv/dt filter compact plus Voltage Peak Limiter	Cross-section [mm ²]
Type 1	16
Type 2	25
Type 3	50
Type 4	95

Table 10- 6 Connection cable enclosed for connecting dv/dt reactor and Voltage Peak Limiter

Voltage Peak Limiter	Cross-section [mm ²]	Lug for connecting 1U2 / 1V2 / 1W2 on the dv/dt reactor
Type 4	70	M12

Cable type: 600 V, UL style 3271, operating temperature 125° C

<p> WARNING</p> <p>Fire and device damage as a result of ground fault/short-circuit</p> <p>Inadequate installation of the cables to the Power Module DC link can result in a ground fault/short-circuit and place persons at risk as a result of the associated smoke and fire.</p> <ul style="list-style-type: none"> • Comply with local installation regulations that enable this fault to be ruled out. • Protect the cables from mechanical damage. • In addition, apply one of the following measures: <ul style="list-style-type: none"> – Use cables with double insulation. – Maintain adequate clearance, e.g. by using spacers. – Lay the cables in separate cable ducts or conduits.
--

<p>NOTICE</p> <p>Damage to the dv/dt filter compact due to mechanical load on connections</p> <p>The connections on the dv/dt filter compact have not been designed for the direct mechanical connection of the motor cables.</p> <ul style="list-style-type: none"> • Take measures on the installation to ensure that the connections cannot be deformed by the mechanical load exerted by the connected cables.

Note

Maximum cable lengths

The connections should be kept as short as possible.

The maximum cable length between the Power Module and the dv/dt filter compact (motor cables and cables to the DC link) is 5 m.

An equivalent cable type must be used when replacing enclosed cables.

10.4 Maintenance and servicing

Maintenance and servicing are not carried out for the complete units (dv/dt filter compact plus Voltage Peak Limiter) and subcomponents (dv/dt reactor, Voltage Peak Limiter). In the case of an error, full replacement is necessary.

10.5 Technical specifications

General technical data

Table 10-7 General technical data

Output frequency	0 ... 150 Hz		
Product standard	EN 61800-5-1		
Ambient conditions	Storage	Transport	Operation
Ambient temperature	-25 ... +70 °C	-25 ... +70 °C	0 ... +50 °C
Relative air humidity ¹⁾ (condensation not permissible) corresponds to class	5 ... 95% 1K4 according to EN 60721-3-1	5 ... 95% at 40 °C 2K3 according to EN 60721-3-2	5 ... 95% 3K3 according to EN 60721-3-3
Mechanical strength	Storage	Transport	Operation
Vibrational load ¹⁾ - Displacement - Acceleration corresponds to class	1.5 mm at 5 ... 9 Hz 5 m/s ² at > 9 ... 200 Hz 1M2 to EN 60721-3-1	3.5 mm at 5 ... 9 Hz 10 m/s ² at > 9 ... 200 Hz 2M2 to EN 60721-3-2	0.075 mm at 10 ... 58 Hz 10 m/s ² at >58 ... 200 Hz -
Shock load ¹⁾ - Acceleration corresponds to class	40 m/s ² at 22 ms 1M2 to EN 60721-3-1	100 m/s ² at 11 ms 2M2 to EN 60721-3-2	100 m/s ² at 11 ms 3M4 to EN 60721-3-3

Deviations from the specified classes are shown in *italics*.

¹⁾ The EN standards specified are the European editions of the international IEC standards with the same designations.

Detailed technical data

Table 10- 8 Technical data for the dv/dt filter compact plus Voltage Peak Limiter, 3 AC 380 V ... 480 V, part 1

Article number	6SL3000-	2DE32-6EA0	2DE35-0EA0	2DE38-4EA0
Suitable for Power Module	6SL3310-	1GE32-1AA3 1GE32-6AA3	1GE33-1AA3 1GE33-8AA3 1GE35-0AA3	1GE36-1AA3 1GE37-5AA3 1GE38-4AA3
Unit rating of the Power Module	kW	110 132	160 200 250	315 400 450
I_{thmax}	A	260	490	840
Degree of protection		IP00	IP00	IP00
Power loss				
- at 50 Hz	kW	0.210	0.290	0.518
- at 60 Hz	kW	0.215	0.296	0.529
- at 150 Hz	kW	0.255	0.344	0.609
Terminals				
- 1U1/1V1/1W1		for M10 bolt	for M10 bolt	for M12 bolt
- DCPS/DCNS		for M8 screw	for M8 screw	for M8 bolt
- 1U2/1V2/1W2		for M10 bolt	for M10 bolt	for M12 bolt
- PE		M6 screw	M6 screw	M6 screw
Max. permissible cable length between dv/dt filter and motor	m	100 (shielded) 150 (unshielded)		
Dimensions				
Width	mm	310	350	440
Height	mm	283	317	369
Depth	mm	238	260	311
Weight, approx.	kg	41	61	103

Table 10- 9 Technical data for the dv/dt filter compact plus Voltage Peak Limiter, 3 AC 380 V ... 480 V, part 2

Article number	6SL3000-	2DE41-4EA0		
Suitable for Power Module	6SL3310-	1GE41-0AA3		
Unit rating of the Power Module	kW	560		
I _{thmax}	A	1405		
Degree of protection		IP00		
Power loss				
- at 50 Hz	kW	1.154		
- at 60 Hz	kW	1.197		
- at 150 Hz	kW	1.444		
Max. permissible cable length between dv/dt filter and motor	m	100 (shielded) 150 (unshielded)		
dv/dt reactor				
Terminals				
- 1U1/1V1/1W1		for 2 x M12 bolts		
- 1U2/1V2/1W2		for 2 x M12 bolts		
- PE		M6 screw		
Dimensions				
Width	mm	430		
Height	mm	385		
Depth	mm	323		
Weight, approx.	kg	168.8		
Voltage Peak Limiter				
Terminals				
- DCPS/DCNS		for M8 bolt		
- 1U2/1V2/1W2		for M8 bolt		
- PE		for M6 screw		
Dimensions				
Width	mm	277		
Height	mm	360		
Depth	mm	291		
Weight, approx.	kg	19.2		

10.5 Technical specifications

Table 10- 10 Technical data for the dv/dt filter compact plus Voltage Peak Limiter, 3 AC 500 V ... 600 V, part 1

Article number	6SL3000-	2DG32-2EA0	2DG33-3EA0	2DG34-1EA0
Suitable for Power Module	6SL3310-	1GF31-8AA3 1GF32-2AA3	1GF32-6AA3 1GF33-3AA3	1GF34-1AA3
Unit rating of the Power Module	kW	110 132	160 200	250
I_{thmax}	A	215	330	410
Degree of protection		IP00	IP00	IP00
Power loss				
- at 50 Hz	kW	0.305	0.385	0.550
- at 60 Hz	kW	0.316	0.399	0.568
- at 150 Hz	kW	0.372	0.480	0.678
Terminals				
- 1U1/1V1/1W1		for M10 bolt	for M10 bolt	for M12 bolt
- DCPS/DCNS		for M8 screw	for M8 screw	for M8 bolt
- 1U2/1V2/1W2		for M10 bolt	for M10 bolt	for M12 bolt
- PE		M6 screw	M6 screw	M6 screw
Max. permissible cable length between dV/dt filter and motor	m	100 (shielded) 150 (unshielded)		
Dimensions				
Width	mm	350	350	440
Height	mm	317	317	369
Depth	mm	260	260	311
Weight, approx.	kg	51	60	87

Table 10- 11 Technical data for the dv/dt filter compact plus Voltage Peak Limiter, 3 AC 500 V ... 600 V, part 2

Article number	6SL3000-	2DG35-8EA0		
Suitable for Power Module	6SL3310-	1GF34-7AA3 1GF35-8AA3		
Unit rating of the Power Module	kW	315 400		
I_{thmax}	A	575		
Degree of protection		IP00		
Power loss				
- at 50 Hz	kW	0.571		
- at 60 Hz	kW	0.586		
- at 150 Hz	kW	0.689		
Terminals				
- 1U1/1V1/1W1		for M12 bolt		
- DCPS/DCNS		for M8 bolt		
- 1U2/1V2/1W2		for M12 bolt		
- PE		M6 screw		
Max. permissible cable length between dV/dt filter and motor	m		100 (shielded) 150 (unshielded)	
Dimensions				
Width	mm	440		
Height	mm	369		
Depth	mm	311		
Weight, approx.	kg	100		

10.5 Technical specifications

Table 10- 12 Technical data for the dv/dt filter compact plus Voltage Peak Limiter, 3 AC 500 V ... 600 V, part 3

Article number	6SL3000-	2DG38-1EA0		
Suitable for Power Module	6SL3310-	1GF37-4AA3 1GF38-1AA3		
Unit rating of the Power Module	kW	500 560		
I_{thmax}	A	810		
Degree of protection		IP00		
Power loss				
- at 50 Hz	kW	0.964		
- at 60 Hz	kW	0.998		
- at 150 Hz	kW	1.196		
Max. permissible cable length between dv/dt filter and motor	m		100 (shielded) 150 (unshielded)	
dv/dt reactor				
Terminals				
- 1U1/1V1/1W1		for 2 x M12 bolts		
- 1U2/1V2/1W2		for 2 x M12 bolts		
- PE		M6 screw		
Dimensions				
Width	mm	430		
Height	mm	385		
Depth	mm	323		
Weight, approx.	kg	171.2		
Voltage Peak Limiter				
Terminals				
- DCPS/DCNS		for M8 bolt		
- 1U2/1V2/1W2		for M8 bolt		
- PE		for M6 screw		
Dimensions				
Width	mm	277		
Height	mm	360		
Depth	mm	291		
Weight, approx.	kg	18.8		

Table 10- 13 Technical data for the dv/dt filter compact plus Voltage Peak Limiter, 3 AC 660 V ... 690 V, part 1

