SINAMICS S120

Chassis Power Units

Manual 01/2013

SINAMICS

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Chassis power units

Manual

(GH3), 01/2013

6SL3097-4AE00-0BP3

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.

Trademarks

All names identified by ® are registered trademarks of Siemens AG. The remaining trademarks in this publication may be trademarks whose use by third parties for their own purposes could violate the rights of the owner.

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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Order number: 6SL3097-4AE00-0BP3
Ⓟ 07/2013 Technical data subject to change

Preface

SINAMICS documentation

The SINAMICS documentation is organized in the following categories:

- General documentation/catalogs
- User documentation
- Manufacturer/service documentation

Additional information

Using the following link, you can find information on the topics:

- Ordering documentation / overview of documentation
- Additional links to download documents
- Using documentation online (find and search in manuals/information)

http://www.siemens.com/motioncontrol/docu

Please send any questions about the technical documentation (e.g. suggestions for improvement, corrections) to the following e-mail address:
docu.motioncontrol@siemens.com

My Documentation Manager

Using the following link, you can find information on how to create your own individual documentation based on Siemens' content, and adapt it for your own machine documentation:
http://www.siemens.com/mdm

Training

Using the following link, you can find information on SITRAIN - training from Siemens for products, systems and drive technology solutions:
http://www.siemens.com/sitrain

FAQs

You can find Frequently Asked Questions in the Service&Support pages under **Product Support**:
http://support.automation.siemens.com

SINAMICS

You can find information on SINAMICS under:
http://www.siemens.com/sinamics

Usage phases and the available tools/documents

Table 1 Usage phases and the available tools/documents

Usage phase	Tools
Orientation	SINAMICS S sales documentation
Planning/engineering	• SIZER engineering tool • Configuration manuals, motors
Decision making/ordering	SINAMICS S Catalogs
Configuring/installation	• SINAMICS S120 Manual for Control Units and Additional System Components • SINAMICS S120 Manual for Booksize Power Units • SINAMICS S120 Manual for Chassis Power Units • SINAMICS S120 Manual for Liquid Cooled Chassis Power Units • SINAMICS S120 Manual for AC Drives • SINAMICS S120M Manual for Distributed Drive Technology
Commissioning	• STARTER Commissioning Tool • SINAMICS S120 Getting Started • SINAMICS S120 Commissioning Manual • SINAMICS S120 CANopen Commissioning Manual • SINAMICS S120 Function Manual • SINAMICS S120/S150 List Manual
Using/operating	• SINAMICS S120 Commissioning Manual • SINAMICS S120/S150 List Manual
Maintenance/Service	• SINAMICS S120 Commissioning Manual • SINAMICS S120/S150 List Manual
List of references	• SINAMICS S120/S150 List Manual

Target group

This documentation is intended for machine manufacturers, commissioning engineers, and service personnel who use the SINAMICS drive system.

Benefits

This manual provides all the information, procedures and operational instructions required for commissioning and servicing SINAMICS S120.

Standard scope

The scope of the functionality described in this document can differ from the scope of the functionality of the drive system that is actually supplied.

- Other functions not described in this documentation might be able to be executed in the drive system. This does not, however, represent an obligation to supply such functions with a new controller or when servicing.
- The documentation can also contain descriptions of functions that are not available in a particular product version of the drive system. The functionalities of the supplied drive system should only be taken from the ordering documentation.
- Extensions or changes made by the machine manufacturer must be documented by the machine manufacturer.

For reasons of clarity, this documentation does not contain all of the detailed information on all of the product types. This documentation cannot take into consideration every conceivable type of installation, operation and service/maintenance.

Technical support

Country-specific telephone numbers for technical support are provided in the Internet under **Contact**:

http://www.siemens.com/automation/service&support

EC declarations of conformity

The EC Declaration of Conformity for the EMC Directive and for the Low-Voltage Directive can be found/obtained from the relevant regional office of the I DT MC and I DT LD Business Units of Siemens AG.

Note

Low-voltage directive

When operated in dry operating areas, SINAMICS equipment with AC motors conforms to Low-Voltage Directive 2006/95/EC.

Note

EC declaration of conformity

In the configuration specified in the corresponding EC Declaration of Conformity regarding EMC requirements and when the EMC installation guideline, order no. 6FC5297-0AD30-0*P* is observed, SINAMICS devices conform to EMC Directive 89/336/EEC and 2004/108/EC. (*A: German; *B: English)

Note

Machinery directive

The devices satisfy the requirements according to Machinery Directive 2006/42/EC for the Safety Integrated safety functions.

Note

Compliance with EMC limit values

The manual describes a target state which, if maintained, ensures the required level of operational reliability and compliance with EMC limit values.

Should there be any deviation from the requirements in the manual, appropriate actions (e.g. measurements) must be taken to check/prove that the required level of operational reliability and compliance with EMC limit values are ensured.

EMC limit values for South Korea

이 기기는 업무용(A급) 전자파적합기기로서 판매자 또는 사용자는 이 점을 주의하시기 바라며, 가정외의 지역에서 사용하는 것을 목적으로 합니다.

For sellers or other user, please keep in mind that this device in an A-grade electromagnetic wave device. This device is intended to be used in areas other than home.

The EMC limit values that have to be observed for South Korea correspond to the limit values of the EMC product standard for variable-speed electric drives EN 61800-3 of category C2 or of limit value class A, Group 1 according to EN 55011.
With suitable additional measures, the limit values of category C2 or of limit class A, Group 1, are maintained. Additional measures, such as the use of an additional RFI suppression filter (EMC filter), may be necessary.
In addition, measures for a correct EMC-compliant configuration of the plant are described in detail in this manual and the "SINAMICS Low-Voltage Configuration Manual".

Spare parts

You will find spare parts on the Internet at:
http://support.automation.siemens.com/WW/view/en/16612315

Test certificates

The Safety Integrated functions of SINAMICS components are generally certified by independent institutes. An up-to-date list of certified components is available on request from your local Siemens office. If you have any questions relating to certifications that have not been completed, please ask your Siemens contact.

ESD information

CAUTION

Electrostatic sensitive devices

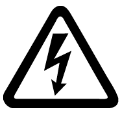
Electrostatic sensitive devices (ESD) are single components, integrated circuits or devices that can be damaged by electrostatic fields or electrostatic discharges.

Regulations for handling ESD components:

- During the handling of electronic components, pay attention to the grounding of the person, workplace and packaging!
- Personnel in ESD areas with conductive flooring may only handle electronic components if:
  - They are grounded with an ESD wrist band
  - They are wearing ESD shoes or ESD shoe grounding straps
- Electronic components should be touched only when this is unavoidable. They must only be handled on the front panel or, in the case of printed circuit boards, at the edge.
- Electronic components must not be brought into contact with plastics or clothing made of artificial fibers.
- Electronic components may only be placed on conducting surfaces (table with ESD coating, conducting ESD foamed material, ESD packing bag, ESD transport container).
- Electronic components may not be placed near display units, monitors or televisions (minimum distance from the screen > 10 cm).
- Measurements must only be taken on boards when the measuring instrument is grounded (via protective conductors, for example) or the measuring probe is briefly discharged before measurements are taken with an isolated measuring device (for example, touching a bare metal housing).

Safety information

> ⚠ DANGER
>
> **Qualified personnel**
>
> SINAMICS S equipment must only be commissioned by suitably qualified personnel.
>
> The personnel must take into account the information provided in the technical customer documentation for the product, and be familiar with and follow the specified danger and warning notices.
>
> When electrical equipment and motors are operated, the electrical circuits automatically conduct a dangerous voltage.
>
> Dangerous mechanical movements of the driven machine components are possible during system operations.
>
> All work on the electrical system must be carried out when the system has been disconnected from the power supply and is de-energized.



> ⚠ DANGER
>
> **Five safety rules**
>
> When carrying out any kind of work on electrical devices, the "five safety rules" according to EN 50110 must always be observed:
>
> 1. Disconnect the system.
> 2. Protect against reconnection.
> 3. Make sure that the equipment is de-energized.
> 4. Ground and short-circuit.
> 5. Cover or enclose adjacent components that are still live.

> ⚠ WARNING
>
> **Correct and safe operation**
>
> Correct and safe operation of SINAMICS S units assumes correct transportation in the transport packaging, correct long-term storage in the transport packaging, setup and installation, as well as careful operation and maintenance.
>
> The details in the catalogs and proposals also apply to the design of special equipment versions.
>
> In addition to the danger and warning information provided in the technical customer documentation, the applicable national, local, and plant-specific regulations and requirements must be taken into account.
>
> According to EN 61800-5-1 and UL 508, only safely isolated protective extra low-voltages may be connected to any of the connections or terminals on the electronics modules.

Note

Installation of a UL-approved system

For a UL-approved system use 60/75° C copper conductors only.

NOTICE
Malfunctions caused by mobile telephones
Operating the equipment in the immediate vicinity (< 1.8 m) of mobile telephones with a transmitting power of > 1 W may cause the devices to malfunction.

Residual risks of power drive systems

The control and drive components of a power drive system (PDS) are approved for industrial and commercial use in industrial line supplies. Their use in public electrical networks requires a different configuration and/or additional measures.

These components may only be operated in closed housings or in higher-level control cabinets with protective covers that are closed, and when all of the protective devices are used.

These components may only be handled by qualified and trained technical personnel who are knowledgeable and observe all of the safety information and instructions on the components and in the associated technical user documentation.

When carrying out a risk assessment of the machine/plant according to the EU Machinery Directive, the machine manufacturer / plant operator must consider the following residual risks associated with the control and drive components of a power drive system (PDS).

1. Unintentional movements of driven machine components during commissioning, operation, maintenance and repairs caused by, for example:
   - Hardware defects and/or software errors in the sensors, controllers, actuators, and connection technology
   - Response times of the controller and drive
   - Operating and/or ambient conditions outside specification
   - Condensation / conductive contamination
   - Parameterization, programming, cabling, and installation errors
   - Use of radio devices / cellular phones in the immediate vicinity of the controller
   - External influences / damage
2. In the event of a fault, exceptionally high temperatures, including open fire, as well as emissions of light, noise, particles, gases, etc. can occur inside and outside the converter, for example:
   - Component malfunctions
   - Software errors
   - Operating and/or ambient conditions outside specification
   - External influences / damage

   Converters of the Open Type/IP20 degree of protection must be installed in a control cabinet (or protected by another equivalent measure) in such a way that contact with fire inside and outside the converter is prevented.
3. Hazardous shock voltages caused by, for example:
   - Component malfunctions
   - Influence of electrostatic charging
   - Induction of voltages in moving motors
   - Operating and/or ambient conditions outside specification
   - Condensation / conductive contamination
   - 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.

Note

The components must be protected against conductive pollution (e.g. by installing them in a cabinet with degree of protection IP54B according to EN 60529).
Provided conductive pollution can be prevented at the installation site, the degree of protection for the cabinet can be decreased accordingly.

For more information about residual risks of the Power Drive System components, see the relevant chapters in the technical user documentation.

Electromagnetic fields

⚠WARNING

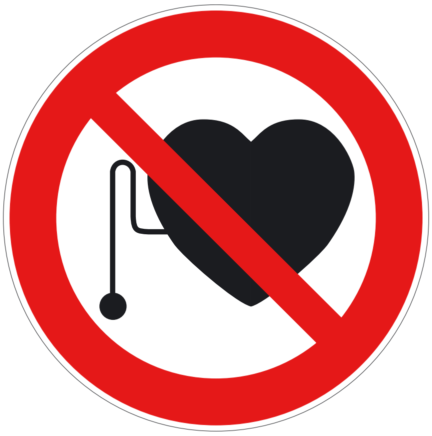
Electromagnetic fields "electro smog"

Electromagnetic fields are generated by the operation of electrical power engineering installations such as transformers, converters or motors.

Electromagnetic fields can interfere with electronic devices, which could cause them to malfunction. For example, the operation of heart pacemakers can be impaired, potentially leading to damage to a person's health or even death. It is therefore forbidden for persons with heart pacemakers to enter these areas.

The plant operator is responsible for taking appropriate measures (labels and hazard warnings) to adequately protect operating personnel and others against any possible risk.

- Observe the relevant nationally applicable health and safety regulations. In Germany, "electromagnetic fields" are subject to regulations BGV B11 and BGR B11 stipulated by the German statutory industrial accident insurance institution.
- Display adequate hazard warning notices.



- Place barriers around hazardous areas.
- Take measures, e.g. using shields, to reduce electromagnetic fields at their source.
- Make sure that personnel are wearing the appropriate protective gear.

Table of contents

1 System overview

1.1 The SINAMICS range of drives

Field of application

SINAMICS is the family of drives from Siemens designed for machine and plant engineering applications. SINAMICS offers solutions for all drive tasks:

- Simple pump and fan applications in the process industry
- Complex single drives in centrifuges, presses, extruders, elevators, as well as conveyor and transport systems
- Drive line-ups in textile, plastic film, and paper machines, as well as in rolling mill plants
- High-precision servo drives for the manufacture of wind turbines
- Highly dynamic servo drives for machine tools, as well as packaging and printing machines.

Figure 1-1 SINAMICS applications

Variants

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

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

Platform concept and Totally Integrated Automation

All SINAMICS versions are based on a platform concept. Common hardware and software components, as well as standardized tools for design, configuration and commissioning tasks, ensure high-level integration across all components. SINAMICS handles a wide variety of drive tasks without system gaps. The different SINAMICS versions can be easily combined with each other.

SINAMICS is part of the Siemens "Totally Integrated Automation" concept. Integrated SINAMICS systems covering engineering, data management and communication at the automation level, result in extremely cost-effective solutions based on SIMOTION, SINUMERIK and SIMATIC control systems.

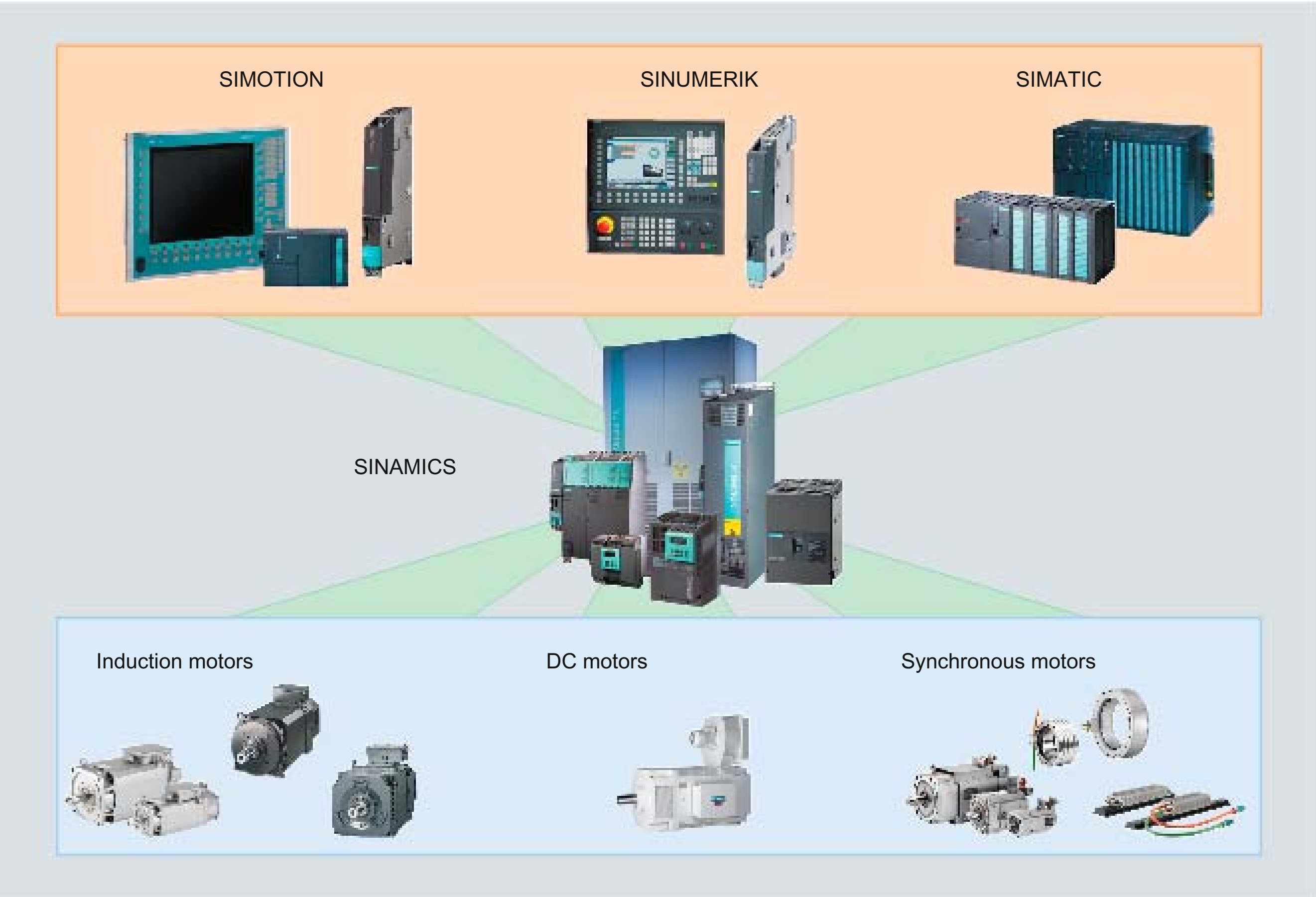


Figure 1-2 SINAMICS as part of the Siemens modular automation system

Quality management according to DIN EN ISO 9001

SINAMICS is able to meet the highest requirements in terms of quality. Comprehensive quality assurance measures in all development and production processes ensure a consistently high level of quality.

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

Universal applications

SINAMICS meets the requirements of relevant international standards and regulations - from the EN European standards through IEC to UL and cULus.

1.2 SINAMICS S120 drive system

Modular system for sophisticated drive tasks

SINAMICS S120 solves demanding drive tasks for a wide range of industrial applications and is, therefore, designed as a modular system. Users can choose from many different harmonized components and functions to create a solution that best meets their requirements. SIZER, a high-performance engineering tool, makes it easier to choose and determine the optimum drive configuration. SINAMICS S120 is enhanced by a wide range of motors. Whether synchronous or induction, all motor types are supported by SINAMICS S120.

Particularly suitable for multi-axis applications

Coordinated drives that carry out drive tasks together are used in many mechanical and plant engineering applications, including running gears in gantry cranes, stretching systems in the textile industry, or paper machines and rolling mills. These require drives with a connected DC link which allows cost-saving energy balancing between braking and driving axes.

SINAMICS S120 features Line Modules (infeed modules) and Motor Modules (inverter modules) covering a wide power range which, having been designed for seamless integration, pave the way for compact multi-axis drive configurations.

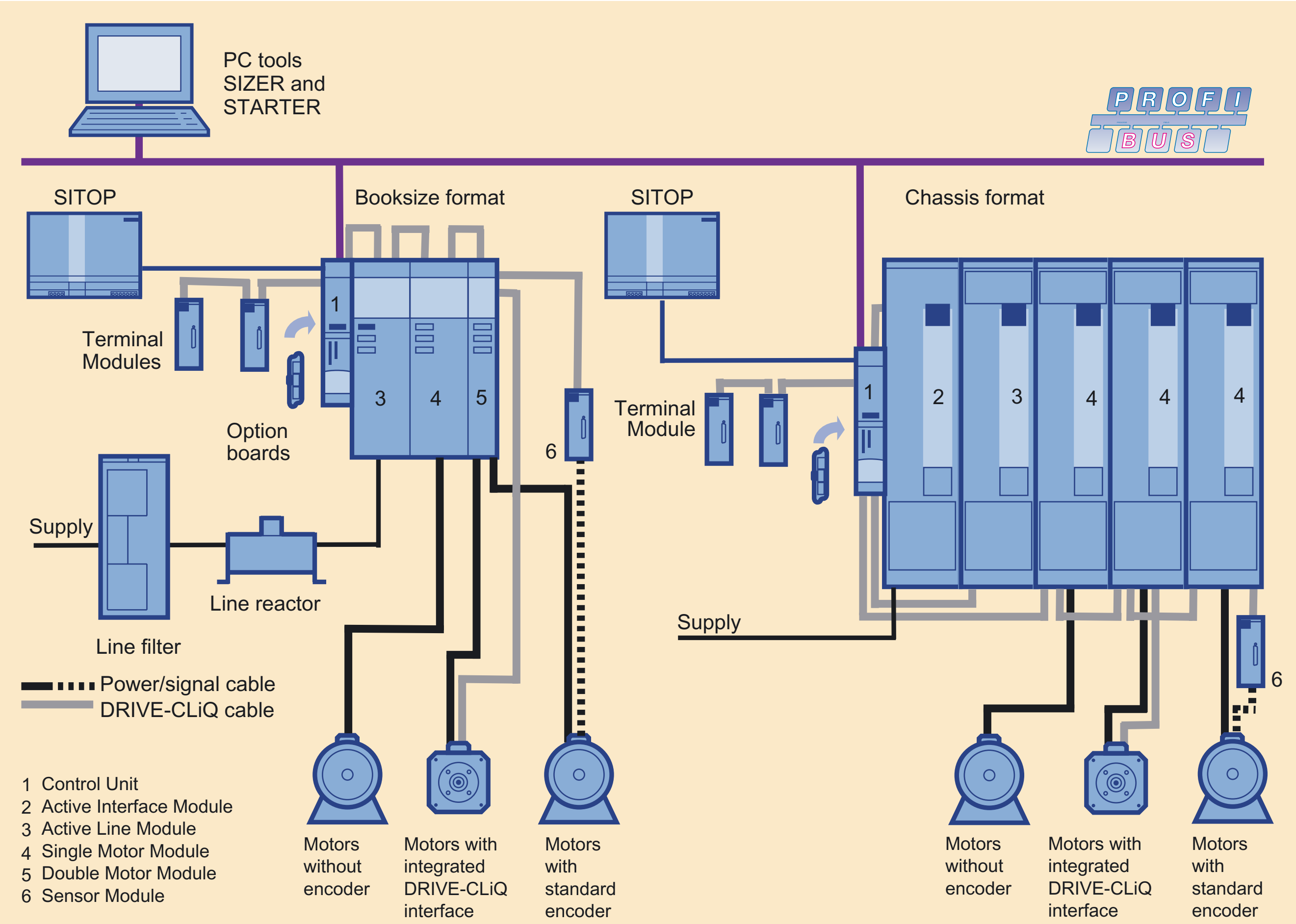


Figure 1-3 SINAMICS S120 system overview

New system architecture with a central Control Unit

Electronically coordinated individual drives work together to perform your drive tasks. Higher-level controllers operate the drives to achieve the required coordinated movement. This requires cyclic data exchange between the controller and all the drives. This exchange usually took place via a field bus, which required a great deal of time and effort for installation and configuration. SINAMICS S120 takes a different approach. A central Control Unit controls the drive for all connected axes and also establishes the technological links between the drives and/or axes. Since all the required data is stored in the central Control Unit, it does not need to be transferred. Inter-axis connections can be established within a Control Unit and easily configured in the STARTER commissioning tool using a mouse.

The SINAMICS S120 Control Unit solves basic technological tasks autonomously. For complex numerical or motion-control tasks, high-performance SIMOTION D modules are used instead.

DRIVE-CLiQ – the digital interface between all components

All SINAMICS S120 components, including the motors and encoders, are interconnected by a shared serial interface called DRIVE-CLiQ. The standardized cables and connectors reduce the variety of different parts and cut storage costs.

Converter boards (Sensor Modules) for converting standard encoder signals to DRIVE-CLiQ are available for third-party motors or retrofit applications.

Electronic rating plates in all components

All SINAMICS S120 components with a DRIVE-CLiQ interface have an electronic rating plate. This electronic rating plate contains all the relevant technical data about that particular component. For motors, for example, this data includes the parameters of the electric equivalent circuit diagram and characteristic values for the built-in motor encoder. The Control Unit records this data automatically via DRIVE-CLiQ so that it does not need to be entered during commissioning or when the equipment is replaced.

In addition to the technical data, the rating plate includes logistical data (manufacturer ID, order number, and globally unique ID). Since this data can be called up electronically on site or remotely, all the components used in a machine can always be individually identified, which helps simplify servicing.

SINAMICS S120 components

The SINAMICS S120 components are primarily used for multi-axis drive tasks.

The following power components are available:

- **Line-side power components**, such as fuses, contactors, line reactors and line filters for switching the power supply and complying with EMC regulations.
- **Line Modules**, which supply power centrally to the DC link.
- **DC-link components** which are used optionally to stabilize the DC-link voltage.
- **Motor Modules**, which act as inverters, receive power from the DC link, and supply the connected motors.
- **Motor-side components**, such as sine-wave filters, motor reactors, and dV/dt filters for reducing the voltage loads on the motor windings.

To carry out the required functions, SINAMICS S120 is equipped with:

- A **Control Unit** that carries out all drive and technological functions across all axes.
- **Additional system components** that enhance functionality and offer different interfaces for encoders and process signals.

SINAMICS S120 components were developed for installation in cabinets. They have the following features and characteristics:

- Easy to handle, simple installation and wiring
- Practical connection system, cable routing according to EMC requirements
- Standardized design, seamless integration
- Internal air cooling (other cooling methods available on request).

1.3 Technical specifications

Technical data

Unless specified otherwise, the following technical data is valid for all the following components of the SINAMICS S120 drive system.

Table 1- 1 General technical data

Electrical data	
Line supply voltage	• 3 AC 380 V -10% (-15% < 1 min) ... 3 AC 480 V +10% • 3 AC 500 V -10% (-15% < 1 min) ... 3 AC 690 V +10%
Line frequency	47 ... 63 Hz
Output voltage	0 to line connection voltage, depending on the type of infeed. With an Active Line Module, it is also possible to achieve a higher output voltage.
Output frequency	Vector control: 0 ... 600 Hz Servo control: 0 ... 650 Hz V/f control: 0 ... 650 Hz
Electronic power supply	24 VDC (20.4 V ... 28.8 V) implemented as PELV circuit according to EN 61800-5-1 Ground = Negative polarity grounded via the electronics
Rated short-circuit current according to IEC, in conjunction with the specified fuses and circuit breakers	• 1.1 ... 447 kW: 65 kA • 448 ... 671 kW: 84 kA • 672 ... 1193 kW: 170 kA • >1194 kW: 200 kA
Rated short-circuit current SCCR (Short-Circuit Current Rating)) according to UL508C (up to 600 V), in conjunction with the specified fuses or circuit breakers	• 1.1 ... 447 kW: 65 kA • 448 ... 671 kW: 84 kA • 672 ... 1193 kW: 170 kA • >1194 kW: 200 kA
Frequency with which the DC link is precharged	Max. 1 precharge every 3 minutes
Interference suppression	
• Standard • With line filter	• Category C3 (second environment) according to EN 61800-3 • Category C2 (first environment) according to EN 61800-3
Overvoltage category	Class III according to EN 61800-5-1
Mechanical data	
Vibratory load • Transport [1)] • Operation	 • EN 60721-3-2, class 2M2 • Test values according to EN 60068-2-6 test Fc: – 10 ... 58 Hz: Constant deflection = 0.075 mm – 58 ... 150 Hz: Constant acceleration = 9.81 m/s² (1 g)
Shock stressing • Transport [1)] • Operation	 • EN 60721-3-2, class 2M2 • Test values according to EN 60068-2-27 test Ea: 98 m/s² (10 g) / 20 ms

Ambient conditions	
Degree of protection	IP00 or IP20 according to EN 60529
Protection class	Class I (with protective conductor system) and class III (PELV) according to EN 61800-5-1
Shock protection	EN 50274 and BGV A 3 when used as intended
Permissible ambient and coolant temperature (air) during operation for line-side components, Line Modules and Motor Modules	0 ... +40° C without derating, >40 ... +55° C, see derating characteristics
Permissible ambient and coolant temperature (air) during operation for DC-link and motor-side power components	0 ... +55° C up to 2000 m above sea level
Cooling method according to EN 60146-1-1:1993	• Active Interface Modules, Basic Line Modules, Smart Line Modules, Active Line Modules, Motor Modules: **AF** – A: Air cooling – F: Forced cooling, drive unit inside the device • Line reactors, sine-wave filters, motor reactors, dV/dt filters with Voltage Peak Limiter: **AN** – A: Air cooling – N : Natural cooling (convection)
Climatic ambient conditions	
• Storage 1) • Transport 1) • Operation	• Class 1K3 according to EN 60721-3-1, temperature -40 ... +70° C • Class 2K4 according to EN 60721-3-2, temperature -40 ... +70° C, max. air humidity 95% at +40° C • Class 3K3 according to EN 60721-3-3, condensation, splashwater and ice formation not permitted (EN 60204, Part 1)
Environmental class / harmful chemical substances	
• Storage 1) • Transport 1) • Operation	• Class 1C2 according to EN 60721-3-1 • Class 2C2 according to EN 60721-3-2 • Class 3C2 according to EN 60721-3-3
Organic/biological influences	
• Storage 1) • Transport 1) • Operation	• Class 1B1 according to EN 60721-3-1 • Class 2B1 according to EN 60721-3-2 • Class 3B1 according to EN 60721-3-3
Degree of pollution	2 according to EN 61800-5-1 The devices may be operated only in environments with degree of pollution 2 and without condensation. On control cabinets with forced air cooling, foreign particles must be filtered out of the inflow air through filter mats. To prevent condensation, the devices can be warmed constantly by heaters.
The Safety Integrated safety function: The components must be protected against conductive contamination (e.g. by installing them in a cabinet with degree of protection IP54B according to EN 60529). Provided that conducted interference can be prevented at the installation site, the degree of protection for the cabinet can be decreased accordingly.	

Installation altitude	• > 2000 m above sea level without derating • > 2000 ... 4000 m above sea level, see derating characteristics
Certificates	
Conformity	CE (Low Voltage and EMC Directives), Machinery Directive
Standards	EN 61800-5-1, EN 60204-1, EN 61800-3, EN 60146-1-1
Approvals (only up to 3 AC 600 V)	cULus (File Nos.: E192450, E214113 and E253831)

1) In transport packaging

1.4 Derating factors as a function of installation altitude and ambient temperature

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

At ambient temperatures > 40° C, the output current must be reduced. Ambient temperatures above 55° C are not permissible.

At installation altitudes > 2000 m above sea level, it must be taken into account that the air pressure, and therefore air density, decreases as the height increases. This reduces the cooling effect as well as the insulating strength of the air.

As a result of the lower cooling effect, on the one hand, the ambient temperature must be reduced, and on the other hand, the power loss in the chassis unit must also be reduced by decreasing the output current; whereby ambient temperatures less than 40° C can be factored in as countermeasure for compensation.

The following table shows the permissible output currents as a function of installation altitude and ambient temperature (the permissible compensation between installation altitude and ambient temperatures of < 40° C – inlet air temperature at the air inlet of the chassis unit – is taken into account in the specified values).

The values apply under the precondition that a cooling air flow though the units as stated in the technical data is ensured.

As a further measure at installation altitudes of 2000 m and 5000 m, the use of an isolating transformer is required to reduce transient overvoltages according to EN 61800-5-1.

Table 1- 2 Current derating for chassis units as a function of ambient temperature (air intake temperature at the air inlet of the chassis unit) and installation altitude

Installation altitude above sea level in m	**Current derating factor (in % of rated current)** at an ambient temperature (air intake temperature) of							
	20° C	25° C	30° C	35° C	40° C	45° C	50° C	55° C
0 ... 2000	100%	100%	100%	100%	100%	93.3%	86.7%	80.0%
... 2500	100%	100%	100%	100%	96.3%			
... 3000	100%	100%	100%	98.7%				
... 3500	100%	100%	100%					
... 4000	100%	100%	96.3%					
... 4500	100%	97.5%						
... 5000	98.2%							

1.5 Standards

Note

Information on the listed standards

The standards listed in the table below are non-binding and do not in any way claim to be complete. The standards listed do not represent a guaranteed property of the product.

Only the statements made in the Declaration of Conformity shall be deemed binding.

Table 1- 3 Fundamental, application-relevant standards in succession: EN, IEC/ISO, DIN, VDE

Standards*	Title
EN 1037 ISO 14118 DIN EN 1037	Safety of machinery; avoiding unexpected starting
EN ISO 9001 ISO 9001 DIN EN ISO 9001	Quality management systems - requirements
EN ISO 12100-x ISO 12100-x DIN EN ISO 12100-x	Safety of Machinery; General Design Guidelines; Part 1: Basic Terminology, Methodology Part 2: Technical Principles and Specifications
EN ISO 13849-x ISO 13849-x DIN EN ISO 13849-x	Safety of Machinery; Safety-Related Parts of Control Systems; Part 1: General Basic Design Principles Part 2: Validation
EN ISO 14121-1 ISO 14121-1 DIN EN ISO 14121-1	Safety of Machinery - Risk Assessment; Part 1: Guidelines
EN 55011 CISPR 11 DIN EN 55011 VDE 0875-11	Industrial, scientific and medical high-frequency devices (ISM devices) - radio interference - limit values and measuring techniques
EN 60146-1-1 IEC 60146-1-1 DIN EN 60146-1-1 VDE 0558-11	Semiconductor converters; general requirements and line-commutated converters; Part 1-1: Defining the basic requirements
EN 60204-1 IEC 60204-1 DIN EN 60204-1 VDE 0113-1	Electrical equipment of machines; Part 1: General definitions
EN 60228 IEC 60228 DIN EN 60228 VDE0295	Conductors for cables and insulated leads
EN 60269-1 IEC 60269-1 DIN EN 60269-1 VDE 0636-1	Low-voltage fuses; Part 1: General requirements

Standards*	Title
IEC 60287-1 to -3	Cables - Calculation of the current carrying capacity Part 1: Current carrying capacity equations (100 % load factor) and calculating the losses Part 2: Thermal resistance - Part 3: Main sections for operating conditions
HD 60364-x-x IEC 60364-x-x DIN VDE 0100-x-x VDE 0100-x-x	Erection of power installations with nominal voltages up to 1000 V; Part 200: Definitions Part 410: Protection for safety, protection against electric shock Part 420: Protection for safety, protection against thermal effects Part 430: Protection of cables and conductors for overcurrent Part 450: Protection for safety, protection against undervoltage Part 470: Protection for safety; use of protection for safety Part 5xx: Selecting and erecting electrical equipment Part 520: Cables, conductors, busbars Part 540: Grounding, protective conductor, potential bonding conductor Part 560: Electrical equipment for safety purposes
EN 60439 IEC 60439 DIN EN 60439 VDE 0660-500	Low-voltage switchgear assemblies; Part 1: Type-tested and partially type-tested assemblies
EN 60529 IEC 60529 DIN EN 60529 VDE 0470-1	Degrees of protection provided by enclosures (IP code)
EN 60721-3-x IEC 60721-3-x DIN EN 60721-3-x	Classification of environmental conditions Part 3-0: Classification of environmental parameters and their severities; Introduction Part 3-1: Classification of environmental parameters and their severities; Long-term storage Part 3-2: Classification of environmental parameters and their severities; Transport Part 3-3: Classification of environmental parameters and their severities; stationary use, weather protected
EN 60947-x-x IEC 60947 -x-x DIN EN 60947-x-x VDE 0660-x	Low-voltage switchgear
EN 61000-6-x IEC 61000-6-x DIN EN 61000-6-x VDE 0839-6-x	Electromagnetic compatibility (EMC) Part 6-1: Generic standard; Immunity for residential, commercial and light-industrial environments Part 6-2: Generic standards; Immunity for industrial environments Part 6-3: Generic standards; Generic standard emission for residential, commercial and light-industrial environments Part 6-4: Generic standards; Generic standard noise emission for industrial environments
EN 61140 IEC 61140 DIN EN 61140 VDE 0140-1	Protection against electric shock; Common aspects for installation and equipment
EN 61800-2 IEC 61800-2 DIN EN 61800-2 VDE 0160-102	Adjustable-speed electrical power drive systems; Part 2: General requirements - Rating specifications for low-voltage adjustable frequency a.c. power drive systems
EN 61800-3 IEC 61800-3 DIN EN 61800-3 VDE 0160-103	Adjustable-speed electrical power drive systems; Part 3: EMC - Requirements and specific test methods

Standards*	Title
EN 61800-5-x IEC 61800-5-x DIN EN 61800-5-x VDE 0160-105-x	Adjustable-speed electrical power drive systems; Part 5: Safety requirements; Main section 1: Electrical, thermal and energy requirements Main section 2: Functional safety requirements
EN 62061 IEC 62061 DIN EN 62061 VDE 0113-50	Safety of machinery; Functional safety of safety-related electrical, electronic and programmable electronic control systems
UL 50 CSA C22.2 No. 94.1	Enclosures for Electrical Equipment
UL 508 CSA C22.2 No. 142	Industrial Control Equipment Process Control Equipment
UL 508C CSA C22.2 No. 14	Power Conversion Equipment Industrial Control Equipment

* The technical requirements in the standards listed are not necessarily identical.

1.6 Basic structure of a drive system with SINAMICS S120

1.6.1 Structure of a drive system with SINAMICS S120 and regulated infeed

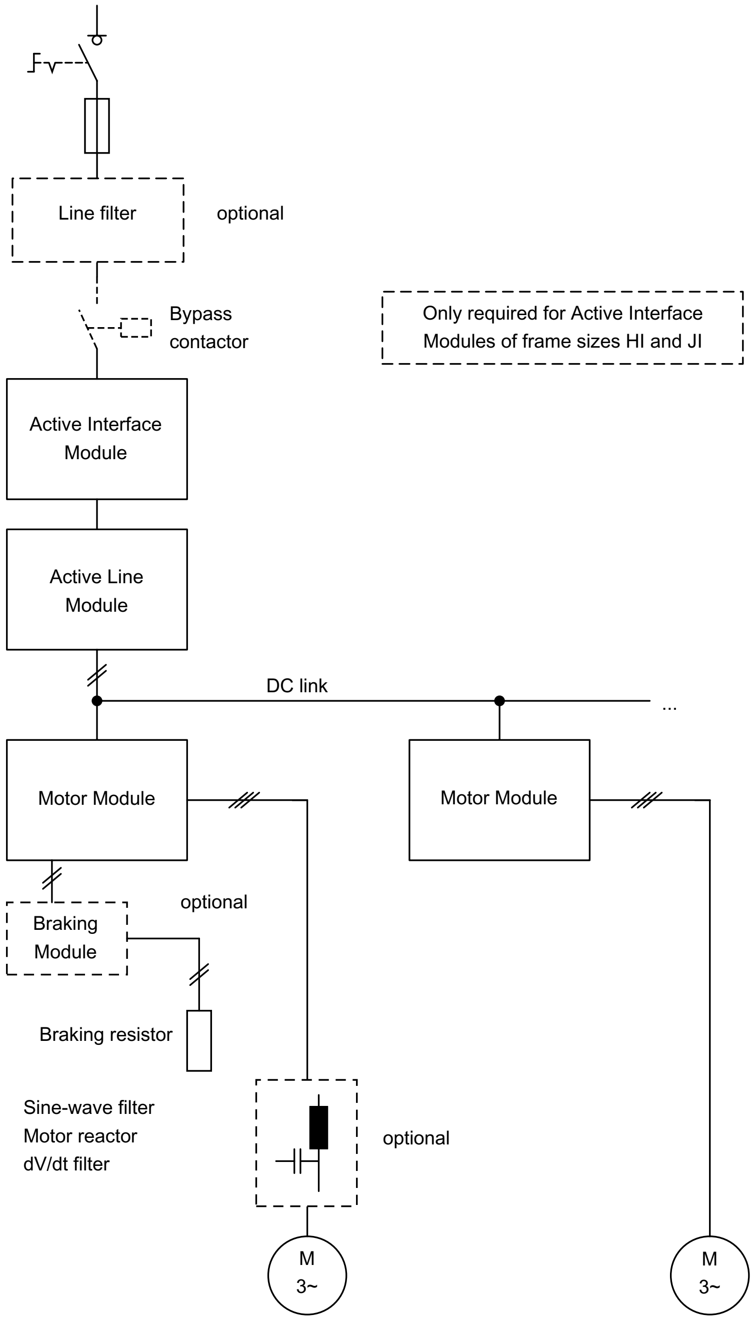


Figure 1-4 Basic structure of a drive system with SINAMICS S120 and regulated infeed

1.6.2 Structure of a drive system with SINAMICS S120 and unregulated infeed / regenerative feedback

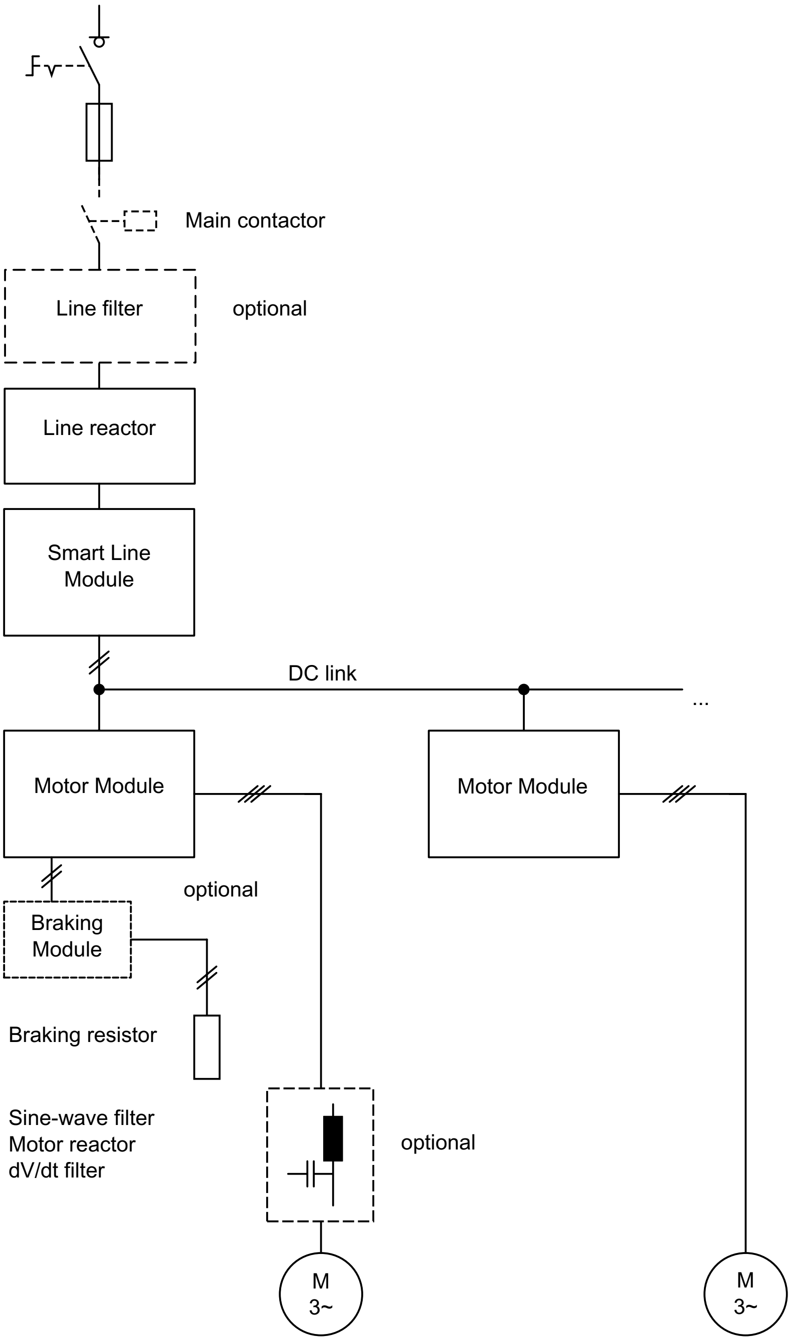


Figure 1-5 Basic structure of a drive system with SINAMICS S120 and unregulated infeed / regenerative feedback

1.6.3 Structure of a drive system with SINAMICS S120 and unregulated infeed

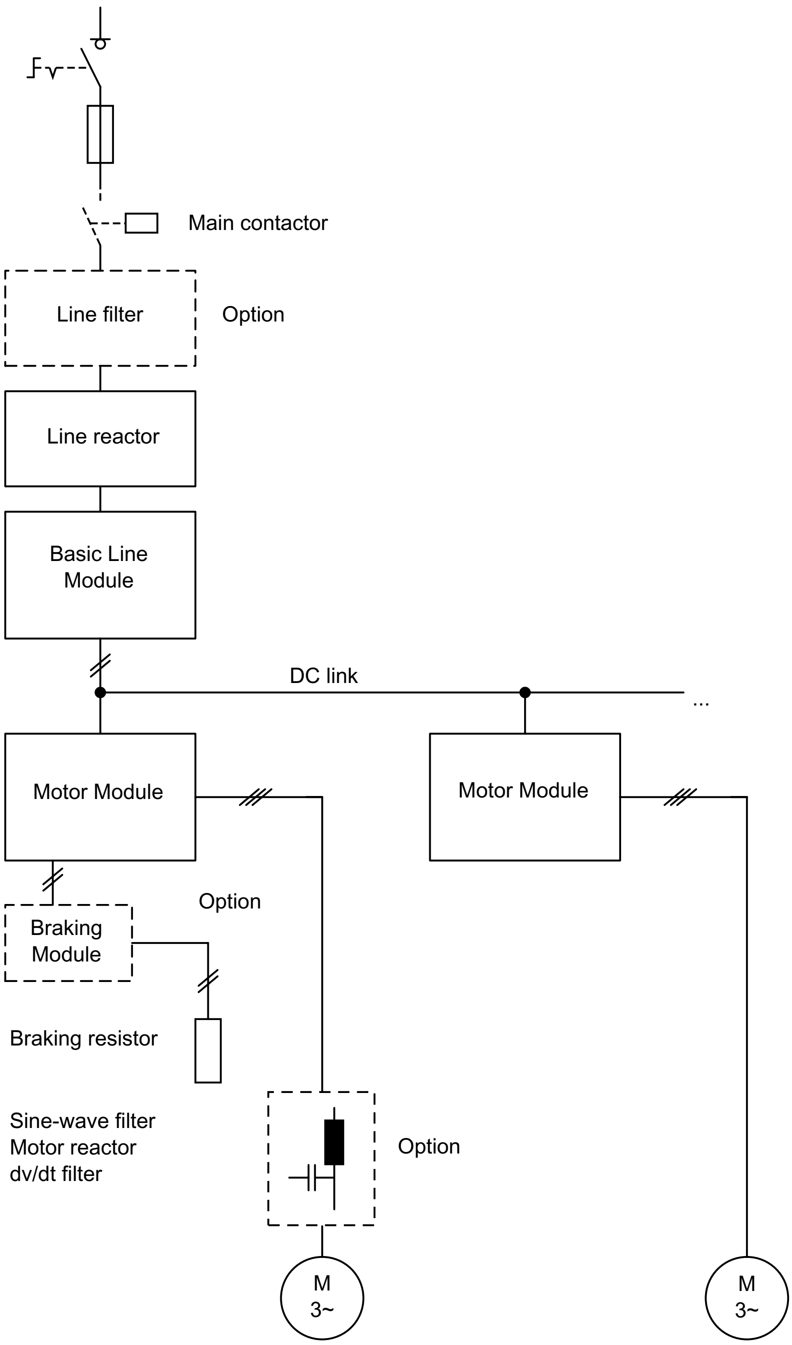


Figure 1-6 Basic structure of a drive system with SINAMICS S120 and unregulated infeed

Line-side power components 2

2.1 General

Line-side power components are used to protect the connected components against transient or continuous overvoltages and ensure that prescribed limit values are adhered to.