Article number	6SL3000-	2DG31-0EA0	2DG31-5EA0	2DG32-2AA0
Suitable for Power Module	6SL3310-	1GH28-5AA3 1GH31-0AA3	1GH31-2AA3 1GH31-5AA3	1GH31-8AA3 1GH32-2AA3
Unit rating of the Power Module	kW	75 90	110 132	160 200
I_{thmax}	A	100	150	215
Degree of protection		IP00	IP00	IP00
Power loss				
- at 50 Hz	kW	0.227	0.270	0.305
- at 60 Hz	kW	0.236	0.279	0.316
- at 150 Hz	kW	0.287	0.335	0.372
Terminals				
- 1U1/1V1/1W1		for M10 bolt	for M10 bolt	for M10 bolt
- DCPS/DCNS		for M8 screw	for M8 screw	for M8 screw
- 1U2/1V2/1W2		for M10 bolt	for M10 bolt	for M10 bolt
- PE		M6 screw	M6 screw	M6 screw
Max. permissible cable length between dV/dt filter and motor	m	100 (shielded) 150 (unshielded)		
Dimensions				
Width	mm	310	310	350
Height	mm	283	283	317
Depth	mm	238	238	260
Weight, approx.	kg	34	36	51

10.5 Technical specifications

Table 10- 14 Technical data for the dv/dt filter compact plus Voltage Peak Limiter, 3 AC 660 V ... 690 V, part 2

Article number	6SL3000-	2DG33-3AA0	2DG34-1EA0	2DG35-8EA0
Suitable for Power Module	6SL3310-	1GH32-6AA3 1GH33-3AA3	1GH34-1AA3	1GH34-7AA3 1GH35-8AA3
Unit rating of the Power Module	kW	250 315	400	450 560
I_{thmax}	A	330	410	575
Degree of protection		IP00	IP00	IP00
Power loss				
- at 50 Hz	kW	0.385	0.550	0.571
- at 60 Hz	kW	0.399	0.568	0.586
- at 150 Hz	kW	0.480	0.678	0.689
Terminals				
- 1U1/1V1/1W1		for M10 bolt	for M12 bolt	for M12 bolt
- DCPS/DCNS		for M8 screw	for M8 bolt	for M8 bolt
- 1U2/1V2/1W2		for M10 bolt	for M12 bolt	for M12 bolt
- PE		M6 screw	M6 screw	M6 screw
Max. permissible cable length between dV/dt filter and motor	m	100 (shielded) 150 (unshielded)		
Dimensions				
Width	mm	350	440	440
Height	mm	317	369	369
Depth	mm	260	311	311
Weight, approx.	kg	60	87	100

Table 10- 15 Technical data for the dv/dt filter compact plus Voltage Peak Limiter, 3 AC 660 V ... 690 V, part 3

Article number	6SL3000-	2DG38-1EA0		
Suitable for Power Module	6SL3310-	1GH37-4AA3 1GH37-4AA3		
Unit rating of the Power Module	kW	710 800		
I_{thmax}	A	810		
Degree of protection		IP00		
Power loss				
- at 50 Hz	kW	0.964		
- at 60 Hz	kW	0.998		
- at 150 Hz	kW	1.196		
Max. permissible cable length between dv/dt filter and motor	m		100 (shielded) 150 (unshielded)	
dv/dt reactor				
Terminals				
- 1U1/1V1/1W1		for 2 x M12 bolts		
- 1U2/1V2/1W2		for 2 x M12 bolts		
- PE		M6 screw		
Dimensions				
Width	mm	430		
Height	mm	385		
Depth	mm	323		
Weight, approx.	kg	171.2		
Voltage Peak Limiter				
Terminals				
- DCPS/DCNS		for M8 bolt		
- 1U2/1V2/1W2		for M8 bolt		
- PE		for M6 screw		
Dimensions				
Width	mm	277		
Height	mm	360		
Depth	mm	291		
Weight, approx.	kg	18.8		

Terminal Board 30 (TB30)

11.1 General

Description

The TB30 Terminal Board supports the addition of digital inputs/digital outputs and analog inputs/analog outputs to 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

The TB30 Terminal Board plugs into the option slot on the Control Unit.

A shield connection for the signal cable shield is located on the Control Unit.

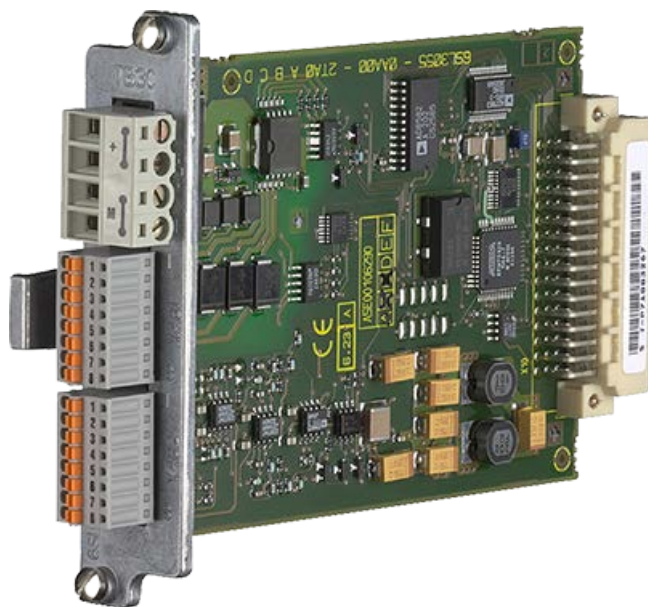


Figure 11-1 Terminal Board TB30

11.2 Mechanical installation

NOTICE

Damage or malfunctions to the Option Board by inserting and withdrawing in operation

Withdrawing and inserting Option Boards during operation can damage them or cause the Option Boards to malfunction.

- Only withdraw or insert Option Boards when the Control Unit is in a current-free state.

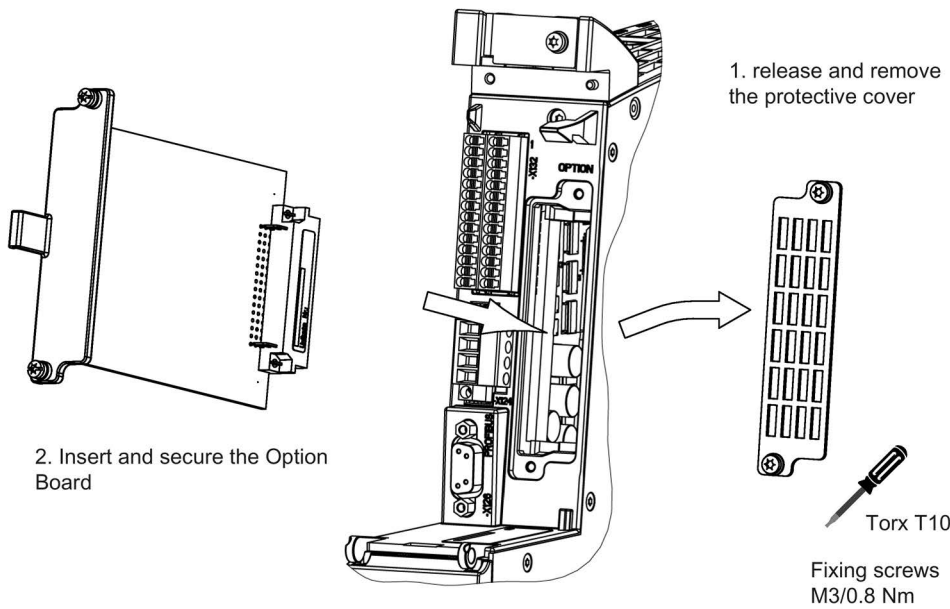


Figure 11-2 Installing an Option Board on a CU320-2 DP

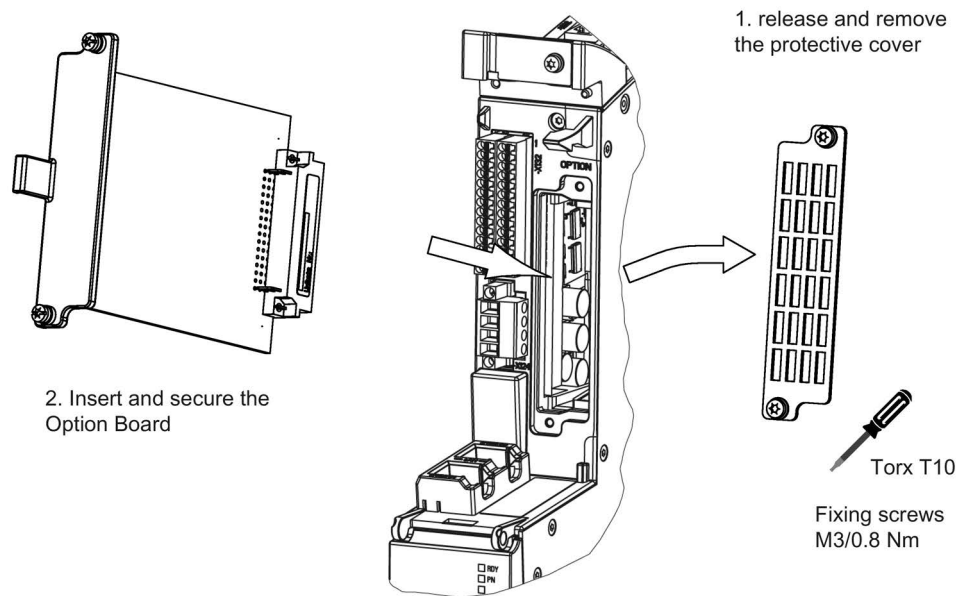


Figure 11-3 Installing an Option Board on a CU320-2 PN

11.3 Electrical installation

Interface overview

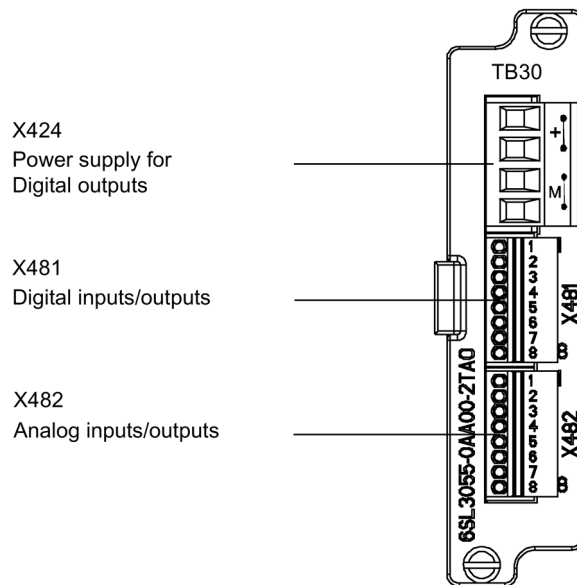


Figure 11-4 Interface description of the TB30

Connection overview

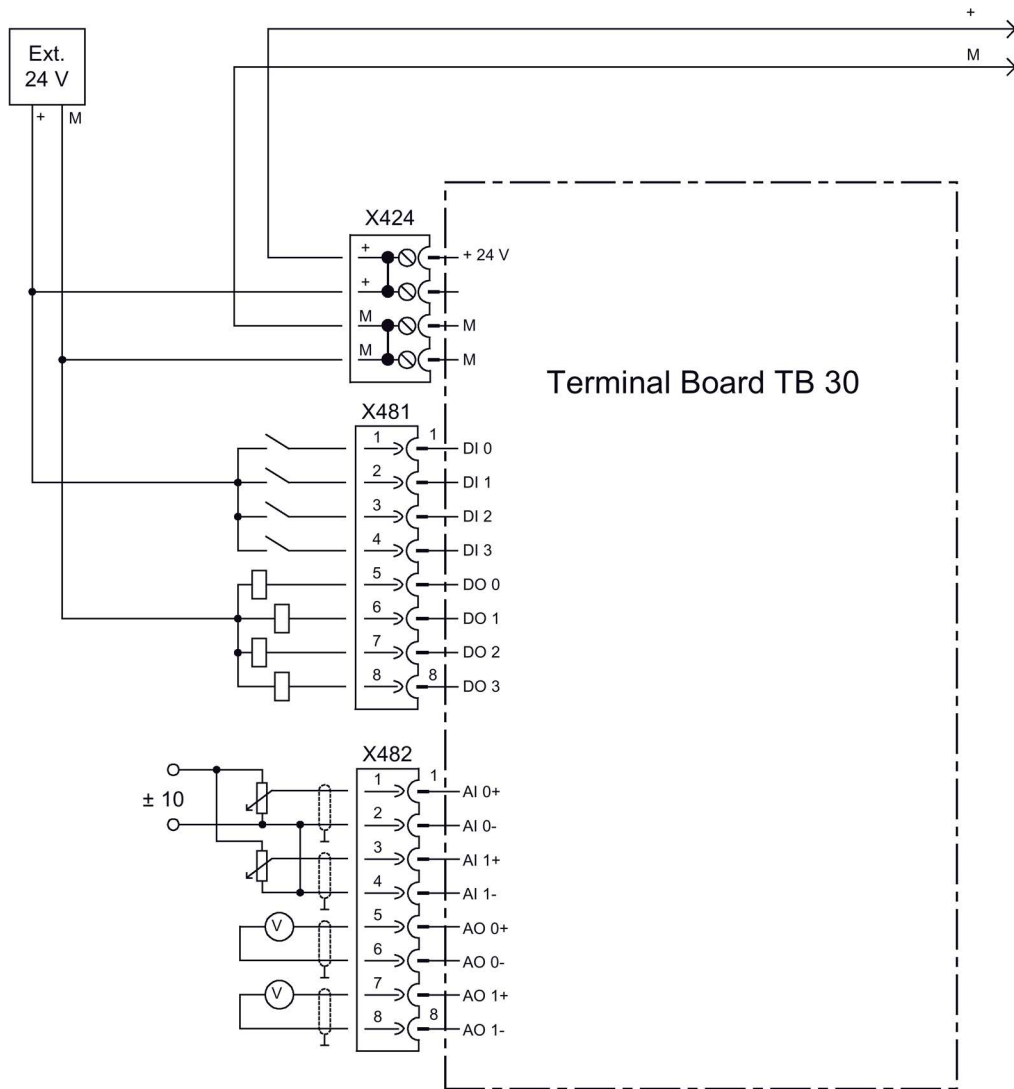
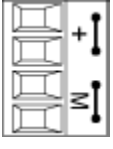


Figure 11-5 Connection overview TB30

X424 power supply, digital outputs

Table 11- 1 Terminal block X424

Connector	Terminal	Function	Technical specifications
	+	Power supply	Voltage: 24 VDC (20.4 V – 28.8 V) Current consumption: Max. 4 A (per digital output max. 0.5 A)
	+	Power supply	
	M	Ground	Max. current via jumper in connector: 20 A at 55° C
	M	Ground	
Max. connectable cross-section: 2.5 mm ²			

Note

The two "+" and "M" terminals are jumpered in the connector. This ensures that the supply voltage is looped through.

This power supply is required for the digital outputs only.

The electronics power supply and the power supply for the analog inputs/outputs are taken from the option slot of the Control Unit.

Note

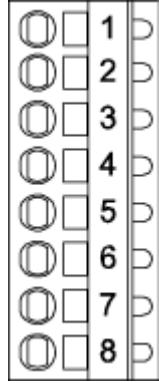
The power supply of the digital outputs and the electronics power supply of the Control Unit are optically isolated.

Note

If a the 24 V supply is briefly interrupted, then the digital outputs are deactivated during this time.

Digital inputs/outputs X481

Table 11- 2 Terminal strip X481

Connector	Terminal	Designation ¹⁾	Technical specifications
	1	DI 0	Voltage: - 3 ... 30 V Current consumption, typical: 10 mA at 24 VDC Ground reference: X424.M Input delay: - For "0" to "1": 20 µs - for "1" to "0": 100 µs Level (incl. ripple) - High level: 15 ... 30 V Low level: -3 ... 5 V
	2	DI 1	
	3	DI 2	
	4	DI 3	
	5	DO 0	Voltage: 24 V DC Max. load current per output: 500 mA Ground reference: X424.M Continued-short-circuit-proof Output delay: - for "0" to "1": Typ. 150 µs at 0.5 A resistive load - (500 µs maximum) - For "1" to "0": Typically 50 µs at 0.5 A resistive load Switching frequency: - For resistive load: Max. 100 Hz - For inductive load: Max. 0.5 Hz - For lamp load: Max. 10 Hz Maximum lamp load: 5 W
	6	DO 1	
	7	DO 2	
	8	DO 3	
Max. connectable cross-section: 0.5 mm ²			

¹⁾ DI: digital input, DO: digital output

Note

An open input is interpreted as "low".

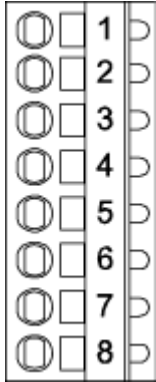
The power supply and the digital inputs/outputs are optically isolated from the Control Unit.

Note

If at the 24 V supply is briefly interrupted, then the digital outputs are deactivated during this time.

Analog inputs/outputs X482

Table 11- 3 Terminal strip X482

Connector	Terminal	Designation ¹⁾	Technical specifications
	1	AI 0+	Analog inputs (AI) Voltage: -10 ... +10 V; R: 65 kΩ Common mode range: ±30 V Resolution: 13 bits + sign
	2	AI 0-	
	3	AI 1+	
	4	AI 1-	
	5	AO 0+	Analog outputs (AO) Voltage range: -10 ... +10 V Load current: max. -3 ... +3 mA Resolution: 11 bits + sign Continuous short-circuit proof
	6	AO 0-	
	7	AO 1+	
	8	AO 1-	

Max. connectable cross-section: 0.5 mm²

¹⁾ AI: Analog input, AO: Analog output

Note**Permissible voltage values**

In order to avoid incorrect results of the analog-digital conversion, the analog differential voltage signals can have a maximum offset voltage of +/-30 V with respect to ground potential.

Note

An open input is interpreted as approximately "0 V".

The power supply of the analog inputs/outputs is taken from the option slot of the Control Unit and not from X424.

The shield is connected to the Control Unit.

Shield connection of the TB30 on the Control Unit CU320

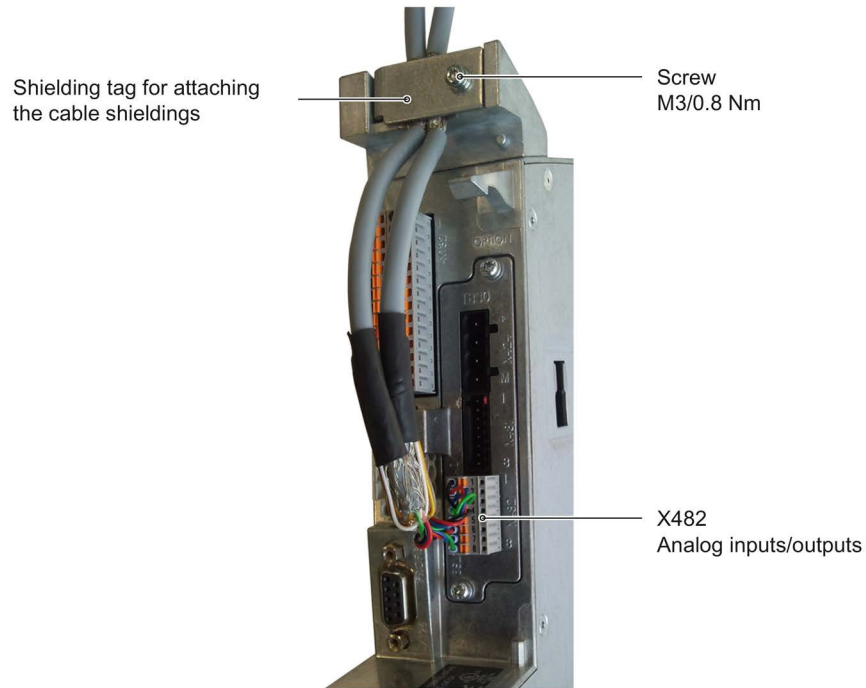


Figure 11-6 TB30 shield connection

The permissible bending radii for the cables must not be exceeded when the cables are being installed.