2.2 Line filters for Basic Line Modules

2.2.1 Description

The line filters limit the conducted interference emitted by the Power Modules to permissible values.

To reduce emissions, the Line Modules are equipped as standard with a line filter in accordance with the limit values defined in category C3 (second environment). The additional line filters described here can be fitted for use in the first environment (category C2).

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 the first environment.

The line filters are suitable for TN and TT supply systems grounded at the neutral point.

2.2.2 Safety information

> ⚠ CAUTION
>
> **Connectable networks**
>
> Line filters are suitable for direct connection to TN or TT line supplies with grounded neutral point.
>
> Line filters are designed for connection to systems with a continuous level to voltage harmonics according to EN 61000-2-4, class 3.

NOTICE

Maximum motor cable length

The maximum permissible motor cable length is 100 m when using the line filters. Shielded motor cable lengths must always be used.

NOTICE

Maintain ventilation clearances

The ventilation clearances of 100 mm above and below the components must be observed. This prevents thermal overloading of the filter.

NOTICE

Do not interchange the I/Os

The connections must not be interchanged:

- Incoming line cable to LINE/NETZ L1, L2, L3
- Outgoing cable to the reactor to LOAD/LAST L1', L2', L3'

Non-observance may damage the line filter.

⚠ DANGER

High leakage current

The line filters listed conduct a high leakage current via the PE conductor. A permanent PE connection for the line filter or control cabinet is required due to the high leakage current of the line filters.

According to EN 61800-5-1, Section 6.3.6.7, the minimum cross-section of the protective ground conductor must conform to the local safety regulations for protective ground conductors for equipment with a high leakage current.

Note

High-voltage test

If a high-voltage test is conducted with alternating voltage, the line filter must be disconnected to obtain an accurate measurement result.

If a high-voltage test is carried out with direct voltage, the connection clip for the interference suppression capacitor in the Basic Line Module must also be removed, refer to sectionHotspot-Text (Page 102) "Electrical connection".

NOTICE

Use only approved line filters

Using line filters not approved by SIEMENS for SINAMICS can lead to line-side harmonics that can interfere with or damage other loads powered from the network.

2.2.3 Dimension drawing

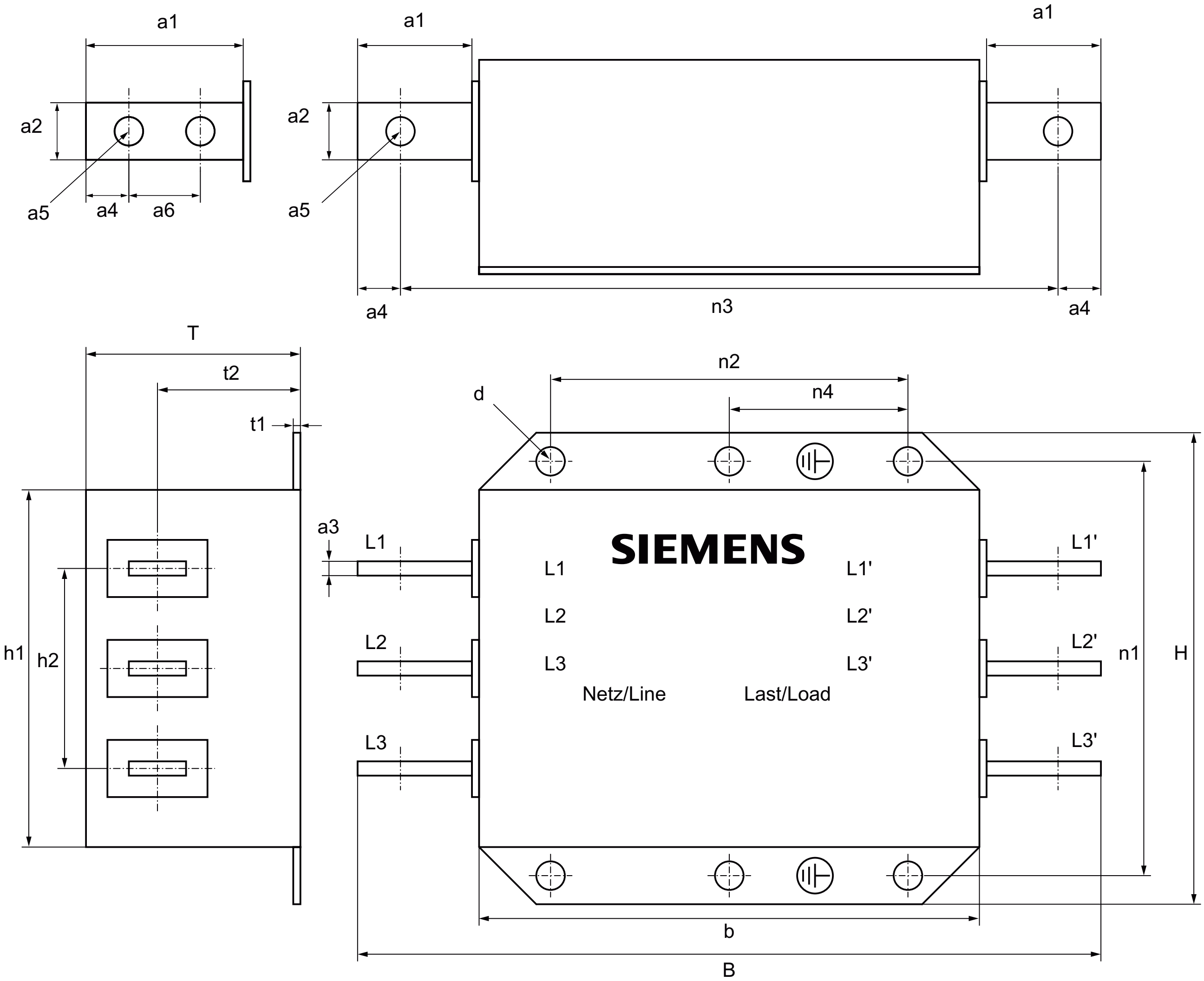


Figure 2-1 Dimension drawing of line filters for Basic Line Modules

Table 2- 1 Dimensions of line filters for Basic Line Modules (all data in mm)

6SL3000-	0BE34-4AA0 0BG34-4AA0	0BE36-0AA0 0BG36-0AA0	0BE41-2AA0 0BG41-2AA0	0BE41-6AA0 0BG41-6AA0
B	360	400	425	505
H	240	265	265	265
T	116	140	145	145
a1	40	40	50	90
a2	25	25	50	50
a3	5	8	10	15
a4	15	15	20	20
a5	11	11	14	14
a6	–	–	–	40
b	270	310	315	315
h1	200	215	215	215
h2	100	120	142	142
t1	2	3	2.5	2.5
t2	78.2	90	91	91
n1 [1)]	220	240	240	240
n2 [1)]	210	250	255	255
n3	330	370	385	465
n4	-	125	127.5	127.5
d	9	12	12	12

1) Lengths n1 and n2 correspond to the distance between holes

2.2.4 Technical data

Table 2- 2 Technical data of line filters for Basic Line Modules, 3 AC 380 ... 480 V, Part 1

Order number	6SL3000-	0BE34-4AA0	0BE36-0AA0	0BE41-2AA0	0BE41-2AA0
Suitable for Basic Line Module	6SL3330-	1TE34-2AAx	1TE35-3AAx	1TE38-2AAx	1TE41-2AAx
Rated power of the Basic Line Module	kW	200	250	400	560
Rated voltage	V	3 AC 380 -10% (-15% < 1 min) ... 3 AC 480 +10%			
Rated current	A	440	600	1200	1200
Power loss	kW	0.047	0.053	0.119	0.119
Line supply/load connection L1, L2, L3 / L1', L2', L3'		M10 connecting lugs	M10 connecting lugs	M12 connecting lugs	M12 connecting lugs
PE connection		M8	M10	M10	M10
Degree of protection		IP00	IP00	IP00	IP00
Dimensions Width Height Depth	 mm mm mm	 360 240 116	 400 265 140	 425 265 145	 425 265 145
Weight	kg	12.3	19.0	25.8	25.8

Table 2- 3 Technical data of line filters for Basic Line Modules, 3 AC 380 ... 480 V, Part 2

Order number	6SL3000-	0BE41-6AA0	0BE41-6AA0		
Suitable for Basic Line Module	6SL3330-	1TE41-5AAx	1TE41-8AAx		
Rated power of the Basic Line Module	kW	710	900		
Rated voltage	V	3 AC 380 -10% (-15% < 1 min) ... 3 AC 480 +10%			
Rated current	A	1600	1600		
Power loss	kW	0.153	0.153		
Line supply/load connection L1, L2, L3 / L1', L2', L3'		M12 connecting lugs	M12 connecting lugs		
PE connection		M10	M10		
Degree of protection		IP00	IP00		
Dimensions Width Height Depth	 mm mm mm	 505 265 145	 505 265 145		
Weight	kg	28.8	28.8		

Table 2- 4 Technical data of line filters for Basic Line Modules, 3 AC 500 ... 690 V, Part 1

Order number	6SL3000-	0BG34-4AA0	0BG34-4AA0	0BG36-0AA0	0BG41-2AA0
Suitable for Basic Line Module	6SL3330-	1TG33-3AAx	1TG34-3AAx	1TG36-8AAx	1TG41-1AAx
Rated power of the Basic Line Module	kW	250	355	560	900
Rated voltage	V	3 AC 500 -10% (-15% < 1 min) ... 3 AC 690 +10%			
Rated current	A	440	440	600	1200
Power loss	kW	0.047	0.047	0.053	0.119
Line supply/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 Height Depth	 mm mm mm	 360 240 116	 360 240 116	 400 265 140	 425 265 145
Weight	kg	12.3	12.3	19.0	25.8

Table 2- 5 Technical data of line filters for Basic Line Modules, 3 AC 500 ... 690 V, Part 2

Order number	6SL3000-	0BG41-2AA0	0BG41-6AA0		
Suitable for Basic Line Module	6SL3330-	1TG41-4AAx	1TG41-8AAx		
Rated power of the Basic Line Module	kW	1100	1500		
Rated voltage	V	3 AC 500 -10% (-15% < 1 min) ... 3 AC 690 +10%			
Rated current	A	1200	1600		
Power loss	kW	0.119	0.182		
Line supply/load connection L1, L2, L3 / L1’, L2’, L3’		M12 connecting lugs	M12 connecting lugs		
PE connection		M10	M10		
Degree of protection		IP00	IP00		
Dimensions Width Height Depth	 mm mm mm	 425 265 145	 505 265 145		
Weight	kg	25.8	28.8		

2.3 Line filters for Smart Line Modules and Active Line Modules

2.3.1 Description

The line filters limit the conducted interference emitted by the Power Modules to permissible values.

To reduce emissions, the Line Modules are equipped as standard with a line filter in accordance with the limit values defined in category C3 (second environment). The additional line filters described here can be fitted for use in the first environment (category C2).

In conjunction with line reactors and/or the Active Interface Modules 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 the first environment.

The line filters are suitable for TN and TT supply systems grounded at the neutral point.

2.3.2 Safety information

⚠ CAUTION
Connectable networks
Line filters are suitable for direct connection to TN or TT line supplies with grounded neutral point. Line filters are designed for connection to systems with a continuous level to voltage harmonics according to EN 61000-2-4, class 3.

NOTICE
Maximum motor cable length
The maximum permissible motor cable length is 300 m when using the line filters. Shielded motor cable lengths must always be used.

NOTICE
Maintain ventilation clearances
The 100 mm clearances above and below the components must be observed. This prevents thermal overloading of the filter.

NOTICE

Do not interchange the I/Os

The connections must not be interchanged:

- Incoming line cable to LINE/NETZ L1, L2, L3
- Outgoing cable to the reactor or to the Active Interface Module at LOAD L1', L2', L3'

Non-observance may damage the line filter.

⚠ DANGER

High leakage current

The line filters listed conduct a high leakage current via the PE conductor. A permanent PE connection for the line filter or control cabinet is required due to the high leakage current of the line filters.

According to EN 61800-5-1, Section 6.3.6.7, the minimum cross-section of the protective ground conductor must conform to the local safety regulations for protective ground conductors for equipment with a high leakage current.

Note

High-voltage test

If a high-voltage test is conducted with alternating voltage, the line filter must be disconnected to obtain an accurate measurement result.

If a high-voltage test is carried out with direct voltage, the connection clip for the noise suppression capacitor must also be removed in the Smart Line Module or in the Active Interface Module.

NOTICE

Use only approved line filters

Using line filters not approved by SIEMENS for SINAMICS can lead to line-side harmonics that can interfere with or damage other loads powered from the network.

2.3.3 Dimension drawing

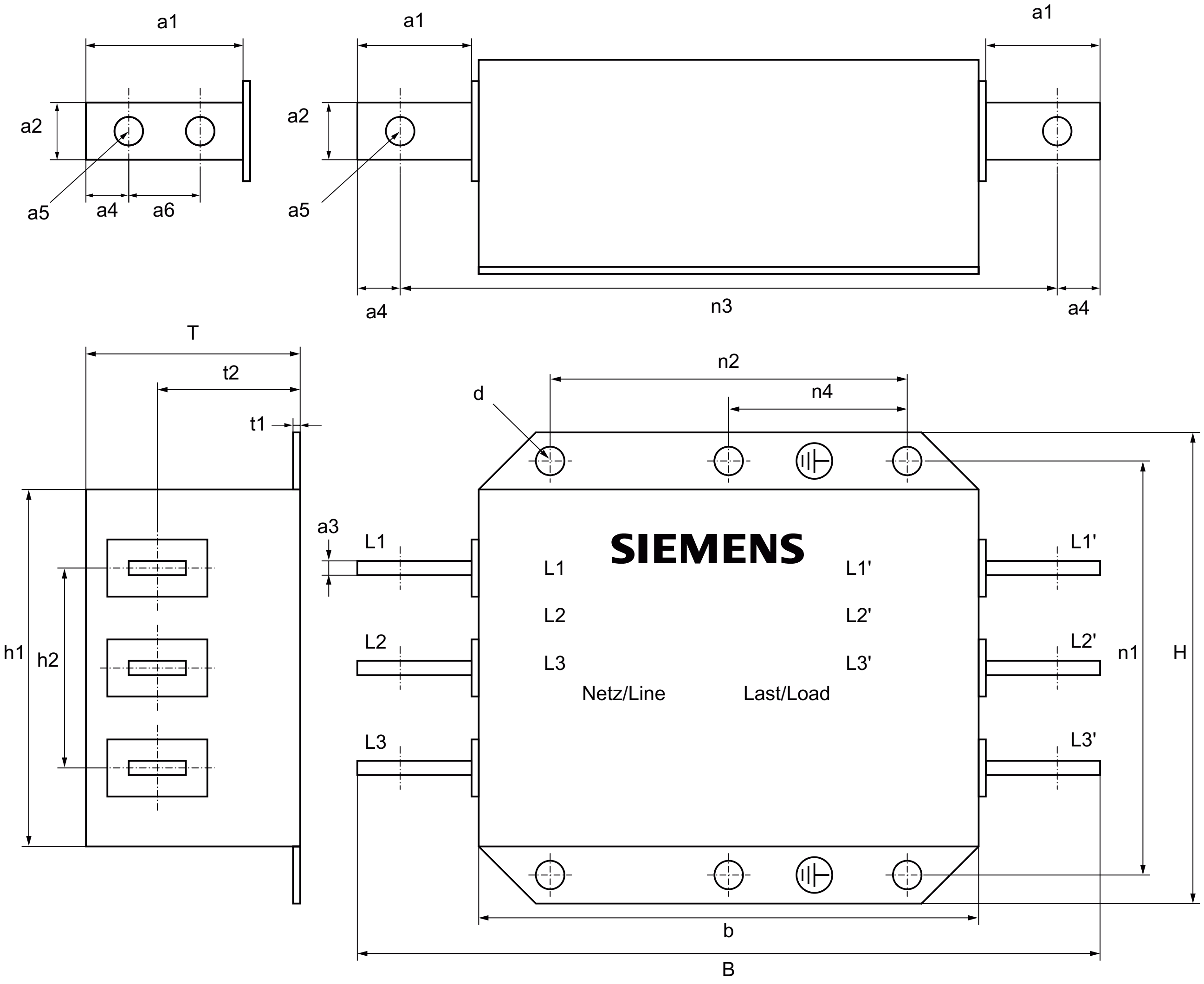


Figure 2-2 Dimension drawing for Line filters for Smart Line Modules and Active Line Modules

Table 2- 6 Dimensions of the line filters for Smart Line Modules and Active Line Modules, 380 V ... 480 V 3 AC (all specifications in mm)

	6SL3000-0BE33-1AA0	6SL3000-0BE35-0AA0	6SL3760-0MB00-0AA0	6SL3760-0MC00-0AA0
B	360	400	425	505
H	240	265	265	265
T	116	140	145	145
a1	40	40	50	90
a2	25	30	50	50
a3	5	8	10	15
a4	15	15	20	20
a5	11	11	14	14
a6	-	-	-	40
b	270	310	315	315
h1	200	215	215	215
h2	100	120	142	142
t1	2	2.5	2.5	2.5
t2	78.2	90	91	91
n1 1)	220	240	240	240
n2 1)	210	250	255	255
n3	330	370	385	465
n4	-	-	127.5	127.5
d	9	12	12	12

1) Lengths n1 and n2 correspond to the distance between holes

Table 2- 7 Dimensions of the line filters for Smart Line Modules and Active Line Modules, 500 V ... 690 V 3 AC (all specifications in mm)

	6SL3760-0ME00-0AA0	6SL3760-0MN00-0AA0	6SL3760-0MG00-0AA0	
B	400	425	505	
H	365	365	365	
T	140	145	145	
a1	38	50	90	
a2	30	50	50	
a3	8	15	15	
a4	15	20	20	
a5	11	14	14	
a6	-	-	40	
b	310	315	315	
h1	315	315	315	
h2	120	142	142	
t1	3	2.5	2.5	
t2	90	91	91	
n1 [1)]	340	340	310	
n2 [1)]	250	255	255	
n3	370	385	465	
n4	125	127.5	127.5	
d	12	12	12	

[1)] Lengths n1 and n2 correspond to the distance between holes

2.3.4 Technical data

Table 2- 8 Technical data of the line filters for the Smart Line Modules and Active Line Modules, 3 AC 380 V ... 480 V

Order number		6SL3000-0BE33-1AA0	6SL3000-0BE35-0AA0	6SL3760-0MB00-0AA0	6SL3760-0MC00-0AA0
Suitable for Smart Line Module	6SL3330-	-	6TE35-5AAx	6TE37-3AAx	6TE41-1AAx 6TE41-3AAx 6TE41-7AAx
Suitable for Active Line Module	6SL3330-	7TE32-1AAx 7TE32-6AAx	7TE33-8AAx 7TE35-0AAx	7TE36-1AAx 7TE37-5AAx	7TE38-4AAx 7TE41-0AAx 7TE41-2AAx 7TE41-4AAx
Rated voltage	V	3 AC 380 -10% (-15% < 1 min) ... 3 AC 480 +10%			
Rated current	A	400	600	840	1405
Power loss	kW	0.042	0.06	0.058	0.111
Line supply/load connection L1, L2, L3 / L1', L2', L3'		M10 connecting lugs	M10 connecting lugs	M12 connecting lugs	M12 connecting lugs
PE connection		M8	M10	M10	M10
Degree of protection		IP00	IP00	IP00	IP00
Dimensions Width Height Depth	 mm mm mm	 360 240 116	 400 265 140	 425 265 145	 505 265 145
Weight	kg	12.7	19.9	25.9	28.9

Table 2- 9 Technical data of the line filters for the Smart Line Modules and Active Line Modules, 3 AC 500 V ... 690 V

Order number		6SL3760-0ME00-0AA0	6SL3760-0MN00-0AA0	6SL3760-0MG00-0AA0	
Suitable for Smart Line Module	6SL3330-	6TG35-5AAx	6TG38-8AAx 6TG41-2AAx	6TG41-7AAx	
Suitable for Active Line Module	6SL3330-	7TG35-8AAx	7TG37-4AAx 7TG41-0AAx	7TG41-3AAx	
Rated voltage	V	3 AC 500 -10% (-15% < 1 min) ... 3 AC 690 +10%			
Rated current	A	600	1025	1270	
Power loss	kW	0.063	0.063	0.097	
Line supply/load connection L1, L2, L3 / L1', L2', L3'		M10 connecting lugs	M12 connecting lugs	M12 connecting lugs	
PE connection		M10	M10	M10	
Degree of protection		IP00	IP00	IP00	
Dimensions Width Height Depth	 mm mm mm	 400 365 140	 425 365 145	 505 365 145	
Weight	kg	27.0	36.7	36.7	

2.4 Line reactors for Basic Line Modules

2.4.1 Description

Line reactors limit low-frequency line harmonics and reduce the load on the semiconductors in the Basic Line Modules. A line reactor must be used in connection with a line filter or if several Basic Line Modules are operated in parallel.

If a Basic Line Module is operated singly and no line filter is used, and with an effective line impedance uk > 3%, the line reactor is not necessary.

2.4.2 Safety information

NOTICE

Maintain ventilation clearances

The 100 mm ventilation clearances above and to the side of the components must be observed.

Note

Cable lengths

The connecting cables to the Line Module must be kept as short as possible (max. 5 m).

NOTICE

Use only approved line reactors

When using line reactors that have not been approved by SIEMENS for SINAMICS, the following can occur:

- The Basic Line Modules may become damaged/faulty.
- Line harmonics may interfere with or damage other loads connected to the same line supply.

⚠ CAUTION

Hot surfaces

The surface temperature of the line reactors can exceed 80° C.

2.4.3 Dimension drawing

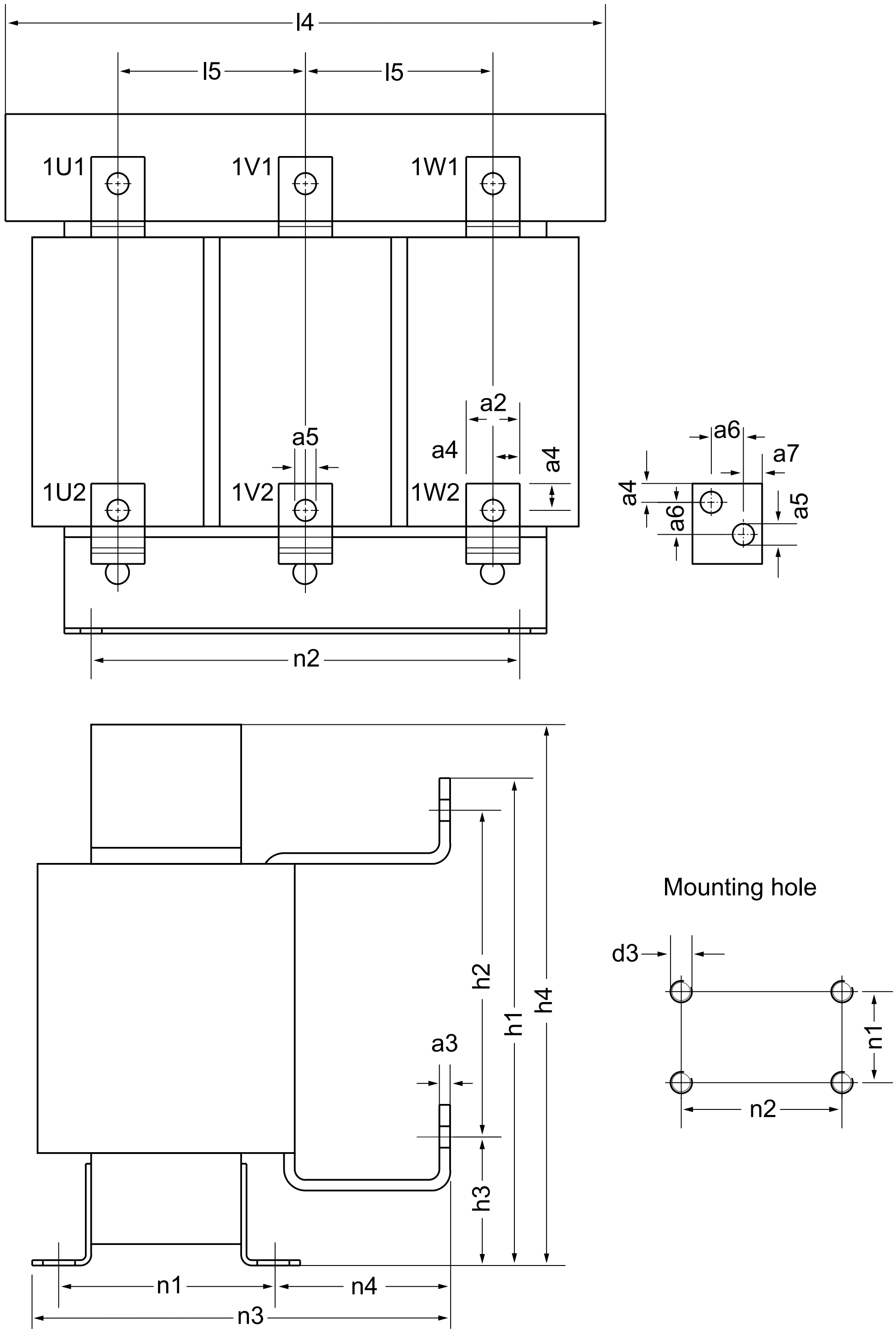


Figure 2-3 Dimension drawing of line reactors for Basic Line Modules

Table 2- 10 Dimensions of line reactors for Basic Line Modules, 3 AC 380 V ... 480 V (all values in mm)

6SL3000-	0CE35-1AA0	0CE37-7AA0	0CE41-0AA0	0CE41-5AA0	0CE41-6AA0
a2	30	30	50	60	60
a3	6	6	8	12	12
a4	15	15	25	25	25
a5	14	14	14	14	14
a6	-	-	-	26	26
a7	-	-	-	17	17
l4	300	300	350	460	410
l5	100	100	120	152.5	152.5
h1	-	-	397	-	-
h2	180	180	252	278	278
h3	60	60	120	120	120
h4	269	269	321	435	419
n1 [1)]	118	118	138	155	155
n2 [1)]	224	224	264	356	356
n3	212.5	212.5	211.5	235	235
n4	81	81	60	60	60.5
d3	M8	M8	M8	M12	M12

1) Lengths n1 and n2 correspond to the distance between holes

Table 2- 11 Dimensions of line reactors for Basic Line Modules, 3 AC 500 V ... 690 V (all values in mm)

6SL3000-	0CH32-7AA0	0CH34-8AA0	0CH36-0AA0	0CH41-2AA0	0CH41-6AA0
a2	25	30	30	60	60
a3	5	6	6	12	12
a4	12.5	15	15	25	25
a5	11	14	14	14	14
a6	-	-	-	26	26
a7	-	-	-	17	17
l4	270	350	350	460	410
l5	88	120	120	152.5	152.5
h1	-	-	-	-	-
h2	150	198	198	278	278
h3	60	75	75	120	120
h4	248	321	321	435	422
n1 [1)]	101	138	138	155	170
n2 [1)]	200	264	264	356	356
n3	200	232.5	232.5	235	247
n4	84.5	81	81	60.5	60.5
d3	M8	M8	M8	M12	M12

1) Lengths n1 and n2 correspond to the distance between holes

2.4.4 Technical data

Table 2- 12 Technical data of line reactors for Basic Line Modules, 3 AC 380 ... 480 V, Part 1

Order number	**6SL3000-**	**0CE35-1AA0**	**0CE35-1AA0**	**0CE37-7AA0**	**0CE41-0AA0**
Suitable for Basic Line Module	6SL3330-	1TE34-2AAx	1TE35-3AAx	1TE38-2AAx	1TE41-2AAx
Rated power of the Basic Line Module	kW	200	250	400	560
Rated voltage	V	3 AC 380 -10% (-15% < 1 min) ... 3 AC 480 +10%			
I_{thmax}	A	508	508	773	1022
Power loss	kW	0.365	0.365	0.351	0.498
Line/load connection 1U1, 1V1, 1W1, 1U2, 1V2, 1W2		M12 connecting lugs	M12 connecting lugs	M12 connecting lugs	M12 connecting lugs
PE connection		M6 screw	M6 screw	M6 screw	M6 screw
Degree of protection		IP00	IP00	IP00	IP00
Dimensions Width Height Depth	 mm mm mm	 300 269 212.5	 300 269 212.5	 300 269 212.5	 350 397 211.5
Weight	kg	38	38	51.3	69.6

Table 2- 13 Technical data of line reactors for Basic Line Modules, 3 AC 380 ... 480 V, Part 2

Order number	**6SL3000-**	**0CE41-5AA0**	**0CE41-6AA0**		
Suitable for Basic Line Module	6SL3330-	1TE41-5AAx	1TE41-8AAx		
Rated power of the Basic Line Module	kW	710	900		
Rated voltage	V	3 AC 380 -10% (-15% < 1 min) ... 3 AC 480 +10%			
I_{thmax}	A	1458	1600		
Power loss	kW	0.776	0.606		
Line/load connection 1U1, 1V1, 1W1, 1U2, 1V2, 1W2		M12 connecting lugs	M12 connecting lugs		
PE connection		M6 screw	M6 screw		
Degree of protection		IP00	IP00		
Dimensions Width Height Depth	 mm mm mm	 460 435 235	 416 435 235		
Weight	kg	118	123		

Table 2- 14 Technical data of line reactors for Basic Line Modules, 3 AC 500 ... 690 V, Part 1

Order number	6SL3000-	0CH32-7AA0	0CH34-8AA0	0CH36-0AA0	0CH41-2AA0
Suitable for Basic Line Module	6SL3330-	1TG33-0AAx	1TG34-3AAx	1TG36-8AAx	1TG41-1AAx
Rated power of the Basic Line Module	kW	250	355	560	900
Rated voltage	V	3 AC 500 -10% (-15% < 1 min) ... 3 AC 690 +10%			
I_{thmax}	A	270	482	597	1167
Power loss	kW	0.277	0.478	0.485	0.783
Line/load connection 1U1, 1V1, 1W1, 1U2, 1V2, 1W2		M10 connecting lugs	M12 connecting lugs	M12 connecting lugs	M12 connecting lugs
PE connection		M6 screw	M6 screw	M6 screw	M6 screw
Degree of protection		IP00	IP00	IP00	IP00
Dimensions Width Height Depth	 mm mm mm	 270 248 200	 350 321 232.5	 350 321 232.5	 460 435 235
Weight	kg	27.9	55.6	63.8	147

Table 2- 15 Technical data of line reactors for Basic Line Modules, 3 AC 500 ... 690 V, Part 2

Order number	6SL3000-	0CH41-2AA0	0CH41-6AA0		
Suitable for Basic Line Module	6SL3330-	1TG41-4AAx	1TG41-8AAx		
Rated power of the Basic Line Module	kW	1100	1500		
Rated voltage	V	3 AC 500 -10% (-15% < 1 min) ... 3 AC 690 +10%			
I_{thmax}	A	1167	1600		
Power loss	kW	0.783	0.977		
Line/load connection 1U1, 1V1, 1W1, 1U2, 1V2, 1W2		M12 connecting lugs	M12 connecting lugs		
PE connection		M6 screw	M6 screw		
Degree of protection		IP00	IP00		
Dimensions Width Height Depth	 mm mm mm	 460 435 235	 416 435 250		
Weight	kg	147	134		

2.5 Line reactors for Smart Line Modules

2.5.1 Description

Line reactors limit low-frequency line harmonics and reduce the load on the semiconductors in the Smart Line Modules. For this reason, line reactors must always be provided when Smart Line Modules are used.

2.5.2 Safety information

NOTICE

Maintain ventilation clearances

The 100 mm ventilation clearances above and to the side of the components must be observed.

Note

Cable lengths

The connecting cables to the Line Module must be kept as short as possible (max. 5 m).

NOTICE

Use only approved line reactors

When using line reactors that have not been approved by SIEMENS for SINAMICS, the following can occur:

- The Smart Line Modules may become damaged/faulty.
- Line harmonics may interfere with or damage other loads connected to the same line supply.

CAUTION

Hot surfaces

The surface temperature of the line reactors can exceed 80° C.

2.5.3 Dimension drawing

Line reactor 6SL3000-0EE36-2AA0

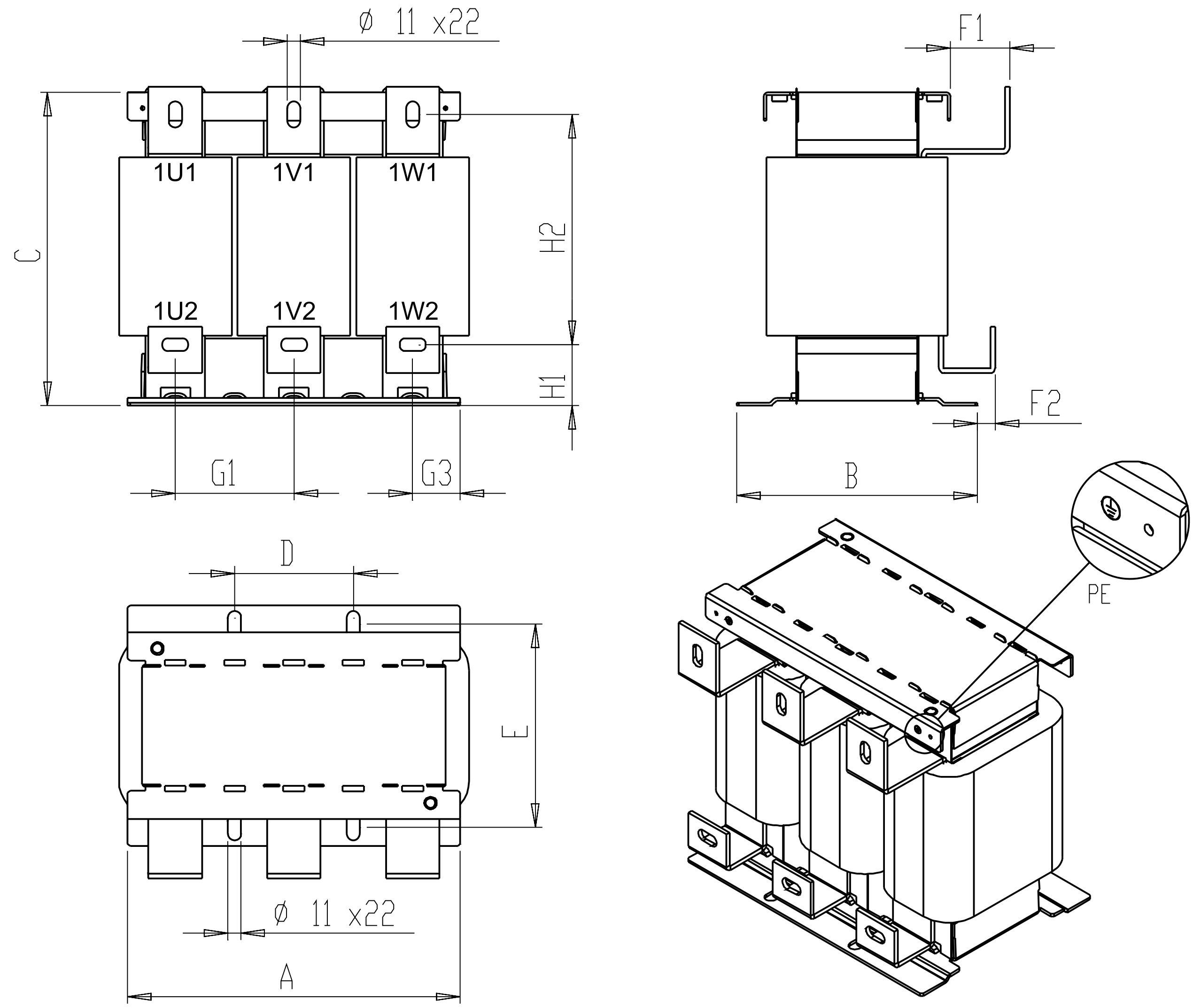


Figure 2-4 Dimension drawing of line reactor 6SL3000-0EE36-2AA0

Table 2- 16 Dimensions (all dimensions in mm)

A	B	C	D[1]	E[1]	F1	F2	G1
280	203	264	100	171	50	15	100
G2	G3	H1	H2	H3			
–	40	51	194	–			

1) Lengths D and E correspond to the distance between holes

Line reactor 6SL3000-0EE38-8AA0

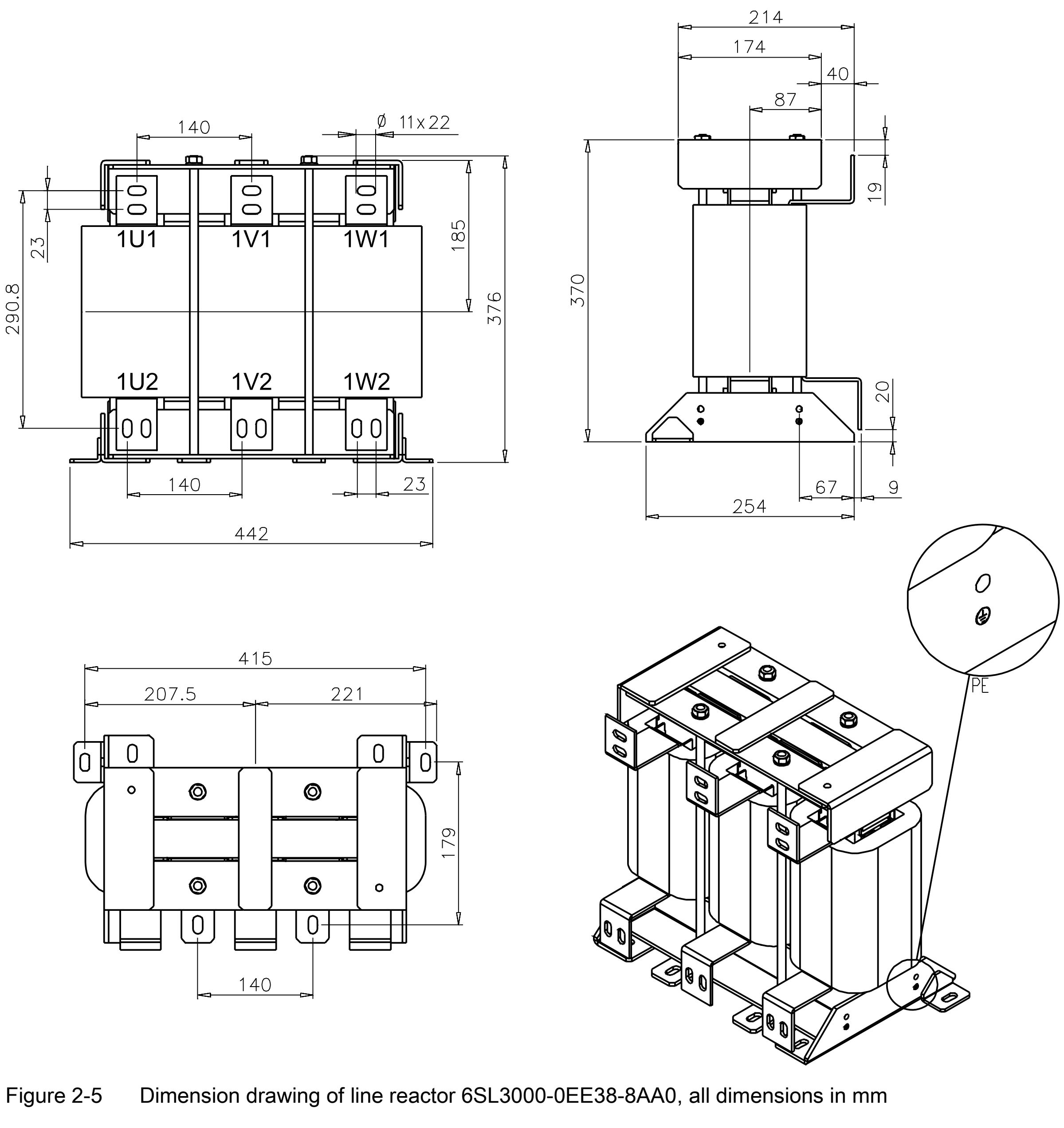


Figure 2-5 Dimension drawing of line reactor 6SL3000-0EE38-8AA0, all dimensions in mm

Line reactor 6SL3000-0EE41-4AA0

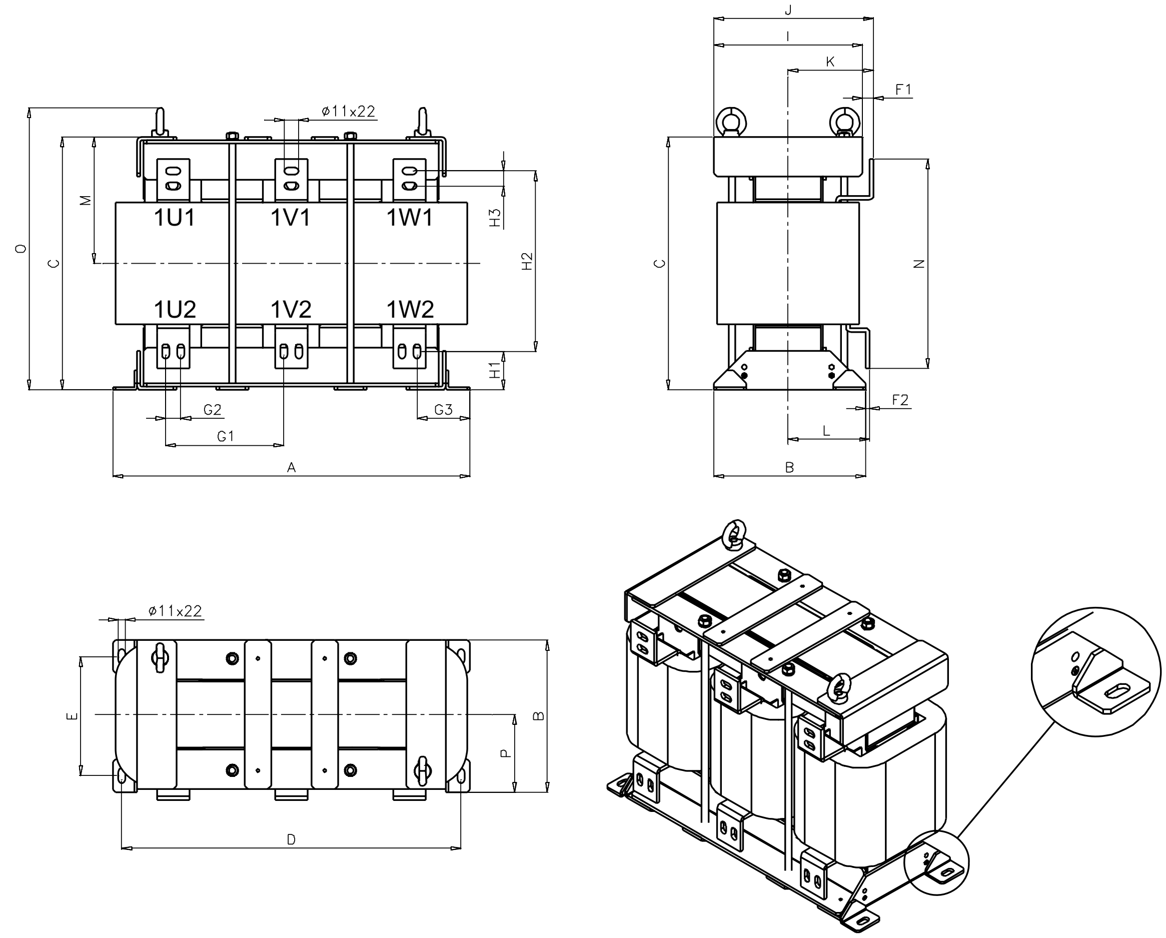


Figure 2-6 Dimension drawing of line reactor 6SL3000-0EE41-4AA0

Table 2- 17 Dimensions (all dimensions in mm)

A	B	C	D[1]	E[1]	F1	F2	G1
544	232	386	517	182	17	6	180
G2	G3	H1	H2	H3	I	J	K
23	80.5	59	276	23	227	244	130.5
L	M	N	O	P			
122	193	320	431	116			

1) Lengths D and E correspond to the distance between holes

Note

Remove the crane lifting eyes

The crane lifting eyes can be removed after installation.