11.4 Technical specifications

General technical data

Table 11- 4 General technical data

Product standard	EN 61800-5-1
------------------	--------------

Technical data

Table 11- 5 Technical data

	Unit	Value
Electronic power supply		
Voltage	V _{DC}	24 DC (20.4 – 28.8)
Current via the option slot of the CU (without digital outputs)	A _{DC}	0.05
Power loss	W	<3
Response time	The reaction time of digital inputs/outputs and analog inputs/outputs depends on the evaluation on the Control Unit (see function diagrams FP 9100 - FP 9106) in the SINAMICS List Manual).	
Weight	kg	0.1

Voltage Sensing Module 10 (VSM10)

12.1 General

Description

The VSM10 Voltage Sensing Module is used for acquiring the voltage characteristic on the motor side, so that the following functions 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 rotating ("flying restart" function).
- Fast flying restart of large induction motors: The time for the demagnetization of the motor is eliminated as a result of the voltage sensing.

When operating a permanent-magnet synchronous motor without encoder, the "Flying restart" function must be activated with p1200.



Figure 12-1 VSM10

12.1.1 Safety information

 **WARNING**

Non-observance of the fundamental safety instructions and residual risks

The non-observance of the fundamental safety instructions and residual risks stated in Chapter 1 can result in accidents with severe injuries or death.

- Adhere to the fundamental safety instructions.
- When assessing the risk, take into account residual risks.

 **WARNING**

Fire through overheating due to insufficient ventilation clearances

Insufficient ventilation clearances result in overheating with danger to persons as a result of smoke and fire. This can also result in more downtimes and reduced service lives of the Voltage Sensing Module.

- For this reason, it is imperative that you maintain the 50 mm clearances above and below the Voltage Sensing Module.

NOTICE

Destruction of the VSM10 as a result of voltage measurements incorrectly carried out

If the voltage measurement is carried out incorrectly, the VSM10 can be destroyed as a result of the high voltage stress across the insulating clearance.

- When using long motor cables, it is not permissible that the output voltage of the Power Module is directly measured at the motor.

NOTICE

Destruction of the VSM10 as a result of a terminal assignment which is not permissible

The VSM10 has two terminal strips, X521 and X522, to sense the three-phase line supply voltage. A terminal assignment which is not permissible results in the module being destroyed.

- Use just one of the two terminal strips.
- Only connect voltages to terminal strip X521 up to a maximum 100 V (phase-to-phase) via a transformer.
- Only connect voltages to terminal strip X522 up to a maximum 690 V (phase-to-phase) directly.

NOTICE**Damage caused by the use of incorrect DRIVE-CLiQ cables**

The use of incorrect or not released DRIVE-CLiQ cables can cause damage or functional faults to devices or the system.

- Use only appropriate DRIVE-CLiQ cables that have been released by Siemens for the associated use case.

Note**Malfunctions due to polluted DRIVE-CLiQ interfaces**

Malfunctions can occur in the system through the use of polluted DRIVE-CLiQ interfaces.

- Cover unused DRIVE-CLiQ interfaces with the supplied blanking covers.

12.2 Mechanical installation

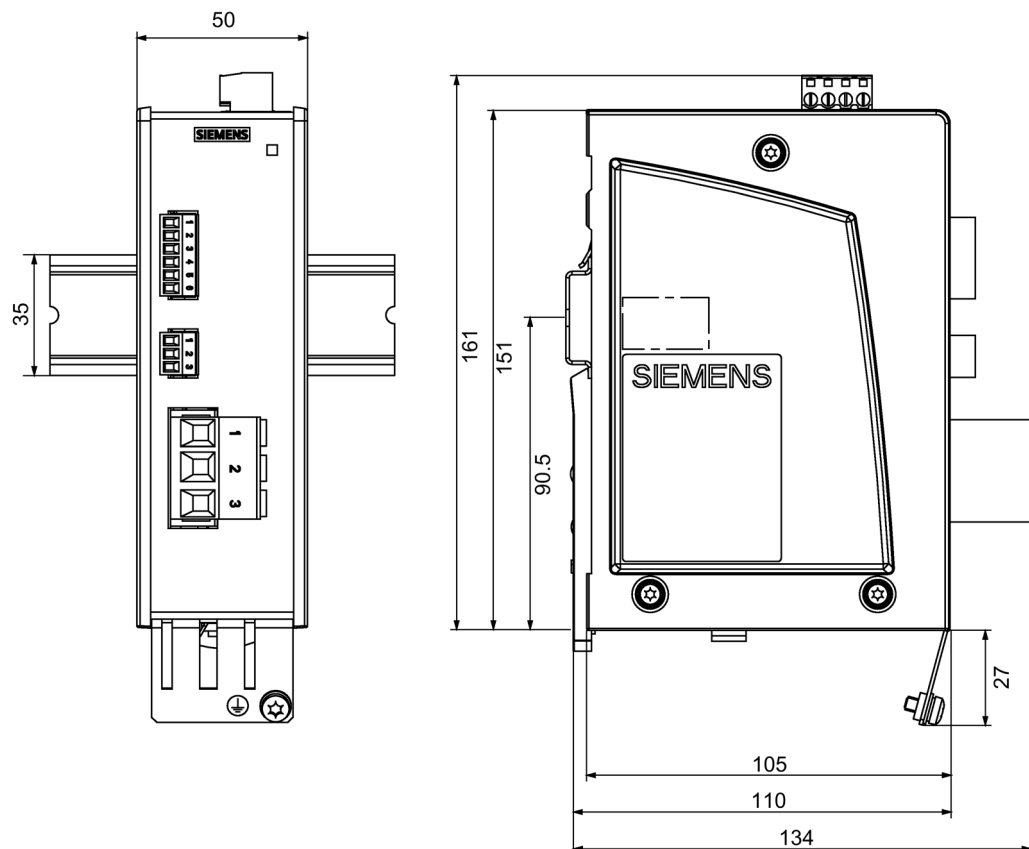


Figure 12-2 Dimension drawing of Voltage Sensing Module VSM10

Note

Mounting space

The VSM10 is installed near the Power Module on a mounting rail which must be provided by the customer.

12.3 Electrical installation

12.3.1 Overview

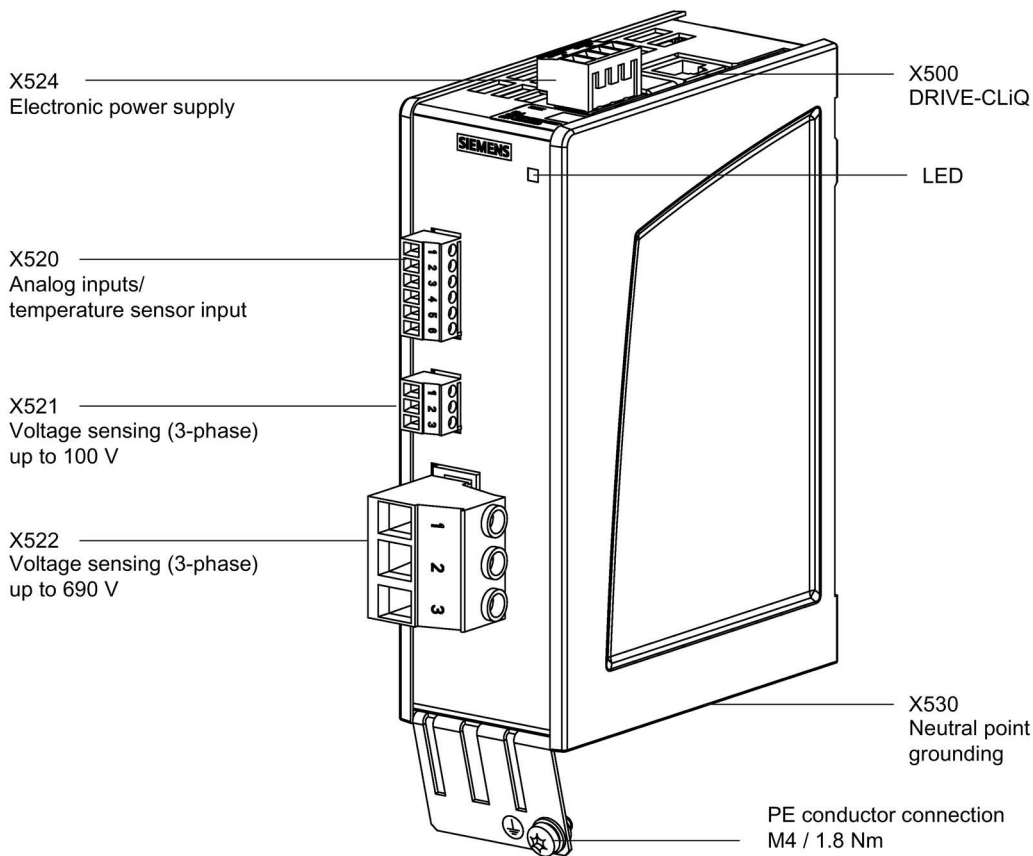


Figure 12-3 Interface overview of the VSM10

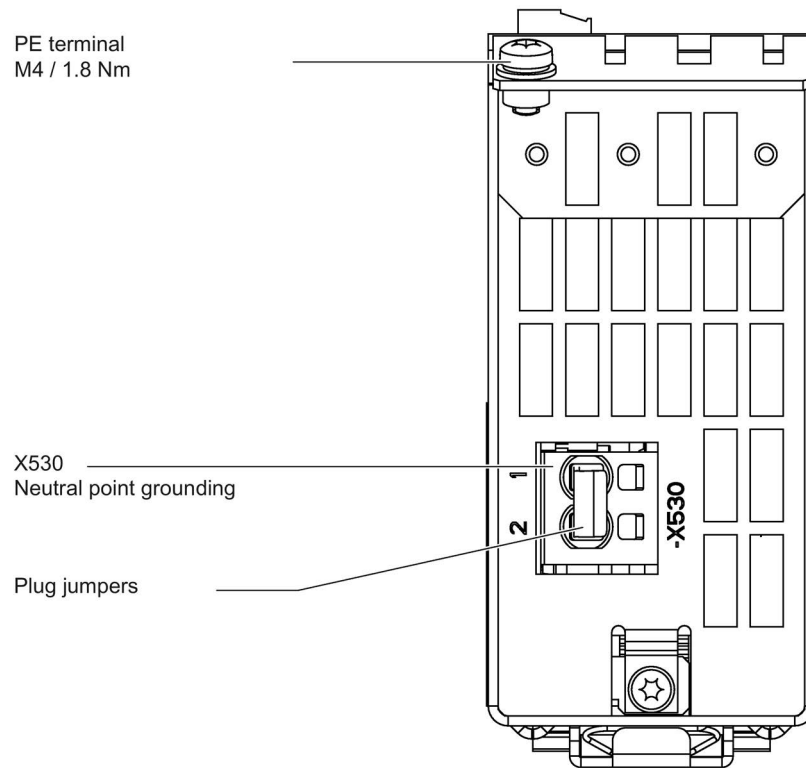


Figure 12-4 X530 interface at the VSM10 (view from below)