Line reactor 6SL3000-0EH34-7AA0

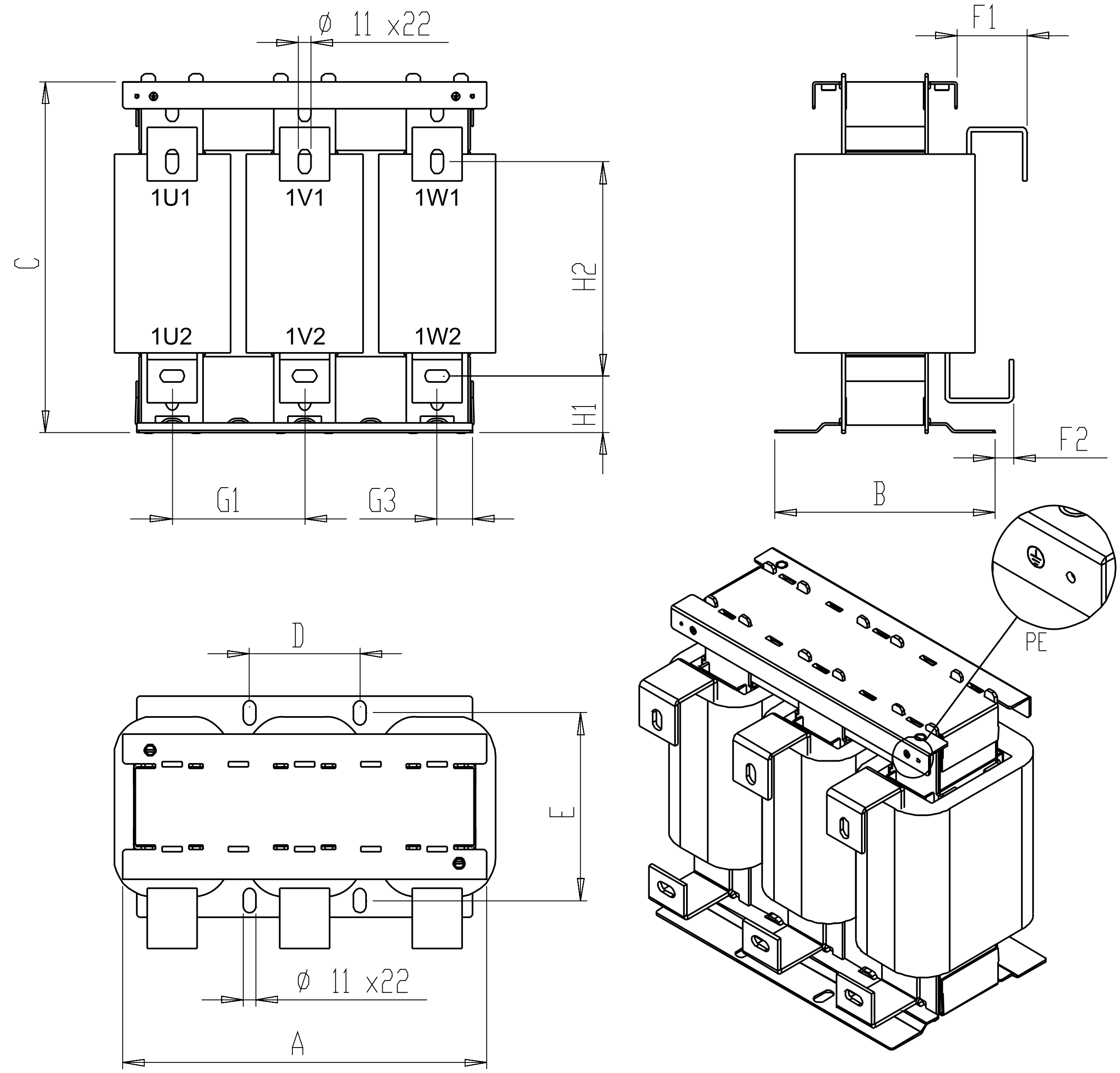


Figure 2-7 Dimension drawing of line reactor 6SL3000-0EH34-7AA0

Table 2- 18 Dimensions (all dimensions in mm)

A	B	C	D[1]	E[1]	F1	F2	G1
330	200	318	100	170	63	16.5	120
G2	**G3**	**H1**	**H2**	**H3**			
–	32	51	194	–			

1) Lengths D and E correspond to the distance between holes

Line reactor 6SL3000-0EH37-6AA0

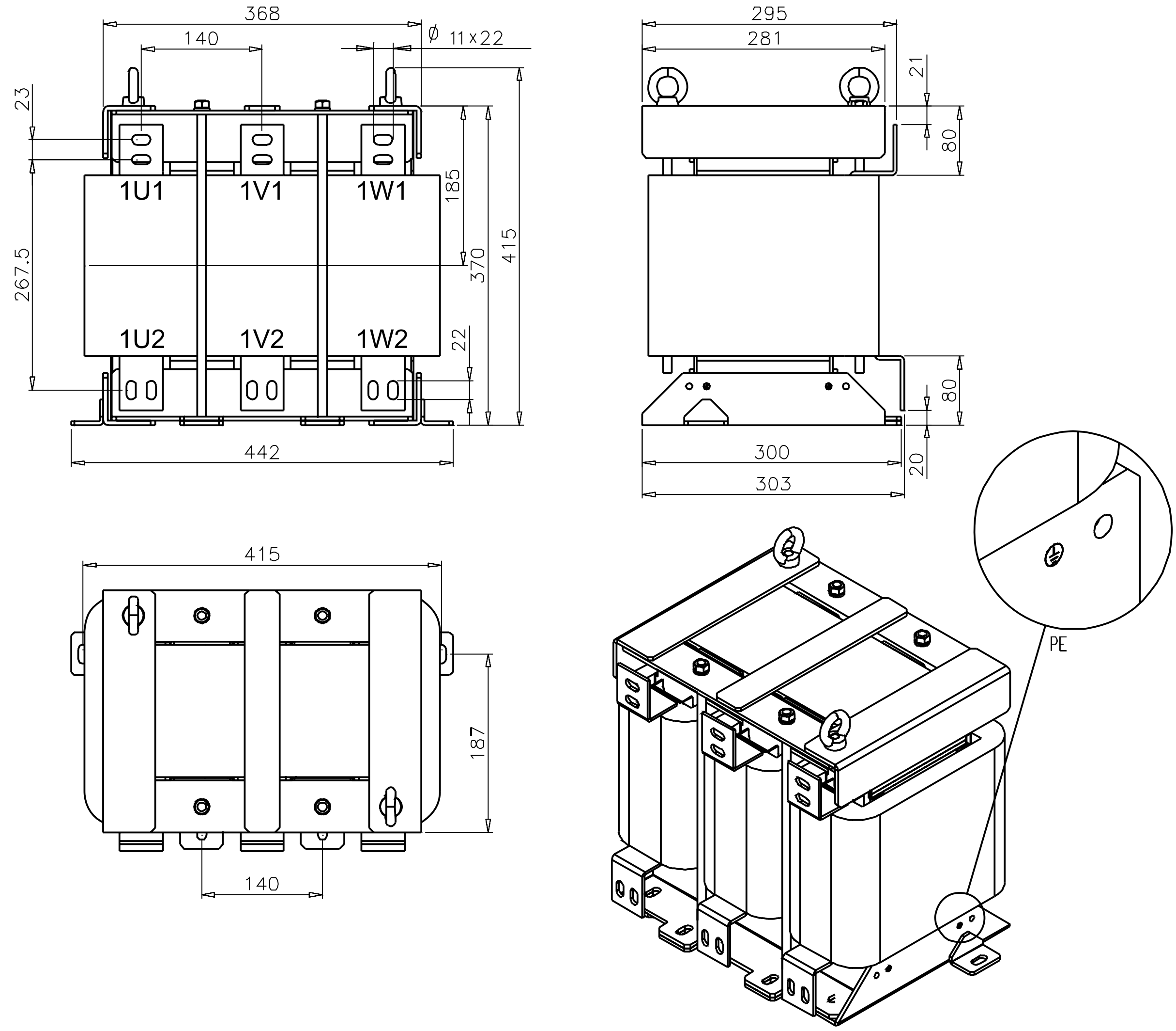


Figure 2-8 Dimension drawing of line reactor 6SL3000-0EE37-6AA0, all dimensions in mm

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Note

Remove the crane lifting eyes

The crane lifting eyes can be removed after installation.

Line reactor 6SL3000-0EE41-4AA0

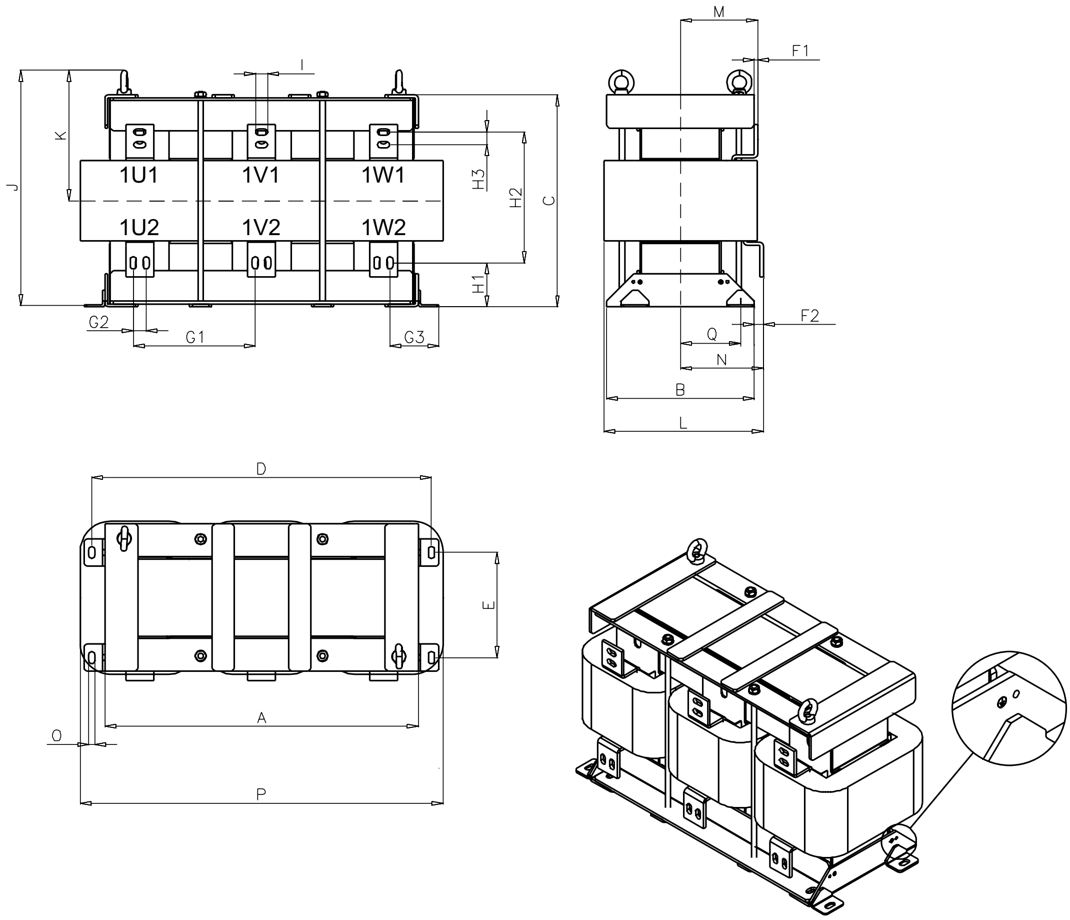


Figure 2-9 Dimension drawing of line reactor 6SL3000-0EH41-4AA0

Table 2- 19 Dimensions (all dimensions in mm)

A	B	C	D[1]	E[1]	F1	F2	G1
566	267	383	613	190	6	16	220
G2	G3	H1	H2	H3	I	J	K
23	88.5	79.5	236.5	23	22	426	213
L	M	N	O	P	Q		
288	139.5	149.5	11	655	108.5		

[1)] Lengths D and E correspond to the distance between holes

Note

Remove the crane lifting eyes

The crane lifting eyes can be removed after installation.

2.5.4 Technical data

Table 2- 20 Technical data, line reactors for Smart Line Modules, 3 AC 380 ... 480 V

Order number	6SL3000-	0EE36-2AA0	0EE36-2AA0	0EE38-8AA0	0EE41-4AA0	0EE41-4AA0
Suitable for Smart Line Module	6SL3330-	6TE35-5AAx	6TE37-3AAx	6TE41-1AAx	6TE41-3AAx	6TE41-7AAx
Rated power of the Smart Line Module	kW	250	355	500	630	800
Rated voltage	V	3 AC 380 -10% (-15% < 1 min) ... 3 AC 480 +10%				
I_{thmax}	A	676.5	676.5	973.5	1573	1573
Power loss 50/60 Hz	kW	0.500/0.560	0.500/0.560	0.725/0.810	0.925/1.080	0.925/1.080
Line/load connection 1U1, 1V1, 1W1, 1U2, 1V2, 1W2		M10 connecting lugs	M10 connecting lugs	M10 connecting lugs	M10 connecting lugs	M10 connecting lugs
PE connection		M6, 4x	M6, 4x	M6, 4x	M6, 4x	M6, 4x
Degree of protection		IP00	IP00	IP00	IP00	IP00
Dimensions Width Height Depth	 mm mm mm	 300 268 230	 300 268 230	 442 376 263	 544 431 244	 544 431 244
Weight	kg	57	57	85.5	220	220

Table 2- 21 Technical data, line reactors for Smart Line Modules, 3 AC 500 ... 690 V

Order number	6SL3000-	0EH34-7AA0	0EH37-6AA0	0EH41-4AA0	0EH41-4AA0	
Suitable for Smart Line Module	6SL3330-	6TG35-5AAx	6TG38-8AAx	6TG41-2AAx	6TG41-7AAx	
Rated power of the Smart Line Module	kW	450	710	1000	1400	
Rated voltage	V	3 AC 500 -10% (-15% < 1 min) ... 3 AC 690 +10%				
I_{thmax}	A	511.5	836	1573	1573	
Power loss 50/60 Hz	kW	0.720/0.820	0.840/0.950	1.680/1.850	1.680/1.850	
Line/load connection 1U1, 1V1, 1W1, 1U2, 1V2, 1W2		M10 connecting lugs	M10 connecting lugs	M10 connecting lugs	M10 connecting lugs	
PE connection		M6, 4x	M6, 4x	M6, 4x	M6, 4x	
Degree of protection		IP00	IP00	IP00	IP00	
Dimensions Width Height Depth	 mm mm mm	 360 325 229	 442 370 303	 655 383 288	 655 383 288	
Weight	kg	58	145	239	239	

2.6 Active Interface Modules

2.6.1 Description

Active Interface Modules are used in conjunction with the Active Line Modules in chassis format. The Active Interface Modules contain a Clean Power Filter with basic RI suppression, the precharging circuit for the Active Line Module, the line voltage sensing circuit and monitoring sensors.

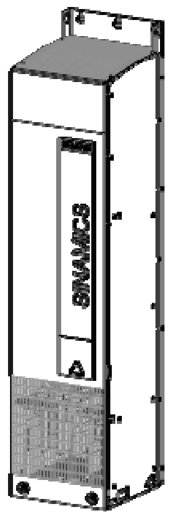
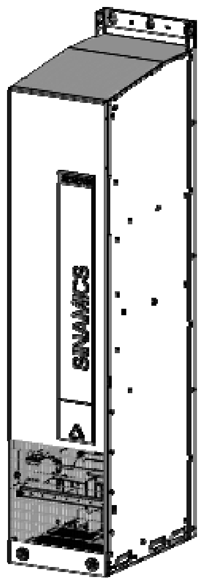
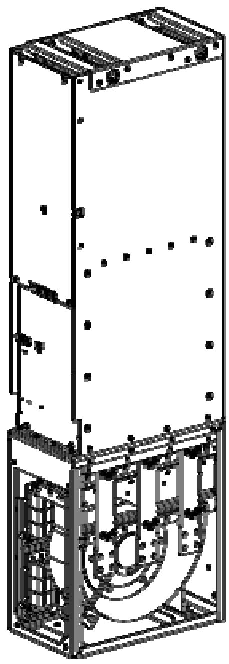
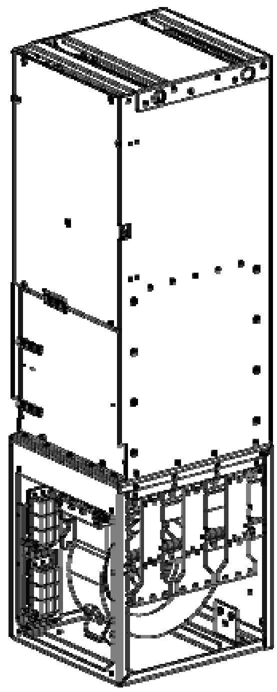
The bypass contactor is an integral component in frame sizes FI and GI, which ensures a highly compact design. The bypass contactor must be provided separately for frame sizes HI and JI.

The vast majority of line harmonics are suppressed by the Clean Power Filter.

The Active Interface Module contains:

- Clean Power Filter
- Line reactor
- Precharging circuit
- Bypass contactor (frame sizes FI/GI)
- Voltage Sensing Module VSM10
- Fan

Table 2- 22 Active Interface Module

			
Frame size FI	Frame size GI	Frame size HI	Frame size JI

2.6.2 Safety information

⚠ CAUTION

Danger notice in the local language

The DC-link discharge time hazard warning must be affixed to the component in the relevant local language.

Note

Maintain ventilation clearances

The ventilation clearances above, below, and in front of the component, which are specified in the dimension drawings, must be observed.

⚠ DANGER

High leakage current

Active Interface Modules discharge a high leakage current to the protective ground conductor.
Due to the high leakage current associated with Active Interface Modules, they or the relevant control cabinet must be permanently connected to PE.

According to EN 61800-5-1, Section 6.3.6.7, the minimum cross-section of the protective ground conductor must conform to the local safety regulations for protective ground conductors for equipment with a high leakage current.

2.6.3 Interface description

2.6.3.1 Overview

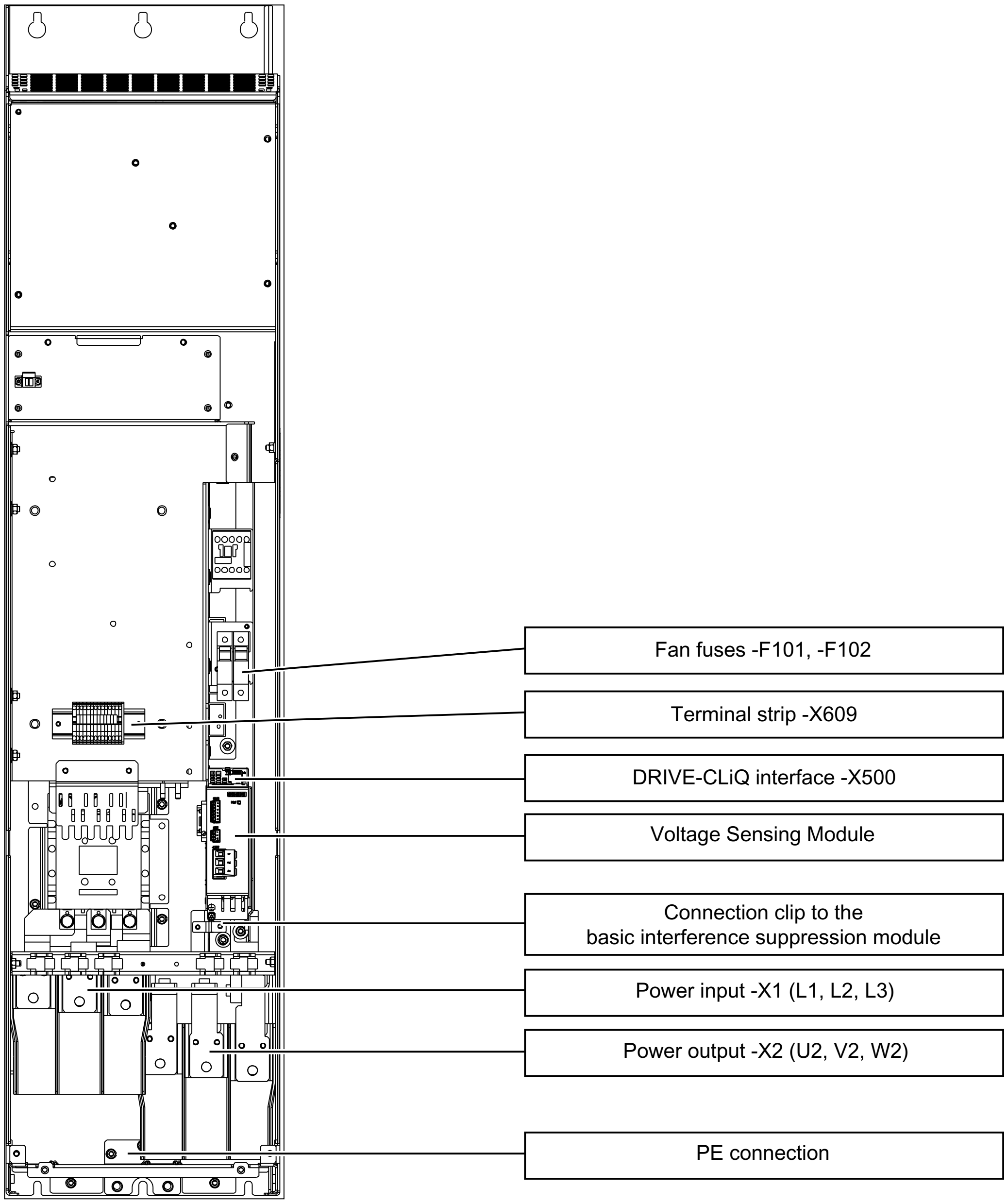


Figure 2-10 Interface overview in the Active Interface Module, frame size FI

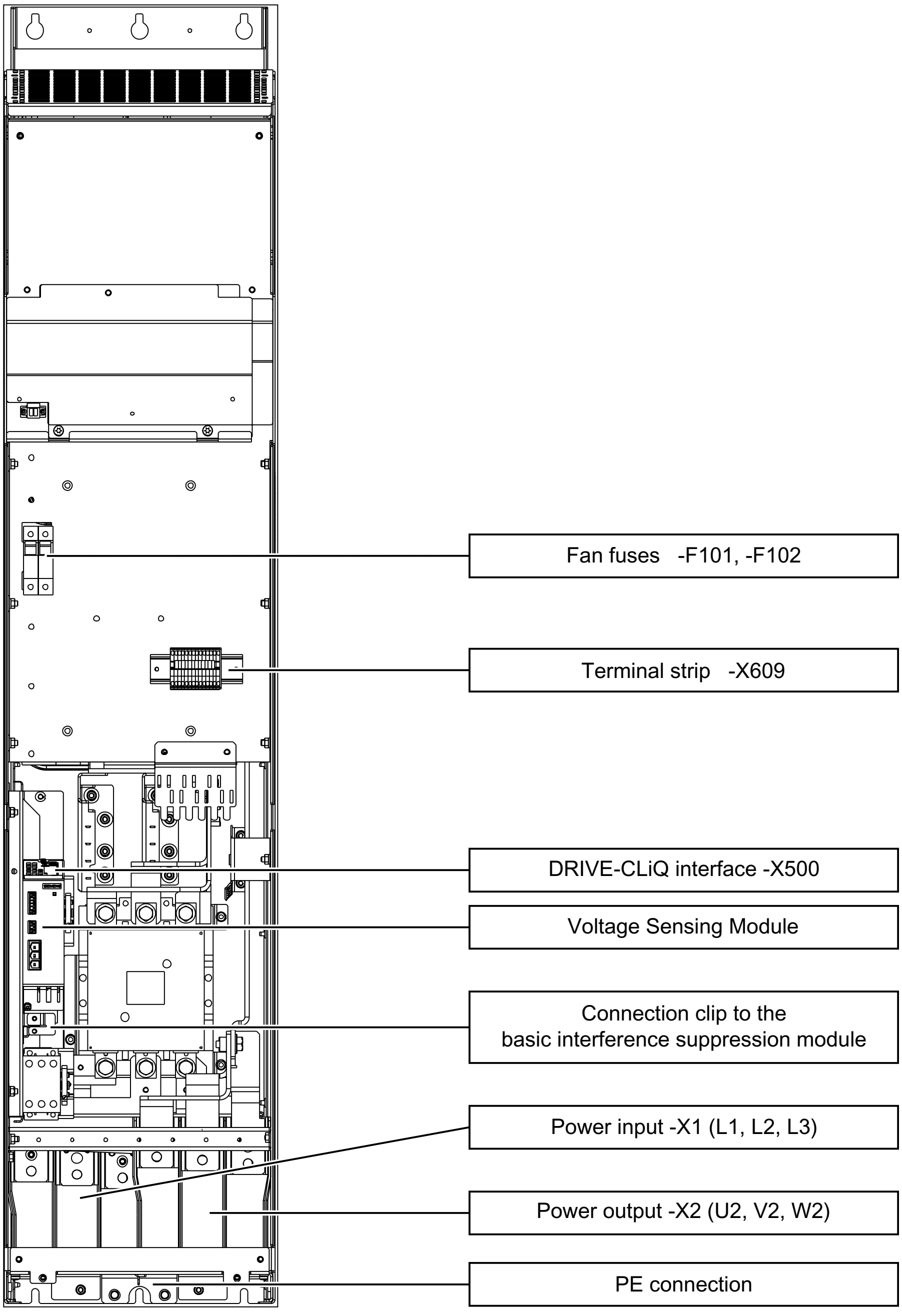


Figure 2-11 Interface overview in the Active Interface Module, frame size GI

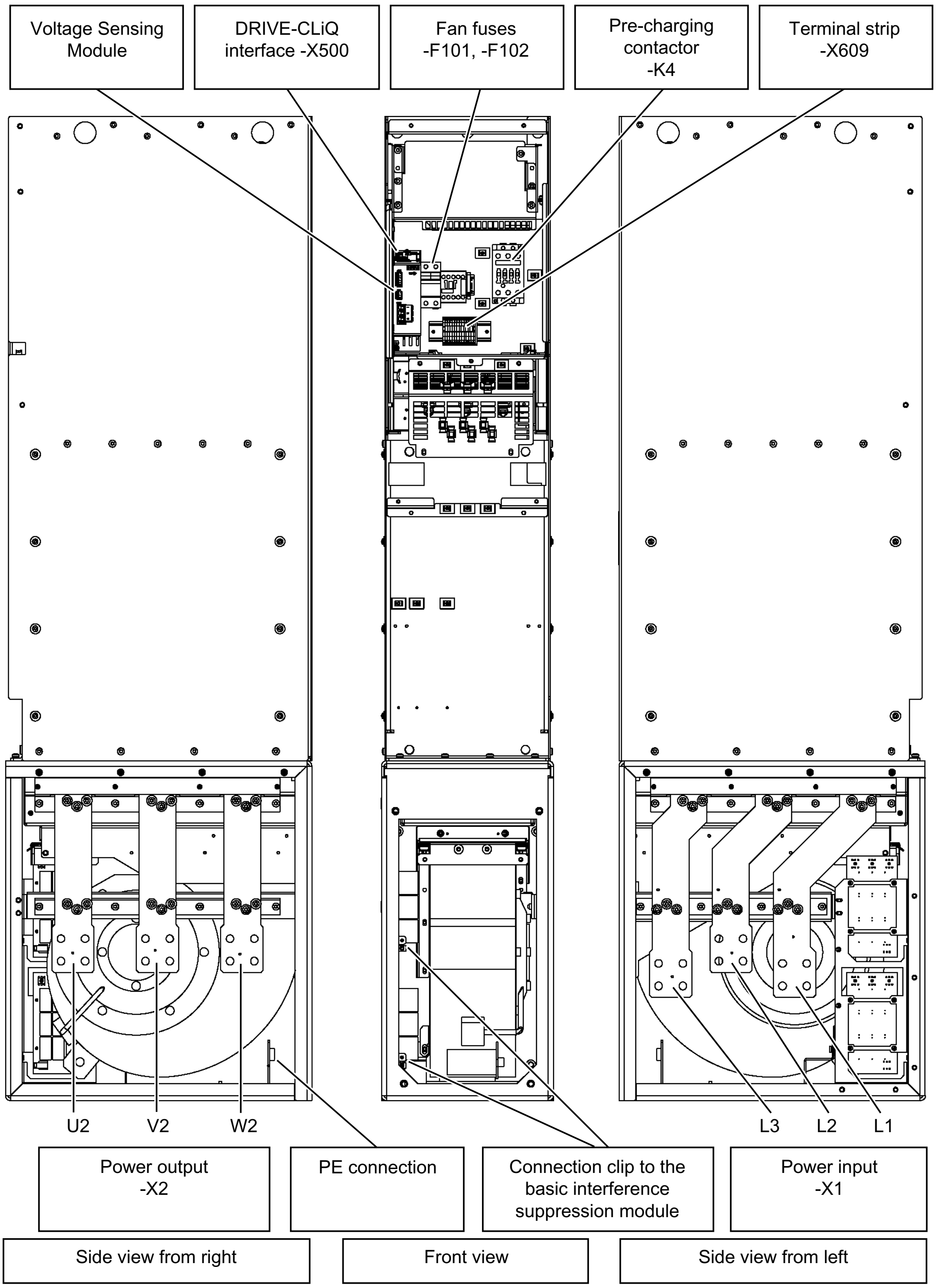


Figure 2-12 Interface overview in the Active Interface Module, frame size HI

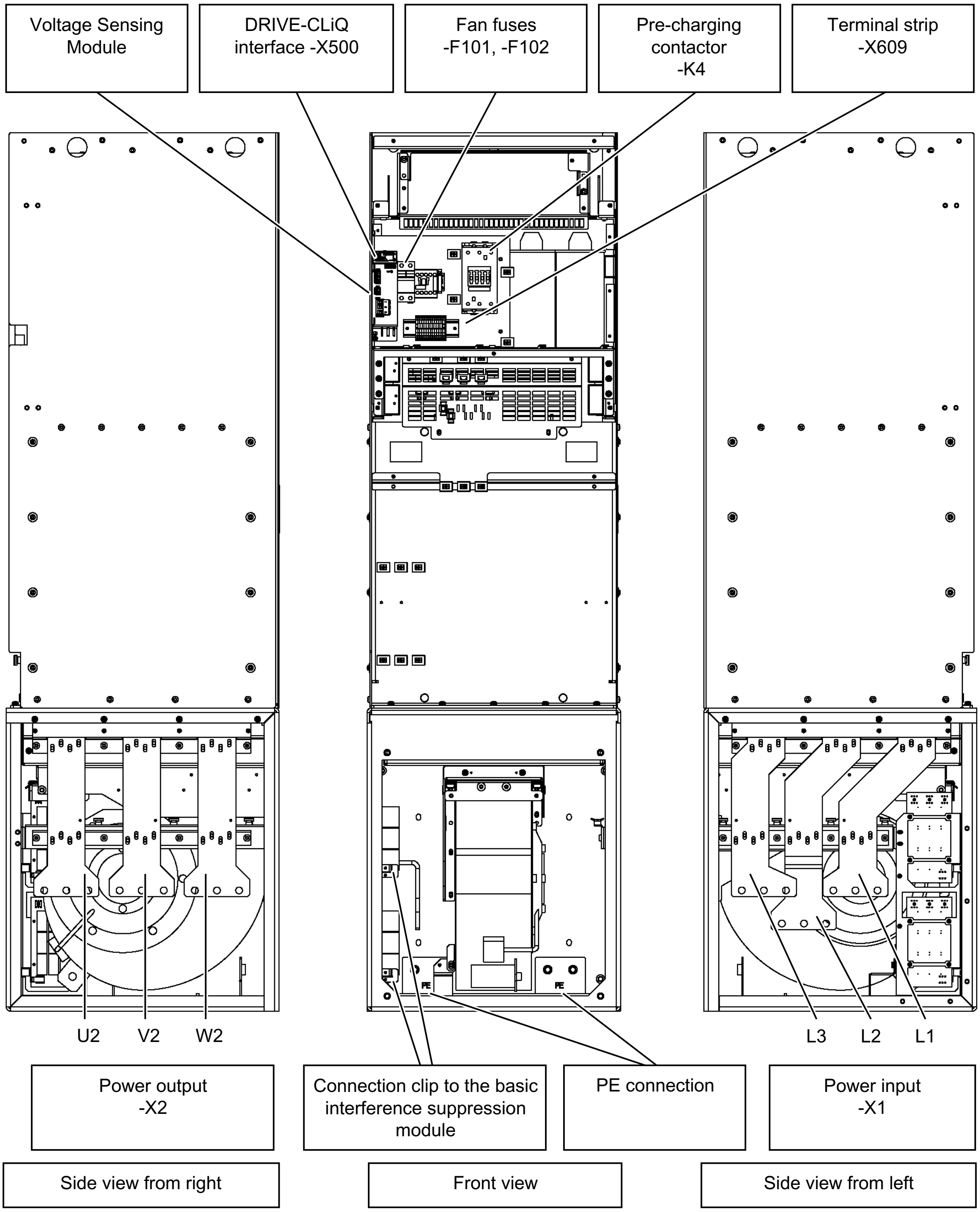
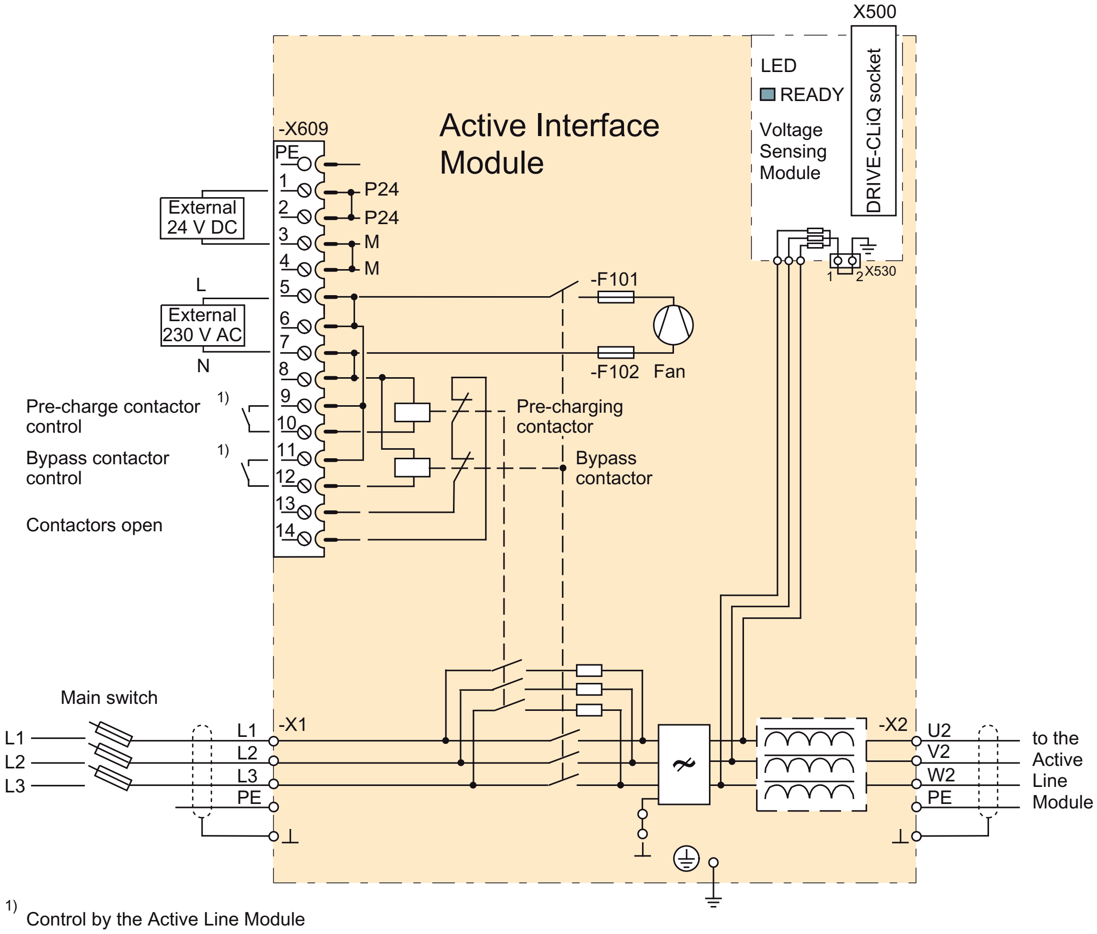


Figure 2-13 Interface overview in the Active Interface Module, frame size JI

2.6.3.2 Connection example



1) Control by the Active Line Module

Figure 2-14 Connection example Active Interface Module, frame sizes FI / GI

> ⚠ **CAUTION**
>
> **Same phase sequence in the precharging and main circuits**
>
> It is absolutely imperative that the precharging and main circuits have the same phase sequence. If this is not the case, during the brief overlap period, where both contactors are simultaneously closed, the precharging resistors will be overloaded and could be destroyed.

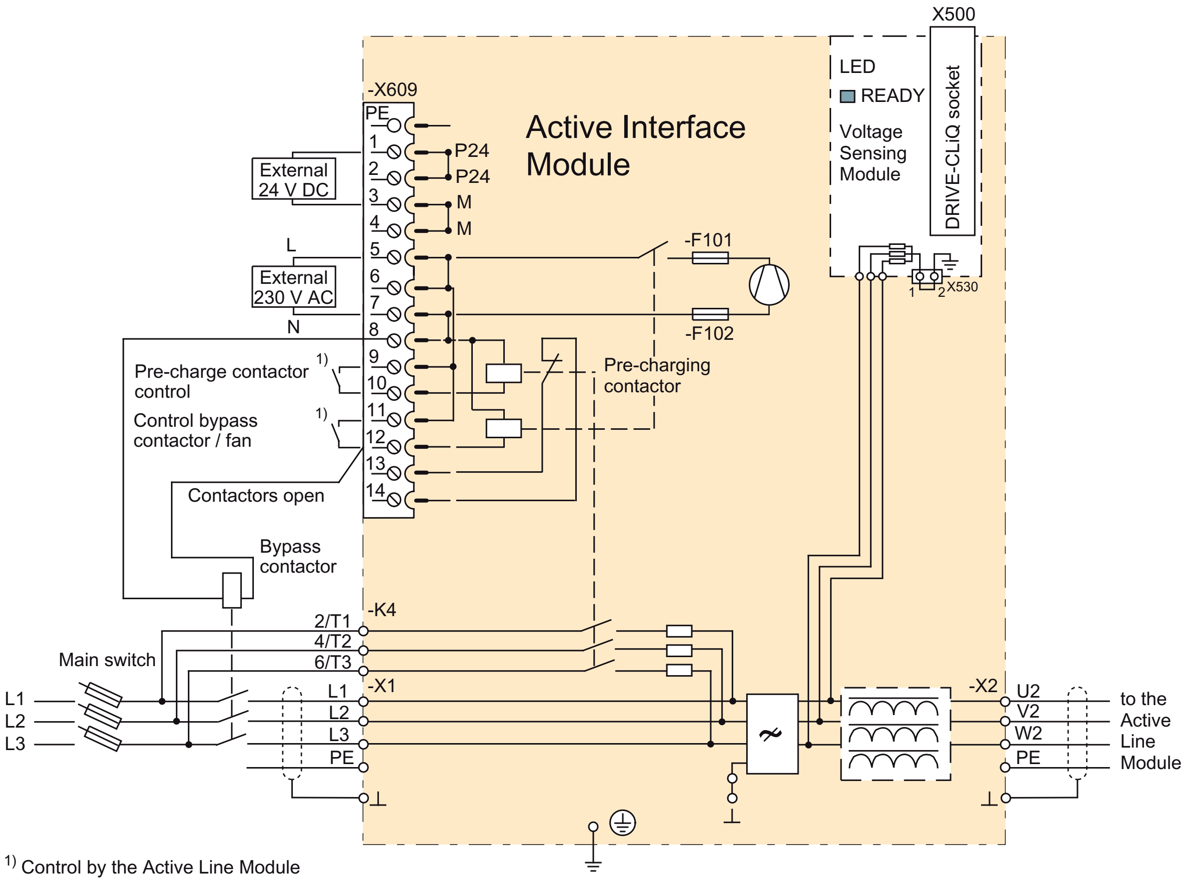


Figure 2-15 Connection example Active Interface Module, frame sizes HI / JI

CAUTION

Same phase sequence in the precharging and main circuits

It is absolutely imperative that the precharging and main circuits have the same phase sequence. If this is not the case, during the brief overlap period, where both contactors are simultaneously closed, the precharging resistors will be overloaded and could be destroyed.

2.6.3.3 Line/load connection

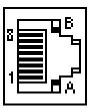
Table 2- 23 Connections for the Active Interface Module

Terminals	Designations
X1: L1, L2, L3 X2: U2, V2, W2	Voltage: • 3 AC 380 V -10 % (-15 % < 1 min) ... 3 AC 480 V +10 % • 3 AC 500 V -10 % (-15 % < 1 min) ... 3 AC 690 V +10 % Frequency: 47 ... 63 Hz Connecting thread: • Frame sizes FI / GI: M10 / 25 Nm for cable lugs in accordance with DIN 46234 / DIN 46235 1) • Frame sizes HI / JI: M12 / 50 Nm for cable lugs in accordance with DIN 46234 / DIN 46235 1)
K4: 2/T1, 4/T2, 6/T3 (for frame sizes HI / JI only)	Connection for pre-charging circuit directly on pre-charging contactor: • Frame size HI: 2 x 16 mm² max. (3RT1034) • Frame size JI: 2 x 35mm² max. (3RT1044)
PE connection	Connecting thread: • Frame sizes FI / GI: M10 / 25 Nm for cable lugs in accordance with DIN 46234 / DIN 46235 1) • Frame sizes HI / JI: M12 / 50 Nm for cable lugs in accordance with DIN 46234 / DIN 46235 1)

1) Dimensions for connecting alternative cable lugs, see "cable lugs" in the appendix.

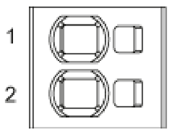
2.6.3.4 DRIVE-CLiQ interface X500

Table 2- 24 DRIVE-CLiQ interface X500

	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)	24 V power supply
	B	M (0 V)	Electronics ground
Blanking plate for DRIVE-CLiQ interfaces (50 pcs.) order number: 6SL3066-4CA00-0AA0			

2.6.3.5 X530 neutral point grounding

Table 2- 25 Neutral point grounding X530

	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. A current flows to PE as a result of the voltage to be measured. This connection is removed by removing the connector jumper. The measurement is then electrically isolated.

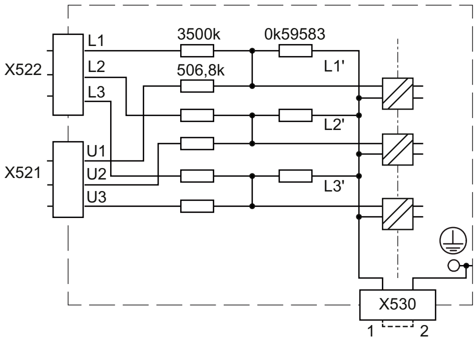
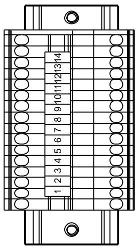


Figure 2-16 Internal circuit of the VSM10 Voltage Sensing Module

2.6.3.6 X609 terminal strip

Table 2- 26 X609 terminal strip

	Terminal	Designation	Technical specifications	
	1	P24	Voltage: 24 VDC (20.4 ... 28.5 V) Current consumption: Max. 0.25 A	
	2	P24		
	3	M		
	4	M		
	5	L	Voltage: 230 VAC (195.5 ... 264.5 V) Current consumption: Max. 10 A Fan operating currents, see "Technical data"	
	6	L		
	7	N		
	8	N		
	9	Precharge contactor–A1	Voltage: 230 VAC (195.5 ... 264.5 V) Current consumption: Max. 4 A	To Active Line Module, X9:5
	10	Precharge contactor–A2		To Active Line Module, X9:6
	11	Bypass contactor–A1	Voltage: 230 VAC (195.5 ... 264.5 V) Current consumption: Max. 6 A	To Active Line Module, X9:3
	12	Bypass contactor–A2		To Active Line Module, X9:4
	13	Contactor feedback 1 *	Voltage: 230 VAC (195.5 ... 264.5 V) Max. permissible current: 6 A	
	14	Contactor feedback 2 *		
Max. connectable cross-section 1.5 mm²				

* Series connection NO contact of precharge contactor and bypass contactor (only for frame size FI, GI)

NOTICE

Active Interface Modules in frame sizes HI and JI

Active Interface Modules of frame sizes HI and JI require a signal on terminal X609:11 and 12 to control the fans. If this signal is not present during operation, the fans do not rotate and the module is shut down on overtemperature.

2.6.3.7 Meaning of the LED on the Voltage Sensing Module (VSM) in the Active Interface Module

Table 2- 27 Description of the LED on the Voltage Sensing Module (VSM) in the Active Interface Module

LED	Color	State	Description
RDY	---	Off	The electronics power supply is missing or out of tolerance
	Green	Continuously lit	The component is ready for operation and cyclic DRIVE-CLiQ communication is taking place.
	Orange	Continuously lit	DRIVE-CLiQ communication is being established.
	Red	Continuously lit	At least one fault is present in this component. Note: LED is driven irrespective of the corresponding messages being 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 2 Hz	Component recognition via LED is activated (p0144) Note: The two options depend on the LED status when module recognition is activated via p0144 = 1.

2.6.4 Dimension drawing

Dimension drawing, frame size FI

The mandatory cooling clearances are indicated by the dotted line.

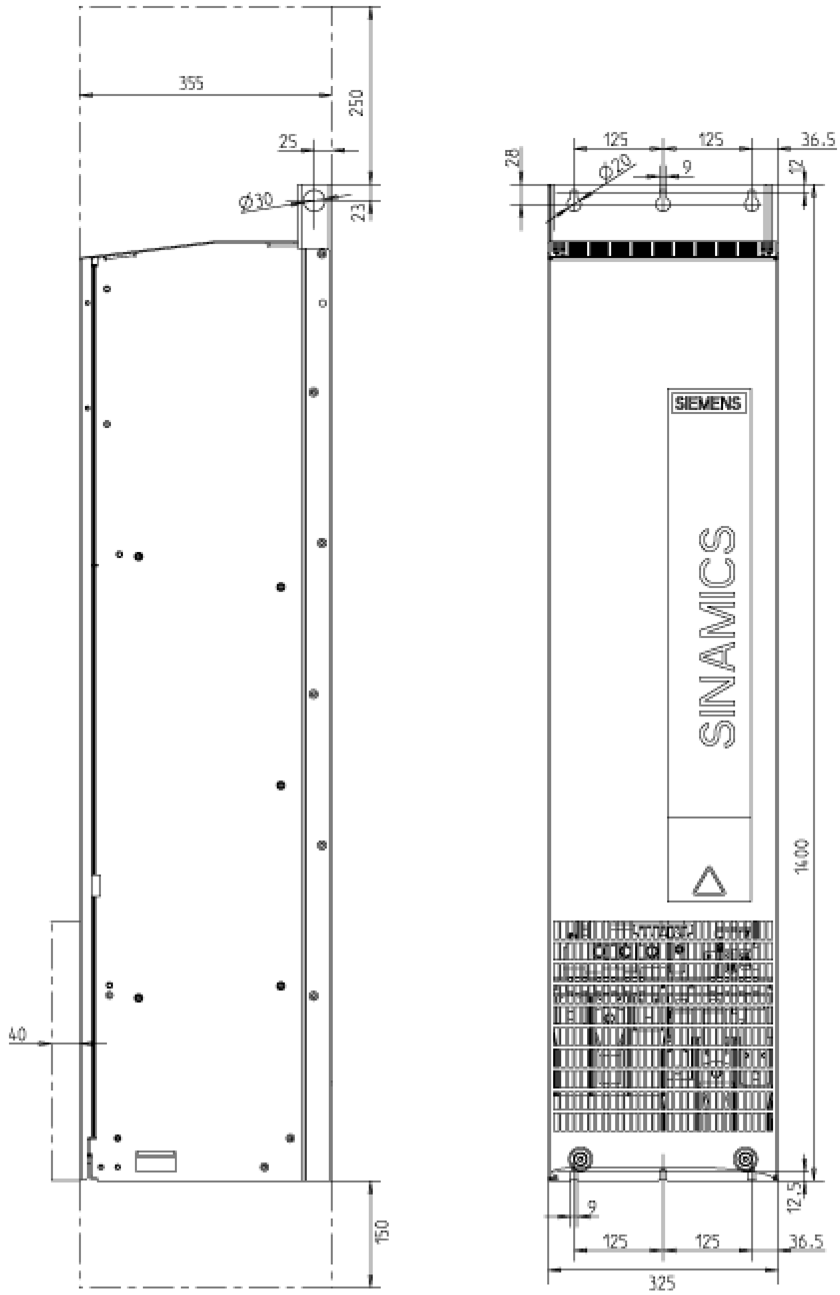


Figure 2-17 Dimension drawing for Active Interface Module, frame size FI Side view, front view

Dimension drawing, frame size GI

The mandatory cooling clearances are indicated by the dotted line.

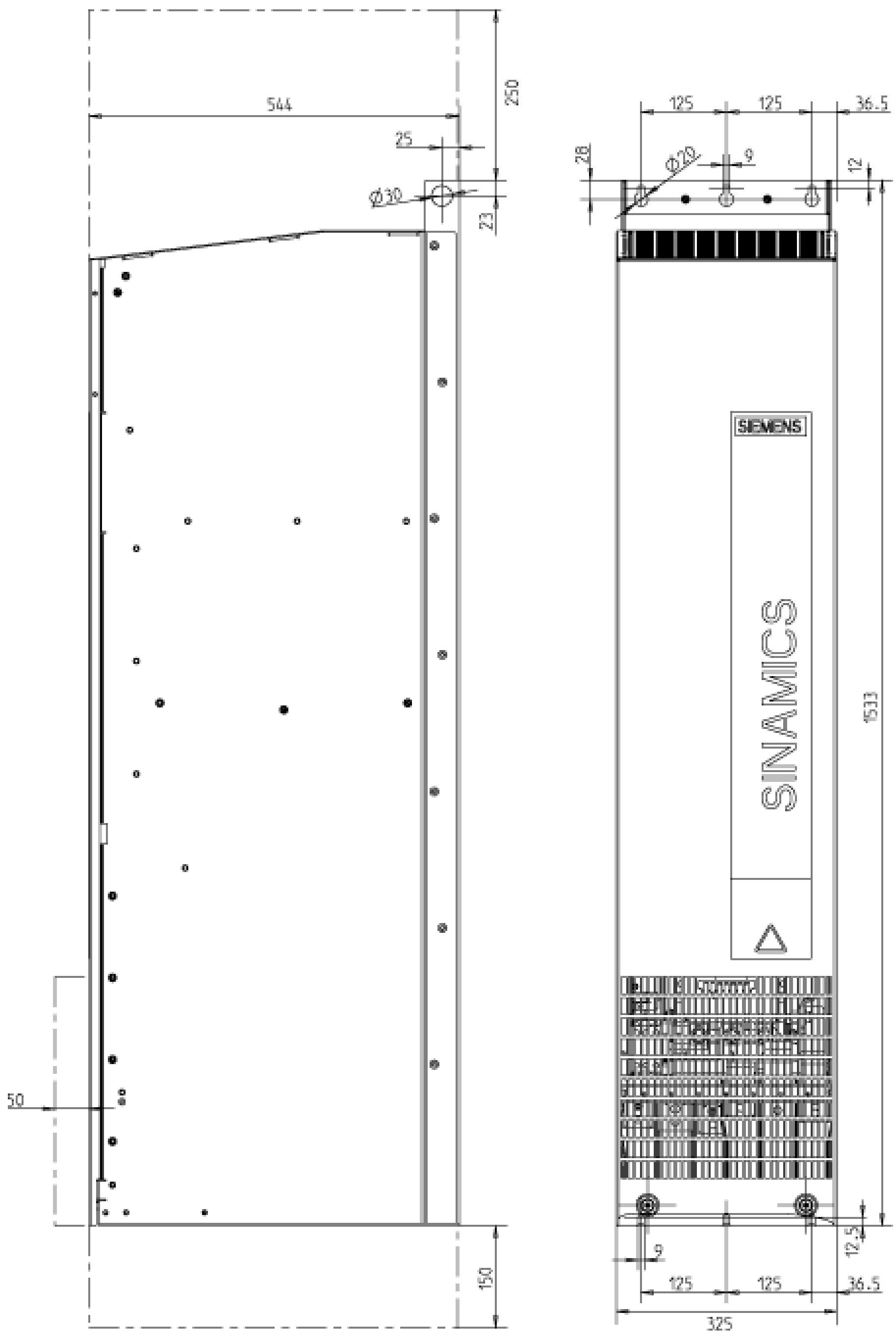


Figure 2-18 Dimension drawing for Active Interface Module, frame size GI Side view, front view

Dimension drawing, frame size HI

The mandatory cooling clearances are indicated by the dotted line.

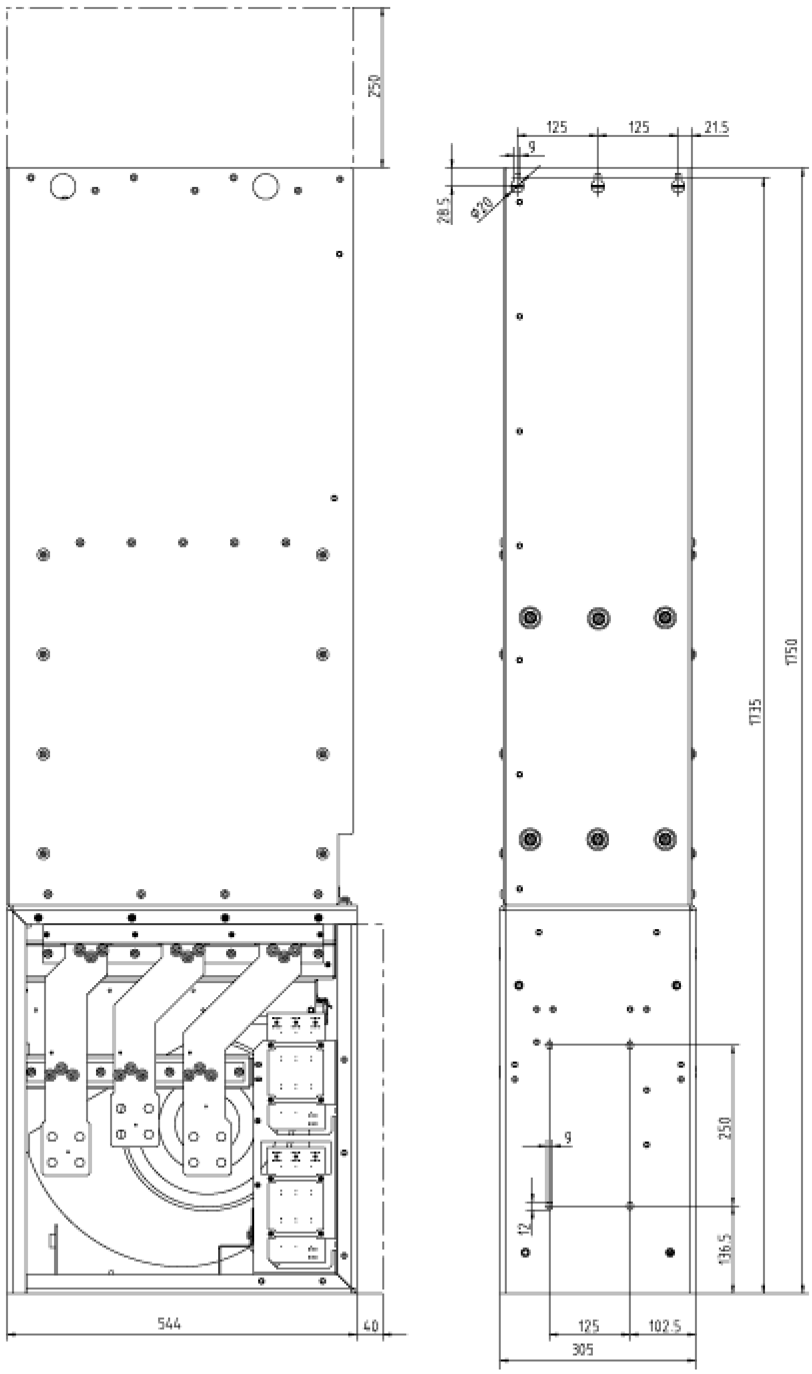


Figure 2-19 Dimension drawing for Active Interface Module, frame size HI Side view, rear view

Dimension drawing, frame size JI

The mandatory cooling clearances are indicated by the dotted line.

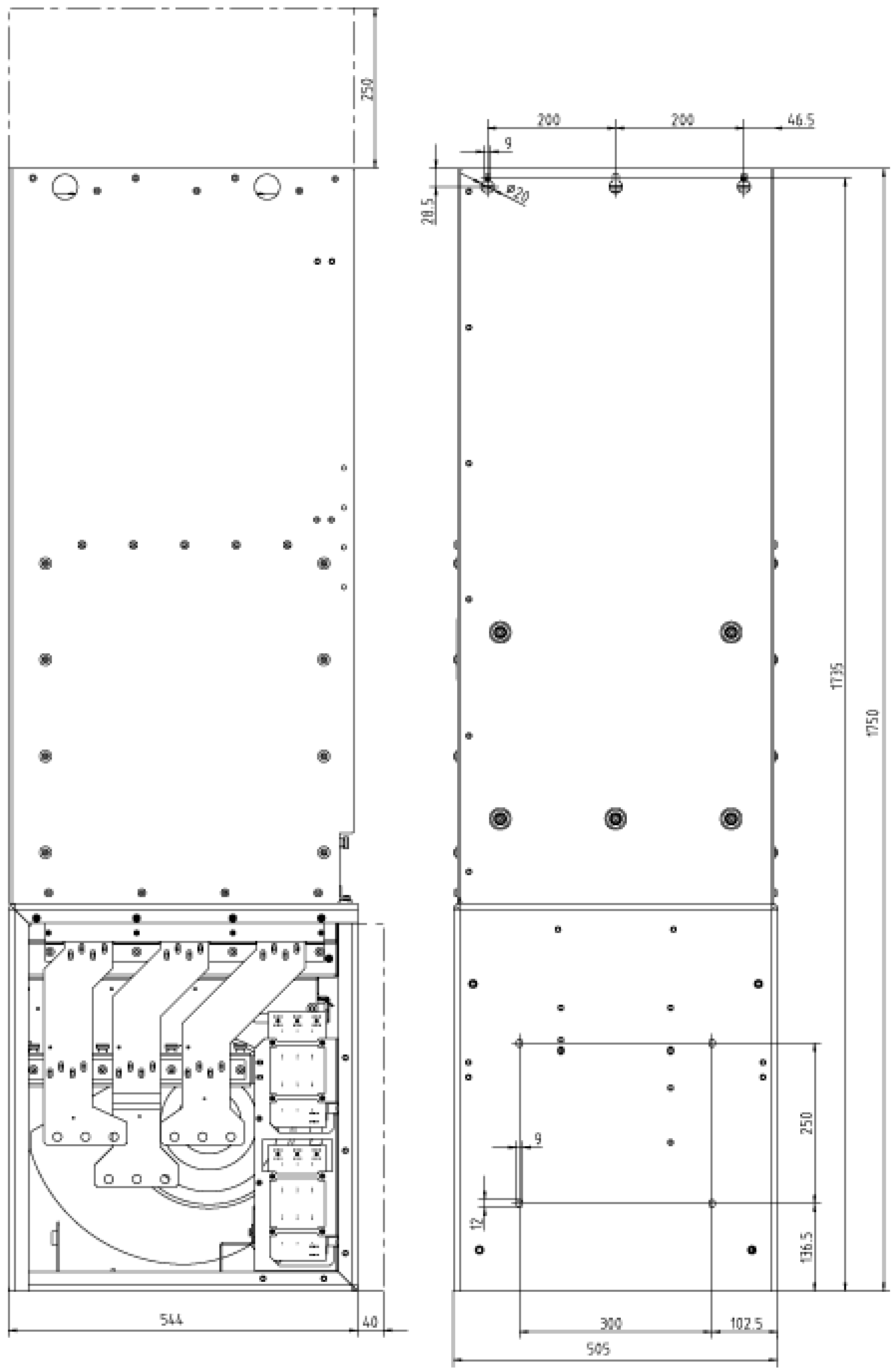


Figure 2-20 Dimension drawing for Active Interface Module, frame size JI Side view, rear view

2.6.5 Electrical connection

The Active Interface Module is electrically connected in accordance with the connection examples shown in section "Interface description".

Operating an Active Interface Module on an ungrounded line supply (IT system)

When the device is operated on an ungrounded line supply (IT system), the integrated basic interference suppression modules must be deactivated by screwing out a connection clip.

Note

Warning label on the connection clip

A yellow warning label is attached to each connection clip so that it is easier to find.

- The warning label must be removed from the connection clip (by pulling it off) if the connection clip is to remain in the unit (operation on a grounded line supply).
- The warning label must be removed together with the connection clip if the unit is operated on a non-grounded line supply (IT system).

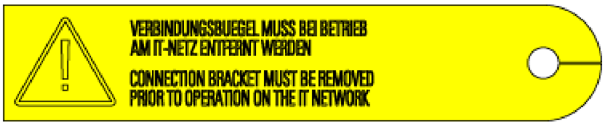


Figure 2-21 Warning label on the connection clip

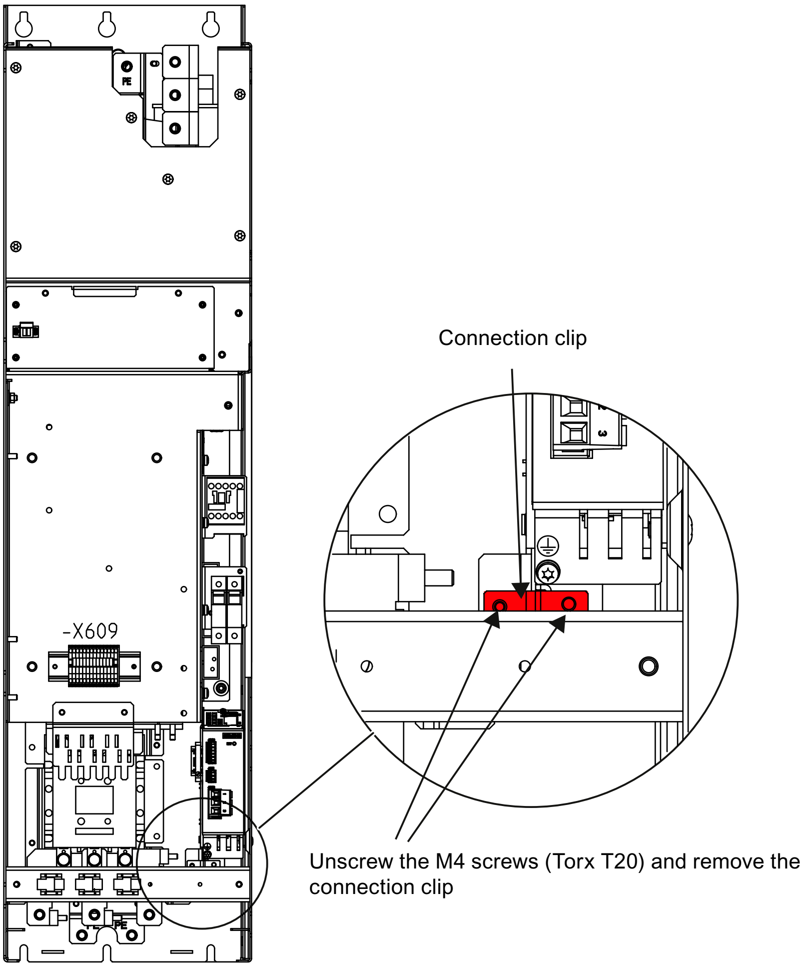


Figure 2-22 Removing the connection clip to the basic interference suppression module in the Active Interface Module for frame size FI

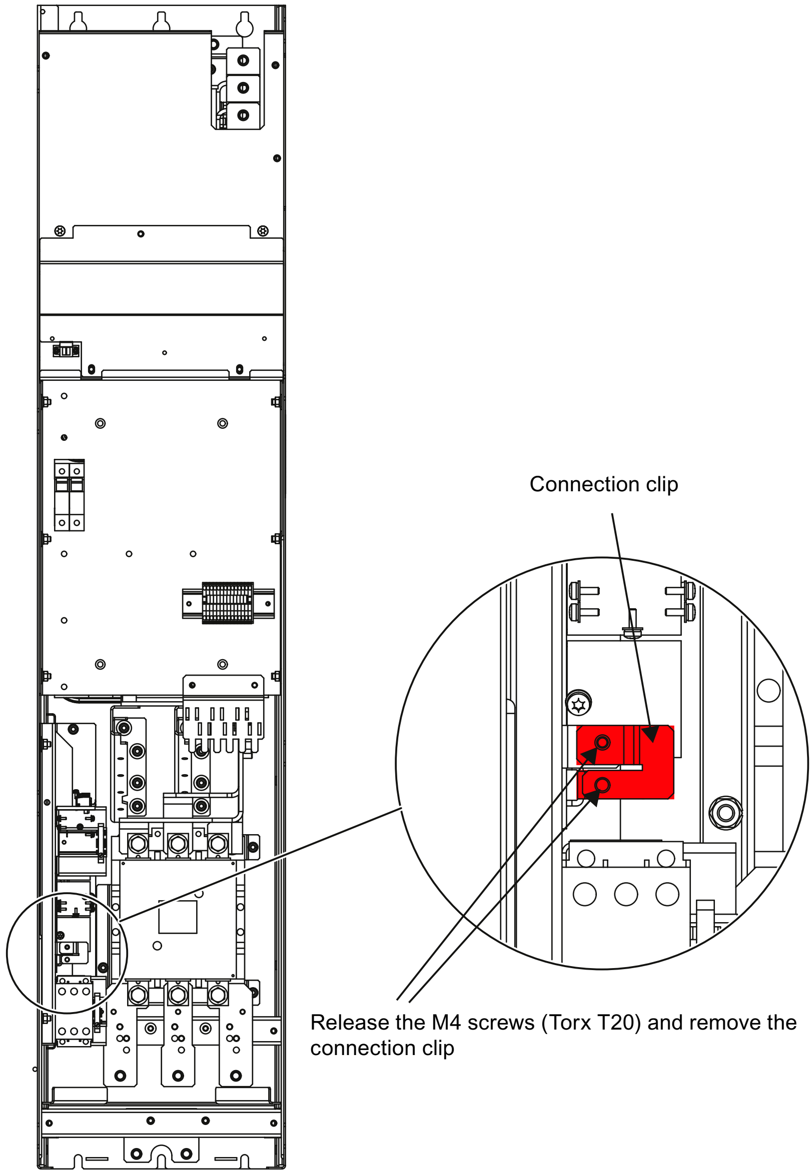


Figure 2-23 Removing the connection clip to the basic interference suppression module in the Active Interface Module for frame size GI

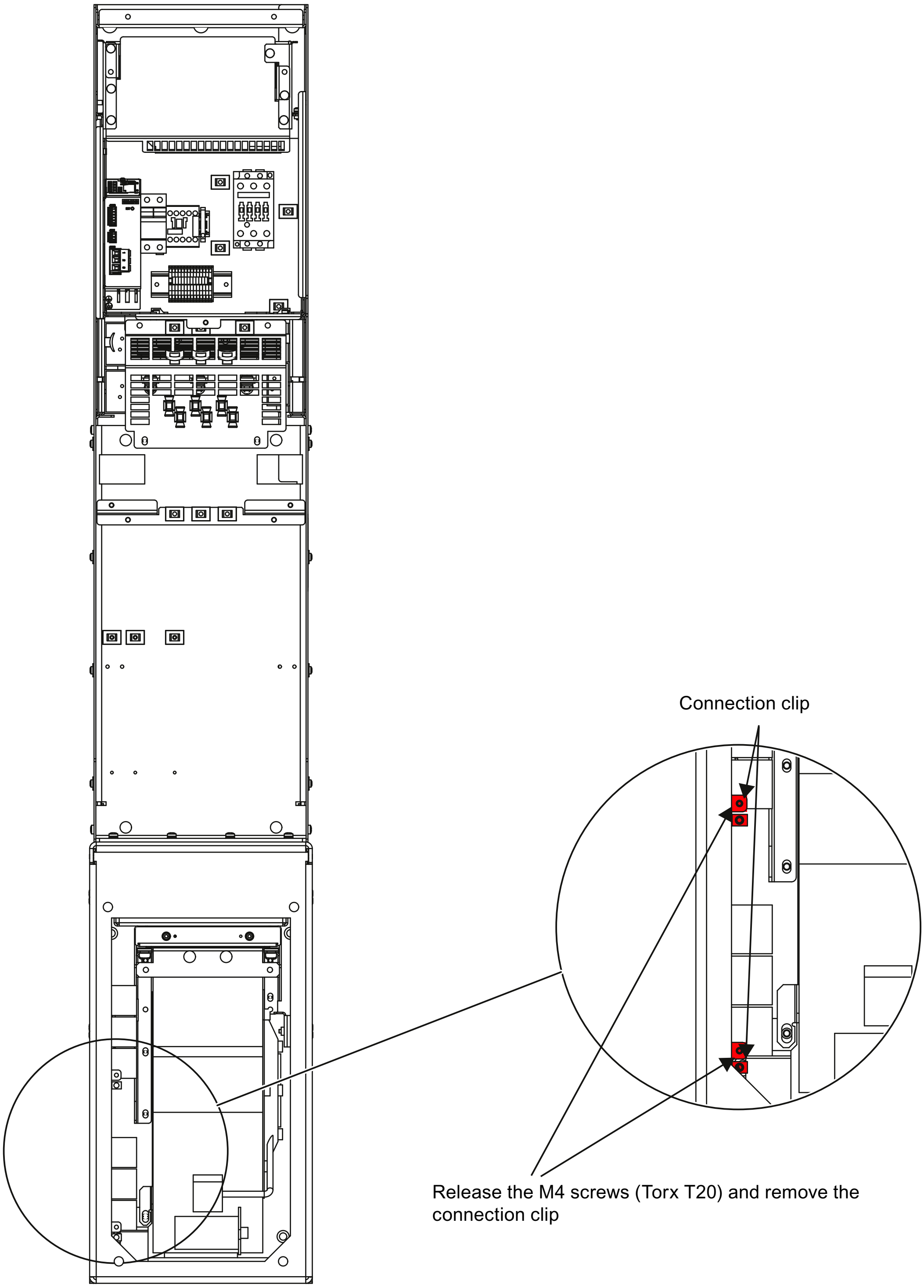


Figure 2-24 Removing the connection clip to the basic interference suppression module in the Active Interface Module for frame size HI

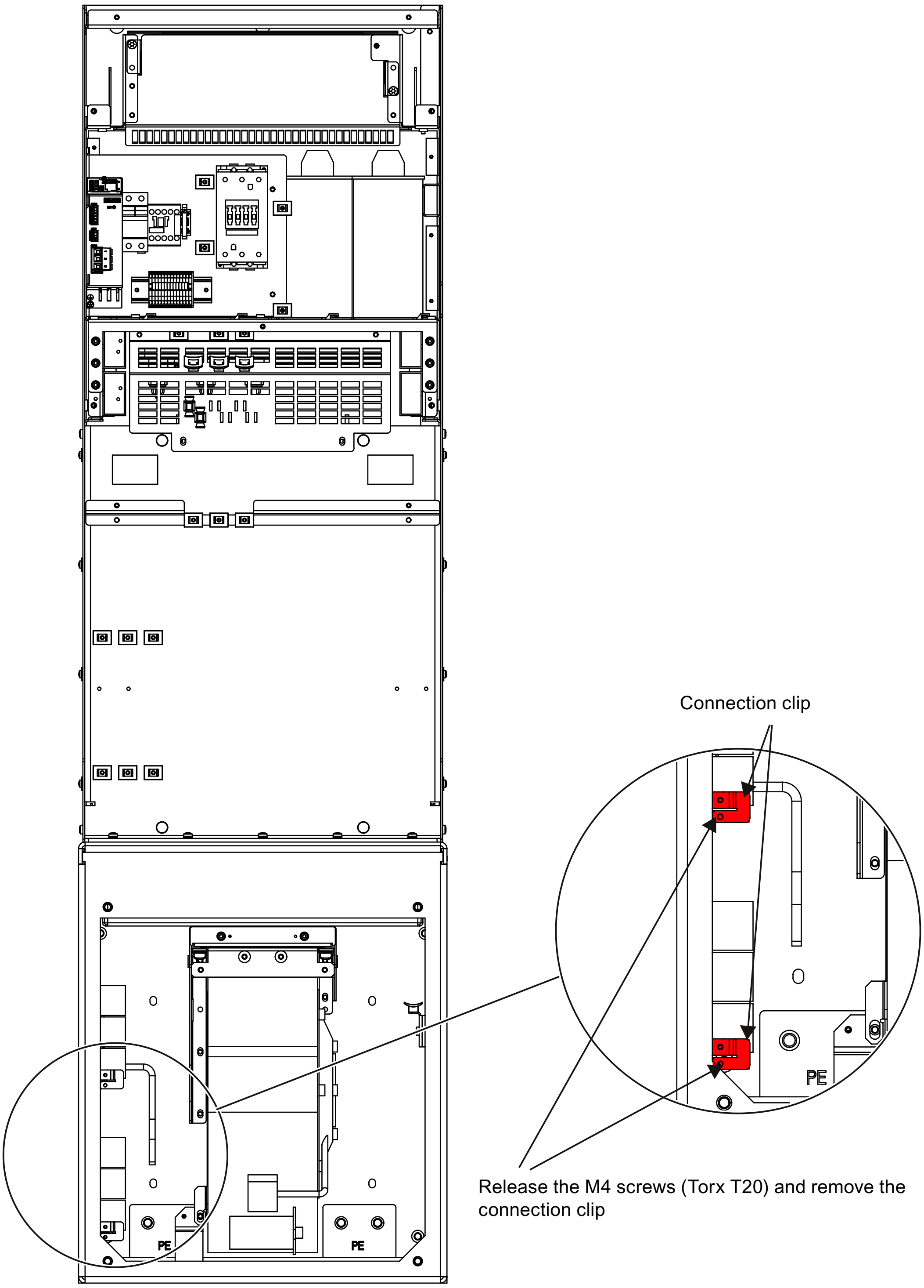
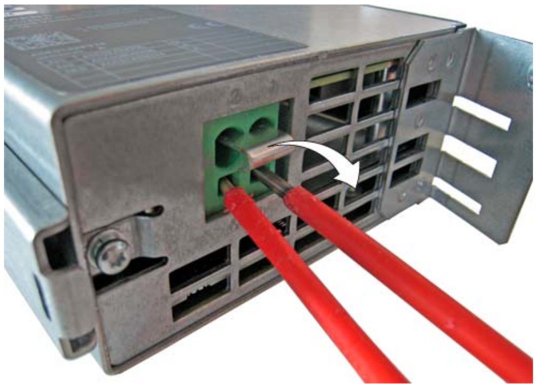


Figure 2-25 Removing the connection clip to the basic interference suppression module in the Active Interface Module for frame size JI

> **⚠ WARNING**
>
> **Removing the connection clip on an ungrounded power network**
>
> Failure to remove the connection clip to the basic interference suppression module on an ungrounded line supply (IT system) can cause significant damage to the device.

Removing the connector jumper on the VSM10 Voltage Sensing Module

When operating the Active Interface Module on an ungrounded line supply (IT system), at the Voltage Sensing Module (VSM10), remove the connector jumper in terminal X530 at the lower side of the component.
Use two screwdrivers or another suitable tool to relieve the holding springs in the terminal and then withdraw the connector jumper.

<table>
<tr><td>
</td><td></td></tr>
<tr><td>Terminal X530 with connector jumper</td><td>Relieve the springs and withdraw the connector jumper</td></tr>
</table>

2.6.6 Technical data

Table 2- 28 Technical data for Active Interface Modules, 3 AC 380 V ... 480 V, Part 1

Order number	6SL3300–	7TE32–6AA0	7TE32–6AA0	7TE33–8AA0	7TE35–0AA0
Suitable for Active Line Module Rated power of Active Line Module	6SL3330- kW	7TE32-1AAx 132	7TE32-6AAx 160	7TE33-8AAx 235	7TE35-0AAx 300
Rated current	A	210	260	380	490
Supply voltages - Line voltage - Line frequency - Electronic power supply - Fan supply voltage	 V_{ACrms} Hz V_{DC} V_{AC}	 3 AC 380 -10% (-15% < 1 min) ... 3 AC 480 +10% 47 ... 63 Hz 24 (20.4 ... 28.8) 230 (195.5 ... 264.5)			
DC-link capacitance of the drive line-up, max.	 µF	 41600	 41600	 76800	 76800
Current consumption - Electronics current consumption (24 VDC) - Fan supply, 2 AC 230 V, 50/60 Hz, max. - Max. precharging current (max. 3 s)	 A A A	 0.17 0.45 / 0.6 57	 0.17 0.45 / 0.6 57	 0.17 0.9 / 1.2 57	 0.17 0.9 / 1.2 57
Bypass contactor		included	included	included	included
Power consumption bypass contactor (230 VAC) - Making current - Holding current	 A A	 1.25 0.6	 1.25 0.6	 2.5 1.2	 2.5 1.2
Max. ambient temperature - Without derating - With derating	 ° C ° C	 40 55	 40 55	 40 55	 40 55
Power loss, max. 1) - At 50 Hz 400 V - At 60 Hz 460 V	 kW kW	 2.1 2.1	 2.2 2.2	 3.0 3.0	 3.9 3.9
Cooling air requirement	m^3/s	0.24	0.24	0.47	0.47
Line/load connection L1, L2, L3 / U2, V2, W2		Flat connector for screw			
		M10	M10	M10	M10
PE connection		M10 screw	M10 screw	M10 screw	M10 screw
Line/load connection - Line connection (L1, L2, L3) - Load connection (U2, V2, W2) - PE connection	 mm² mm² mm²	 2 x 185 2 x 185 2 x 185	 2 x 185 2 x 185 2 x 185	 2 x 185 2 x 185 2 x 185	 2 x 185 2 x 185 2 x 185
Degree of protection		IP20	IP20	IP20	IP20
Dimensions - Width - Height - Depth	 mm mm mm	 325 1400 355	 325 1400 355	 325 1533 544	 325 1533 544
Frame size		FI	FI	GI	GI
Weight	kg	135	135	190	190

1) The specified power loss is the maximum value at 100% capacity utilization. The value in normal operation is lower.

Table 2- 29 Technical data for Active Interface Modules, 3 AC 380 V ... 480 V, Part 2

Order number	6SL3300–	7TE38–4AA0	7TE38–4AA0	7TE41–4AA0	7TE41–4AA0
Suitable for Active Line Module Rated power of Active Line Module	6SL3330- kW	7TE36-1AAx 380	7TE37-5AAx 7TE38-4AAx 450/500	7TE41-0AAx 630	7TE41-2AAx 7TE41-4AAx 800/900
Rated current	A	605	840	985	1405
Supply voltages - Line voltage - Line frequency - Electronic power supply - Fan supply voltage	 V_{ACrms} Hz V_{DC} V_{AC}	 3 AC 380 -10% (-15% < 1 min) ... 3 AC 480 +10% 47 ... 63 Hz 24 (20.4 ... 28.8) 230 (195.5 ... 264.5)			
DC-link capacitance of the drive line-up, max.	 µF	 134400	 134400	 230400	 230400
Current consumption - Electronics current consumption (24 VDC) - Fan supply, 2 AC 230 V, 50/60 Hz, max. - Max. precharging current (max. 3 s)	 A A A	 0.17 3.6 / 4.6 178	 0.17 3.6 / 4.6 178	 0.17 3.8 / 4.9 178	 0.17 3.8 / 4.9 178
Bypass contactor [2]		3RT1476- 6AP36	3WL1110- 2BB34-4AN2-Z Z=C22 [3]	3WL1112- 2BB34-4AN2-Z Z=C22 [3]	3WL1116- 2BB34-4AN2-Z Z=C22 [3]
Max. ambient temperature - Without derating - With derating	 ° C ° C	 40 55	 40 55	 40 55	 40 55
Power loss, max. [1] - At 50 Hz 400 V - At 60 Hz 460 V	 kW kW	 5.5 5.5	 6.1 6.1	 7.5 7.5	 8.5 8.5
Cooling air requirement	m^3/s	0.40	0.40	0.40	0.40
Line/load connection L1, L2, L3 / U2, V2, W2		Flat connector for screw			
		M12	M12	M12	M12
PE connection		M12 screw	M12 screw	M12 screw	M12 screw
Line/load connection - Line connection (L1, L2, L3) - Load connection (U2, V2, W2) - PE connection	 mm² mm² mm²	 4 x 240 4 x 240 2 x 240	 4 x 240 4 x 240 2 x 240	 6 x 240 6 x 240 4 x 240	 6 x 240 6 x 240 4 x 240
Degree of protection		IP00	IP00	IP00	IP00
Dimensions - Width - Height - Depth	 mm mm mm	 305 1750 544	 305 1750 544	 505 1750 544	 505 1750 544
Frame size		HI	HI	JI	JI
Weight	kg	390	390	620	620

[1] The specified power loss is the maximum value at 100% capacity utilization. The value in normal operation is lower.

[2] Bypass contactor is not included, must be provided separately.

[3] The circuit breaker is controlled by the sequential control system of the Active Line Module and must not be switched on manually. It is therefore recommended that the circuit breaker be equipped with the 3WL9111-0BA21-0AA0 locking set.

Table 2- 30 Technical data for Active Interface Modules, 3 AC 500 V ... 690 V

Order number	6SL3300–	7TG35–8AA0	7TG37–4AA0	7TG41–3AA0	7TG41–3AA0
Suitable for Active Line Module Rated power of Active Line Module	6SL3330- kW	7TG35-8AAx 560	7TG37-4AAx 800	7TG41-0AAx 1100	7TG41-3AAx 1400
Rated current	A	575	735	1025	1270
Supply voltages - Line voltage - Line frequency - Electronic power supply - Fan supply voltage	 V_{ACrms} Hz V_{DC} V_{AC}	 3 AC 500 –10% (-15% < 1 min) ... 3 AC 690 +10% 47 ... 63 Hz 24 (20.4 ... 28.8) 230 (195.5 ... 264.5)			
DC-link capacitance of the drive line-up, max.	 µF	 59200	 153600	 153600	 153600
Current consumption - Electronics current consumption (24 VDC) - Fan supply, 2 AC 230 V, - Max. precharging current (max. 3 s)	 A A A	 0.17 4.6 141	 0.17 4.9 141	 0.17 4.9 141	 0.17 4.9 141
Bypass contactor 2)		3RT1476- 6AP36	3RT1476- 6AP36 (3 x)	3WL1212- 4BB34-4AN2-Z Z=C22 3)	3WL1216- 4BB34-4AN2-Z Z=C22 3)
Max. ambient temperature - Without derating - With derating	 ° C ° C	 40 55	 40 55	 40 55	 40 55
Power loss, max. 1) - At 50 Hz 690 V - At 60 Hz 575 V	 kW kW	 6.8 6.8	 9.0 9.0	 9.2 9.2	 9.6 9.6
Cooling air requirement	m^3/s	0.40	0.40	0.40	0.40
Line/load connection L1, L2, L3 / U2, V2, W2		Flat connector for screw M12	 M12	 M12	 M12
PE connection		M12 screw	M12 screw	M12 screw	M12 screw
Line/load connection - Line connection (L1, L2, L3) - Load connection (U2, V2, W2) - PE connection	 mm² mm² mm²	 4 x 240 4 x 240 2 x 240	 6 x 240 6 x 240 4 x 240	 6 x 240 6 x 240 4 x 240	 6 x 240 6 x 240 4 x 240
Degree of protection		IP00	IP00	IP00	IP00
Dimensions - Width - Height - Depth	 mm mm mm	 305 1750 544	 505 1750 544	 505 1750 544	 505 1750 544
Frame size		HI	JI	JI	JI
Weight	kg	390	620	620	620

1) The specified power loss is the maximum value at 100% capacity utilization. The value in normal operation is lower.

2) Bypass contactor is not included, must be provided separately.

3) The circuit breaker is controlled by the sequential control system of the Active Line Module and must not be switched on manually. It is therefore recommended that the circuit breaker be equipped with the 3WL9111-0BA21-0AA0 locking set.

Line Modules 3

3.1 Introduction

The drive line-up is connected to the power supply network via the Line Modules.

Line Infeeds comprise a Line Module and the associated line connection and generate a DC voltage from the connected line voltage that is used to power the connected Motor Modules.

The Line Modules and Interface Modules are suitable for direct operation on TN, IT and TT systems.

General characteristics of the Line Modules

- Supply voltage:
  - 3 AC 380 V -10% (-15% < 1 min) to 3 AC 480 V +10%
  - 3 AC 500 V -10% (-15% < 1 min) to 3 AC 690 V +10%
- Line frequency: 47 to 63 Hz
- Suitable for TN, TT, and IT supply systems
- Operating status and error status via LEDs

3.2 Basic Line Modules

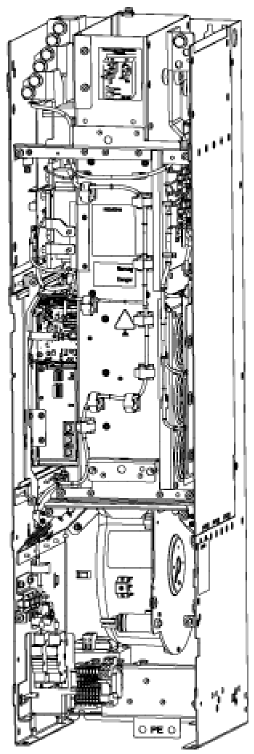
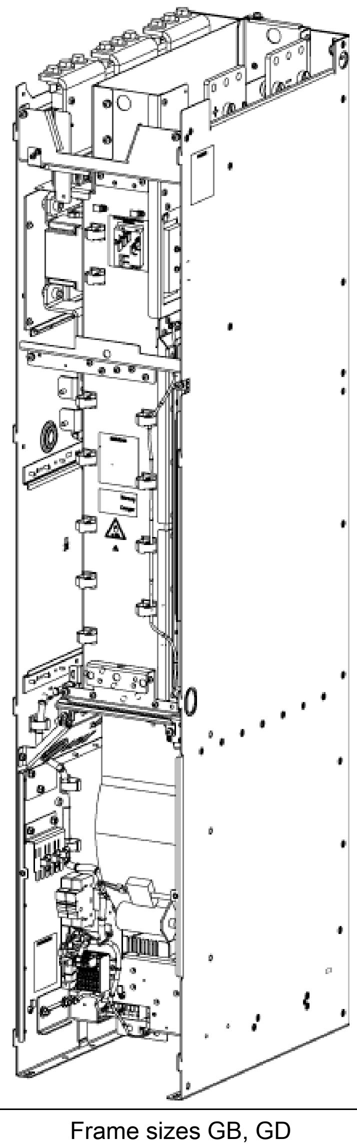
3.2.1 Description

Basic Line Modules are used for the power infeed into the DC link.

They are suitable for applications in which no regenerative energy is produced, or in which the energy exchange takes place between the motor- and the generator-driven axes in the DC link.

The DC-link voltage is greater than the rms value of the line rated voltage by a factor of 1.35 (under partial load) or 1.32 (under full load).

Table 3- 1 Overview of Basic Line Modules

	
Frame size FB	Frame sizes GB, GD

Components of the Basic Infeed

A Basic Infeed comprises a Basic Line Module and an external line connection, which comprises a line filter and a line reactor.

Operating principle

One or more Motor Modules can be connected to the power supply network via the Basic Line Module. The Basic Line Module provides the DC-link voltage for the Motor Modules.

The Basic Line Module is suitable for direct operation both on TN and on IT and TT systems.

Parallel connection of Basic Line Modules to increase power rating

Up to four Basic Line Modules with the same power rating can be connected in parallel in order to increase power.

The following rules must be observed when connecting Basic Line Modules in parallel:

- Up to four identical Basic Line Modules can be connected in parallel.
- A common Control Unit is required whenever the modules are connected in parallel.
- With multiple infeeds, power must be supplied to the systems from a common infeed point (i.e. different supply systems are not permitted).
- A line reactor must be series-connected to every parallel-connected Basic Line Module.
- The upstream line contactors of the individual precharging circuits must switch-on jointly and simultaneously.
- A derating factor of 7.5% must be taken into consideration, regardless of the number of modules connected in parallel.

The following rules must be observed when connecting Basic Line Modules of frame size GD in parallel:

- Each Basic Line Module must be precharged via a separate precharging circuit.
- The circuit breakers of the respective precharging circuits must switch-on jointly and simultaneously; this can be performed via a monitoring function of the circuit breaker feedback signals.

Note

Mixed operation is not possible

It is only possible to connect identical power units in parallel if all power units have the same hardware version. Mixed operation between a power unit with Control Interface Module (order number 6SL33xx-xxxxx–xAA3) and a power unit with Control Interface Board (order number 6SL33xx-xxxxx–xAA0) is not possible.

3.2.2 Safety information

⚠WARNING

Dangerous electrical voltage

A hazardous voltage will be present in the component for a further 5 minutes after all voltage supplies have been disconnected. Work cannot be carried out until this time has elapsed.

Before starting work, you should also measure the voltage after the 5 minutes have elapsed. The voltage can be measured on DC-link terminals DCP and DCN.

⚠CAUTION

Danger notice in the local language

The DC-link discharge time hazard warning must be affixed to the component in the relevant local language.

Note

Maintain ventilation clearances

The ventilation clearances above, below, and in front of the component, which are specified in the dimension drawings, must be observed.

⚠DANGER

High leakage current

Basic Line Modules discharge a high leakage current to the protective ground conductor. Due to the high leakage current associated with Basic Line Modules, they or the relevant control cabinet must be permanently connected to PE.

According to EN 61800-5-1, Section 6.3.6.7, the minimum cross-section of the protective ground conductor must conform to the local safety regulations for protective ground conductors for equipment with a high leakage current.