12.3.2 Connection diagram

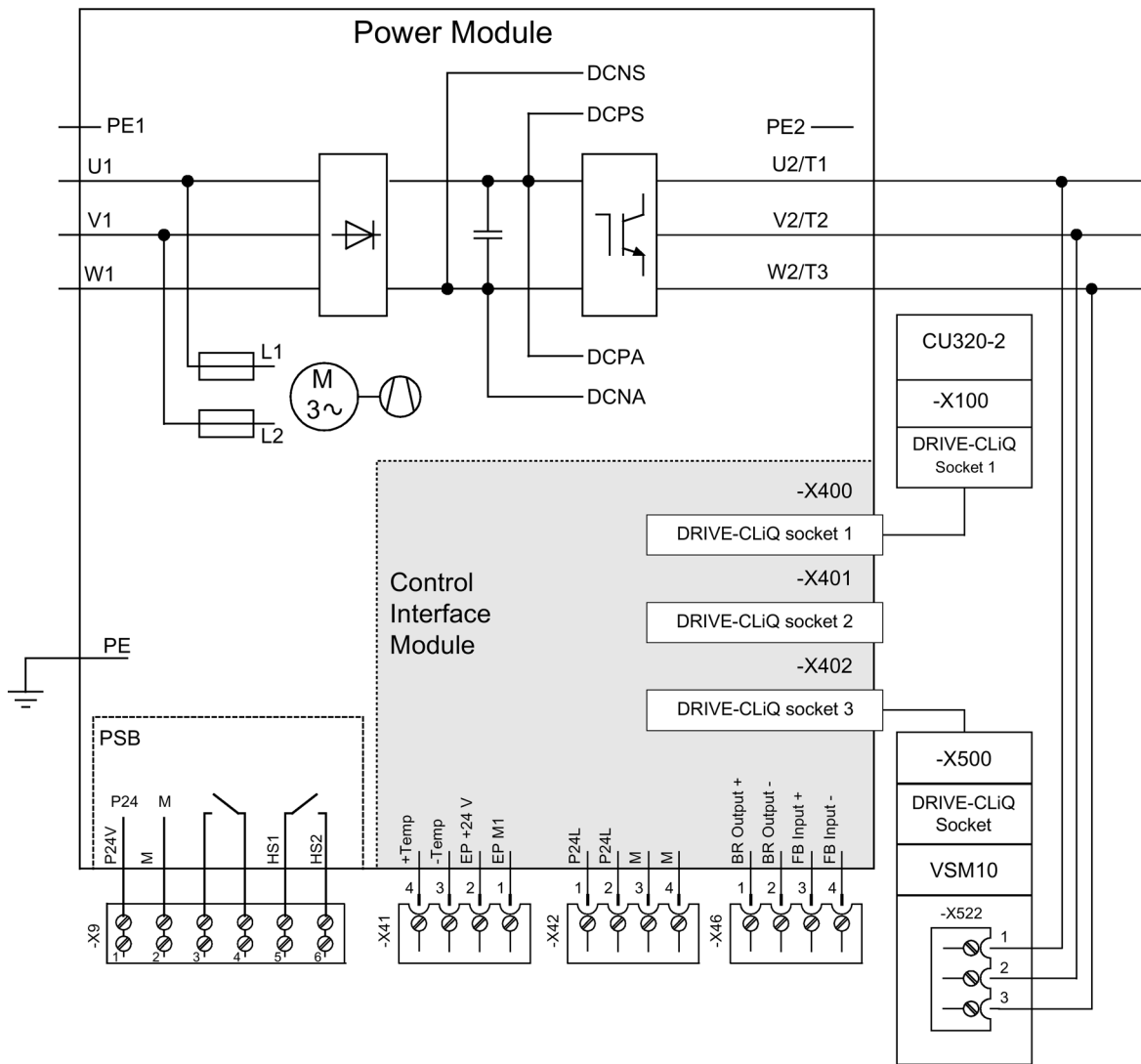



Figure 12-5 Connection example VSM10 for sensorless operation of a permanent-magnet synchronous machine

NOTICE

Pick-off of the line voltage at connection -X522

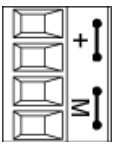
The pick-offs for the cable to terminal -X522 must be located on the load side of an optional reactor or dV/dt filter, if possible directly at the motor connection terminals.

 WARNING
<p>Fire and device damage as a result of ground fault/short-circuit</p> <p>Inadequate installation of the cables to the connection -X522 can result in a ground fault / short-circuit and place persons at risk as a result of the associated smoke and fire.</p> <ul style="list-style-type: none"> • Comply with local installation regulations that enable this fault to be ruled out. • Protect the cables from mechanical damage. • In addition, apply one of the following measures: <ul style="list-style-type: none"> – Use cables with double insulation. – Maintain adequate clearance, e.g. by using spacers. – Lay the cables in separate cable ducts or conduits.

12.3.3 Interface description

12.3.3.1 Electronics power supply X524

Table 12- 1 Terminal strip for the electronics power supply X524

Connector	Terminal	Designation	Technical specifications
	+	Electronic power supply	Voltage: 24 V DC (20.4 V – 28.8 V) Current consumption: Max. 0.2 A Max. current through the jumper in the connector: 20 A at 55°C
	+	Electronic power supply	
	M	Electronic ground	
	M	Electronic ground	
Max. connectable cross-section: 2.5 mm ²			

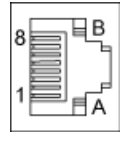
Note

Looping through the supply voltage

The two "+" and "M" terminals are jumpered in the connector. This ensures that the supply voltage is looped through.

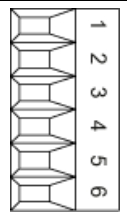
12.3.3.2 DRIVE-CLiQ interface X500

Table 12- 2 DRIVE-CLiQ interface X500

Connector	Pin	Signal name	Technical specifications
	1	TXP	Transmit data +
	2	TXN	Transmit data -
	3	RXP	Receive data +
	4	Reserved, do not use	
	5	Reserved, do not use	
	6	RXN	Receive data -
	7	Reserved, do not use	
	8	Reserved, do not use	
	A	+ (24 V)	Power supply
	B	M (0 V)	Electronics ground
Blanking plate for DRIVE-CLiQ interfaces (50 pcs.) Article number: 6SL3066-4CA00-0AA0			

12.3.3.3 X520 analog inputs/temperature sensor

Table 12- 3 Terminal block X520

Connector	Terminal	Designation	Technical specifications
	1	AI 0-	2 analog differential inputs Voltage: -10 ... +10 V; $R_i > 100 \text{ k}\Omega$ Resolution: 12 bits + sign
	2	AI 0+	
	3	AI 1-	
	4	AI 1+	
	5	+ Temp ¹⁾	Temperature sensor KTY84-1C130/PT1000/PTC Measuring current via temperature sensor connection: 2 mA
	6	- Temp ¹⁾	
Max. connectable cross-section: 1.5 mm ²			

¹⁾ Accuracy of the temperature measurement:

- KTY: $\pm 7 \text{ }^\circ\text{C}$ (including evaluation)
- PT1000: $\pm 5 \text{ }^\circ\text{C}$ (PT1000 tolerance class B according to EN 60751 including evaluation)
- PTC: $\pm 5 \text{ }^\circ\text{C}$ (including evaluation)

**! WARNING****Electric shock in the event of voltage flashovers on the temperature sensor cable**

Voltage flashovers in the signal electronics can occur in motors without safe electrical separation of the temperature sensors.

- Only use temperature sensors that fully comply with the specifications of the safety isolation.
- If safe electrical separation cannot be guaranteed (for linear motors or third-party motors, for example), use a Sensor Module External (SME120 or SME125) or Terminal Module TM120.

Note**Permissible voltage values**

The common mode range must not be violated in order to avoid incorrect analog-digital conversion results. The following voltages are permissible:

- Input voltage: ± 30 V (destruction limit)
- Common mode voltage: ± 10 V with respect to ground potential (increased errors when exceeded)

NOTICE**Damage to motor in the event of incorrectly connected KTY temperature sensor**

If a KTY temperature sensor is connected with incorrect polarity, it is not possible to detect when the motor overheats. Overheating can cause damage to the motor.

- Connect a KTY temperature sensor with the correct polarity.

Note

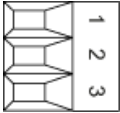
In order to minimize noise emission, shielded cables should be used.

Note

The maximum cable length for a shielded cable – connected at both ends – to the temperature sensor and to the analog inputs is 30 m.

12.3.3.4 X521 three-phase line supply voltage sensing up to 100 V (phase-to-phase)

Table 12- 4 Terminal block X521

Connector	Terminal	Designation	Technical specifications
	1	Phase voltage U	Connection to the voltage sensing for medium-voltage networks via a safe electrically isolated transformer Resistance to neutral point: each ~500 kΩ Insulation resistance, neutral point - ground when the jumper is not inserted: >10 MΩ
	2	Phase voltage V	
	3	Phase voltage W	
Max. connectable cross-section: 1.5 mm ²			

NOTICE

Destruction of the VSM10 as a result of a terminal assignment which is not permissible

The VSM10 has two terminal strips, X521 and X522, to sense the three-phase line supply voltage. A terminal assignment which is not permissible results in the module being destroyed.

- Use just one of the two terminal strips.
- Only connect voltages to terminal strip X521 up to a maximum 100 V (phase-to-phase) via a transformer.
- Only connect voltages to terminal strip X522 up to a maximum 690 V (phase-to-phase) directly.

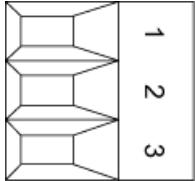
Note

Connection sequence

The phases must be connected to the VSM10 with the same sequence as that of the Power Module.

12.3.3.5 X522 three-phase line supply voltage sensing up to 690 V (phase-to-phase)

Table 12- 5 Terminal block X522

Connector	Terminal	Designation	Technical specifications
	1	Phase voltage U	Directly connected to the line voltage sensing Resistance to neutral point: each ~3500 kΩ Insulation resistance, neutral point - ground when the jumper is not inserted: >10 MΩ
	2	Phase voltage V	
	3	Phase voltage W	
Max. connectable cross-section: 6 mm ²			

NOTICE**Destruction of the VSM10 as a result of a terminal assignment which is not permissible**

The VSM10 has two terminal strips, X521 and X522, to sense the three-phase line supply voltage. A terminal assignment which is not permissible results in the module being destroyed.

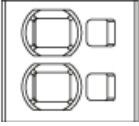
- Use just one of the two terminal strips.
- Only connect voltages to terminal strip X521 up to a maximum 100 V (phase-to-phase) via a transformer.
- Only connect voltages to terminal strip X522 up to a maximum 690 V (phase-to-phase) directly.

Note**Connection sequence**

The phases must be connected to the VSM10 with the same sequence as that of the Power Module.

12.3.3.6 X530 neutral point grounding

Table 12- 6 Neutral point grounding X530

Connector	Terminal	Designation	Technical data
	1	Neutral point of the voltage sensing	Jumper inserted: Grounded measurement
	2	Ground potential	Jumper not inserted: isolated measurement

The Voltage Sensing Module is supplied with inserted jumper. When delivered, the neutral point is connected to the protective conductor via the connector jumper. Current can flow to PE. This connection is removed by removing the connector jumper. The measurement is then electrically isolated.

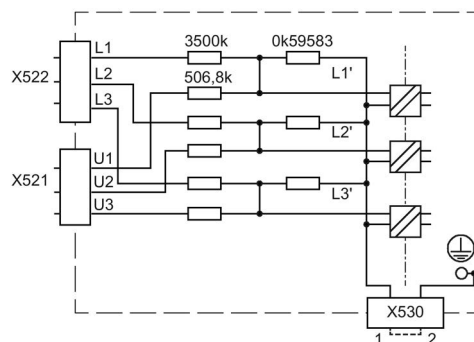
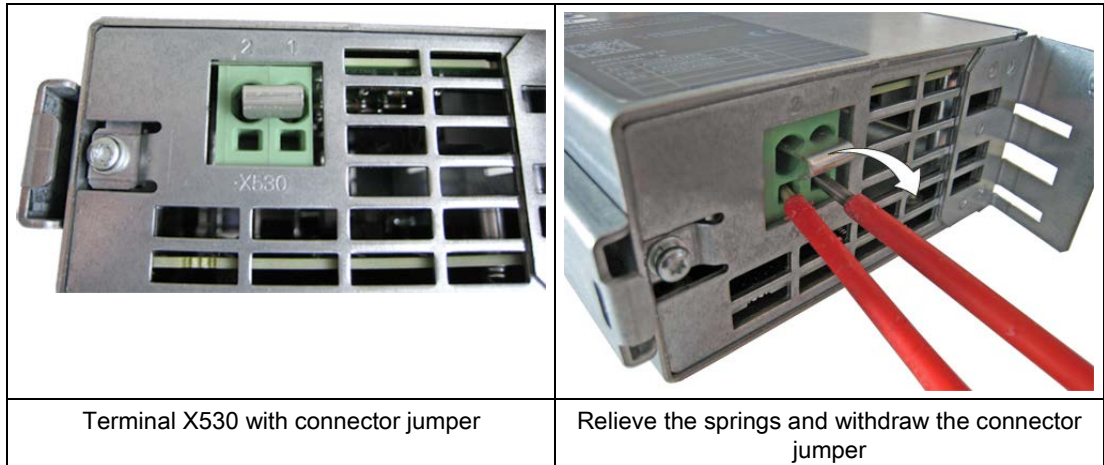


Figure 12-6 Internal circuit of the VSM10 Voltage Sensing Module

12.3.3.7 Operating on an ungrounded line supply (IT system)

When using a Voltage Sensing Module on a non-grounded line supply (IT system), remove the connector jumper in terminal X530 on the lower side of the component.

Use two screwdrivers or a suitable tool in order to relieve the holding springs in the terminal and then withdraw the connector jumper.



Note

False tripping caused by not removing the connection clip with a non-grounded line supply

Failure to remove the connection clip to the basic interference suppression module on a non-grounded line supply (IT system) can cause false tripping for a sensitive IT system monitoring.

- Remove the connection kit for a non-grounded line supply (IT system).

12.3.3.8 Significance of the LEDs for the Voltage Sensing Module VSM10

Table 12- 7 Description of the LEDs on the Voltage Sensing Module

LED	Color	Status	Description
READY	---	OFF	The electronics power supply is missing or lies outside the permissible tolerance range.
	Green	Continuous light	The component is ready for operation and cyclic DRIVE-CLiQ communication is taking place.
	Orange	Continuous light	DRIVE-CLiQ communication is being established.
	Red	Continuous light	This component has at least one fault. Remark: The LED is activated irrespective of whether the corresponding messages have been reconfigured.
	Green/red	Flashing 0.5 Hz	Firmware is being downloaded.
		Flashing 2 Hz	Firmware download is complete. Waiting for POWER ON.
	Green/orange or red/orange	Flashing light	Detection of the components via LED is activated (p0144). Remark: Both options depend on the LED status when module recognition is activated via p0144 = 1.

12.4 Technical specifications

General technical data

Table 12- 8 General technical data

Product standard	EN 61800-5-1
------------------	--------------

Technical data

Table 12- 9 Technical data

	Unit	Value
Electronic power supply		
Voltage	V _{DC}	24 DC (20.4 – 28.8)
Current (without DRIVE-CLiQ or digital outputs)	A _{DC}	0.3
Power loss	W	<10
PE/ground connection	On the housing with M4, 1.8 Nm screw	
Weight	kg	1
Degree of protection		IP20

Terminal Module 150 (TM150)

13.1 General information

Description

The TM150 Terminal Module is a DRIVE-CLiQ component for temperature evaluation. The temperature is measured in a temperature range from -99°C to $+250^{\circ}\text{C}$ 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 short-circuit monitoring)
- Bimetallic NC contact (without monitoring)

For the temperature sensor inputs, for each terminal block the evaluation can be parameterized for 1x2-wire, 2x2-wire, 3-wire or 4-wire. There is no galvanic isolation in the TM150.

The TM150 is mounted in the control cabinet and can be snapped on to a standard mounting rail (EN 60715).



Figure 13-1 TM150

13.1 General information

The TM150 contains the following interfaces:

Table 13- 1 Overview of the TM150 interfaces

Type	Quantity
DRIVE-CLiQ interfaces	2
Temperature sensor inputs	6/12
Electronic power supply	1

13.1.1 Safety information

 **WARNING**
Non-observance of the fundamental safety instructions and residual risks

The non-observance of the fundamental safety instructions and residual risks stated in Chapter 1 can result in accidents with severe injuries or death.

- Adhere to the fundamental safety instructions.
- When assessing the risk, take into account residual risks.

 **WARNING**
Fire through overheating due to insufficient ventilation clearances

Insufficient ventilation clearances result in overheating with danger to persons as a result of smoke and fire. This can also result in more downtimes and reduced service lives of the Terminal Module.

- For this reason, it is imperative that you maintain the 50 mm clearances above and below the Terminal Module.

NOTICE**Device failure as a result of unshielded or incorrectly routed cables to temperature sensors**

Unshielded or incorrectly routed cables to temperature sensors can result in interference being coupled into the signal processing electronics from the power side. This can result in significant disturbance of all signals (fault messages) up to failure of individual components (destruction of the devices).

- Only use shielded cables as temperature sensor cables.
- If temperature sensor cables are routed together with the motor cable, use separately shielded cables twisted in pairs.
- Connect the cable shield to ground potential through a large surface area.

NOTICE**Damage caused by the use of incorrect DRIVE-CLiQ cables**

The use of incorrect or not released DRIVE-CLiQ cables can cause damage or functional faults to devices or the system.

- Use only appropriate DRIVE-CLiQ cables that have been released by Siemens for the associated use case.

Note**Malfunctions due to polluted DRIVE-CLiQ interfaces**

Malfunctions can occur in the system through the use of polluted DRIVE-CLiQ interfaces.

- Cover unused DRIVE-CLiQ interfaces with the supplied blanking covers.

Note**Function equipotential bonding for distributed DRIVE-CLiQ nodes**

Integrate all of the components that are connected via DRIVE-CLiQ into the function equipotential bonding concept. The connection should be preferably established by mounting on metallic bare machine and plant components that are connected with one another using an equipotential bonding conductor.

Alternatively, you can establish equipotential bonding using a conductor (min. 6 mm²), which as far as possible, is routed in parallel to the DRIVE-CLiQ cable. This applies to all distributed DRIVE-CLiQ nodes such as DM20, SME2x, SME12x.