3.2.3 Interface description

3.2.3.1 Overview

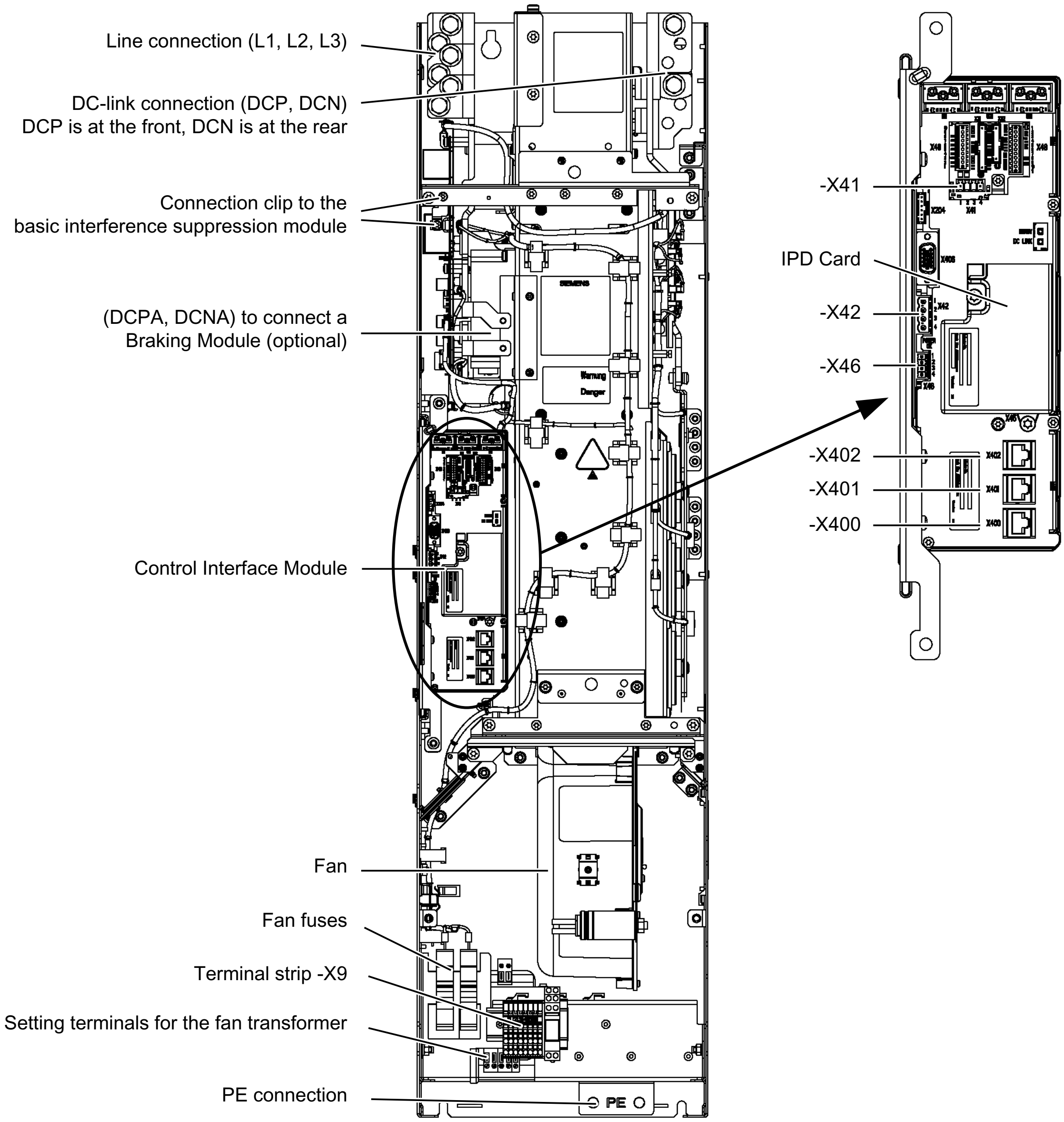


Figure 3-1 Basic Line Module, frame size FB

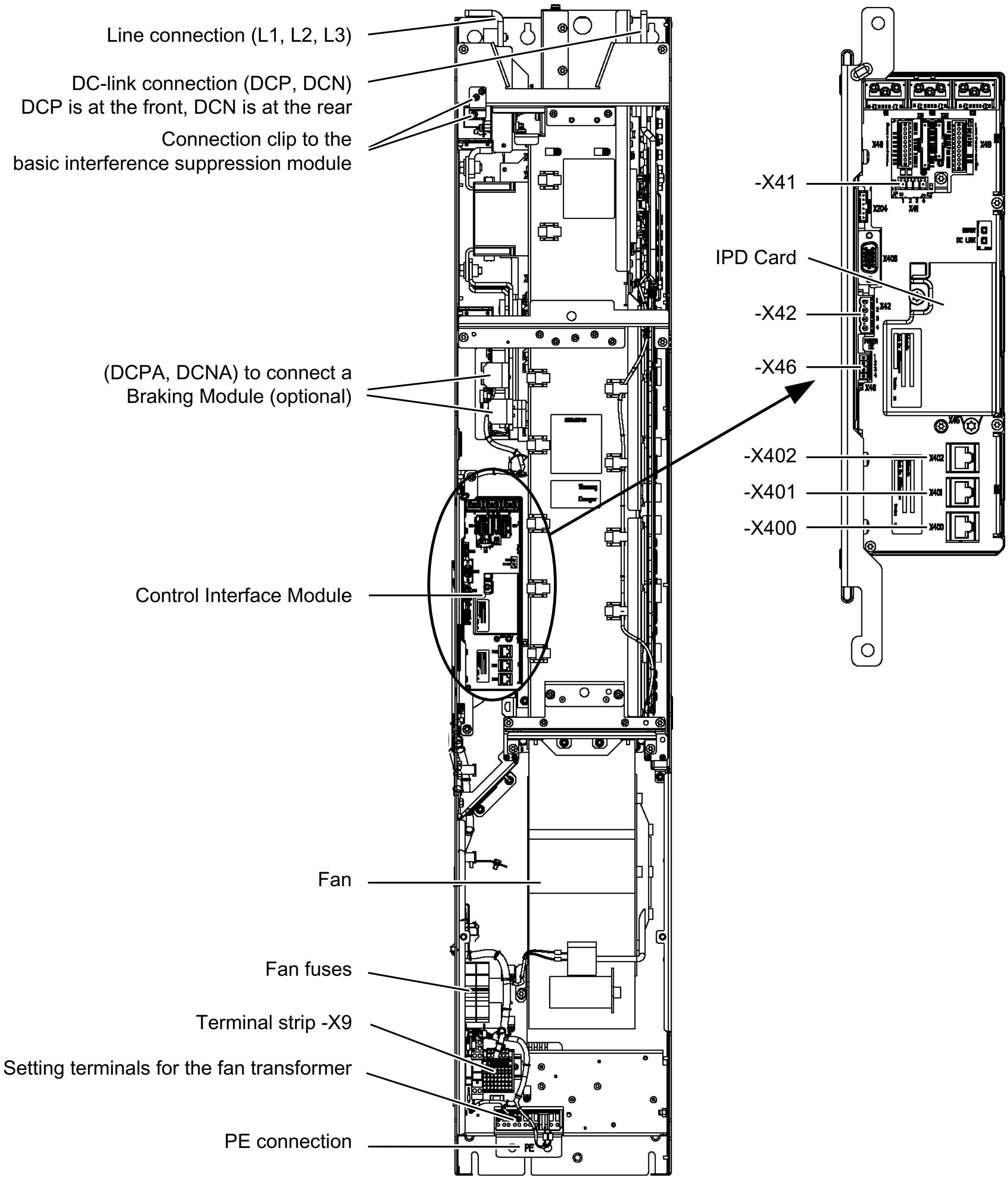


Figure 3-2 Basic Line Module, frame sizes GB, GD

3.2.3.2 Connection example

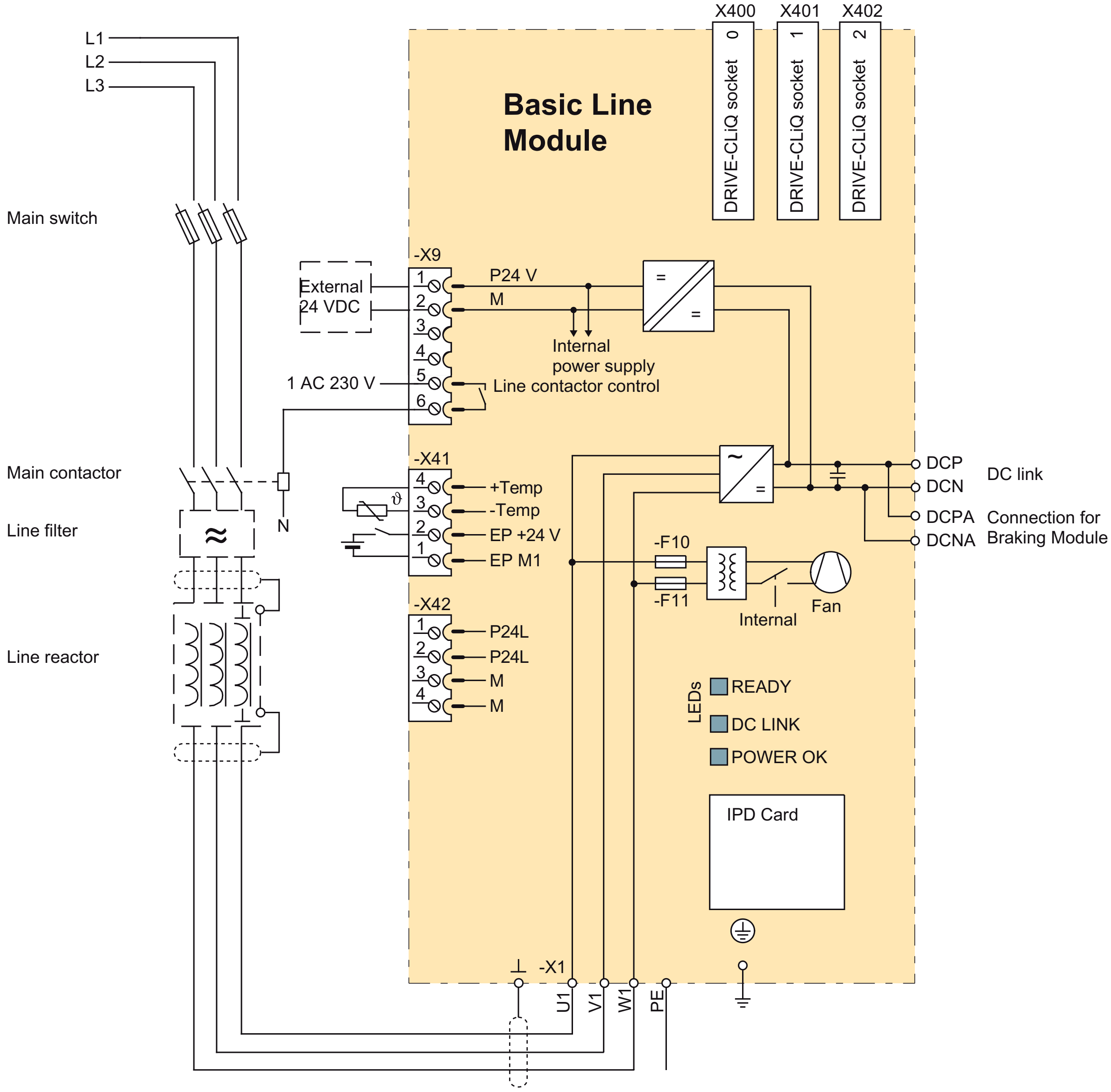


Figure 3-3 Connection example for Basic Line Module, frame sizes FB, GB,

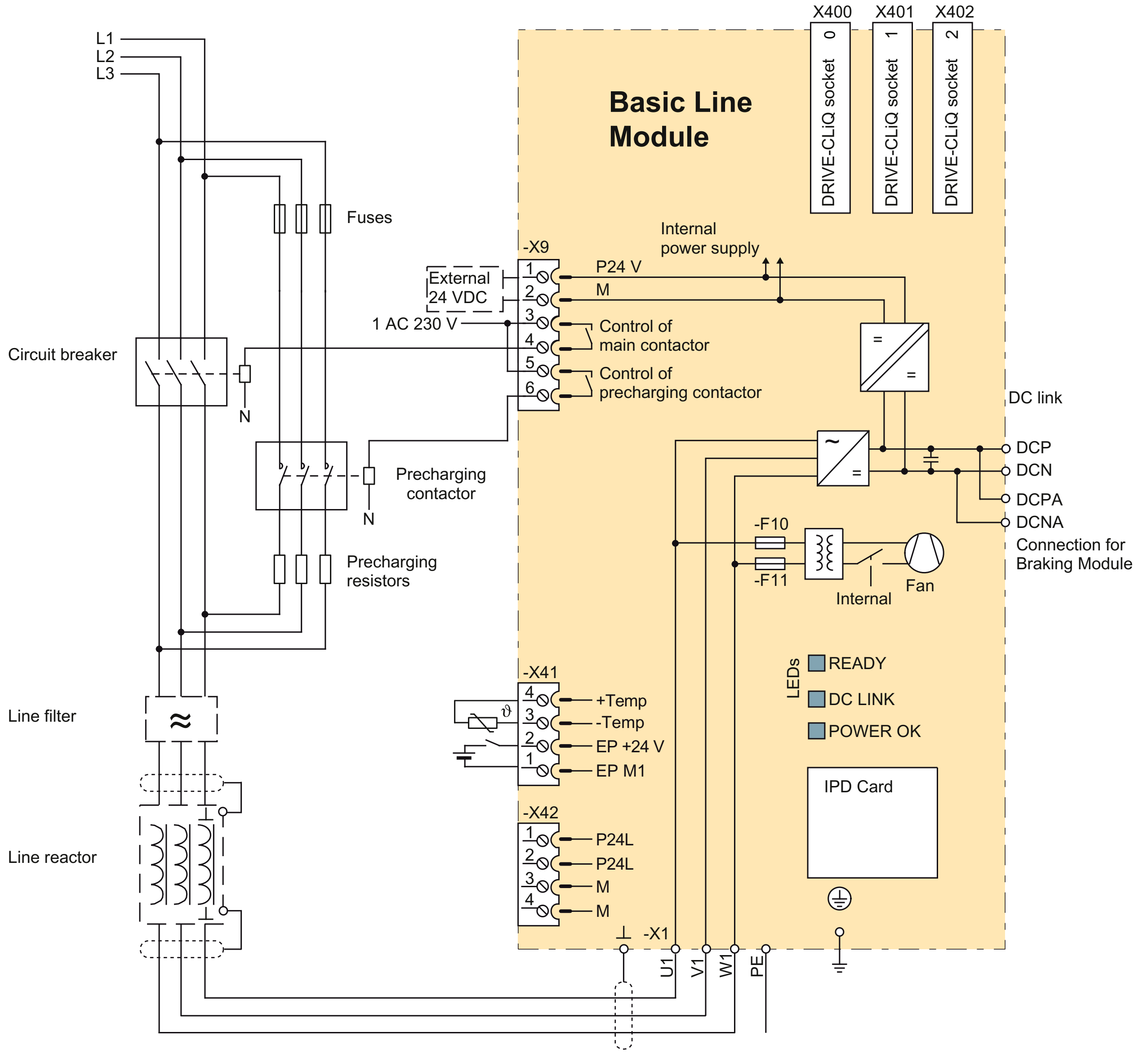


Figure 3-4 Connection example, Basic Line Module, frame size GD

CAUTION

Same phase sequence in the precharging and main circuits

It is absolutely imperative that the precharging and main circuits have the same phase sequence. If this is not the case, during the brief overlap period, where both contactors are simultaneously closed, the precharging resistors will be overloaded and could be destroyed.

3.2.3.3 Line/load connection

Table 3- 2 Line/load connection of the Basic Line Module

Terminals	Technical specifications
U1, V1, W1 3 AC power input	Voltage: • 3 AC 380 V -10% (-15% < 1 min) ... 3 AC 480 V +10% • 3 AC 500 V -10% (-15% < 1 min) ... 3 AC 690 V +10% Frequency: 47 ... 63 Hz Connecting thread: • Frame size FB: M10 / 25 Nm for cable lugs according to DIN 46234 / DIN 46235 [1)] • Frame sizes GB, GD: M12 / 50 Nm for cable lugs according to DIN 46234 / DIN 46235 [1)]
DCPA, DCNA Connection for Braking Module	Voltage: • 513 ... 648 VDC • 675 ... 932 VDC Connections: Frame sizes FB, GB, GD: Threaded bolts M6 / 6 Nm for cable lugs according to DIN 46234 / DIN 46235 [1)]
DCP, DCN DC power output	Voltage: • 513 ... 648 VDC • 675 ... 932 VDC Connecting thread: • Frame size FB: M10 / 25 Nm for cable lugs according to DIN 46234 / DIN 46235 [1)] • Frame sizes GB, GD: M12 / 50 Nm for cable lugs according to DIN 46234 / DIN 46235 [1)]
PE connection	Connecting thread: • Frame size FB: M10 / 25 Nm for cable lugs according to DIN 46234 / DIN 46235 [1)] • Frame sizes GB, GD: M12 / 50 Nm for cable lugs according to DIN 46234 / DIN 46235 [1)]

[1]) Dimensions for connecting alternative cable lugs, see "cable lugs" in the appendix.

3.2.3.4 X9 terminal strip

Table 3- 3 Terminal strip X9 for Basic Line Modules, frame sizes FB, GB

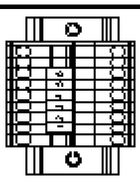
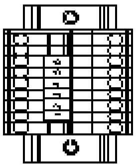
	Terminal	Signal name	Technical specifications
	1	P24V	Voltage: 24 VDC (20.4 ... 28.8 V) Current consumption: Max. 1.1 A
	2	M	
	3	Reserved, do not use	
	4		
	5	Line contactor control	240 VAC: Max. 8 A 30 VDC: Max. 1 A isolated
	6		
Max. connectable cross-section 1.5 mm^2			

Table 3- 4 Terminal strip X9 for Basic Line Modules, frame size GD

	Terminal	Signal name	Technical specifications
	1	P24V	Voltage: 24 VDC (20.4 ... 28.8 V) Current consumption: Max. 1.1 A
	2	M	
	3	Line contactor control	240 VAC: Max. 8 A 30 VDC: Max. 1 A isolated
	4		
	5	Precharge contactor control	240 VAC: Max. 8 A 30 VDC: Max. 1 A isolated
	6		
Max. connectable cross-section 1.5 mm^2			

⚠ CAUTION

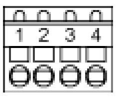
Destruction of the device through incorrect connection of terminal strip X9

If the connections for the "Line contactor control" and the "Precharging contactor control" are swapped, the device can be destroyed.

Note the different connection assignments for terminal strip X9 for the various modules.

3.2.3.5 X41 EP terminal / temperature sensor connection

Table 3- 5 Terminal strip X41

	Terminal	Function	Technical specifications
	1	EP M1 (Enable Pulses)	Supply voltage: 24 VDC (20.4 ... 28.8 V) Current consumption: 10 mA
	2	EP +24 V (Enable Pulses)	
	3	- Temp	Temperature sensor connection KTY84-1C130/PTC
	4	+ Temp	
Max. connectable cross-section 1.5 mm^2			

Note

Connection to terminals 1 and 2

For operation, 24 VDC must be connected to terminal 2 and ground to terminal 1. Pulse suppression is activated when removed.

⚠ DANGER
Electrical shock hazard
Only temperature sensors that meet the safety isolation specifications stipulated in EN 61800-5-1 may be connected to terminals "+Temp" and "-Temp". If safe electrical separation cannot be guaranteed (for linear motors or third-party motors, for example), a Sensor Module External (SME120 or SME125) must be used.
If these instructions are not complied with, there is a risk of electric shock!

Note

Connectable sensor

The following probes can be connected to the temperature sensor connection:
KTY84-1C130 / PTC.

NOTICE
Use shielded cables
The temperature sensor connection must be shielded. The shielding must be attached to the shield support of the module.

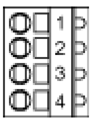
Note

KTY temperature sensor connected with the correct polarity

The KTY temperature sensor must be connected with the correct polarity.
If the polarity is reversed, the sensor will not be able to detect if the motor overheats.

3.2.3.6 X42 terminal strip

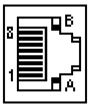
Table 3- 6 Terminal strip X42 voltage supply for Control Unit, Sensor Module and Terminal Module

	Terminal	Function	Technical specifications
	1	P24L	Voltage supply for Control Unit, Sensor Module and Terminal Module (18 to 28.8 V) maximum load current: 3 A
	2		
	3	M	
	4		
Max. connectable cross-section 2.5 mm^2			

⚠ CAUTION
Terminal strip is not intended for free 24 VDC availability
The terminal strip is not intended for free 24V DC availability (for example for supplying further line-side components), as the voltage supply of the Control Interface Module could also be overloaded and operating capability could thus be compromised.

3.2.3.7 DRIVE-CLiQ interfaces X400, X401, X402

Table 3- 7 DRIVE-CLiQ interfaces X400, X401, X402

	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)	24 V power supply
	B	M (0 V)	Electronics ground
Blanking plate for DRIVE-CLiQ interfaces (50 pcs.) order number: 6SL3066-4CA00-0AA0			

3.2.3.8 Meaning of the LEDs on the Control Interface Module in the Basic Line Module

Table 3- 8 Meaning of the LEDs "READY" and "DC LINK" on the Control Interface Module in the Basic Line Module

LED state		Description
READY	DC LINK	
Off	Off	The electronics power supply is missing or out of tolerance.
Green	Off	The component is ready for operation and cyclic DRIVE-CLiQ communication is taking place.
	Orange	The component is ready for operation and cyclic DRIVE-CLiQ communication is taking place. The DC-link voltage is present.
	Red	The component is ready for operation and cyclic DRIVE-CLiQ communication is taking place. The DC-link voltage is too high.
Orange	Orange	DRIVE-CLiQ communication is being established.
Red	---	At least one fault is present in this component. Note: LED is driven irrespective of the corresponding messages being reconfigured.
Flashing light 0.5 Hz: Green / red	---	Firmware is being downloaded.
2 Hz flashing: Green / red	---	Firmware download is complete. Waiting for POWER ON.
2 Hz flashing: Green / orange or red / orange	---	Component detection using LED is activated (p0124) Note: The two options depend on the LED status when module recognition is activated via p0124 = 1.

Table 3- 9 Meaning of the LED "POWER OK" on the Control Interface Module in the Basic Line Module

LED	Color	Status	Description
POWER OK	Green	Off	DC-link voltage < 100 V and voltage at -X9:1/2 less than 12 V.
		On	The component is ready for operation.
		Flashing light	There is a fault. If the LED continues to flash after you have performed a POWER ON, please contact your Siemens service center.

⚠ WARNING

Hazardous DC-link voltage

Irrespective of the state of the LED "DC LINK", hazardous DC-link voltages can always be present.

The warning information on the component must be carefully observed!

3.2.4 Dimension drawing

Dimension drawing, frame size FB

The mandatory ventilation clearances are indicated by the dotted line.

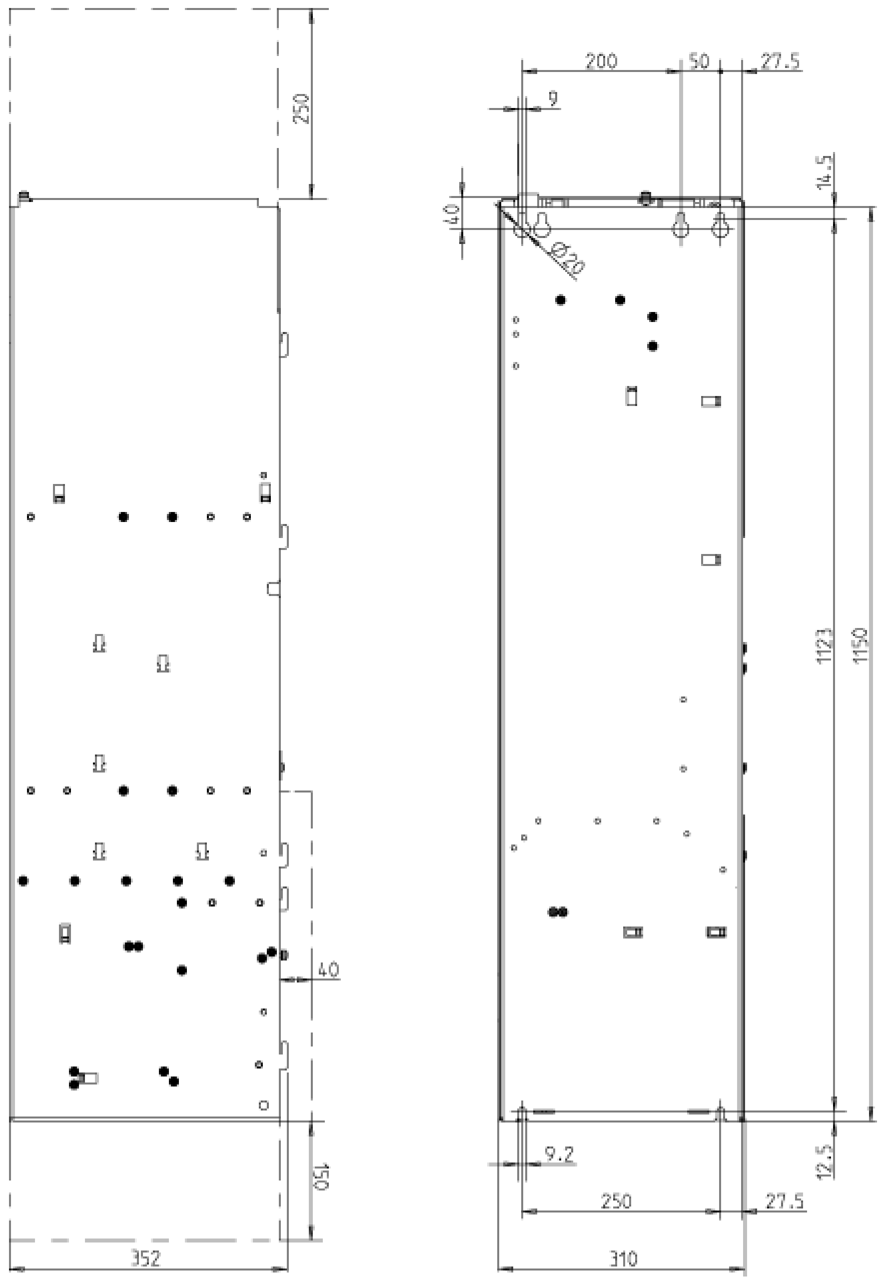


Figure 3-5 Dimension drawing, Basic Line Module, frame sizes FB, side view, front view

Dimension drawing, frame sizes GB, GD

The mandatory ventilation clearances are indicated by the dotted line.

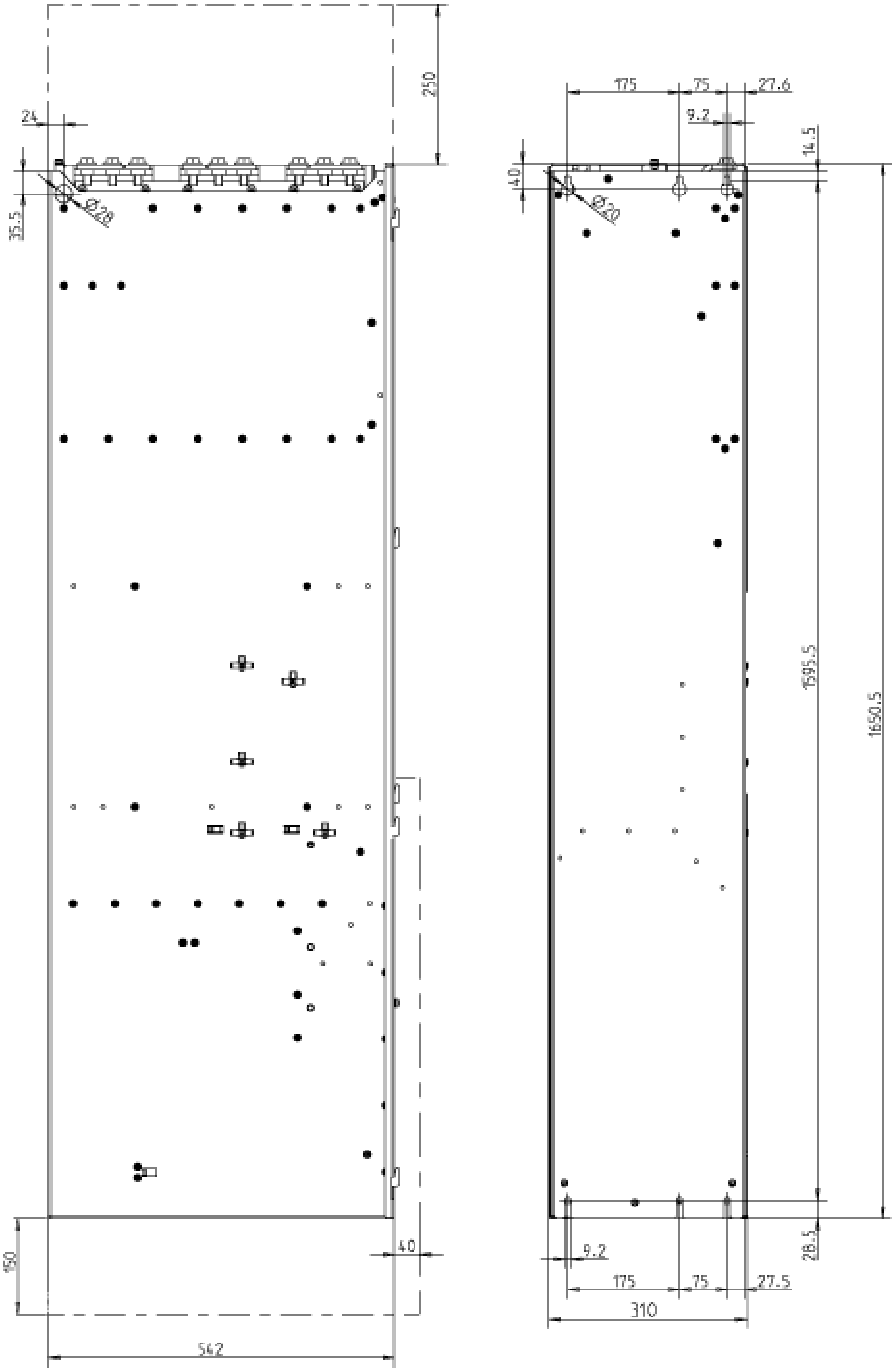


Figure 3-6 Dimension drawing, Basic Line Module, frame sizes GB, GD. Side view, rear view

3.2.5 Electrical connection

Operating a Basic Line Module on a non-grounded line supply (IT system)

When the Basic Line Module is operated on an ungrounded line supply (IT system), the integrated basic interference suppression modules must be deactivated by screwing out a connection clip.

Note

Warning label on the connection clip

A yellow warning label is attached to each connection clip so that it is easier to find.

- The warning label must be removed from the connection clip (by pulling it off) if the connection clip is to remain in the unit (operation on a grounded line supply).
- The warning label must be removed together with the connection clip if the unit is operated on a non-grounded line supply (IT system).

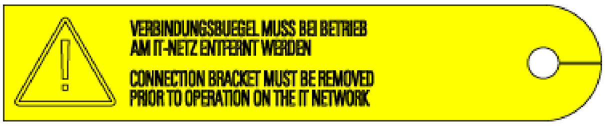


Figure 3-7 Warning label on the connection clip

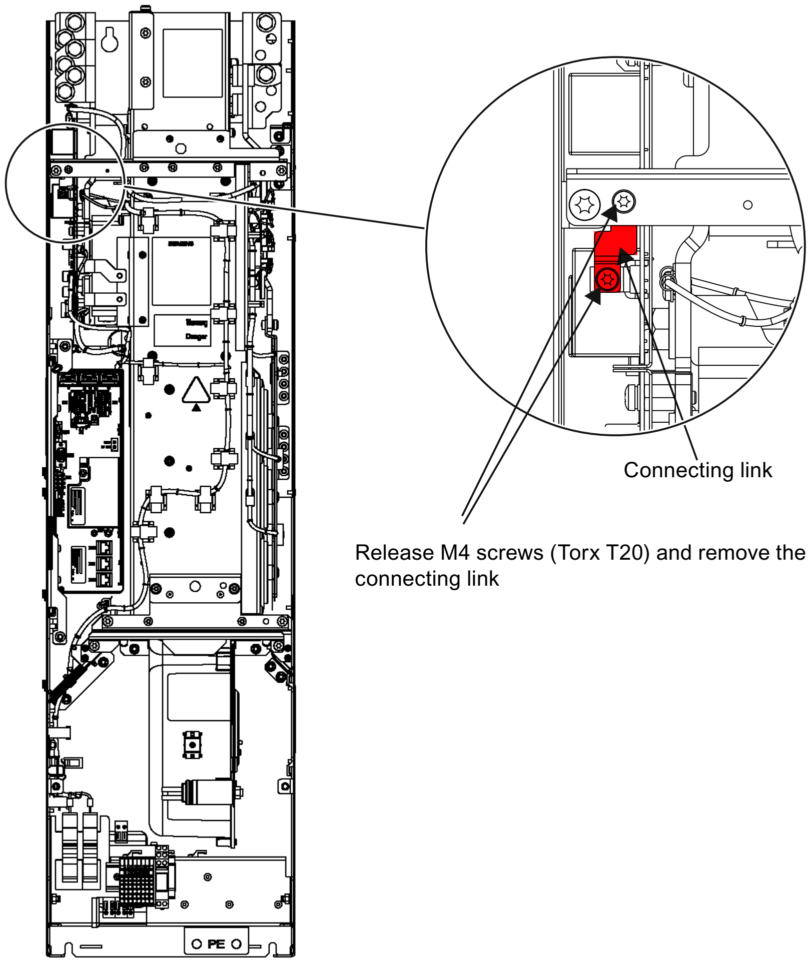


Figure 3-8 Removing the connection clip to the basic interference suppression module in the Basic Line Module, frame size FB

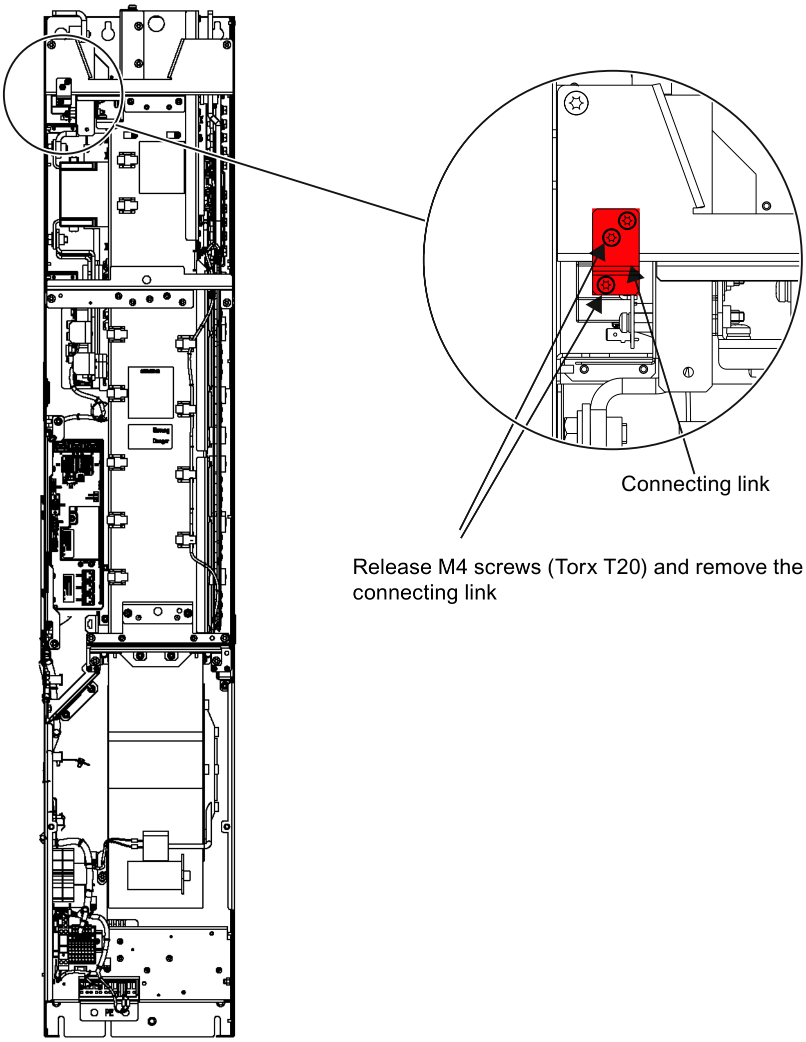


Figure 3-9 Removing the connection clip to the basic interference suppression module in the Basic Line Module, frame sizes GB, GD

⚠ WARNING
Removing the connection clip on an ungrounded power network Failure to remove the connection clip to the basic interference suppression module on an ungrounded line supply (IT system) can cause significant damage to the device.

Adjusting the fan voltage (-T10)

The power supply for the device fans (1 AC 230 V) in the Basic Line Module (-T10) is taken from the line supply using transformers. The installation position of the transformers is indicated in the interface descriptions.

The transformers are fitted with primary taps so that they can be fine-tuned to the line supply voltage.

If necessary, the connection fitted in the factory, shown with a dashed line, must be reconnected to the actual line voltage.

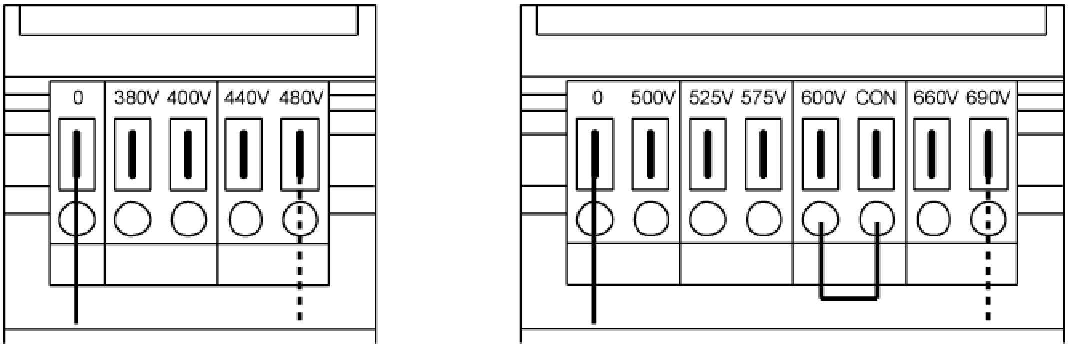


Figure 3-10 Setting terminals for the fan transformers (3 AC 380 to 480 V / 3 AC 500 to 690 V

The supply voltage assignments for making the appropriate setting on the fan transformer are indicated in the following tables (factory presetting: 480 V / 0 V or 690 V / 0 V).

Note

With the 3 AC 500 V to 690 V fan transformer, a jumper is inserted between the "600 V" terminal and "CON" terminal. The "600 V" and "CON" terminals are reserved for internal use.

NOTICE

Consequences of incorrect voltage setting

If the terminals are not reconnected to the actual line voltage:

- The required cooling level will not be provided (risk of overheating).
- The fan fuses may blow (overload).

Table 3- 10 Line voltage assignment for the setting at the fan transformer (3 AC 380 ... 480 V)

Line voltage	Tap at the fan transformer (-T10)
380 V ± 10%	380 V
400 V ± 10%	400 V
440 V ± 10%	440 V
480 V ± 10%	480 V

Table 3- 11 Line voltage assignment for the setting at the fan transformer (3 AC 500 ... 690 V)

Line voltage	Tap at the fan transformer (-T10)
500 V ± 10%	500 V
525 V ± 10%	525 V
575 V ± 10%	575 V
600 V ± 10%	600 V
660 V ± 10%	660 V
690 V ± 10%	690 V

3.2.6 Precharging circuit for the Basic Line Modules, frame size GD

Description

When switching on, the precharging circuit ensures that the DC-link capacitors of the Basic Line Module and the connected Motor Modules are precharged with current limiting.

After precharging has been completed, the circuit breaker is closed and the precharging circuit bypassed; the Basic Line Module is then directly connected to the line supply.

The precharging circuit comprises a precharging contactor and precharging resistors; the circuit must be protected against overcurrent using suitable protection measures.

To increase the permissible DC-link capacitance, the precharging resistors can also be connected in parallel in each phase.

WARNING

Damage to the units if the precharging circuit is faulty

When it is switched on, the Basic Line Module can be destroyed if the precharging circuit is not correctly implemented.

For Basic Line Modules, frame size GD, the precharging circuit must be implemented according to the following circuit and the notes for dimensioning the various components.

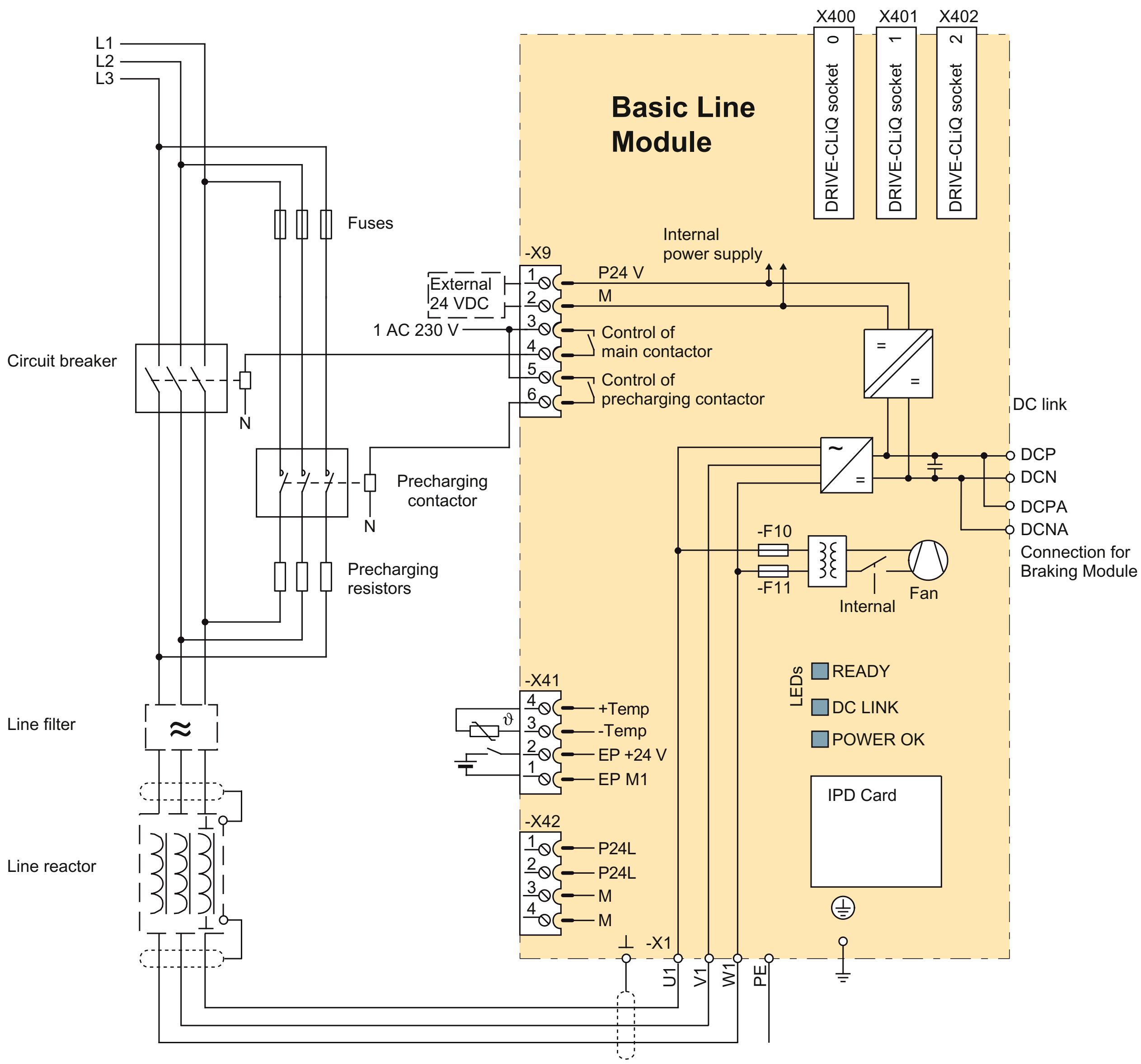


Figure 3-11 Connection example, Basic Line Module, frame size GD

Precharging contactor

The precharging contactor must be able to conduct the maximum precharging current for approx. 1 second (see the technical data).

To protect against overvoltage when opening, the contactor should be equipped with a varistor, corresponding to the manufacturer's recommendations.

The precharging contactor is controlled via terminal -X9: 5, 6 of the Basic Line Module.

In a version with one precharging resistor for each phase, a contactor of the Sirius 3RT1034 series is recommended.

In a version with two precharging resistors connected in parallel for each phase, a contactor of the Sirius 3RT1044 series is recommended.

Precharging resistors

The precharging resistors are used to limit the current while precharging.

Table 3- 12 Technical data for the precharging resistors

Category	Unit	3 AC 380 ... 480 V	3 AC 500 ... 690 V
Rated voltage	V	690 VAC	690 VAC
Frequency	Hz	47 ... 63	47 ... 63
Resistance value	Ω	2.2 ±10%	4.0 ±10%
Pulse loading capability 1)	Ws	18000	18000
Precharging current 2) - one resistor per phase - two resistors per phase	 A A	 91 182	 86 172
Ambient temperature	° C	60	60
Order number		6SL3000-0KE12-2AA0	6SL3000-0KH14-0AA0

1) The pulse load is present for a minimum of 1 second, followed by a pause of 175 seconds.

2) Line current present at the start of the precharging (initial rms value)

As the precharging resistors can get hot, sufficient cooling and clearance to adjacent components must be ensured in operation.

Fuses

The precharging circuit components are protected against overload using fuses.

In a version with one precharging resistor for each phase, fuses of the 3NE1 817-0 (50 A) type are recommended.

In a version with two precharging resistors connected in parallel for each phase, fuses of the 3NE1 021-0 (100 A) type are recommended.

Circuit breaker

The circuit breaker is used to connect to the line supply.

A 3WL1220 circuit breaker is recommended.

The circuit breaker is controlled via terminal -X9: 3, 4 of the Basic Line Module.

3.2.7 Technical data

Table 3- 13 Technical data for Basic Line Modules, 3 AC 380 V ... 480 V, Part 1

Order number	6SL3330–	1TE34–2AA3	1TE35–3AA3	1TE38–2AA3	1TE41–2AA3
Rated output					
- For I_{n_DC} (50 Hz, 400 V)	kW	200	250	400	560
- For I_{H_DC} (50 Hz, 400 V)	kW	160	200	315	450
- For I_{n_DC} (60 Hz, 460 V)	HP	305	385	615	860
- For I_{H_DC} (60 Hz, 460 V)	HP	245	305	485	690
DC-link current					
- Rated current I_{n_DC}	A	420	530	820	1200
- Base load current I_{H_DC}	A	328	413	640	936
- Maximum current I_{max_DC}	A	630	795	1230	1800
Input current					
- Rated current I_{n_E}	A	365	460	710	1010
- Maximum current I_{max_E}	A	547	690	1065	1515
- Maximum precharging current (max. 3 s)	A	internal	internal	internal	internal
Supply voltages					
- Line voltage	V_{ACrms}	3 AC 380 -10% (-15% < 1 min) ... 3 AC 480 +10%			
- Line frequency	Hz	47 ... 63 Hz			
- Electronic power supply	V_{DC}	24 (20.4 ... 28.8)			
- Fan supply voltage	V_{AC}	230 (195.5 ... 264.5)			
- DC-link voltage	V_{DC}	1.35 x U_{line} (partial load) / 1.32 x U_{line} (full load)			
Current consumption					
- Electronics current consumption (24 VDC)	A	1.1	1.1	1.1	1.1
- Fan power consumption (230 VAC)	A	1.1	1.1	1.1	4.5
Max. ambient temperature					
- Without derating	° C	40	40	40	40
- With derating	° C	55	55	55	55
DC-link capacitance					
- Basic Line Module	µF	7200	9600	14600	23200
- Drive line-up, max.	µF	57600	76800	116800	185600
Power loss, max. 1)					
- At 50 Hz 400 V	kW	1.9	2.1	3.2	4.6
- At 60 Hz 460 V	kW	1.9	2.1	3.2	4.6
Cooling air requirement	m^3/s	0.17	0.17	0.17	0.36
Sound pressure level					
L_{pA} (1 m) at 50/60 Hz	dB(A)	66 / 68	66 / 68	66 / 68	71 / 73
Line/load connection		Flat connector for screw			
		M10	M10	M10	M12
Max. connection cross-sections					
- Line connection (U1, V1, W1)	mm²	2 x 240	2 x 240	2 x 240	6 x 185
- DC-link connection (DCP, DCN)	mm²	2 x 240	2 x 240	2 x 240	6 x 185
- PE connection	mm²	2 x 240	2 x 240	2 x 240	4 x 240
Max. cable length (total of all motor cables and DC link)					
- Shielded	m	2600	2600	2600	4000
- Unshielded	m	3900	3900	3900	6000

Order number	6SL3330–	1TE34–2AA3	1TE35–3AA3	1TE38–2AA3	1TE41–2AA3
Degree of protection		IP00	IP00	IP00	IP00
Dimensions - Width - Height - Depth	 mm mm mm	 310 1164 352	 310 1164 352	 310 1164 352	 310 1653 550
Frame size		FB	FB	FB	GB
Weight	kg	96	96	96	214
Recommended fuse [2)] - Number (connected in parallel) - Rated current - Frame size acc. to IEC 60269		3NE1333-2 1 450 2	3NE1334-2 1 500 3	3NE1438-2 1 800 3	3NE1435-2 2 560 3
Minimum short-circuit current [3)]	A	4400	5200	10000	12400

1) The specified power loss is the maximum value at 100% capacity utilization. The value in normal operation is lower.

2) To achieve a UL-approved system, it is absolutely essential to use the fuse types specified in the table.

3) Current required for reliable triggering of the protective devices.