13.2 Mechanical installation

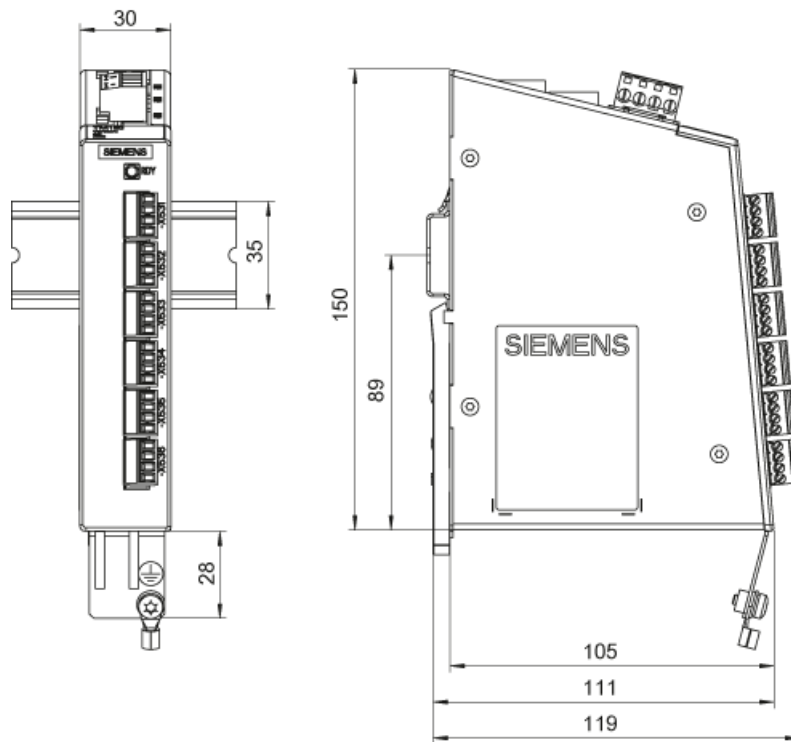


Figure 13-2 Dimension drawing Terminal Module 150 (TM150)

Note

Mounting space

The TM150 is installed near the Power Module on a mounting rail, which must be provided by the customer.

13.3 Electrical installation

13.3.1 Overview

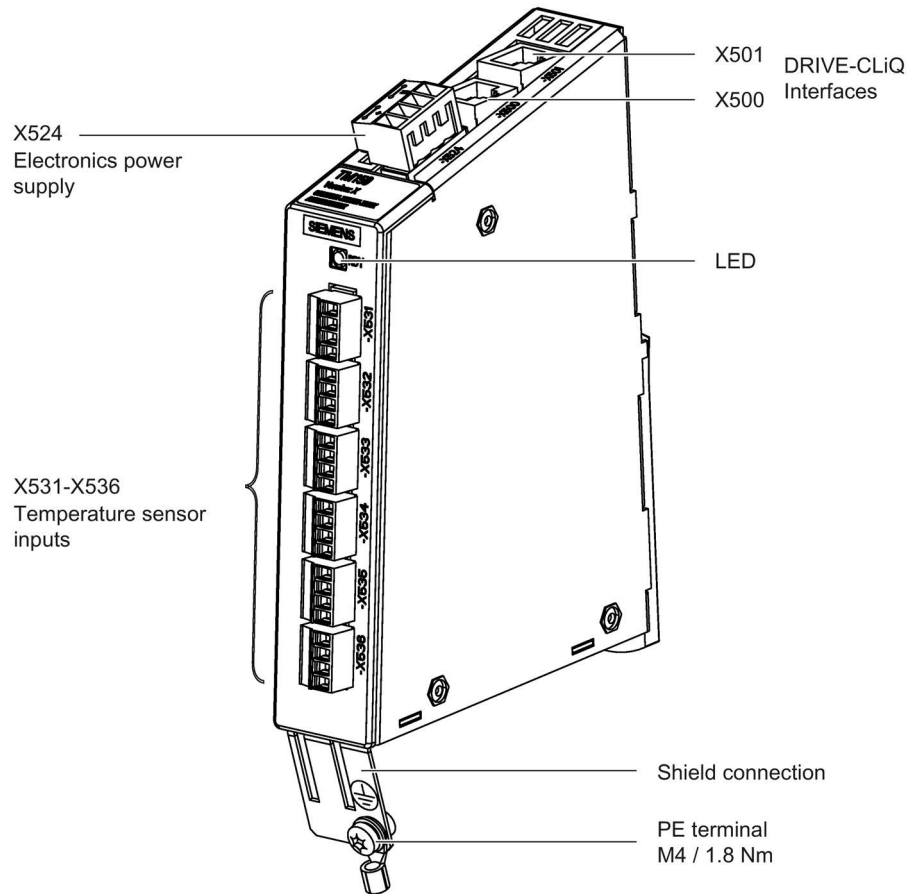
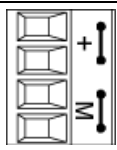


Figure 13-3 Terminal Module 150 (TM150)

13.3.2 Interface description

13.3.2.1 X524 electronics power supply

Table 13- 2 Terminal strip for the electronic power supply X524

Connector	Terminal	Designation	Technical specifications
	+	Power supply	Voltage: 24 VDC (20.4 V – 28.8 V) Current consumption (max./typ.): 0.5 A / 0.1 A max. current through the jumper in the connector: 20 A (15 A according to UL/CSA)
	+	Power supply	
	M	Ground	
	M	Ground	
Max. connectable cross-section: 2.5 mm ²			

Note

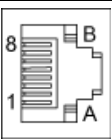
Looping through the supply voltage

The two "+" and "M" terminals are jumpered in the connector. This ensures that the supply voltage is looped through.

The current consumption increases by the value for the DRIVE-CLiQ node.

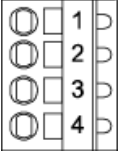
13.3.2.2 X500, X501 DRIVE-CLiQ interfaces

Table 13- 3 DRIVE-CLiQ interface X500, X501

Connector	Pin	Signal name	Technical data
	1	TXP	Transmit data +
	2	TXN	Transmit data -
	3	RXP	Receive data +
	4	Reserved, do not use	
	5	Reserved, do not use	
	6	RXN	Receive data -
	7	Reserved, do not use	
	8	Reserved, do not use	
	A	+ (24 V)	Power supply
	B	M (0 V)	Electronics ground
Blanking plate for DRIVE-CLiQ interfaces (50 pcs.) Article number: 6SL3066-4CA00-0AA0			

13.3.2.3 X531-X536 temperature sensor inputs

Table 13- 4 X531-X536 temperature sensor inputs

Connector	Terminal	Function 1x2-/2x2-wire	Function 3 and 4-wire	Technical data
	1	+Temp (channel x)	+ (Channel x)	Temperature sensor connection for sensors with 1x2 wires Connection of the 2nd measurement cable for sensors with 4 wires
	2	-Temp (channel x)	- (Channel x)	Temperature sensor connection for sensors with 1x2 wires Connection of the 1st measurement cable for sensors with 3 and 4 wires
	3	+Temp (channel y)	+ I _c (constant current, positive channel x)	Temperature sensor connection for sensors with 2x2, 3 and 4-wires
	4	-Temp (channel y)	- I _c (constant current, negative channel x)	
Max. connectable cross-section: 1.5 mm ²				

Measuring current via temperature sensor connection: approx. 0.83 mA

When connecting temperature sensors with 3 wires, a jumper must be inserted between X53x.2 and X53x.4.

Table 13- 5 Channel assignment

Terminal	Channel number [x] for 1x2, 3 and 4-wires	Channel number [y] for 2x2 wires
X531	0	6
X532	1	7
X533	2	8
X534	3	9
X535	4	10
X536	5	11


! WARNING
Electric shock in the event of voltage flashovers at the temperature sensor

Voltage flashovers in the signal electronics can occur in motors without safe electrical separation of the temperature sensors.

- Use temperature sensors that fully comply with the specifications of the safety isolation.

NOTICE
Damage to motor in the event of incorrectly connected KTY temperature sensor

If a KTY temperature sensor is connected with incorrect polarity, it is not possible to detect when the motor overheats. Overheating can cause damage to the motor.

- Connect a KTY temperature sensor with the correct polarity.

NOTICE
Overheating of the motor through jumpering the temperature sensor connections

Jumpering of the temperature sensor connections "+Temp" and "- Temp" results in incorrect measured results. Damage to the motor can result if the overheating is not detected.

- When using several temperature sensors, separately connect the individual sensors to "+Temp" and "-Temp".

NOTICE
Device failure as a result of unshielded or incorrectly routed cables to temperature sensors

Unshielded or incorrectly routed cables to temperature sensors can result in interference being coupled into the signal processing electronics from the power side. This can result in significant disturbance of all signals (fault messages) up to failure of individual components (destruction of the devices).

- Only use shielded cables as temperature sensor cables.
- If temperature sensor cables are routed together with the motor cable, use separately shielded cables twisted in pairs.
- Connect the cable shield to ground potential through a large surface area.

Note
Incorrect temperature measured values as a result of cables with an excessively high resistance

An excessively long cable length or an excessively small cable cross-section can falsify the temperature measurement (for a PT100, 10 Ω cable resistance can falsify the measurement result by 10%). As a consequence, excessively high measured values are output, which could lead to the motor being unnecessarily tripped prematurely.

- Use only cable lengths ≤ 300 m.
- For cable lengths >100 m, use cables with a cross-section of ≥ 1 mm².

13.3.2.4 Meaning of the LEDs on the Terminal Module TM150

Table 13- 6 Description of the LEDs on the TM150

LED	Color	State	Description	
READY	-	OFF	The electronic power supply is missing or lies outside the permissible tolerance range.	
	Green	Continuous light	The component is ready for operation and cyclic DRIVE-CLiQ communication is taking place.	
	Orange	Continuous light	DRIVE-CLiQ communication is being established.	
	Red	Continuous light	This component has at least one fault. Remark: The LED is activated irrespective of whether the corresponding messages have been reconfigured.	
	Green/red	Flashing 0.5 Hz	Flashing 0.5 Hz	Firmware is being downloaded.
			Flashing 2 Hz	Firmware download is complete. Waiting for POWER ON.
Green/orange or red/orange	Flashing 2 Hz	Flashing 2 Hz	Detection of the components via LED is activated (p0154). Remark: Both options depend on the LED status when module recognition is activated via p0154 = 1.	