Table 3- 14 Technical data for Basic Line Modules, 3 AC 380 V ... 480 V, Part 2

Order number	6SL3330–	1TE41–5AA3	1TE41–8AA3		
Rated output					
- For I_{n_DC} (50 Hz, 400 V)	kW	710	900		
- For I_{H_DC} (50 Hz, 400 V)	kW	560	705		
- For I_{n_DC} (60 Hz, 460 V)	HP	1090	1390		
- For I_{H_DC} (60 Hz, 460 V)	HP	860	1090		
DC-link current					
- Rated current I_{n_DC}	A	1500	1880		
- Base load current I_{H_DC}	A	1170	1467		
- Maximum current I_{max_DC}	A	2250	2820		
Input current					
- Rated current I_{n_E}	A	1265	1630		
- Maximum current I_{max_E}	A	1897	2380		
- Maximum precharging current (max. 3 s)	A	internal	308		
Supply voltages					
- Line voltage	V_{ACrms}	3 AC 380 -10% (-15% < 1 min) ... 3 AC 480 +10%			
- Line frequency	Hz	47 ... 63 Hz			
- Electronic power supply	V_{DC}	24 (20.4 ... 28.8)			
- Fan supply voltage	V_{AC}	230 (195.5 ... 264.5)			
- DC-link voltage	V_{DC}	1.35 x U_{line} (partial load) / 1.32 x U_{line} (full load)			
Current consumption					
- Electronics current consumption (24 VDC)	A	1.1	1.1		
- Fan power consumption (230 VAC)	A	4.5	4.5		
Max. ambient temperature					
- Without derating	° C	40	40		
- With derating	° C	55	55		
DC-link capacitance					
- Basic Line Module	µF	29000	34800		
- Drive line-up, max.	µF	232000	139200/278400 4)		
Power loss, max. 1)					
- At 50 Hz 400 V	kW	5.5	6.9		
- At 60 Hz 460 V	kW	5.5	6.9		
Cooling air requirement	m^3/s	0.36	0.36		
Sound pressure level					
L_{pA} (1 m) at 50/60 Hz	dB(A)	71 / 73	71 / 73		
Line/load connection		Flat connector for screw			
		M12	M12		
Max. connection cross-sections					
- Line connection (U1, V1, W1)	mm²	6 x 185	6 x 185		
- DC-link connection (DCP, DCN)	mm²	6 x 185	6 x 185		
- PE connection	mm²	4 x 240	4 x 240		
Max. cable length (total of all motor cables and DC link)					
- Shielded					
- Unshielded	m	4000	4800		
	m	6000	7200		
Degree of protection		IP00	IP00		

Order number	6SL3330–	1TE41–5AA3	1TE41–8AA3		
Dimensions - Width - Height - Depth	 mm mm mm	 310 1653 550	 310 1653 550		
Frame size		GB	GD		
Weight	kg	214	214		
Recommended fuse [2)] - Number (connected in parallel) - Rated current - Frame size acc. to IEC 60269		3NE1437-2 2 710 3	3NE1435-2 3 560 3		
Minimum short-circuit current [3)]	A	18400	18600		

1) The specified power loss is the maximum value at 100% capacity utilization. The value in normal operation is lower.

2) To achieve a UL-approved system, it is absolutely essential to use the fuse types specified in the table.

3) Current required for reliable triggering of the protective devices.

4) The first value applies for one precharging resistor for each phase, the second value for two precharging resistors connected in parallel for each phase

Table 3- 15 Technical data for Basic Line Modules, 500 V ... 690 V 3 AC, Part 1

Order number	6SL3330–	1TG33–0AA3	1TG34–3AA3	1TG36–8AA3	1TG41–1AA3
Rated power - For I_{n_DC} (50 Hz, 690 V) - For I_{H_DC} (50 Hz, 690 V) - For I_{n_DC} (50 Hz, 500 V) - For I_{H_DC} (50 Hz, 500 V) - For I_{n_DC} (60 Hz, 575 V) - For I_{H_DC} (60 Hz, 575 V)	 kW kW kW kW HP HP	 250 195 175 165 250 200	 355 280 250 235 350 300	 560 440 390 365 600 450	 900 710 635 595 900 800
DC-link current - Rated current I_{n_DC} - Base load current I_{H_DC} - Maximum current I_{max_DC}	 A A A	 300 234 450	 430 335 645	 680 530 1020	 1100 858 1650
Input current - Rated current I_{n_E} - Maximum current I_{max_E} - Maximum precharging current (max. 3 s)	 A A A	 260 390 internal	 375 563 internal	 575 863 internal	 925 1388 internal
Supply voltages - Line voltage - Line frequency - Electronic power supply - Fan supply voltage - DC-link voltage	 V_{ACrms} Hz V_{DC} V_{AC} V_{DC}	 3 AC 500 -10% (-15% < 1 min) ... 3 AC 690 +10% 47 ... 63 Hz 24 (20.4 ... 28.8) 230 (195.5 ... 264.5) 1.35 x U_{line} (partial load) / 1.32 x U_{line} (full load)			
Current consumption - Electronics current consumption (24 VDC) - Fan power consumption (230 VAC)	 A A	 1.1 1.1	 1.1 1.1	 1.1 1.1	 1.1 4.5
Max. ambient temperature - Without derating - With derating	 ° C ° C	 40 55	 40 55	 40 55	 40 55
DC-link capacitance - Basic Line Module - Drive line-up, max.	 µF µF	 3200 25600	 4800 38400	 7300 58400	 11600 92800
Power loss, max. 1) - At 50 Hz 690 V - At 60 Hz 575 V	 kW kW	 1.5 1.5	 2.1 2.1	 3.0 3.0	 5.4 5.4
Cooling air requirement	m^3/s	0.17	0.17	0.17	0.36
Sound pressure level L_{pA} (1 m) at 50/60 Hz	 dB(A)	 66 / 68	 66 / 68	 66 / 68	 71 / 73
Line/load connection		Flat connector for screw			
		M10	M10	M10	M12
Max. connection cross-sections - Line connection (U1, V1, W1) - DC-link connection (DCP, DCN) - PE connection	 mm² mm² mm²	 2 x 240 2 x 240 2 x 240	 2 x 240 2 x 240 2 x 240	 2 x 240 2 x 240 2 x 240	 6 x 185 6 x 185 4 x 240
Max. cable length (total of all motor cables and DC link) - Shielded - Unshielded	 m m	 1500 2250	 1500 2250	 1500 2250	 2250 3375
Degree of protection		IP00	IP00	IP00	IP00

Order number	6SL3330–	1TG33–0AA3	1TG34–3AA3	1TG36–8AA3	1TG41–1AA3
Dimensions - Width - Height - Depth	 mm mm mm	 310 1164 352	 310 1164 352	 310 1164 352	 310 1653 550
Frame size		FB	FB	FB	GB
Weight	kg	96	96	96	214
Recommended fuse [2)] - Number (connected in parallel) - Rated current - Frame size acc. to IEC 60269		3NE1230-2 1 315 2	3NE1333-2 1 450 2	3NE1436-2 1 630 3	3NE1334-2 2 500 3
Minimum short-circuit current [3)]	A	3000	4400	8000	10400

1) The specified power loss is the maximum value at 100% capacity utilization. The value in normal operation is lower.

2) To achieve a UL-approved system, it is absolutely essential to use the fuse types specified in the table.

3) Current required for reliable triggering of the protective devices.

Table 3- 16 Technical data for Basic Line Modules, 500 V ... 690 V 3 AC, Part 2

Order number	6SL3330–	1TG41–4AA3	1TG41–8AA3		
Rated power					
- For I_{n_DC} (50 Hz, 690 V)	kW	1100	1500		
- For I_{H_DC} (50 Hz, 690 V)	kW	910	1220		
- For I_{n_DC} (50 Hz, 500 V)	kW	810	1085		
- For I_{H_DC} (50 Hz, 500 V)	kW	755	1015		
- For I_{n_DC} (60 Hz, 575 V)	HP	1250	1500		
- For I_{H_DC} (60 Hz, 575 V)	HP	1000	1250		
DC-link current					
- Rated current I_{n_DC}	A	1400	1880		
- Base load current I_{H_DC}	A	1092	1467		
- Maximum current I_{max_DC}	A	2100	2820		
Input current					
- Rated current I_{n_E}	A	1180	1580		
- Maximum current I_{max_E}	A	1770	2370		
- Maximum precharging current (max. 3 s)	A	internal	234		
Supply voltages					
- Line voltage	V_{ACrms}	3 AC 500 -10% (-15% < 1 min) ... 3 AC 690 +10%			
- Line frequency	Hz	47 ... 63 Hz			
- Electronic power supply	V_{DC}	24 (20.4 ... 28.8)			
- Fan supply voltage	V_{AC}	230 (195.5 ... 264.5)			
- DC-link voltage	V_{DC}	1.35 x U_{line} (partial load) / 1.32 x U_{line} (full load)			
Current consumption					
- Electronics current consumption (24 VDC)	A	1.1	1.1		
- Fan power consumption (230 VAC)	A	4.5	4.5		
Max. ambient temperature					
- Without derating	° C	40	40		
- With derating	° C	55	55		
DC-link capacitance					
- Basic Line Module	µF	15470	19500		
- Drive line-up, max.	µF	123760	78000/156000 4)		
Power loss, max. 1)					
- At 50 Hz 690 V	kW	5.8	7.3		
- At 60 Hz 575 V	kW	5.8	7.3		
Cooling air requirement	m^3/s	0.36	0.36		
Sound pressure level					
L_{pA} (1 m) at 50/60 Hz	dB(A)	71 / 73	71 / 73		
Line/load connection		Flat connector for screw			
		M12			
Max. connection cross-sections					
- Line connection (U1, V1, W1)	mm²	6 x 185	6 x 185		
- DC-link connection (DCP, DCN)	mm²	6 x 185	6 x 185		
- PE connection	mm²	4 x 240	4 x 240		
Max. cable length (total of all motor cables and DC link)					
- Shielded	m	2250	2750		
- Unshielded	m	3375	4125		

Order number	6SL3330–	1TG41–4AA3	1TG41–8AA3		
Degree of protection		IP00	IP00		
Dimensions - Width - Height - Depth	 mm mm mm	 310 1653 550	 310 1653 550		
Frame size		GB	GD		
Weight	kg	214	214		
Recommended fuse [2)] - Number (connected in parallel) - Rated current - Frame size acc. to IEC 60269		3NE1436-2 2 630 3	3NE1435-2 3 560 3		
Minimum short-circuit current [3)]	A	16000	18600		

1) The specified power loss is the maximum value at 100% capacity utilization. The value in normal operation is lower.

2) To achieve a UL-approved system, it is absolutely essential to use the fuse types specified in the table.

3) Current required for reliable triggering of the protective devices.

4) The first value applies for one precharging resistor for each phase, the second value for two precharging resistors connected in parallel for each phase

Overload capability

The Basic Line Modules have an overload reserve.

The criterion for overload is that the Basic Line Module is operated with its base load current before and after the overload occurs (a load duration of 300 s is used as a basis here).

High overload

The base load current for a high overload I_{H_DC} is based on a duty cycle of 150% for 60 s; the max. current I_{max_DC} can flow for 5 s.

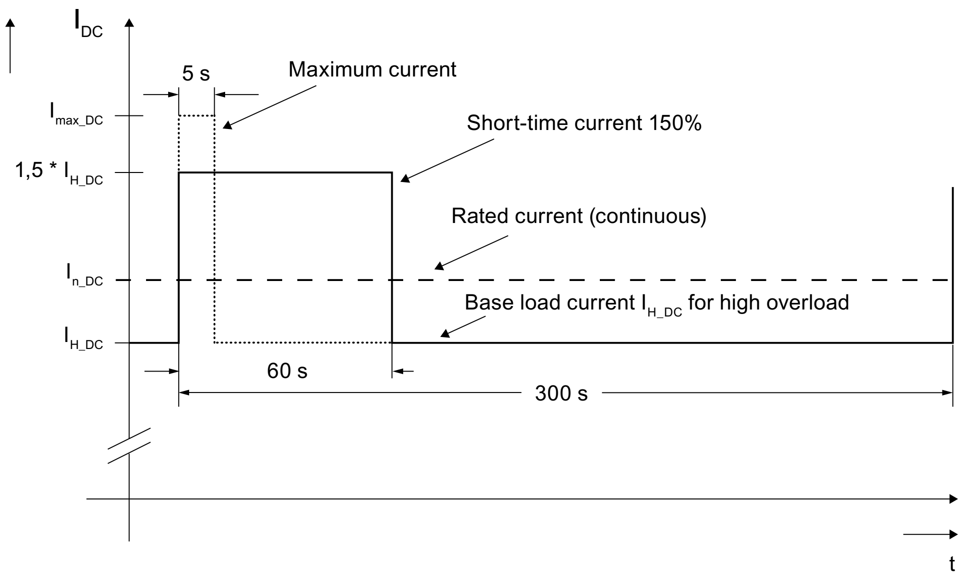


Figure 3-12 High overload

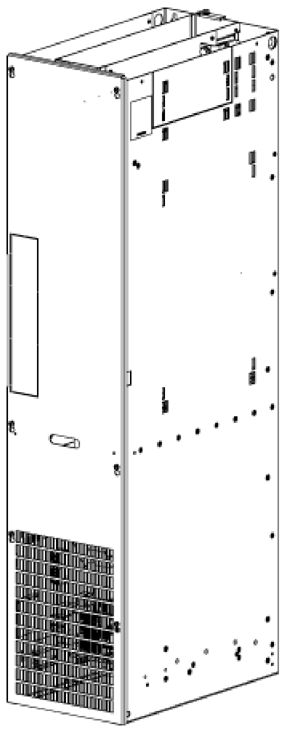
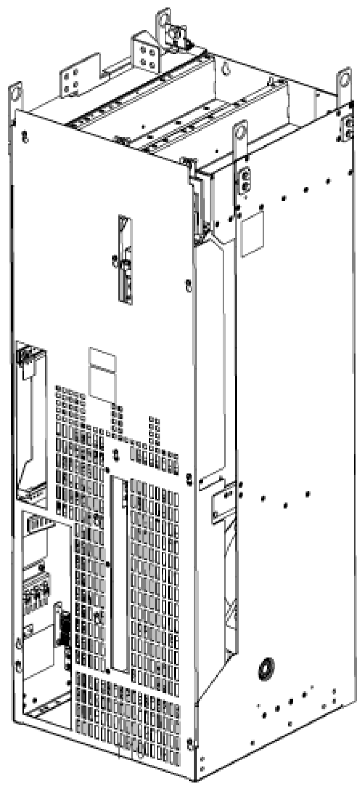
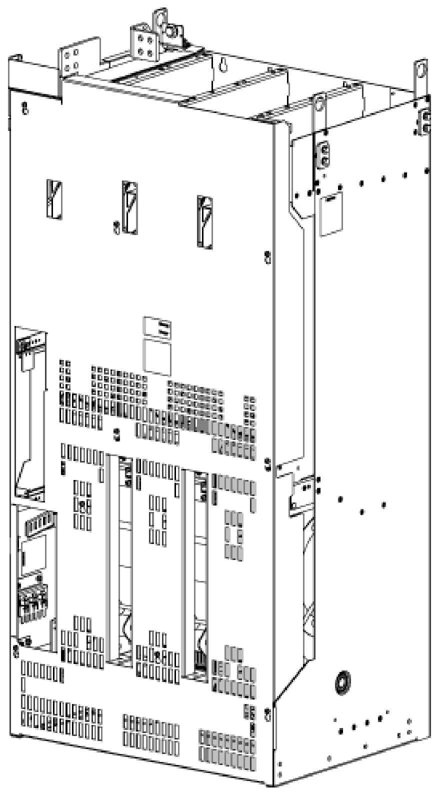
3.3 Smart Line Modules

3.3.1 Description

Smart Line Modules are infeed/regenerative feedback units. Like the Basic Line Module, they supply energy to the connected Motor Modules, but unlike the Basic Line Module, they can feed back regenerative energy.
The infeed occurs over a diode jumper, while stable, line-commutated regenerative feedback takes place via IGBTs with 100% continuous energy regeneration.

The DC-link voltage is greater than the rms value of the line rated voltage by a factor of 1.32 (under partial load) or 1.30 (under full load).

Table 3- 17 Overview of Smart Line Modules

		
Frame size GX	Frame size HX	Frame size JX

Components of the Smart Infeed

A Smart Infeed comprises a Smart Line Module and an external line connection, which comprises bypass contactor, precharging input circuit, fuse, and line reactor.

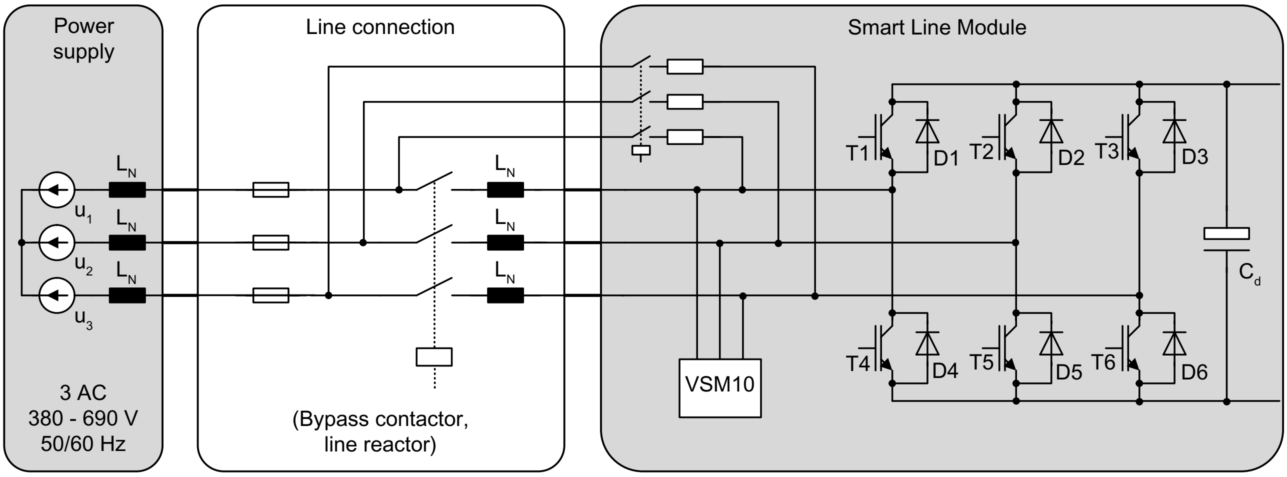


Figure 3-13 Overview of Smart Infeed

Operating principle

One or more Motor Modules can be connected to the power supply network via the Smart Line Module. The Smart Line Module provides the DC-link voltage for the Motor Modules. The regenerative feedback capability of the Smart Line Module can be deactivated by parameterization.

The Smart Line Module is suitable for direct operation both on TN and on IT and TT systems.

In generator mode, the Smart Line Module feeds regenerative energy into the supply network. An integrated Voltage Sensing Module 10 (VSM10) is used for sensing the line voltage for regenerative feedback

The Smart Line Module is used for:

- Machines with medium dynamic requirements
- Infrequent braking cycles and high braking energy

Parallel connection of Smart Line Modules to increase power rating

Up to four Smart Line Modules with the same power rating can be connected in parallel in order to increase power.

The following rules must be observed when connecting Smart Line Modules in parallel:

- Up to four identical Smart Line Modules can be connected in parallel.
- A common Control Unit is required whenever the modules are connected in parallel.
- With multiple infeeds, power must be supplied to the systems from a common infeed point (i.e. different supply systems are not permitted).
- A line reactor must be series-connected to every parallel-connected Smart Line Module.
- A derating factor of 7.5% must be taken into consideration, regardless of the number of modules connected in parallel.

Note

Mixed operation is not possible

It is only possible to connect identical power units in parallel if all power units have the same hardware version. Mixed operation between a power unit with Control Interface Module (order number 6SL33xx-xxxxx–xAA3) and a power unit with Control Interface Board (order number 6SL33xx-xxxxx–xAA0) is not possible.

⚠ CAUTION

Circuit breaker wiring

The signal from the leading contact of the circuit breaker must be interconnected to the OFF2 signal from the Control Unit. In this way, the SINAMICS control is able to delete pulses from the Smart Line Modules in good time, before the circuit breaker is opened.

Otherwise, the SINAMICS control would react with an overvoltage or undervoltage error message when the circuit breaker is triggered.

3.3.2 Safety information

⚠ WARNING
Dangerous electrical voltage
A hazardous voltage will be present in the component for a further 5 minutes after all voltage supplies have been disconnected. Work cannot be carried out until this time has elapsed.
Before starting work, you should also measure the voltage after the 5 minutes have elapsed. The voltage can be measured on DC-link terminals DCP and DCN.

⚠ CAUTION
Danger notice in the local language
The DC-link discharge time hazard warning must be affixed to the component in the relevant local language.

Note

Maintain ventilation clearances

The ventilation clearances above, below, and in front of the component, which are specified in the dimension drawings, must be observed.

NOTICE
Use on a line supply where energy recovery is not possible
In a supply system without regenerative capability (e.g. diesel generator), the regenerative feedback capability of the Smart Line Module must be deactivated in the relevant parameter (see Description of Functions). The braking energy must then be dissipated via an additional Braking Module with a braking resistor in the drive line-up.

⚠ WARNING
Remove linkage levers for frame sizes HX and JX
For Line Modules of frame sizes HX and JX, the linkage levers marked in red must be removed once the devices have been installed.
Non-observance can cause damage to the device through undershooting the necessary voltage clearances.

⚠ DANGER
High leakage current Smart Line Modules discharge a high leakage current to the protective ground conductor. Due to the high leakage current associated with Smart Line Modules, they or the relevant control cabinet must be permanently connected to PE. According to EN 61800-5-1, Section 6.3.6.7, the minimum cross-section of the protective ground conductor must conform to the local safety regulations for protective ground conductors for equipment with a high leakage current.

3.3.3 Interface description

3.3.3.1 Overview

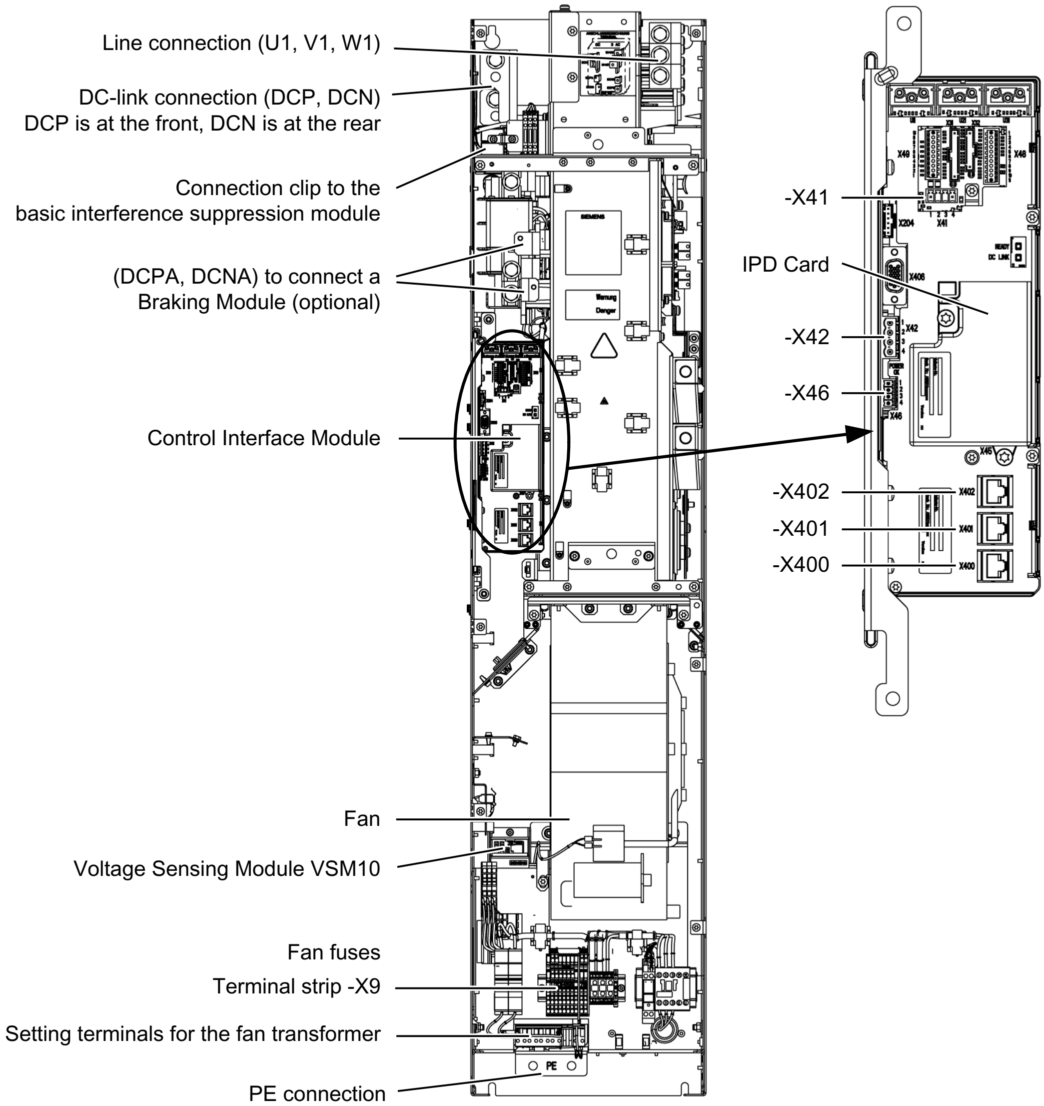


Figure 3-14 Smart Line Module, frame size GX

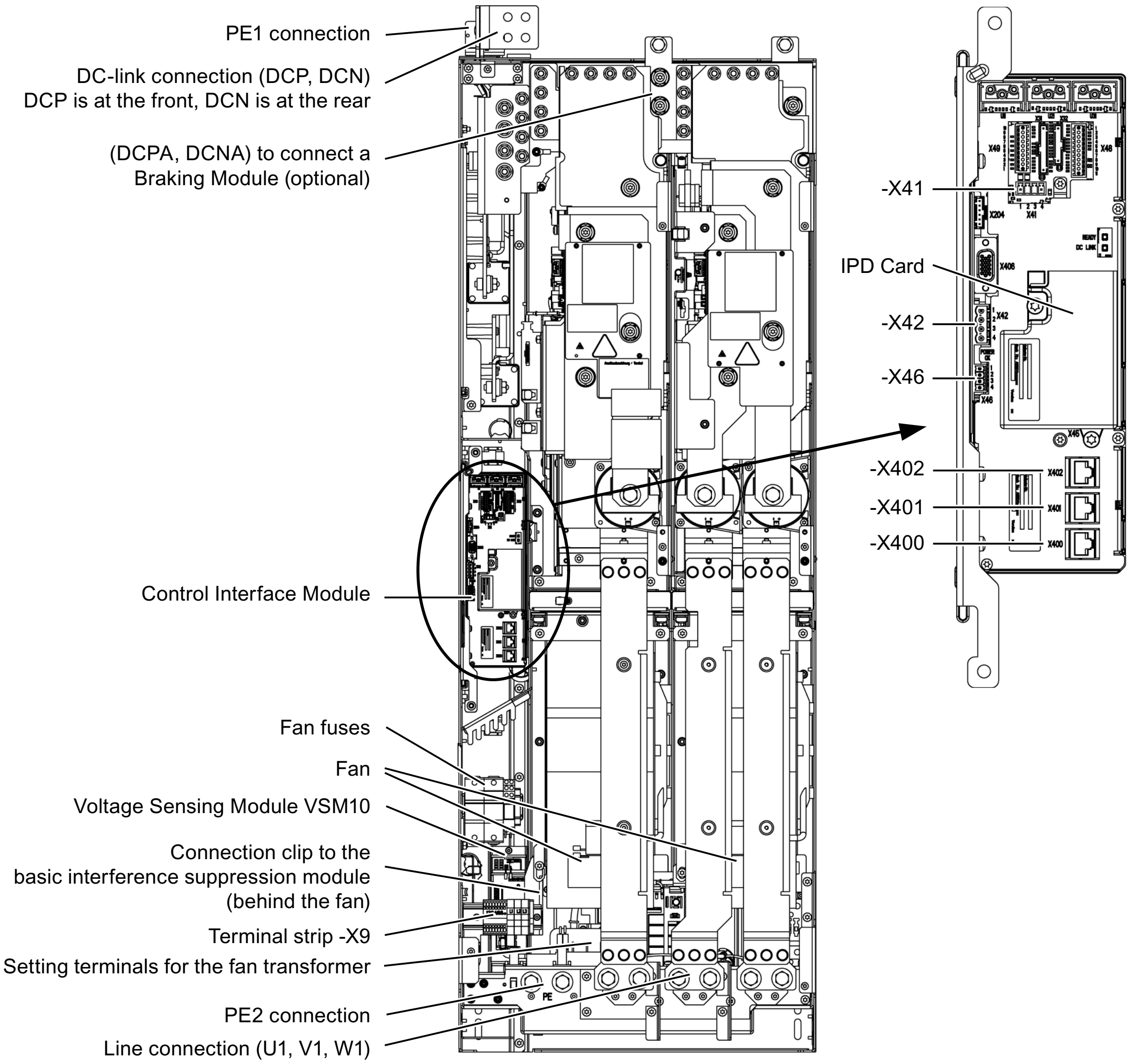


Figure 3-15 Smart Line Module, frame size HX

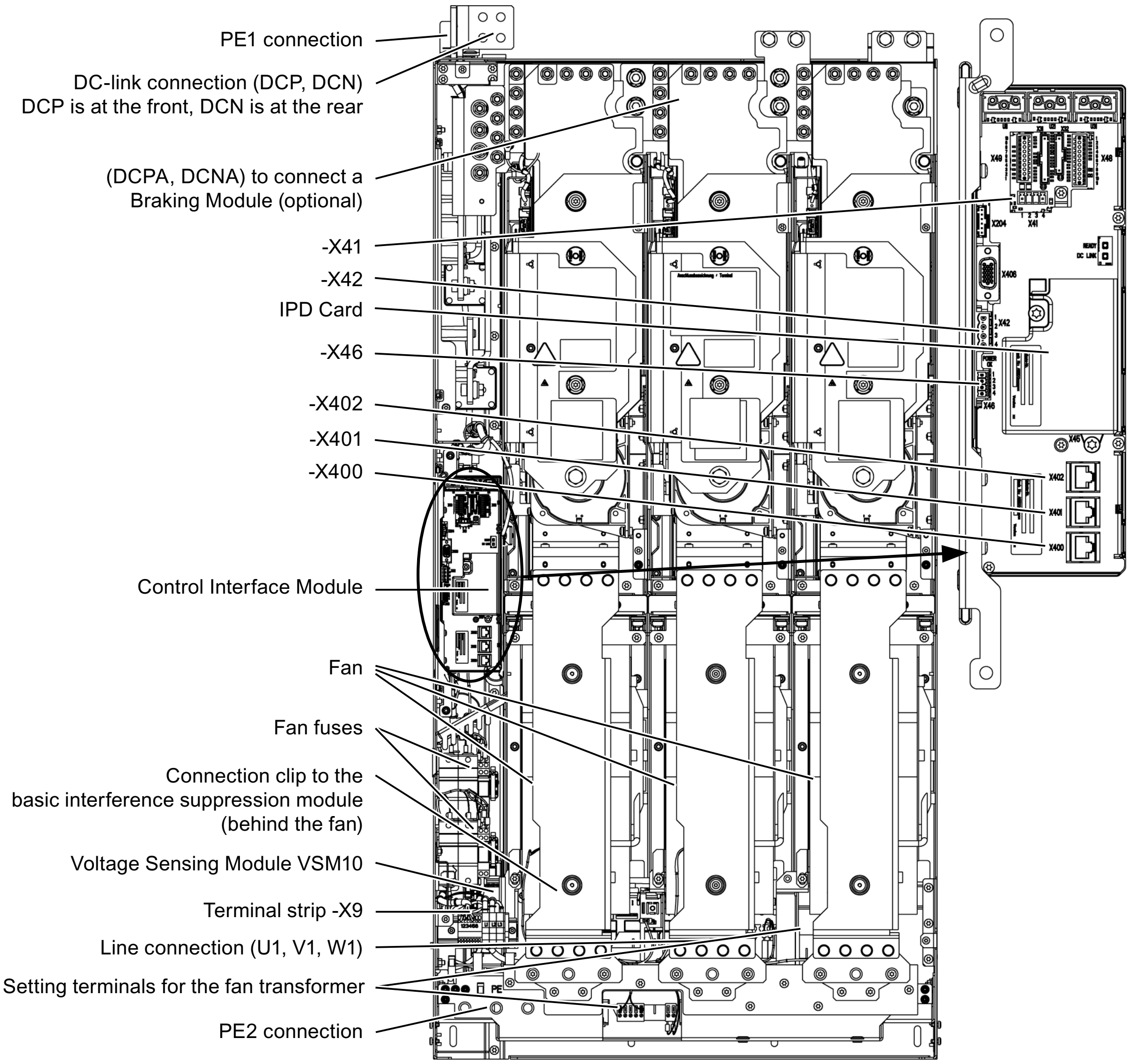
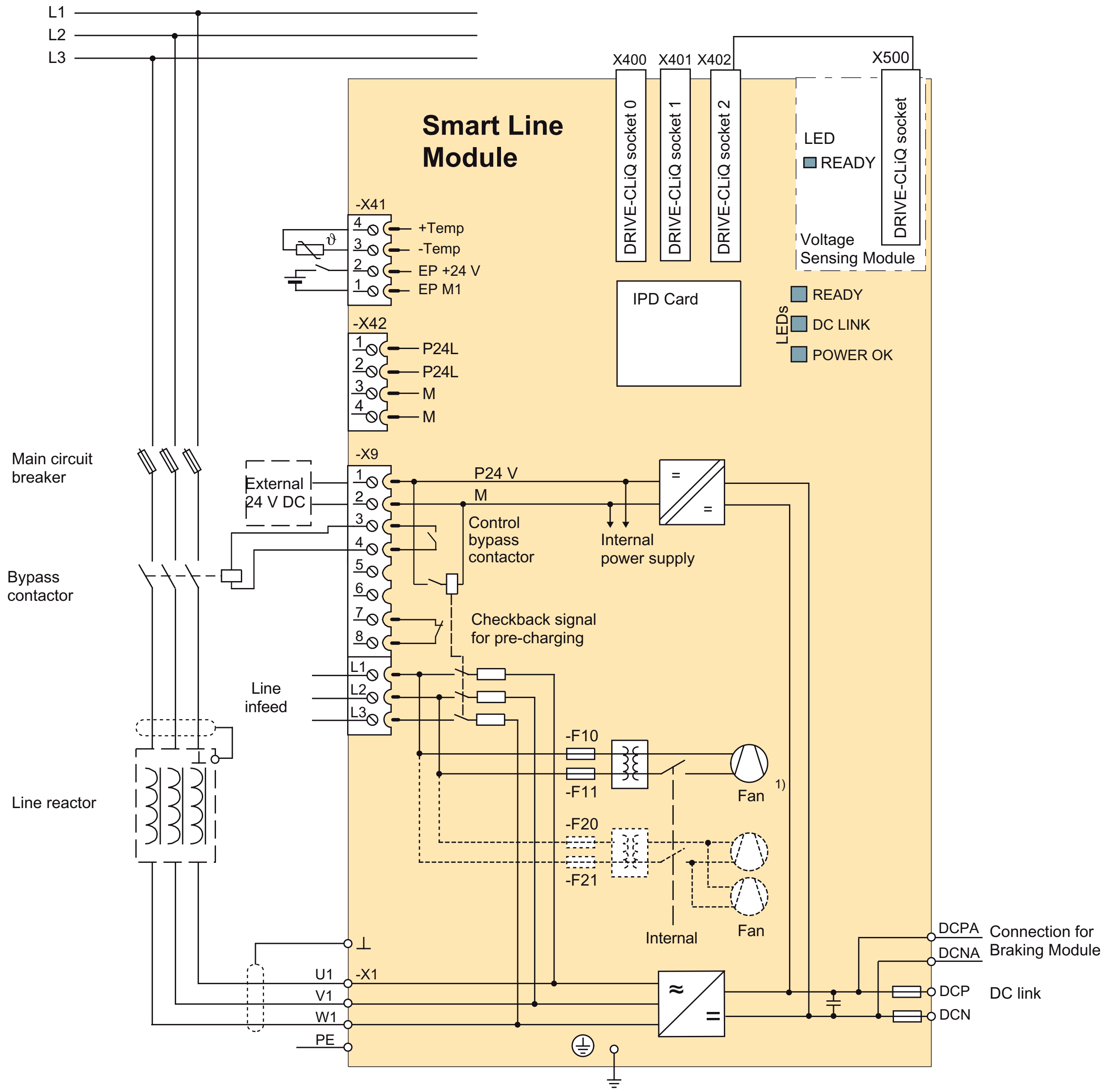


Figure 3-16 Smart Line Module, frame size JX

3.3.3.2 Connection example



1)The number of fans depends on the frame size.

Figure 3-17 Smart Line Module wiring diagram

⚠ CAUTION

Same phase sequence in the precharging and main circuits

It is absolutely imperative that the precharging and main circuits have the same phase sequence. If this is not the case, during the brief overlap period, where both contactors are simultaneously closed, the precharging resistors will be overloaded and could be destroyed.

3.3.3.3 Line/load connection

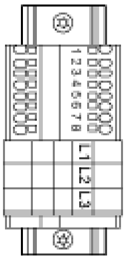
Table 3- 18 Line/load connection of the Smart Line Module

Terminals	Technical specifications
U1, V1, W1 3 AC power input	Voltage: • 3 AC 380 V -10 % (-15 % < 1 min) ... 3 AC 480 V +10 % • 3 AC 500 V -10 % (-15 % < 1 min) ... 3 AC 690 V +10 % Frequency: 47 ... 63 Hz Connecting thread: • Frame size GX: M10 / 25 Nm for cable lugs in accordance with DIN 46234 / DIN 46235 [1)] • Frame sizes HX / JX: M12 / 50 Nm for cable lugs in accordance with DIN 46234 / DIN 46235 [1)]
DCPA, DCNA Connection for Braking Module	Voltage: • 500 ... 630 V DC • 650 ... 900 V DC Connections: • Frame size GX: Threaded bolts M6 / 6 Nm for cable lugs in accordance with DIN 46234 / DIN 46235 [1)] • Frame sizes HX / JX: Connection for connection clip
DCP, DCN DC power output	Voltage: • 500 ... 630 V DC • 650 ... 900 V DC Connections: • Frame size GX: Thread M10 / 25 Nm for cable lugs in accordance with DIN 46234 / DIN 46235 [1)] • Frame sizes HX / JX: d = 12 mm (M12/50 Nm) flat connector for busbar
PE connection PE1, PE2	Connecting thread: • Frame size GX: M10 / 25 Nm for cable lugs in accordance with DIN 46234 / DIN 46235 [1)] • Frame sizes HX / JX: M12 / 50 Nm for cable lugs in accordance with DIN 46234 / DIN 46235 [1)]

[1]) Dimensions for connecting alternative cable lugs, see "cable lugs" in the appendix.

3.3.3.4 X9 terminal strip

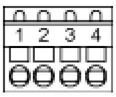
Table 3- 19 Terminal strip X9

	Terminal	Signal name	Technical specifications
	1	P24V	Voltage: 24 V DC (20.4 ... 28.8 V) Current consumption: max. 1.7 A
	2	M	
	3	Bypass contactor control	240 V AC: 8 A max. 24 V DC: max. 1 A isolated
	4		
	5	Not assigned	
	6		
	7	Checkback signal pre-charge contactor	Voltage: 230 V AC Maximum permissible current: 6 A isolated • Contact closed: Contactor is de-energized • Contact open: Contactor is energized
	8		
	L1	Connection of precharging circuit and fan supply	3 AC 380 ... 3 AC 480 V or 3 AC 500 ... 3 AC 690 V Current consumption: See Technical data
	L2		
	L3		

Max. connectable cross-section: Terminals 1 ... 8: 1.5 mm², Terminals L1 ... L3: 16 mm²

3.3.3.5 X41 EP terminal / temperature sensor connection

Table 3- 20 Terminal strip X41

	Terminal	Function	Technical specifications
	1	EP M1 (Enable Pulses)	Supply voltage: 24 VDC (20.4 ... 28.8 V) Current consumption: 10 mA
	2	EP +24 V (Enable Pulses)	
	3	- Temp	Temperature sensor connection KTY84-1C130/PTC
	4	+ Temp	
Max. connectable cross-section 1.5 mm²			

Note

Connection to terminals 1 and 2

For operation, 24 VDC must be connected to terminal 2 and ground to terminal 1. Pulse suppression is activated when removed.

> ⚠ DANGER
>
> **Electrical shock hazard**
>
> Only temperature sensors that meet the safety isolation specifications stipulated in EN 61800-5-1 may be connected to terminals "+Temp" and "-Temp". If safe electrical separation cannot be guaranteed (for linear motors or third-party motors, for example), a Sensor Module External (SME120 or SME125) must be used.
>
> If these instructions are not complied with, there is a risk of electric shock!

Note

Connectable sensor

The following probes can be connected to the temperature sensor connection:
KTY84-1C130 / PTC.

> NOTICE
>
> **Use shielded cables**
>
> The temperature sensor connection must be shielded. The shielding must be attached to the shield support of the module.

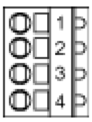
Note

KTY temperature sensor connected with the correct polarity

The KTY temperature sensor must be connected with the correct polarity.
If the polarity is reversed, the sensor will not be able to detect if the motor overheats.

3.3.3.6 X42 terminal strip

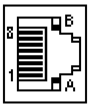
Table 3- 21 Terminal strip X42 voltage supply for Control Unit, Sensor Module and Terminal Module

	Terminal	Function	Technical specifications
	1	P24L	Voltage supply for Control Unit, Sensor Module and Terminal Module (18 to 28.8 V) maximum load current: 3 A
	2		
	3	M	
	4		
Max. connectable cross-section 2.5 mm^2			

> ⚠ CAUTION
>
> **Terminal strip is not intended for free 24 VDC availability**
>
> The terminal strip is not intended for free 24V DC availability (for example for supplying further line-side components), as the voltage supply of the Control Interface Module could also be overloaded and operating capability could thus be compromised.

3.3.3.7 DRIVE-CLiQ interfaces X400, X401, X402

Table 3- 22 DRIVE-CLiQ interfaces X400, X401, X402

	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)	24 V power supply
	B	M (0 V)	Electronics ground
Blanking plate for DRIVE-CLiQ interfaces (50 pcs.) order number: 6SL3066-4CA00-0AA0			

3.3.3.8 Meaning of the LEDs on the Control Interface Module in the Smart Line Module

Table 3- 23 Meaning of the LEDs "READY" and "DC LINK" on the Control Interface Module in the Smart Line Module

LED state		Description
READY	DC LINK	
Off	Off	The electronics power supply is missing or out of tolerance.
Green	Off	The component is ready for operation and cyclic DRIVE-CLiQ communication is taking place.
	Orange	The component is ready for operation and cyclic DRIVE-CLiQ communication is taking place. The DC-link voltage is present.
	Red	The component is ready for operation and cyclic DRIVE-CLiQ communication is taking place. The DC-link voltage is too high.
Orange	Orange	DRIVE-CLiQ communication is being established.
Red	---	At least one fault is present in this component. Note: LED is driven irrespective of the corresponding messages being reconfigured.
Flashing light 0.5 Hz: Green / red	---	Firmware is being downloaded.
2 Hz flashing: Green / red	---	Firmware download is complete. Waiting for POWER ON.
2 Hz flashing: Green / orange or red / orange	---	Component detection using LED is activated (p0124) Note: The two options depend on the LED status when module recognition is activated via p0124 = 1.

Table 3- 24 Meaning of the LED "POWER OK" on the Control Interface Module in the Smart Line Module

LED	Color	Status	Description
POWER OK	Green	Off	DC-link voltage < 100 V and voltage at -X9:1/2 less than 12 V.
		On	The component is ready for operation.
		Flashing light	There is a fault. If the LED continues to flash after you have performed a POWER ON, please contact your Siemens service center.

⚠ WARNING

Hazardous DC-link voltage

Irrespective of the state of the LED "DC LINK", hazardous DC-link voltages can always be present.

The warning information on the component must be carefully observed!

3.3.4 Dimension drawing

Dimension drawing, frame size GX

The mandatory cooling clearances are indicated by the dotted line.

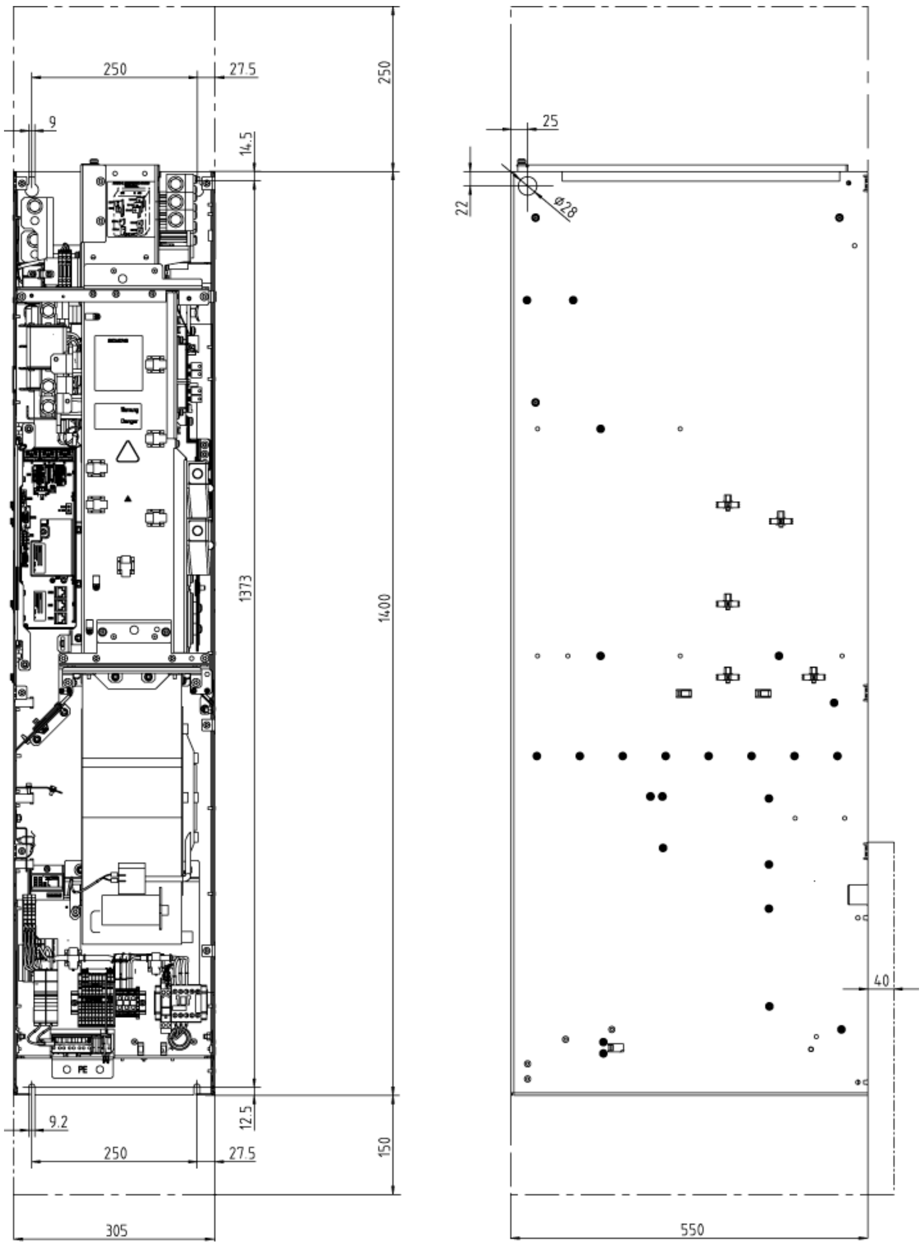


Figure 3-18 Dimension drawing Smart Line Module, frame size GX Front view, side view

Dimension drawing, frame size HX

The mandatory cooling clearances are indicated by the dotted line.

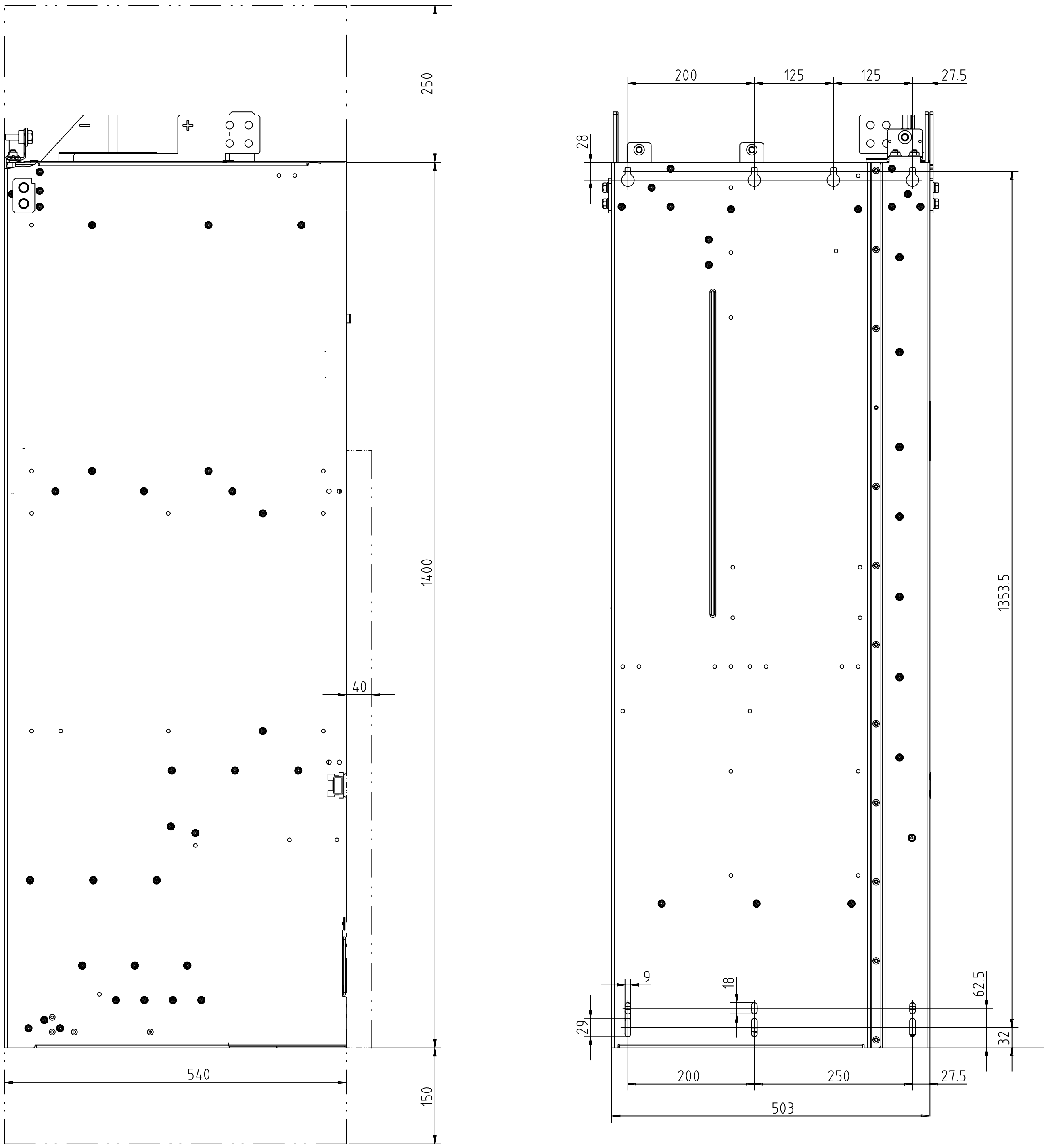


Figure 3-19 Dimension drawing Smart Line Module, frame size HX Side view, rear view

Dimension drawing, frame size JX

The mandatory cooling clearances are indicated by the dotted line.

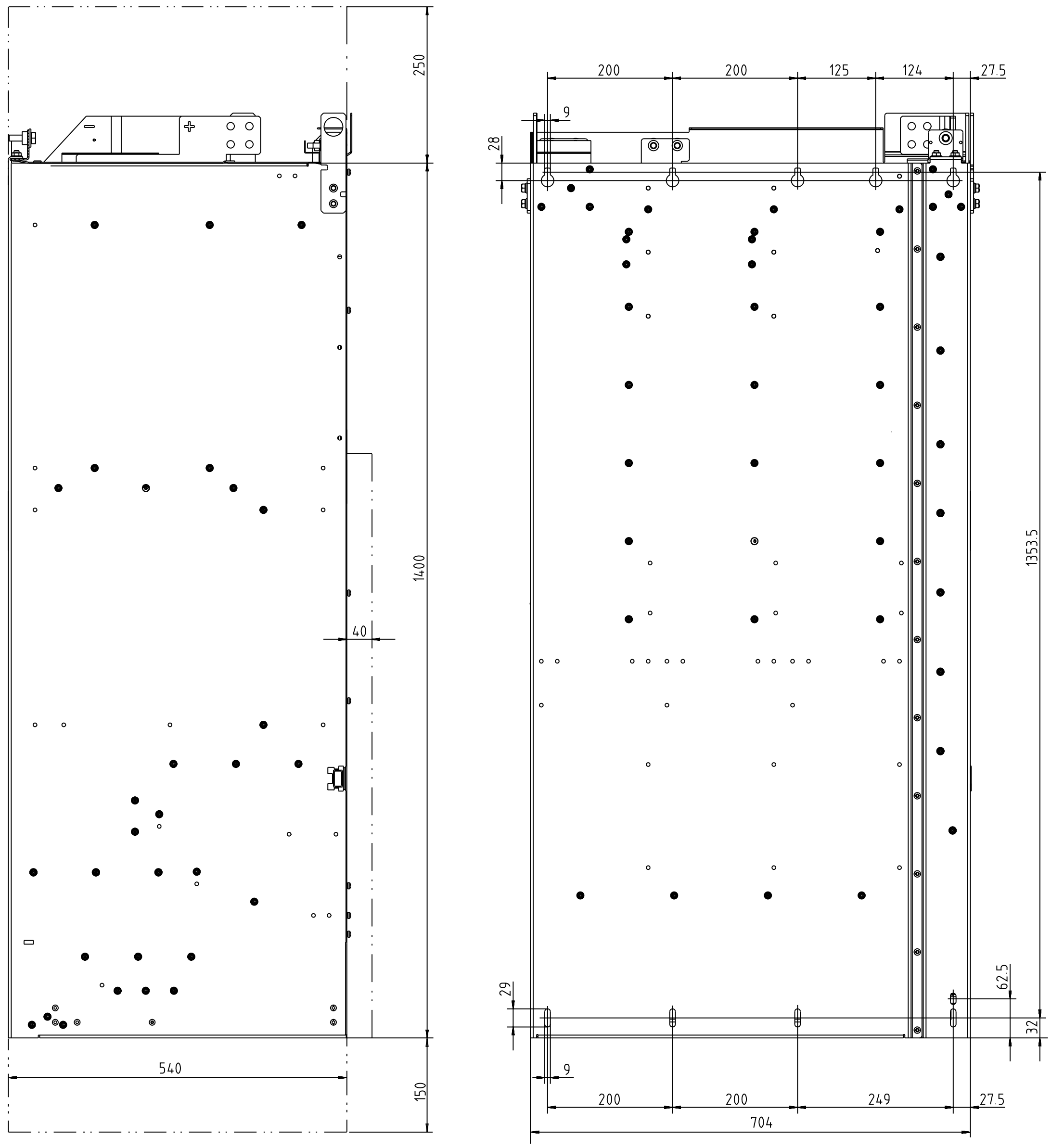


Figure 3-20 Dimension drawing Smart Line Module, frame size JX Side view, rear view

3.3.5 Electrical connection

Operating a Smart Line Module on a non-grounded line supply (IT system)

When the device is operated on an ungrounded line supply (IT system), the integrated basic interference suppression modules must be deactivated by screwing out a connection clip.

Note

Warning label on the connection clip

A yellow warning label is attached to each connection clip so that it is easier to find.

- The warning label must be removed from the connection clip (by pulling it off) if the connection clip is to remain in the unit (operation on a grounded line supply).
- The warning label must be removed together with the connection clip if the unit is operated on a non-grounded line supply (IT system).

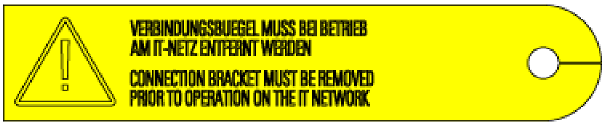


Figure 3-21 Warning label on the connection clip

With frame sizes HX and JX, you must remove the left-hand fan before removing the connection clip (see "Replacing components").

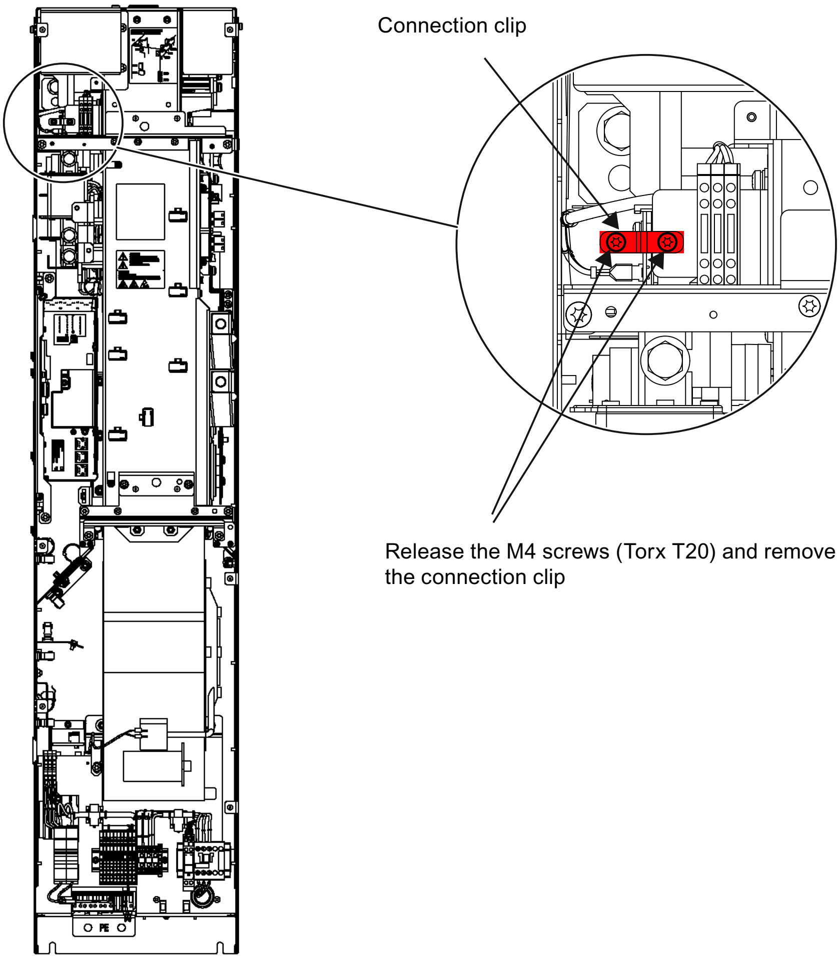


Figure 3-22 Removing the connection clip to the basic interference suppression module in the Smart Line Module for frame size GX

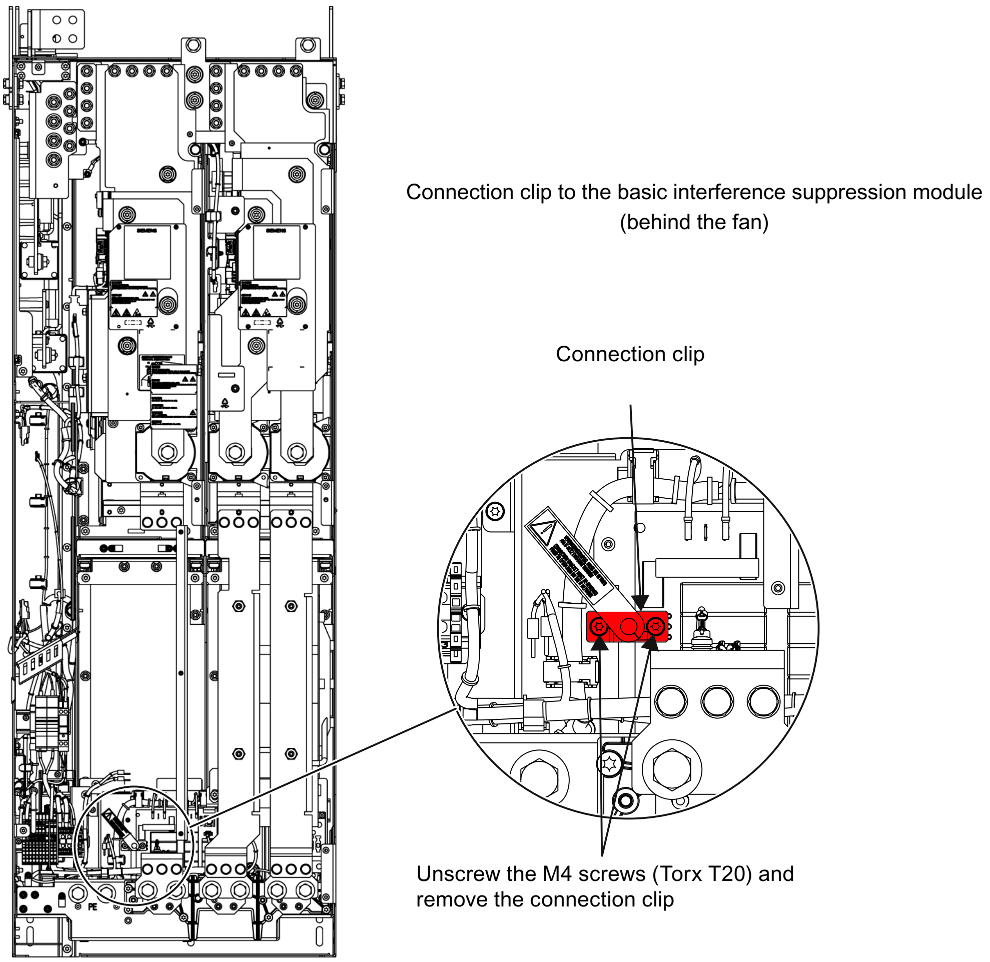


Figure 3-23 Removing the connection clip to the basic interference suppression module in the Smart Line Module for frame size HX

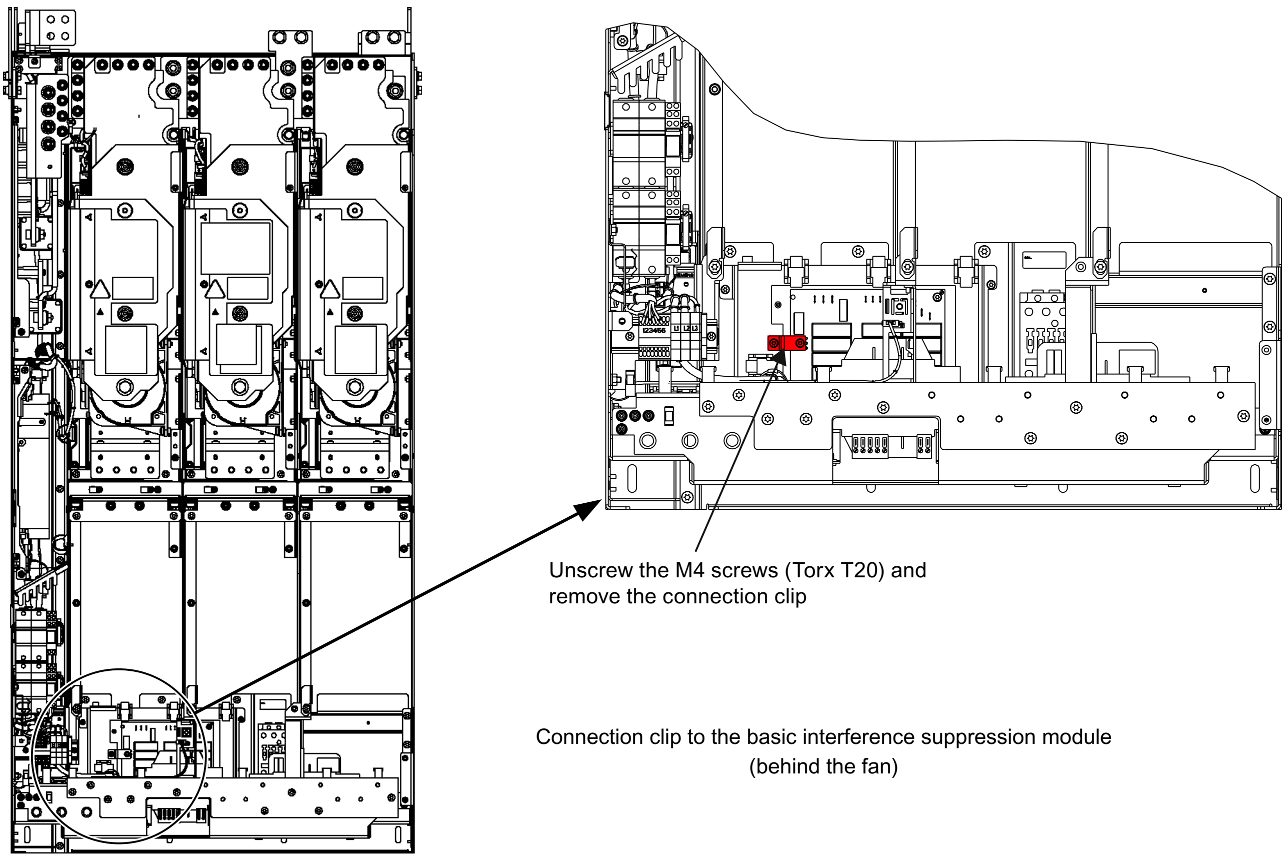
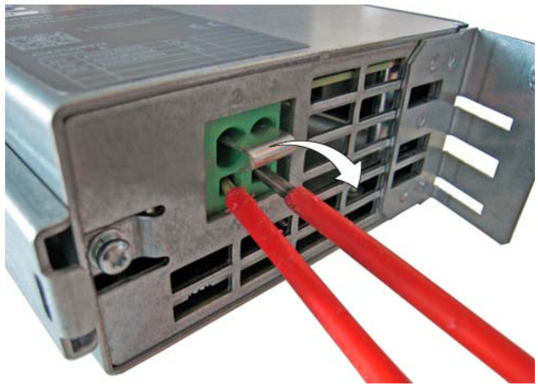


Figure 3-24 Removing the connection clip to the basic interference suppression module in the Smart Line Module for frame size JX

> ⚠ **WARNING**
>
> **Removing the connection clip on an ungrounded power network**
>
> Failure to remove the connection clip to the basic interference suppression module on an ungrounded line supply (IT system) can cause significant damage to the device.

Removing the connector jumper on the VSM10 Voltage Sensing Module

When operating the Smart Line Module on an ungrounded line supply (IT system), at the Voltage Sensing Module (VSM10), remove the connector jumper in terminal X530 at the lower side of the component.
Use two screwdrivers or another suitable tool to relieve the holding springs in the terminal and then withdraw the connector jumper.

	
Terminal X530 with connector jumper	Relieve the springs and withdraw the connector jumper

Adjusting the fan voltage (-T10)

The power supply for the device fans (1 AC 230 V) in the Smart Line Module (-T10) is taken from the line supply using transformers. The installation position of the transformers is indicated in the interface descriptions.

The transformers are fitted with primary taps so that they can be fine-tuned to the line supply voltage.

If necessary, the connection fitted in the factory, shown with a dashed line, must be reconnected to the actual line voltage.

Note

Two transformers (–T10 and –T20) are installed in Smart Line Modules, frame size JX. The two primary-side terminals on each of these devices must be adjusted together.

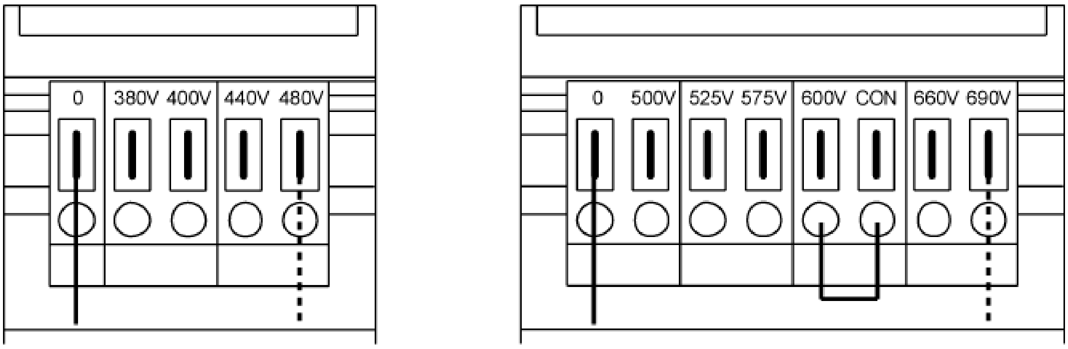


Figure 3-25 Setting terminals for the fan transformers (3 AC 380 to 480 V / 3 AC 500 to 690 V

The supply voltage assignments for making the appropriate setting on the fan transformer are indicated in the following tables (factory presetting: 480 V / 0 V or 690 V / 0 V).

Note

With the 3 AC 500 V to 690 V fan transformer, a jumper is inserted between the "600 V" terminal and "CON" terminal. The jumper between terminal "600 V" and "CON" is for internal use.

NOTICE

Consequences of incorrect voltage setting

If the terminals are not reconnected to the actual line voltage:

- The required cooling level will not be provided (risk of overheating).
- The fan fuses may blow (overload).

Table 3- 25 Line voltage assignment for the setting at the fan transformer (3 AC 380 ... 480 V)

Line voltage	Tap at the fan transformer (-T10)
380 V ± 10%	380 V
400 V ± 10%	400 V
440 V ± 10%	440 V
480 V ± 10%	480 V

Table 3- 26 Line voltage assignment for the setting at the fan transformer (3 AC 500 ... 690 V)

Line voltage	Tap at the fan transformer (-T10)
500 V ± 10%	500 V
525 V ± 10%	525 V
575 V ± 10%	575 V
600 V ± 10%	600 V
660 V ± 10%	660 V
690 V ± 10%	690 V

3.3.6 Technical data

Table 3- 27 Technical data for Smart Line Modules, 3 AC 380 V ... 480 V, Part 1

Order number	6SL3330–	6TE35–5AA3	6TE37–3AA3	6TE41–1AA3	6TE41–3AA3
Rated output - For I_{n_DC} (50 Hz, 400 V) - For I_{H_DC} (50 Hz, 400 V) - For I_{n_DC} (60 Hz, 460 V) - For I_{H_DC} (60 Hz, 460 V)	 kW kW HP HP	 250 235 385 360	 355 315 545 485	 500 450 770 695	 630 555 970 855
DC-link current - Rated current I_{n_DC} - Base load current I_{H_DC} - Maximum current I_{max_DC}	 A A A	 550 490 825	 730 650 1095	 1050 934 1575	 1300 1157 1950
Infeed/regenerative feedback current - Rated current I_{n_E} - Maximum current I_{max_E}	 A A	 463 694	 614 921	 883 1324	 1093 1639
Supply voltages - Line voltage - Line frequency - Electronic power supply - DC-link voltage	 V_{ACrms} Hz V_{DC} V_{DC}	 3 AC 380 -10% (-15% < 1 min) ... 3 AC 480 +10% 47 ... 63 Hz 24 (20.4 ... 28.8) 1.32 x U_{line} (partial load) / 1.30 x U_{line} (full load)			
Current consumption - Electronics current consumption (24 VDC) - Fan power consumption (at 400 VAC)	 A A	 1.35 1.8	 1.35 1.8	 1.4 3.6	 1.5 5.4
Max. precharging current (max. 3 s)	A	33	33	98	98
Max. ambient temperature - Without derating - With derating	 ° C ° C	 40 55	 40 55	 40 55	 40 55
DC-link capacitance - Smart Line Module - Drive line-up, max.	 µF µF	 8400 42000	 12000 60000	 16800 67200	 18900 75600
Power loss, max. [1] - At 50 Hz 400 V - At 60 Hz 460 V	 kW kW	 3.7 3.7	 4.7 4.7	 7.1 7.1	 11.0 11.0
Cooling air requirement	m^3/s	0.36	0.36	0.78	1.08
Sound pressure level L_{pA} (1 m) at 50/60 Hz	 dB(A)	 69 / 73	 69 / 73	 70 / 73	 70 / 73
Line/load connection		Flat connector for screw			
		M10	M10	M12	M12
Max. connection cross-sections - Line connection (U1, V1, W1) - DC-link connection (DCP, DCN) - PE connection PE1 - PE connection PE2	 mm² mm² mm² mm²	 2 x 240 2 x 240 2 x 240 -	 2 x 240 2 x 240 2 x 240 -	 4 x 240 Busbar 1 x 240 2 x 240	 6 x 240 Busbar 1 x 240 3 x 240
Max. cable length (total of all motor cables and DC link) - Shielded - Unshielded	 m m	 4000 6000	 4000 6000	 4800 7200	 4800 7200

Order number	6SL3330–	6TE35–5AA3	6TE37–3AA3	6TE41–1AA3	6TE41–3AA3
Degree of protection		IP00	IP00	IP00	IP00
Dimensions - Width - Height - Depth	 mm mm mm	 310 1420 550	 310 1420 550	 503 1475 550	 704 1480 550
Frame size		GX	GX	HX	JX
Weight, approx.	kg	150	150	294	458
Recommended fuse [2)] - Number (connected in parallel) - Rated current - Frame size acc. to IEC 60269		3NE1435-2 1 560 3	3NE1437-2 1 710 3	3NE1334-2 2 500 3	3NE1436-2 2 630 3
Minimum short-circuit current [3)]	A	6200	9200	10400	16000

1) The specified power loss is the maximum value at 100% capacity utilization. The value in normal operation is lower.

2) To achieve a UL-approved system, it is absolutely essential to use the fuse types specified in the table.

3) Current required for reliable triggering of the protective devices.

Table 3- 28 Technical data for Smart Line Modules, 3 AC 380 V ... 480 V, Part 2

Order number	6SL3330–	6TE41–7AA3			
Rated output - For I_{n_DC} (50 Hz, 400 V) - For I_{H_DC} (50 Hz, 400 V) - For I_{n_DC} (60 Hz, 460 V) - For I_{H_DC} (60 Hz, 460 V)	 kW kW HP HP	 800 730 1230 1125			
DC-link current - Rated current I_{n_DC} - Base load current I_{H_DC} - Maximum current I_{max_DC}	 A A A	 1700 1513 2550			
Infeed/regenerative feedback current - Rated current I_{n_E} - Maximum current I_{max_E}	 A A	 1430 2145			
Supply voltages - Line voltage - Line frequency - Electronic power supply - DC-link voltage	 V_{ACrms} Hz V_{DC} V_{DC}	 3 AC 380 -10% (-15% < 1 min) ... 3 AC 480 +10% 47 ... 63 Hz 24 (20.4 ... 28.8) 1.32 x U_{line} (partial load) / 1.30 x U_{line} (full load)			
Current consumption - Electronics current consumption (24 VDC) - Fan power consumption (at 400 VAC)	 A A	 1.7 5.4			
Max. precharging current (max. 3 s)	A	98			
Max. ambient temperature - Without derating - With derating	 ° C ° C	 40 55			
DC-link capacitance - Smart Line Module - Drive line-up, max.	 µF µF	 28800 115200			
Power loss, max. 1) - At 50 Hz 400 V - At 60 Hz 460 V	 kW kW	 11.5 11.5			
Cooling air requirement	m^3/s	1.08			
Sound pressure level L_{pA} (1 m) at 50/60 Hz	 dB(A)	 70 / 73			
Line/load connection		Flat connector for screw M12			
Max. connection cross-sections - Line connection (U1, V1, W1) - DC-link connection (DCP, DCN) - PE connection PE1 - PE connection PE2	 mm² mm² mm² mm²	 6 x 240 Busbar 1 x 240 3 x 240			
Max. cable length (total of all motor cables and DC link) - Shielded - Unshielded	 m m	 4800 7200			
Degree of protection		IP00			

Order number	6SL3330–	6TE41–7AA3			
Dimensions - Width - Height - Depth	 mm mm mm	 704 1480 550			
Frame size		JX			
Weight, approx.	kg	458			
Recommended fuse [2] - Number (connected in parallel) - Rated current - Frame size acc. to IEC 60269		3NE1448-2 2 850 3			
Minimum short-circuit current [3]	A	21000			

[1] The specified power loss is the maximum value at 100% capacity utilization. The value in normal operation is lower.

[2] To achieve a UL-approved system, it is absolutely essential to use the fuse types specified in the table.

[3] Current required for reliable triggering of the protective devices.

Table 3- 29 Technical data for Smart Line Modules, 3 AC 500 to 690 V

Order number	6SL3330–	6TG35–5AA3	6TG38–8AA3	6TG41–2AA3	6TG41–7AA3
Rated power - For I_{n_DC} (50 Hz, 690 V) - For I_{H_DC} (50 Hz, 690 V) - For I_{n_DC} (50 Hz, 500 V) - For I_{H_DC} (50 Hz, 500 V) - For I_{n_DC} (60 Hz, 575 V) - For I_{H_DC} (60 Hz, 575 V)	 kW kW kW kW HP HP	 450 405 320 295 500 450	 710 665 525 480 790 740	 1000 885 705 640 1115 990	 1400 1255 995 910 1465 1400
DC-link current - Rated current I_{n_DC} - Base load current I_{H_DC} - Maximum current I_{max_DC}	 A A A	 550 490 825	 900 800 1350	 1200 1068 1800	 1700 1513 2550
Infeed/regenerative feedback current - Rated current I_{n_E} - Maximum current I_{max_E}	 A A	 463 694	 757 1135	 1009 1513	 1430 2145
Supply voltages - Line voltage - Line frequency - Electronic power supply - DC-link voltage	 V_{ACrms} Hz V_{DC} V_{DC}	 3 AC 500 -10% (-15% < 1 min) ... 3 AC 690 +10% 47 ... 63 Hz 24 (20.4 ... 28.8) 1.32 x U_{line} (partial load) / 1.30 x U_{line} (full load)			
Current consumption - Electronics current consumption (24 VDC) - Fan power consumption (at 500 VAC / 690 VAC)	 A A	 1.35 1.4 / 1.0	 1.4 2.9 / 2.1	 1.5 4.3 / 3.1	 1.7 4.3 / 3.1
Max. precharging current (max. 3 s)	A	41	122	122	122
Max. ambient temperature - Without derating - With derating	 ° C ° C	 40 55	 40 55	 40 55	 40 55
DC-link capacitance - Smart Line Module - Drive line-up, max.	 µF µF	 5600 28000	 7400 29600	 11100 44400	 14400 57600
Power loss, max. 1) - At 50 Hz 690 V - At 60 Hz 575 V	 kW kW	 4.3 4.3	 6.5 6.5	 12.0 12.0	 13.8 13.8
Cooling air requirement	m^3/s	0.36	0.78	1.08	1.08
Sound pressure level L_{pA} (1 m) at 50/60 Hz	 dB(A)	 69 / 73	 70 / 73	 70 / 73	 70 / 73
Line/load connection		Flat connector for screw			
		M10	M12	M12	M12
Max. connection cross-sections - Line connection (U1, V1, W1) - DC-link connection (DCP, DCN) - PE connection PE1 - PE connection PE2	 mm² mm² mm² mm²	 2 x 240 2 x 240 2 x 240 -	 4 x 240 Busbar 1 x 240 2 x 240	 6 x 240 Busbar 1 x 240 3 x 240	 6 x 240 Busbar 1 x 240 3 x 240
Max. cable length (total of all motor cables and DC link) - Shielded - Unshielded	 m m	 2250 3375	 2750 4125	 2750 4125	 2750 4125
Degree of protection		IP00	IP00	IP00	IP00

Order number	6SL3330–	6TG35–5AA3	6TG38–8AA3	6TG41–2AA3	6TG41–7AA3
Dimensions - Width - Height - Depth	 mm mm mm	 310 1420 550	 503 1475 550	 704 1480 550	 704 1480 550
Frame size		GX	HX	JX	JX
Weight, approx.	kg	150	294	458	458
Recommended fuse 2) - Number (connected in parallel) - Rated current - Frame size acc. to IEC 60269		3NE1435-2 1 560 3	3NE1448-2 1 850 3	3NE1435-2 2 560 3	3NE1448-2 2 850 3
Minimum short-circuit current 3)	A	6200	10500	12400	21000

1) The specified power loss is the maximum value at 100% capacity utilization. The value in normal operation is lower.

2) To achieve a UL-approved system, it is absolutely essential to use the fuse types specified in the table.

3) Current required for reliable triggering of the protective devices.

Overload capability

The Smart Line Modules have an overload reserve.

The criterion for overload is that the Smart Line Module is operated with its base load current before and after the overload occurs (a load duration of 300 s is used as a basis here).

High overload

The base load current for a high overload I_{H_DC} is based on a duty cycle of 150% for 60 s; the max. current I_{max_DC} can flow for 5 s.

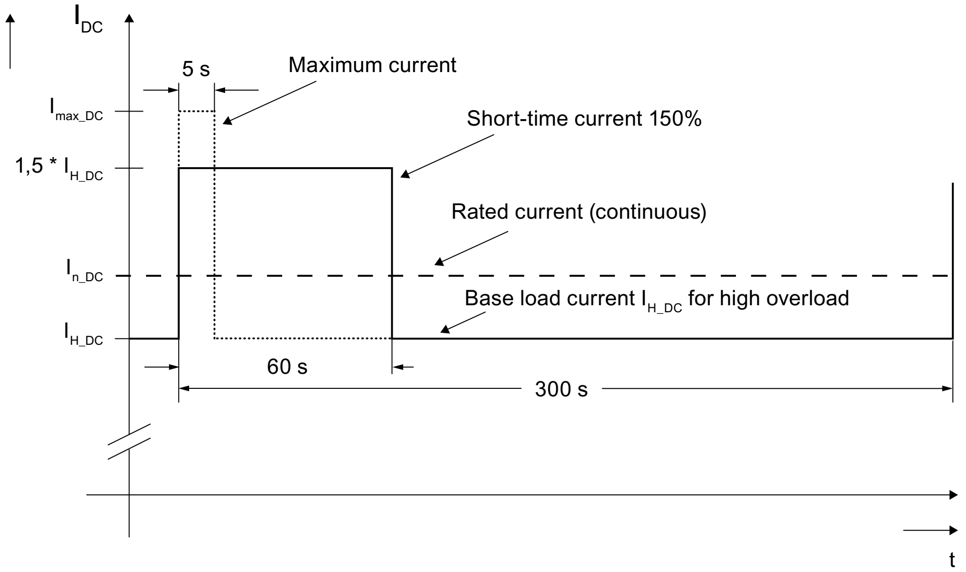


Figure 3-26 High overload

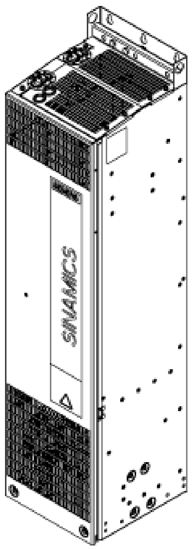
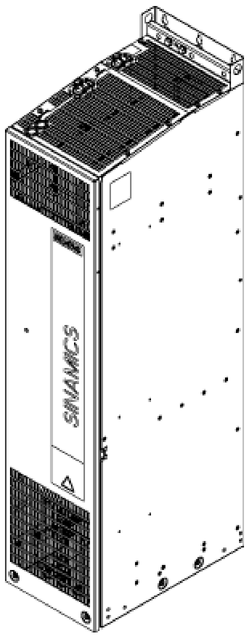
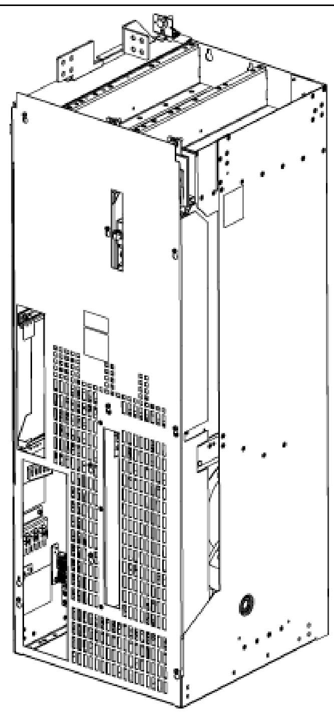
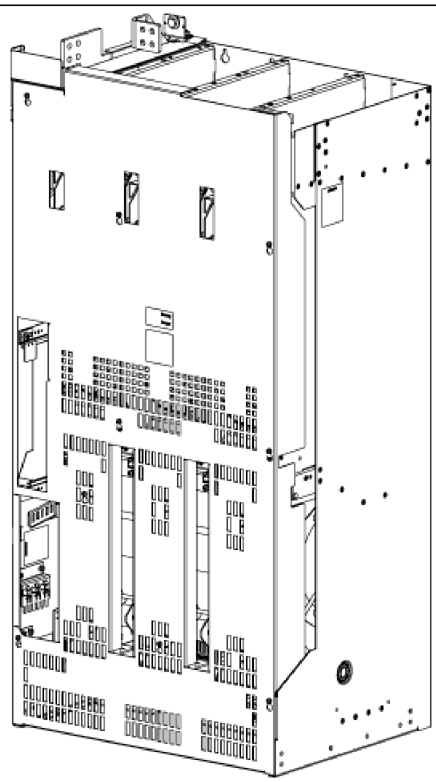
3.4 Active Line Modules

3.4.1 Description

The self-commutating infeed / regenerative feedback units act as step-up converters and generate a stabilized DC-link voltage that is 1.5x greater than the rated line supply voltage. In this way, the connected Motor Modules are isolated from the line voltage. This improves the dynamic response and control quality because line tolerances and fluctuations do not affect the motor voltage.

If required, the Active Line Modules can also provide reactive power compensation.

Table 3- 30 Overview of Active Line Modules

			
Frame size FX	Frame size GX	Frame size HX	Frame size JX

Active Infeed components

An Active Infeed comprises an Active Interface Module and an Active Line Module.

The bypass contactor is fitted in the relevant Active Interface Module on Active Infeeds which feature an Active Line Module of frame size FX or GX. The Active Interface Modules and Active Line Modules of these frame sizes have degree of protection IP20.

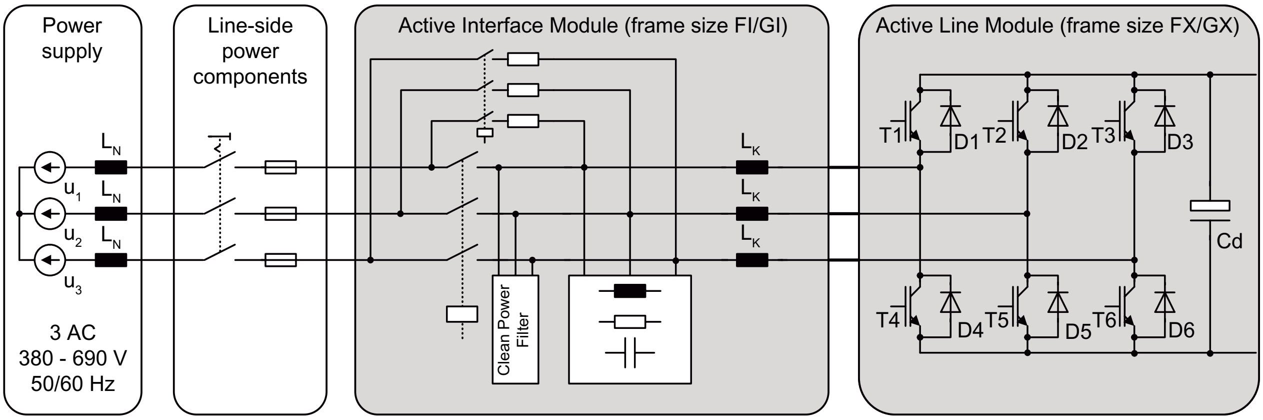


Figure 3-27 Overview of Active Infeed (frame sizes FI/FX and GI/GX)

In the case of an Active Infeed with an Active Line Module of frame sizes HX or JX, the bypass contactor is not included in the associated Active Interface Module, but must be provided separately. The Active Interface Modules and Active Line Modules of these frame sizes have degree of protection IP00.

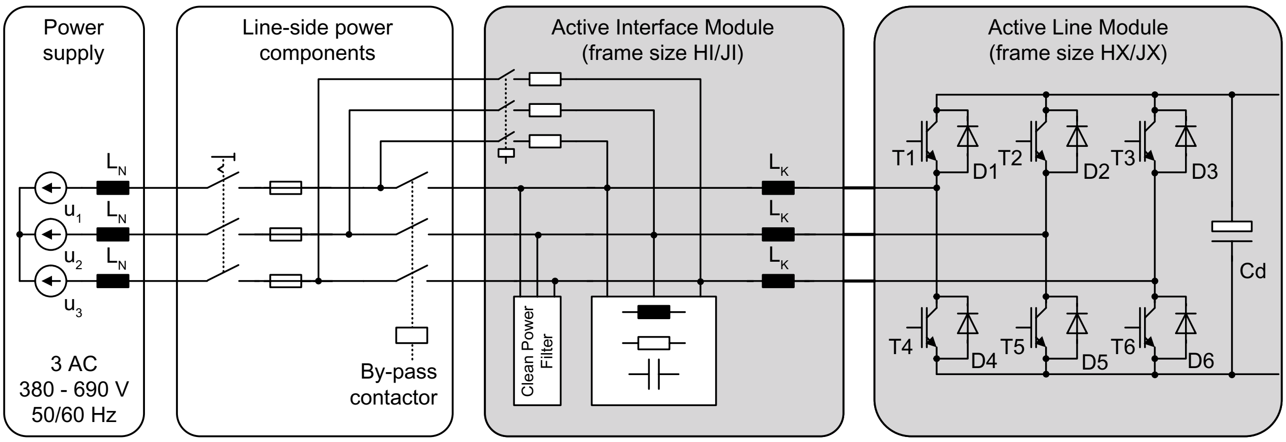


Figure 3-28 Overview of Active Infeed (frame sizes HI/HX and JI/JX)

Operating principle

One or more Motor Modules can be connected to the power supply network via the Active Line Module. The Active Line Module provides a constant DC-link voltage for the Motor Modules. This ensures that they are not influenced by line voltage fluctuations. The regenerative feedback capability of the Active Line Module can be deactivated by parameterization.

The Active Line Module is suitable for direct operation both on TN and on IT and TT systems.

With the motors operating as generators, the Active Line Module feeds regenerative energy into the supply network.

The Active Line Module is used for:

- Machines with high dynamic drive requirements
- Frequent braking cycles and high braking energy

Parallel connection of Active Line Modules to increase power rating

Up to four Active Line Modules with the same power rating can be connected in parallel in order to increase power.

The following rules must be observed when connecting Active Line Modules in parallel:

- Up to four identical Active Line Modules can be connected in parallel.
- A common Control Unit is required whenever the modules are connected in parallel.
- With multiple infeeds, power must be supplied to the systems from a common infeed point (i.e. different supply systems are not permitted).
- A derating factor of 5% must be taken into consideration, regardless of the number of modules connected in parallel.

Note

Mixed operation is not possible

It is only possible to connect identical power units in parallel if all power units have the same hardware version. Mixed operation between a power unit with Control Interface Module (order number 6SL33xx-xxxxx–xAA3) and a power unit with Control Interface Board (order number 6SL33xx-xxxxx–xAA0) is not possible.

3.4.2 Safety information

⚠ WARNING

Dangerous electrical voltage

A hazardous voltage will be present in the component for a further 5 minutes after all voltage supplies have been disconnected. Work cannot be carried out until this time has elapsed.

Before starting work, you should also measure the voltage after the 5 minutes have elapsed. The voltage can be measured on DC-link terminals DCP and DCN.

⚠ CAUTION

Danger notice in the local language

The DC-link discharge time hazard warning must be affixed to the component in the relevant local language.

Note

Maintain ventilation clearances

The ventilation clearances above, below, and in front of the component, which are specified in the dimension drawings, must be observed.

NOTICE

Use on a line supply where energy recovery is not possible

In a supply system without regenerative capability (e.g. diesel generator), the regenerative feedback capability of the Active Line Module must be deactivated in the relevant parameter (see Description of Functions). The braking energy must then be dissipated via an additional Braking Module with a braking resistor in the drive line-up.

⚠ WARNING

Remove linkage levers for frame sizes HX and JX

For Line Modules of frame sizes HX and JX, the linkage levers marked in red must be removed once the devices have been installed.

Non-observance can cause damage to the device through undershooting the necessary voltage clearances.