13.3.3 Connection examples

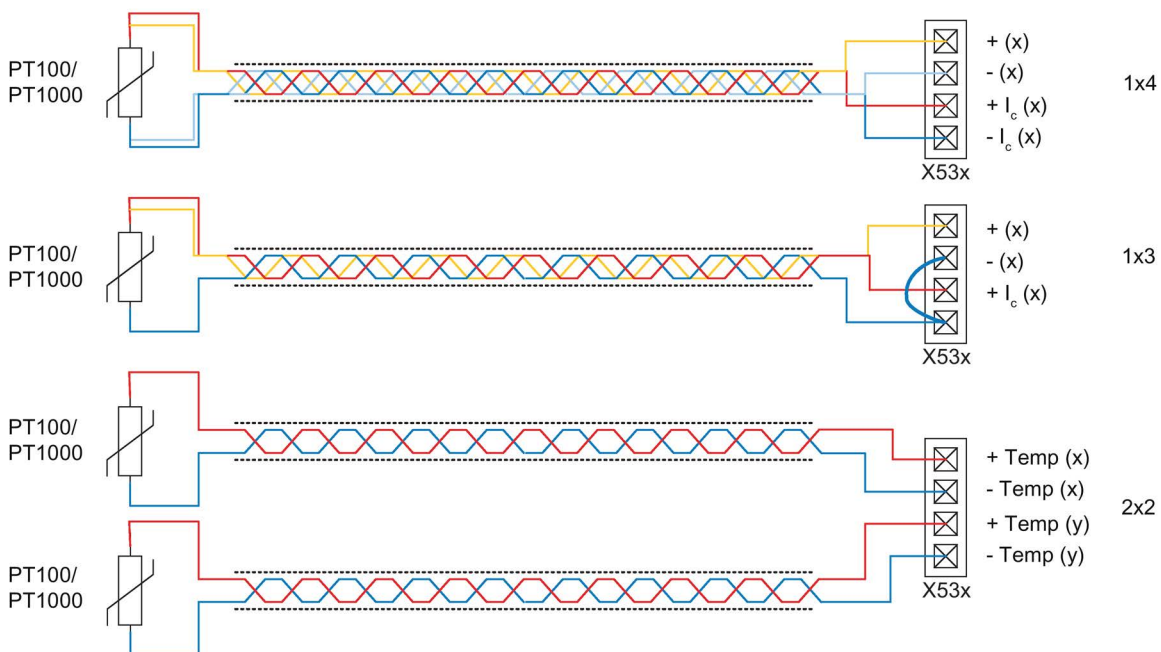


Figure 13-4 Connecting a PT100/PT1000 with 2x2, 3 and 4-wires to the temperature sensor inputs X53x of Terminal Module TM150

13.3 Electrical installation

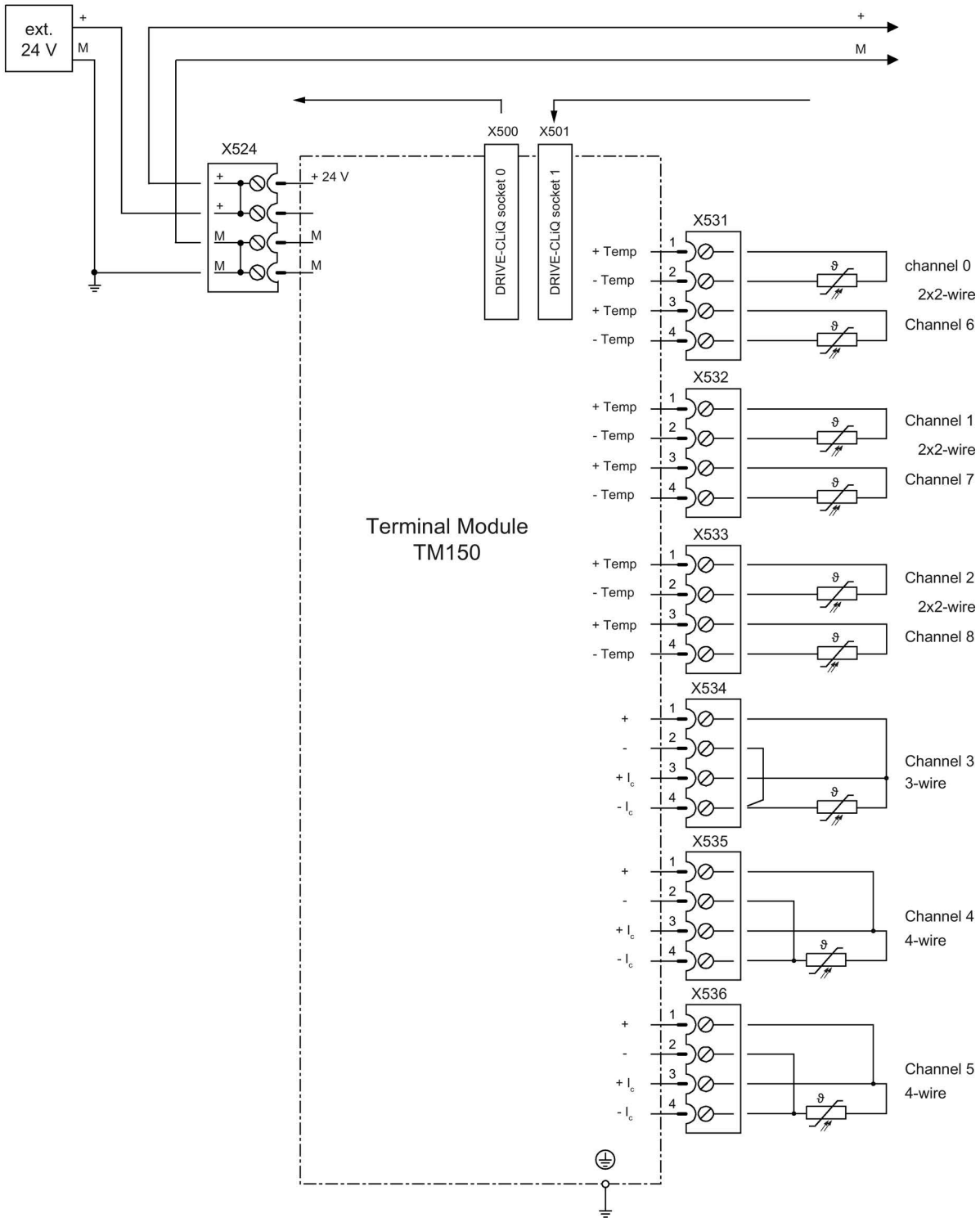
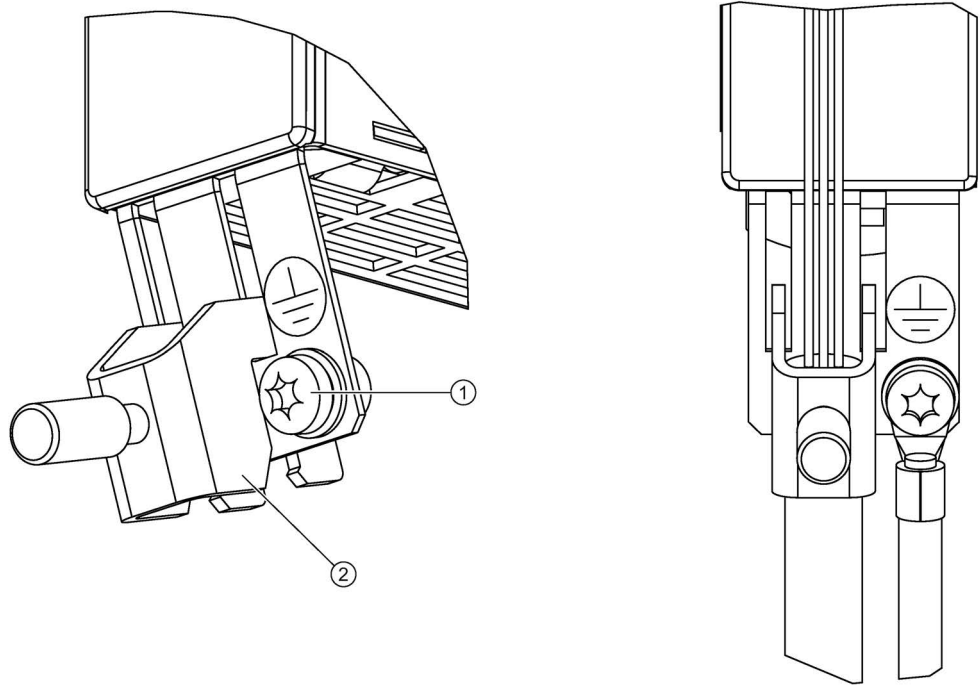


Figure 13-5 Connection example for a Terminal Module TM150

13.3.4 Protective conductor connection and shield support

The following diagram shows a typical Weidmüller shield connection clamp for the shield supports.



- ① Protective conductor connection M4/1.8 Nm
- ② Shield connection terminal, Weidmüller company, type: KLBÜ CO1, order number: 1753311001

Figure 13-6 Shield support and protective conductor connection of the TM150

NOTICE

Damage or faulty operation due to incorrect shielding or inadmissible cable lengths

If the correct shielding procedures or the permissible cable lengths are not observed, it can cause damage or the machine may malfunction.

- Only use shielded cables.
- Do not exceed the cable lengths stated in the technical specifications.

13.4 Technical specifications

General technical data

Table 13- 7 General technical data

Product standard	EN 61800-5-1
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Technical data

Table 13- 8 Technical data

6SL3055-0AA00-3LA0	Unit	Value
Electronic power supply		
Voltage	V _{DC}	24 V DC (20.4 – 28.8)
Current (without DRIVE-CLiQ)	A _{DC}	0.07
Power loss	W	1.6
PE/ground connection	On housing with M4/1.8 Nm screw	
Weight	kg	0.4
Degree of protection	IP20	

Note

Screw plug correctly or latch

In order to guarantee the degree of protection, all of the connectors must be correctly screwed into place and appropriately locked.

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Additional information

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