3.4.3 Interface description

3.4.3.1 Overview

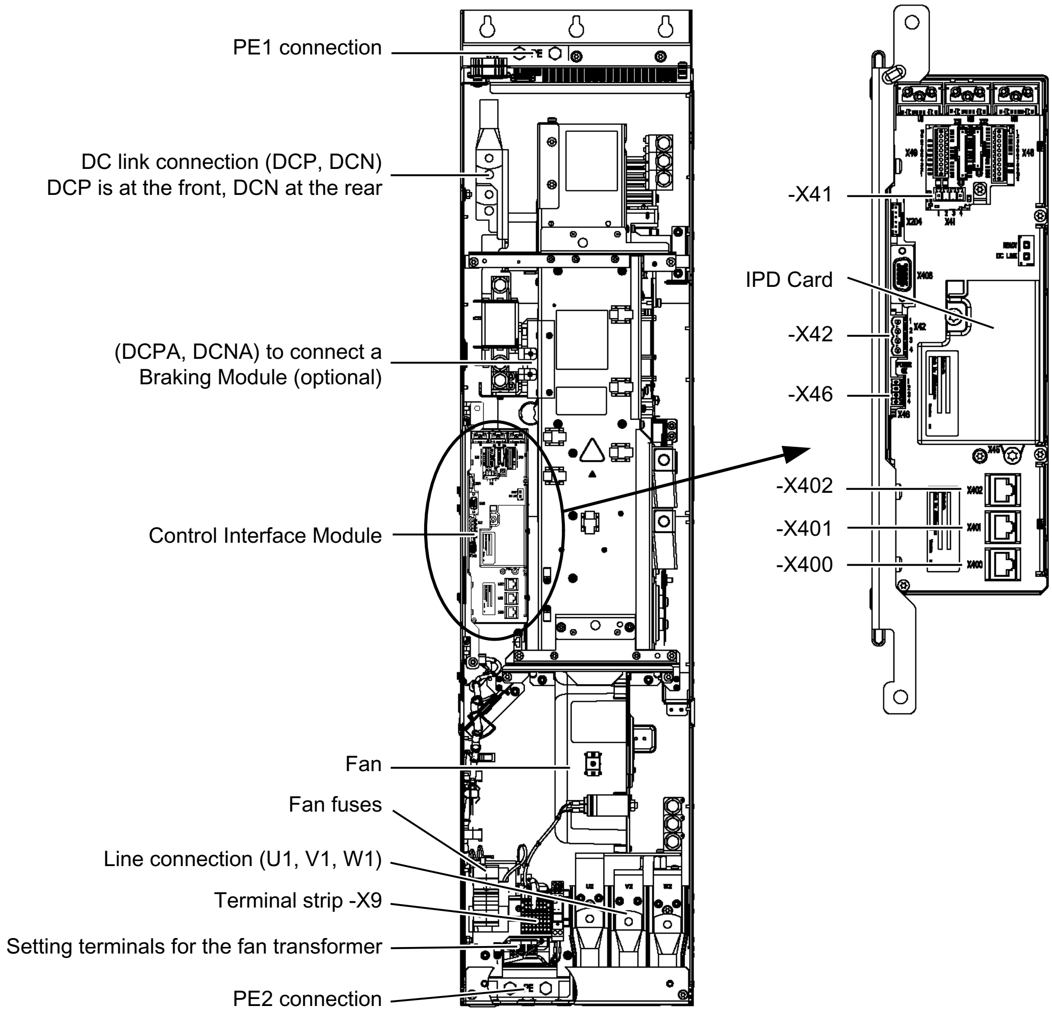


Figure 3-29 Active Line Module, frame size FX

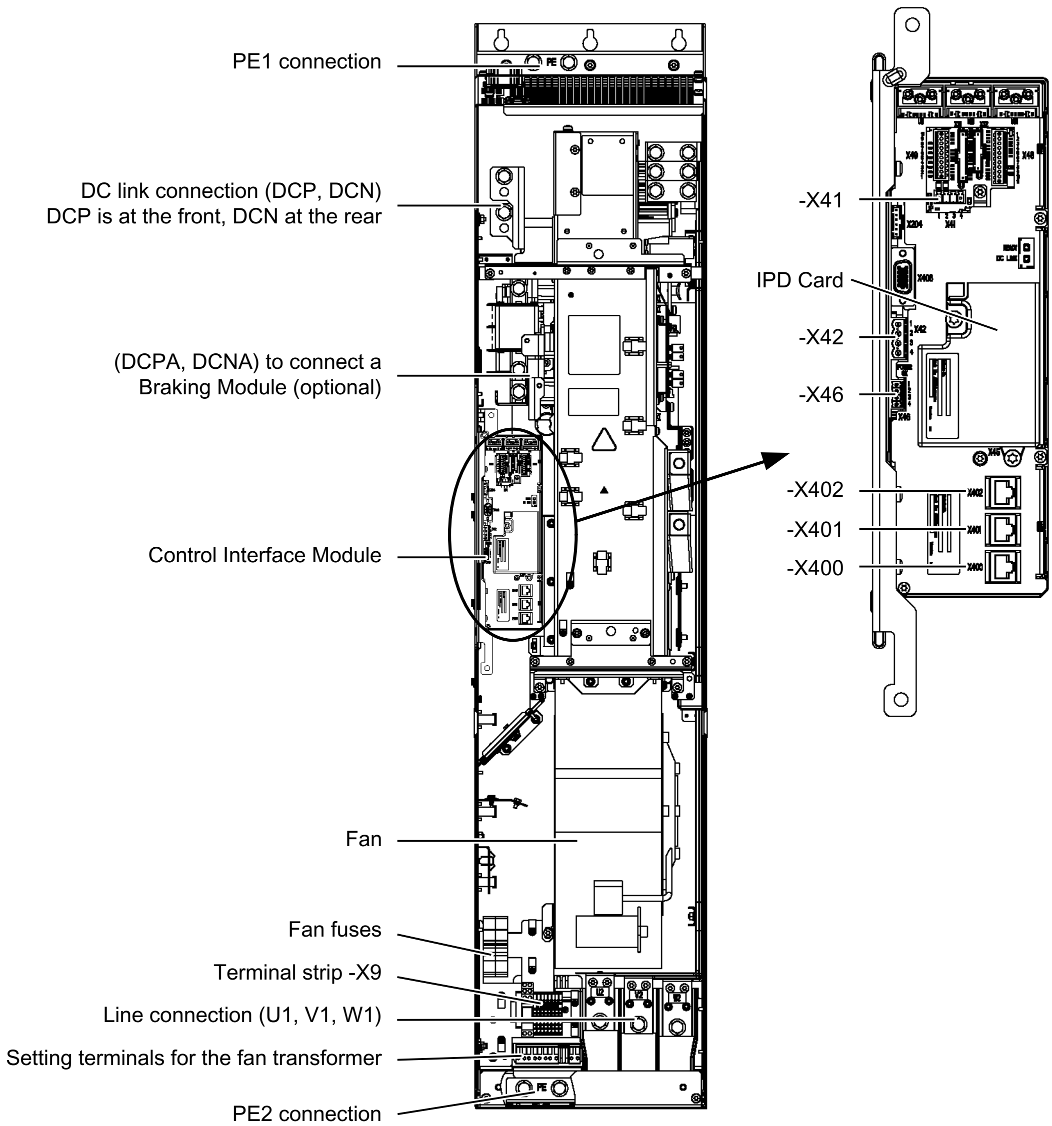


Figure 3-30 Active Line Module, frame size GX

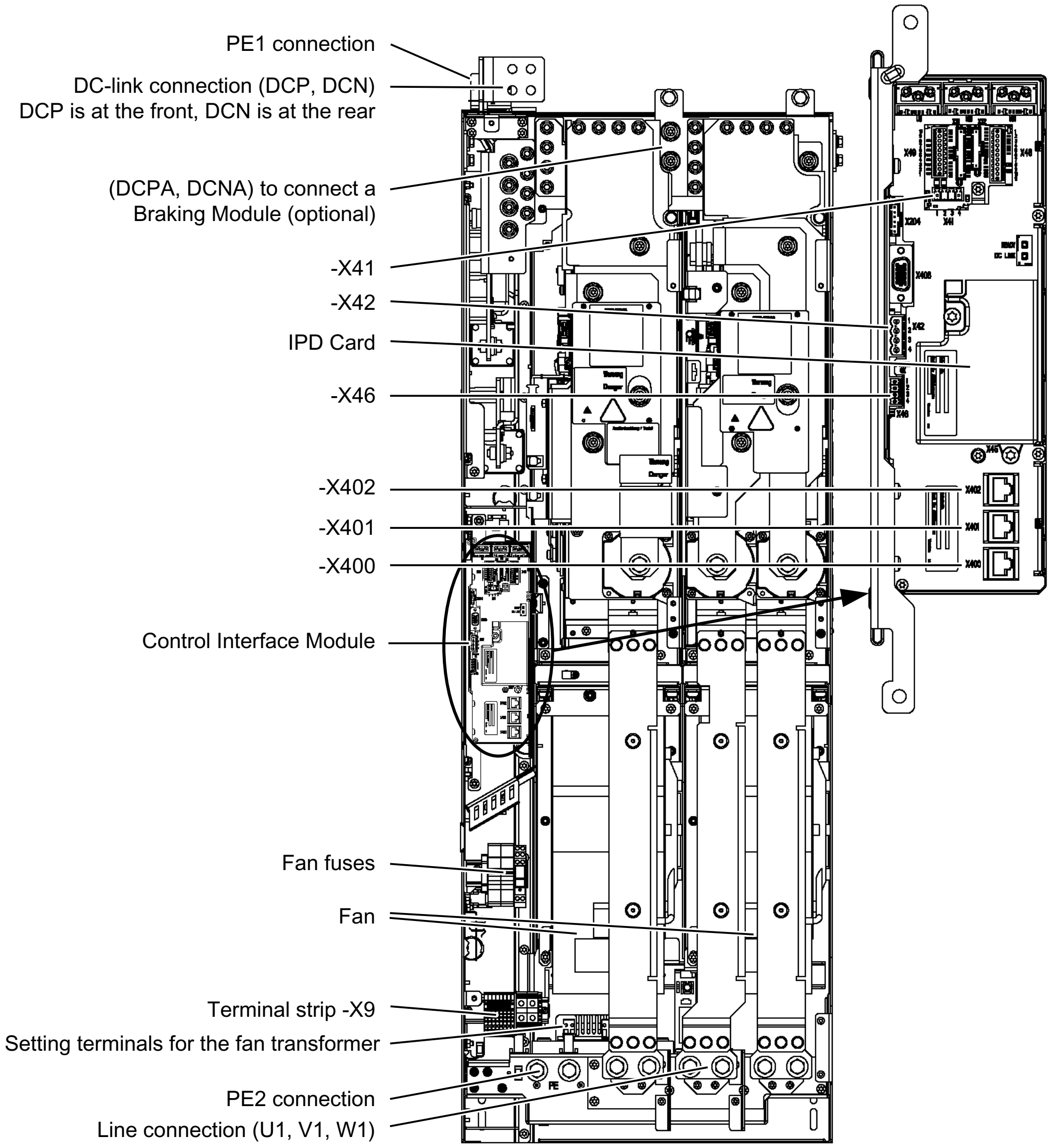


Figure 3-31 Active Line Module, frame size HX

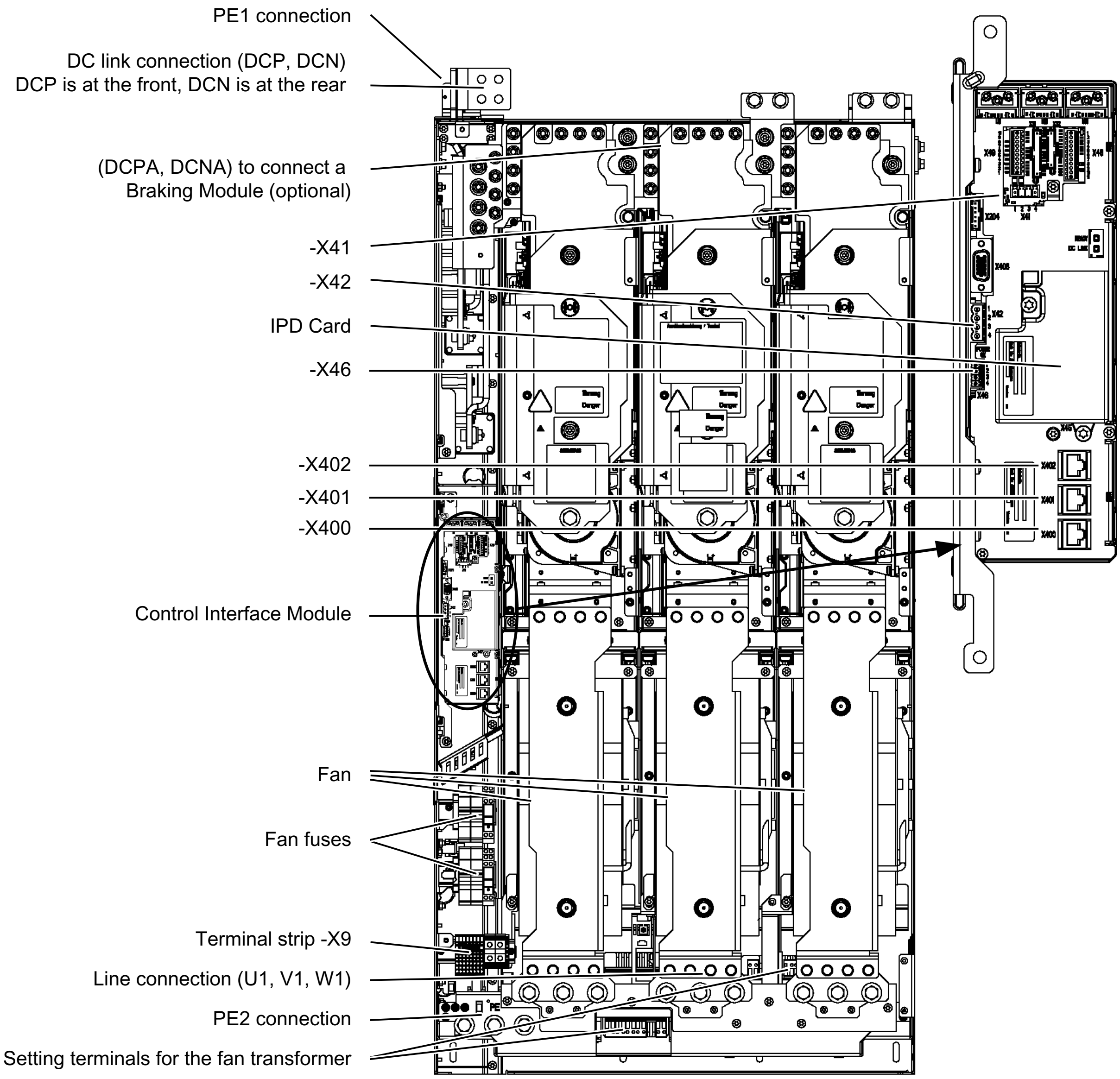


Figure 3-32 Active Line Module, frame size JX

3.4.3.2 Connection example

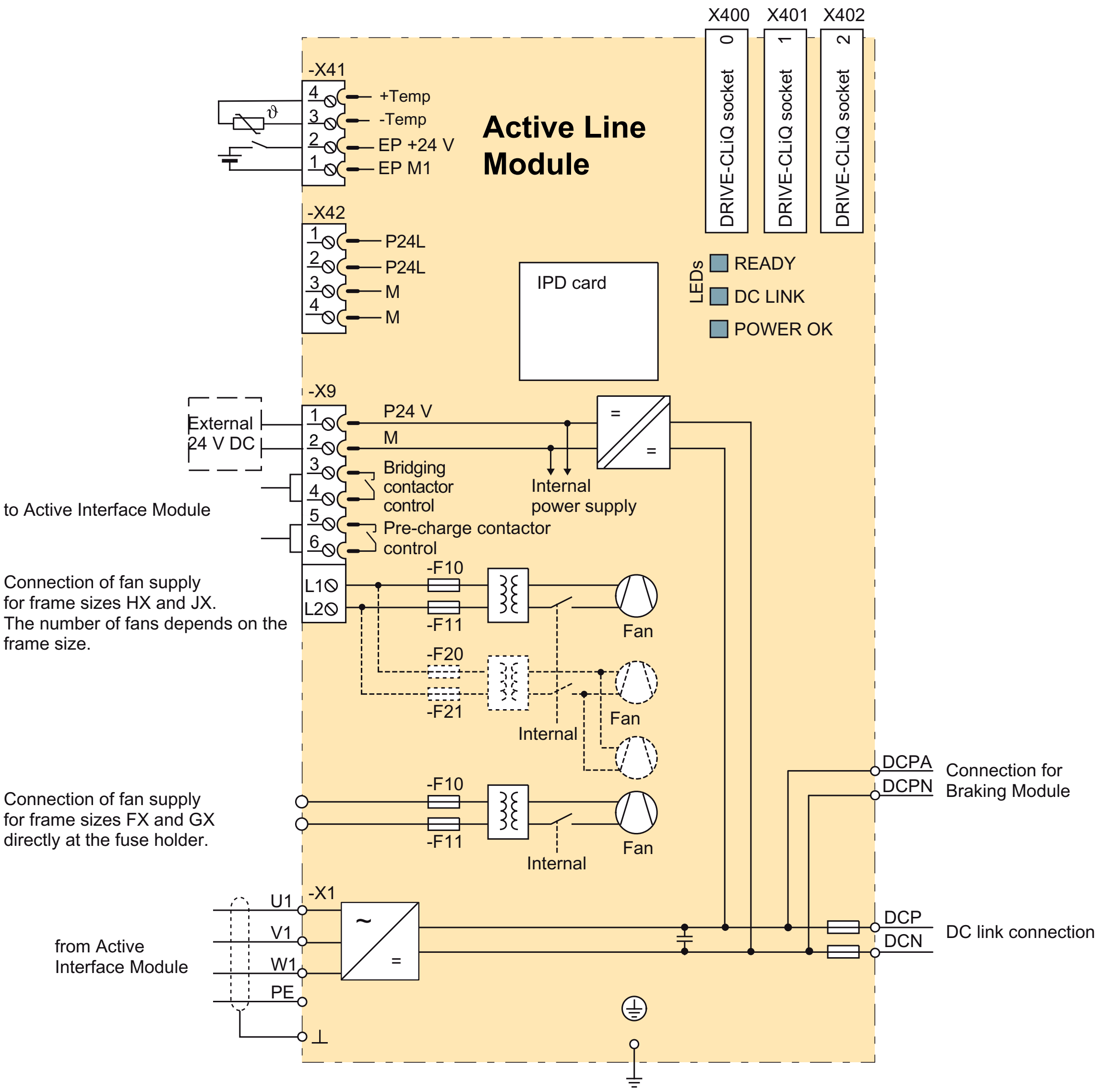


Figure 3-33 Active Line Module wiring diagram

3.4.3.3 Line/load connection

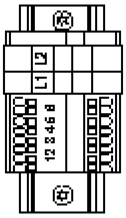
Table 3- 31 Line/load connection of the Active Line Module

Terminals	Technical specifications
U1, V1, W1 3 AC power input	Voltage: • 3 AC 380 V -10 % (-15 % < 1 min) ... 3 AC 480 V +10 % • 3 AC 500 V -10 % (-15 % < 1 min) ... 3 AC 690 V +10 % Frequency: 47 ... 63 Hz Connecting thread: • Frame sizes FX / GX: M10 / 25 Nm for cable lugs in accordance with DIN 46234 / DIN 46235 1) • Frame sizes HX / JX: M12 / 50 Nm for cable lugs in accordance with DIN 46234 / DIN 46235 1)
DCPA, DCNA Connection for Braking Module	Voltage: • 570 ... 720 V DC • 750 ... 1035 V DC Connections: • Frame sizes FX / GX: Threaded bolts M6 / 6 Nm for cable lugs in accordance with DIN 46234 / DIN 46235 1) • Frame sizes HX / JX: Connection for connection clip
DCP, DCN DC power output	Voltage: • 570 ... 720 V DC • 750 ... 1035 V DC Connections: • Frame sizes FX / GX: Thread M10 / 25 Nm for cable lugs in accordance with DIN 46234 / DIN 46235 1) • Frame sizes HX / JX: d = 12 mm (M12/50 Nm) flat connector for busbar
PE connection PE1, PE2	Connecting thread: • Frame sizes FX / GX: M10 / 25 Nm for cable lugs in accordance with DIN 46234 / DIN 46235 1) • Frame sizes HX / JX: M12 / 50 Nm for cable lugs in accordance with DIN 46234 / DIN 46235 1)

1) Dimensions for connecting alternative cable lugs, see "cable lugs" in the appendix.

3.4.3.4 X9 terminal strip

Table 3- 32 Terminal strip X9

	Terminal	Signal name	Technical specifications
	1	P24V	Voltage: 24 V DC (20.4 ... 28.8 V) Current consumption: max. 1.7 A
	2	M	
	3	Bypass contactor control	for Active Interface Module, X609:11
	4		for Active Interface Module, X609:12
	5	Pre-charge contactor control	for Active Interface Module, X609:9
	6		for Active Interface Module, X609:10
	L1	Connection for fan supply	AC 380 ... 480 V / AC 500 ... 690 V Current consumption: See Technical data
	L2	(frame sizes HX and JX only)	
Max. connectable cross-section: Terminals 1 ... 6: 1.5 mm², Terminals L1 - L2: 35 mm²			

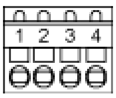
Note

Connecting fan supply, with frame sizes FX and GX

The fan supply for frame sizes FX and GX is connected directly to fuse holders -F10 and -F11.

3.4.3.5 X41 EP terminal / temperature sensor connection

Table 3- 33 Terminal strip X41

	Terminal	Function	Technical specifications
	1	EP M1 (Enable Pulses)	Supply voltage: 24 VDC (20.4 ... 28.8 V) Current consumption: 10 mA
	2	EP +24 V (Enable Pulses)	
	3	- Temp	Temperature sensor connection KTY84-1C130/PTC
	4	+ Temp	
Max. connectable cross-section 1.5 mm²			

Note

Connection to terminals 1 and 2

For operation, 24 VDC must be connected to terminal 2 and ground to terminal 1. Pulse suppression is activated when removed.

⚠ DANGER

Electrical shock hazard

Only temperature sensors that meet the safety isolation specifications stipulated in EN 61800-5-1 may be connected to terminals "+Temp" and "-Temp". If safe electrical separation cannot be guaranteed (for linear motors or third-party motors, for example), a Sensor Module External (SME120 or SME125) must be used.

If these instructions are not complied with, there is a risk of electric shock!

Note

Connectable sensor

The following probes can be connected to the temperature sensor connection:
KTY84-1C130 / PTC.

NOTICE

Use shielded cables

The temperature sensor connection must be shielded. The shielding must be attached to the shield support of the module.

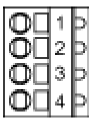
Note

KTY temperature sensor connected with the correct polarity

The KTY temperature sensor must be connected with the correct polarity.
If the polarity is reversed, the sensor will not be able to detect if the motor overheats.

3.4.3.6 X42 terminal strip

Table 3- 34 Terminal strip X42 voltage supply for Control Unit, Sensor Module and Terminal Module

	Terminal	Function	Technical specifications
	1	P24L	Voltage supply for Control Unit, Sensor Module and Terminal Module (18 to 28.8 V) maximum load current: 3 A
	2		
	3	M	
	4		
Max. connectable cross-section 2.5 mm^2			

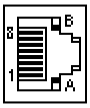
⚠ CAUTION

Terminal strip is not intended for free 24 VDC availability

The terminal strip is not intended for free 24V DC availability (for example for supplying further line-side components), as the voltage supply of the Control Interface Module could also be overloaded and operating capability could thus be compromised.

3.4.3.7 DRIVE-CLiQ interfaces X400, X401, X402

Table 3- 35 DRIVE-CLiQ interfaces X400, X401, X402

	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)	24 V power supply
	B	M (0 V)	Electronics ground
Blanking plate for DRIVE-CLiQ interfaces (50 pcs.) order number: 6SL3066-4CA00-0AA0			

3.4.3.8 Meaning of the LEDs on the Control Interface Module in the Active Line Module

Table 3- 36 Meaning of the LEDs "READY" and "DC LINK" on the Control Interface Module in the Active Line Module

LED state		Description
READY	**DC LINK**	
Off	Off	The electronics power supply is missing or out of tolerance.
Green	Off	The component is ready for operation and cyclic DRIVE-CLiQ communication is taking place.
	Orange	The component is ready for operation and cyclic DRIVE-CLiQ communication is taking place. The DC-link voltage is present.
	Red	The component is ready for operation and cyclic DRIVE-CLiQ communication is taking place. The DC-link voltage is too high.
Orange	Orange	DRIVE-CLiQ communication is being established.
Red	---	At least one fault is present in this component. Note: LED is driven irrespective of the corresponding messages being reconfigured.
Flashing light 0.5 Hz: Green / red	---	Firmware is being downloaded.
2 Hz flashing: Green / red	---	Firmware download is complete. Waiting for POWER ON.
2 Hz flashing: Green / orange or red / orange	---	Component detection using LED is activated (p0124) Note: The two options depend on the LED status when module recognition is activated via p0124 = 1.

Table 3- 37 Meaning of the LED "POWER OK" on the Control Interface Module in the Active Line Module

LED	Color	Status	Description
POWER OK	Green	Off	DC-link voltage < 100 V and voltage at -X9:1/2 less than 12 V.
		On	The component is ready for operation.
		Flashing light	There is a fault. If the LED continues to flash after you have performed a POWER ON, please contact your Siemens service center.

⚠ WARNING

Hazardous DC-link voltage

Irrespective of the state of the LED "DC LINK", hazardous DC-link voltages can always be present.

The warning information on the component must be carefully observed!

3.4.4 Dimension drawing

Dimension drawing, frame size FX

The mandatory cooling clearances are indicated by the dotted line.

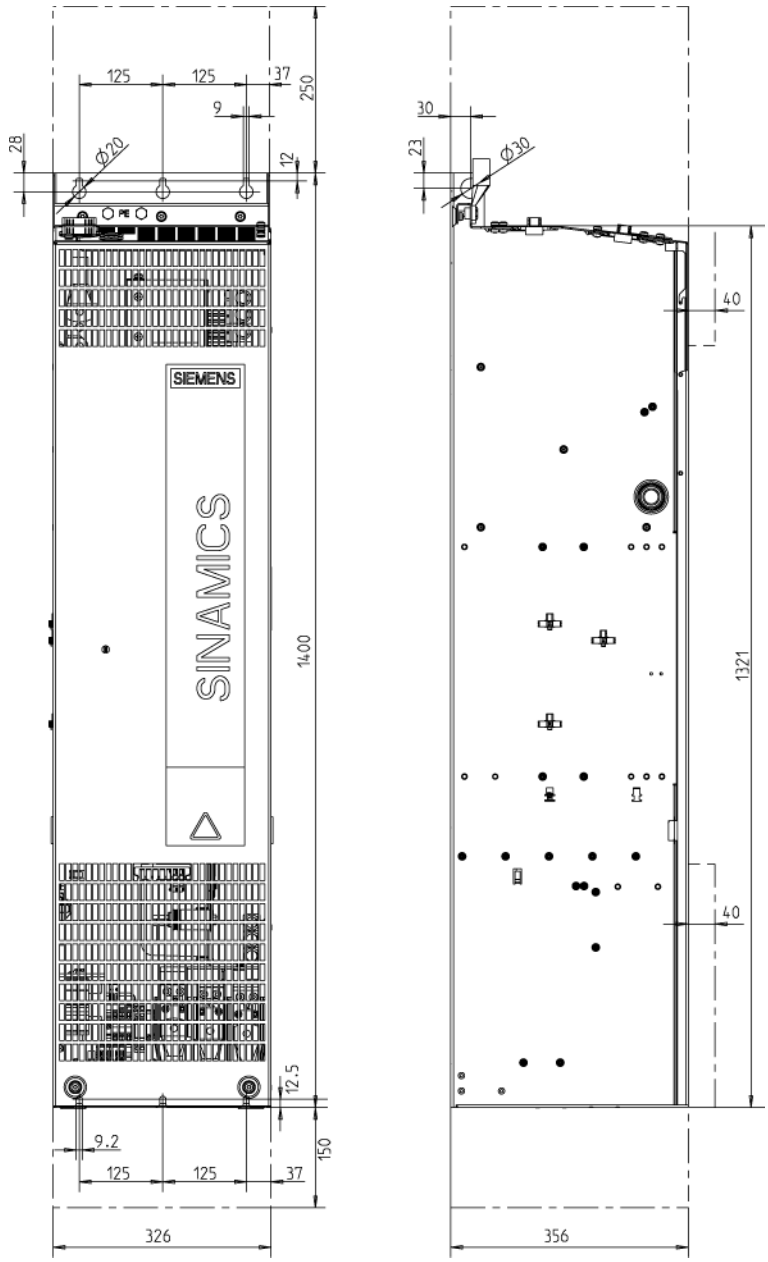


Figure 3-34 Dimension drawing Active Line Module, frame size FX Front view, side view

Dimension drawing, frame size GX

The mandatory cooling clearances are indicated by the dotted line.

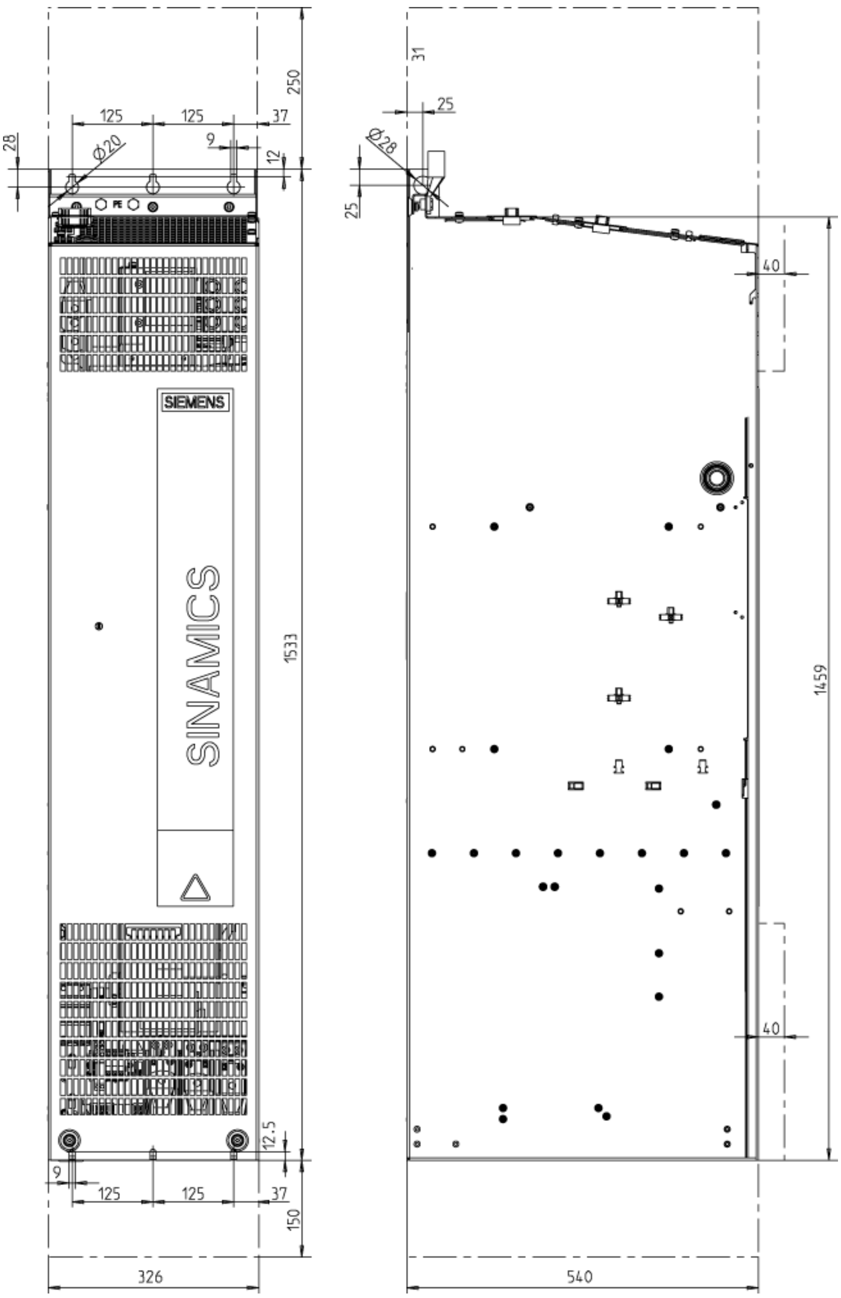


Figure 3-35 Dimension drawing Active Line Module, frame size GX Front view, side view

Dimension drawing, frame size HX

The mandatory cooling clearances are indicated by the dotted line.

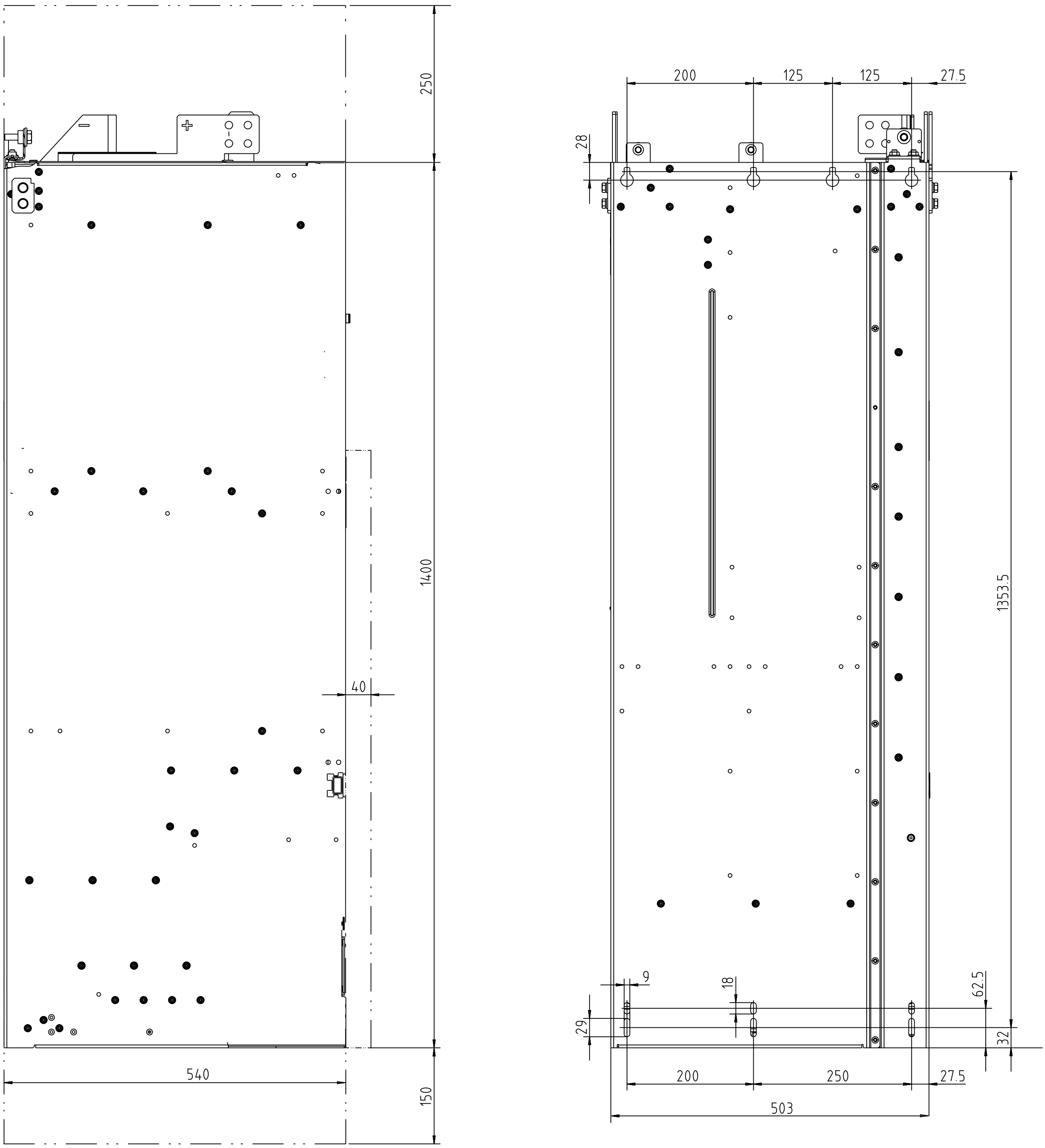


Figure 3-36 Dimension drawing Active Line Module, frame size HX Side view, rear view

Dimension drawing, frame size JX

The mandatory cooling clearances are indicated by the dotted line.

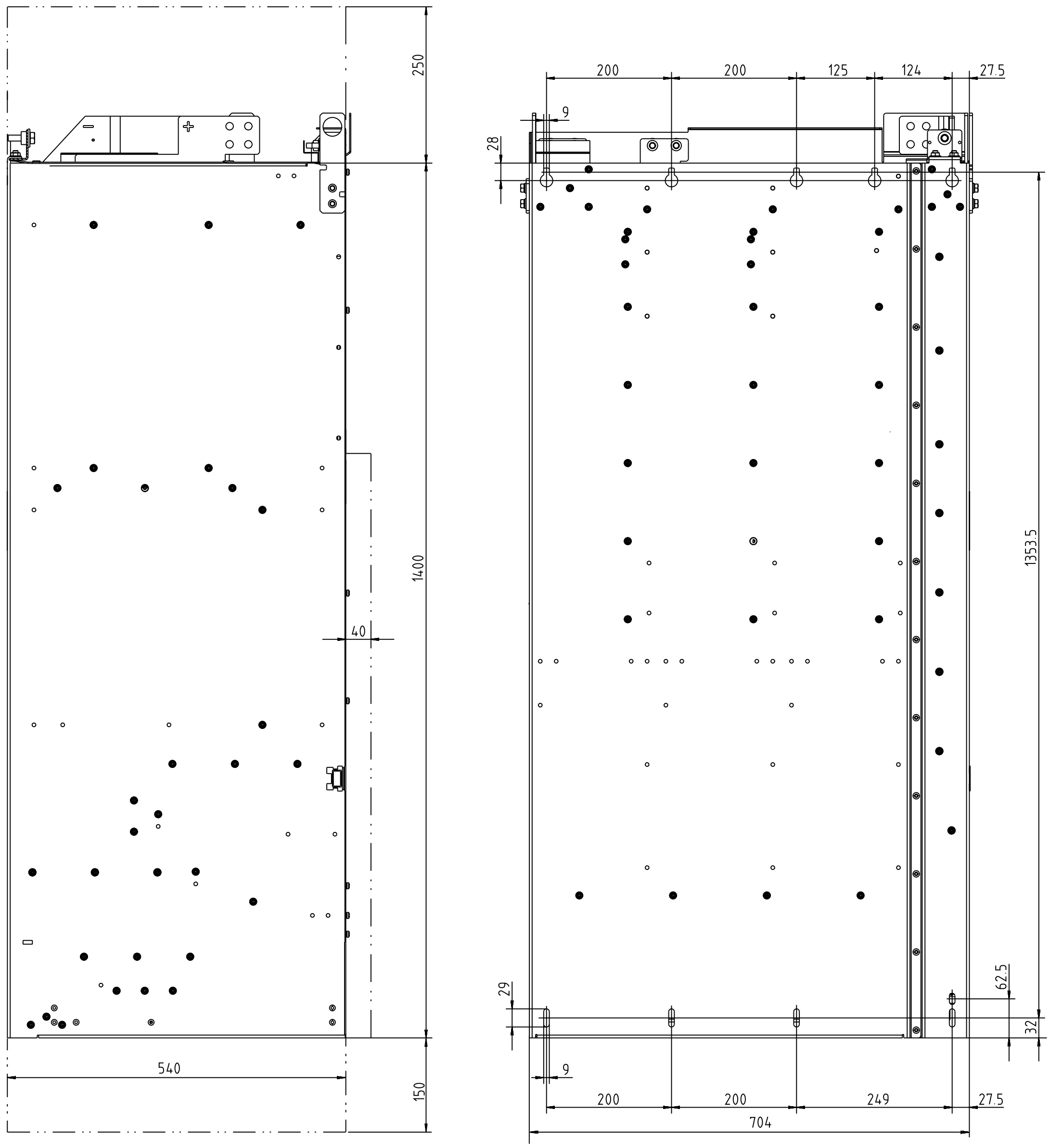


Figure 3-37 Dimension drawing Active Line Module, frame size JX Side view, rear view

3.4.5 Electrical connection

Adjusting the fan voltage (-T10)

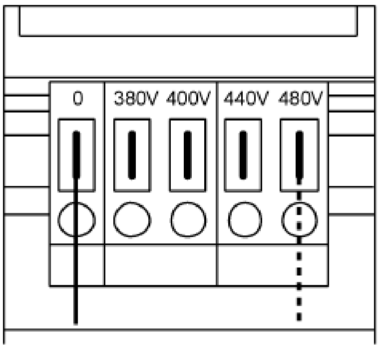
The power supply for the device fans (1 AC 230 V) in the Active Line Module (-T10) is taken from the line supply using transformers. The locations of the transformers are indicated in the interface descriptions.

The transformers are fitted with primary taps so that they can be fine-tuned to the line supply voltage.

If necessary, the connection fitted in the factory, shown with a dashed line, must be reconnected to the actual line voltage.

Note

Two transformers (–T10 and –T20) are installed in Active Line Modules, frame size JX. The two primary-side terminals on each of these devices must be adjusted together.



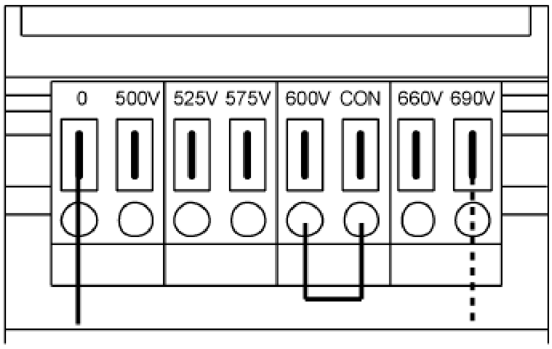


Figure 3-38 Setting terminals for the fan transformers (3 AC 380 to 480 V / 3 AC 500 to 690 V

The supply voltage assignments for making the appropriate setting on the fan transformer are indicated in the following tables (factory presetting: 480 V / 0 V or 690 V / 0 V).

Note

With the 3 AC 500 V to 690 V fan transformer, a jumper is inserted between the "600 V" terminal and "CON" terminal. The jumper between terminal "600 V" and "CON" is for internal use.

NOTICE

Consequences of incorrect voltage setting

If the terminals are not reconnected to the actual line voltage:

- The required cooling level will not be provided (risk of overheating).
- The fan fuses may blow (overload).

Table 3- 38 Line voltage assignment for the setting at the fan transformer (3 AC 380 ... 480 V)

Line voltage	Tap at the fan transformer (-T10)
380 V ± 10%	380 V
400 V ± 10%	400 V
440 V ± 10%	440 V
480 V ± 10%	480 V

Table 3- 39 Line voltage assignment for the setting at the fan transformer (3 AC 500 ... 690 V)

Line voltage	Tap at the fan transformer (-T10)
500 V ± 10%	500 V
525 V ± 10%	525 V
575 V ± 10%	575 V
600 V ± 10%	600 V
660 V ± 10%	660 V
690 V ± 10%	690 V

3.4.6 Technical specifications

Table 3- 40 Technical data for Active Line Modules, 3 AC 380 V ... 480 V, Part 1

Order number	6SL3330–	7TE32–1AA3	7TE32–6AA3	7TE33–8AA3	7TE35–0AA3
Rated output					
- For I_{n_DC} (50 Hz, 400 V)	kW	132	160	235	300
- For I_{H_DC} (50 Hz, 400 V)	kW	115	145	210	270
- For I_{n_DC} (60 Hz, 460 V)	HP	200	250	400	500
- For I_{H_DC} (60 Hz, 460 V)	HP	150	200	300	400
DC-link current					
- Rated current I_{n_DC}	A	235	291	425	549
- Base load current I_{H_DC}	A	209	259	378	489
- Maximum current I_{max_DC}	A	352	436	637	823
Infeed/regenerative feedback current					
- Rated current I_{n_E}	A	210	260	380	490
- Maximum current I_{max_E}	A	315	390	570	735
Supply voltages					
- Line voltage	V_{ACrms}	3AC 380 -10% (-15% < 1 min) ... 3AC 480 +10%			
- Line frequency	Hz	47 ... 63Hz			
- Electronic power supply	V_{DC}	24 (20.4 ... 28.8)			
- DC-link voltage	V_{DC}	1.5 x U_{line}			
Pulse frequency	kHz	4	4	4	4
Current consumption					
- Electronics current consumption (24 VDC)	A	1.1	1.1	1.35	1.35
- Total fan current consumption (at 400 VAC)	A	0.63	1.13	1.8	1.8
Max. ambient temperature					
- Without derating	° C	40	40	40	40
- With derating	° C	55	55	55	55
DC-link capacitance	µF	4200	5200	7800	9600
Power loss 1)					
- At 50 Hz 400 V	kW	2.2	2.7	3.9	4.8
- At 60 Hz 460 V	kW	2.3	2.9	4.2	5.1
Cooling air requirement	m^3/s	0.17	0.23	0.36	0.36
Sound pressure level 2)					
L_{pA} (1 m) at 50/60 Hz	dB(A)	64 / 67	64 / 67	69 / 73	69 / 73
Line/load connection		Flat connector for screw			
		M10	M10	M10	M10
Max. connection cross-sections					
- Line connection (U1, V1, W1)	mm²	2 x 185	2 x 185	2 x 240	2 x 240
- DC-link connection (DCP, DCN)	mm²	2 x 185	2 x 185	2 x 240	2 x 240
- PE connection PE1	mm²	2 x 185	2 x 185	2 x 240	2 x 240
- PE connection PE2	mm²	2 x 185	2 x 185	2 x 240	2 x 240
Max. cable length (total of all motor cables and DC link)					
- Shielded					
- Unshielded	m	2700	2700	2700	2700
	m	4050	4050	4050	4050
Degree of protection		IP20	IP20	IP20	IP20

Order number	6SL3330–	7TE32–1AA3	7TE32–6AA3	7TE33–8AA3	7TE35–0AA3
Dimensions - Width - Height - Depth	 mm mm mm	 326 1400 356	 326 1400 356	 326 1533 545	 326 1533 545
Frame size		FX	FX	GX	GX
Weight	kg	95	95	136	136
Recommended fuse 3) - Number (connected in parallel) - Rated current - Frame size acc. to IEC 60269		3NE1230-2 1 315 2	3NE1331-2 1 350 2	3NE1334-2 1 500 3	3NE1436-2 1 630 3
Minimum short-circuit current 4)	A	6200	10500	10500	8000

1) The specified power loss is the maximum value at 100% capacity utilization. The value in normal operation is lower.

2) Total sound pressure level of Active Interface Module and Active Line Module.

3) To achieve a UL-approved system, it is absolutely essential to use the fuse types specified in the table.

4) Current required for reliable triggering of the protective devices.

Table 3- 41 Technical data for Active Line Modules, 3 AC 380 V ... 480 V, Part 2

Order number	6SL3330–	7TE36–1AA3	7TE37–5AA3	7TE38–4AA3	7TE41–0AA3
Rated output - For I_{n_DC} (50 Hz, 400 V) - For I_{H_DC} (50 Hz, 400 V) - For I_{n_DC} (60 Hz, 460 V) - For I_{H_DC} (60 Hz, 460 V)	 kW kW HP HP	 380 335 600 500	 450 400 600 600	 500 465 700 700	 630 545 900 800
DC-link current - Rated current I_{n_DC} - Base load current I_{H_DC} - Maximum current I_{max_DC}	 A A A	 678 603 1017	 835 700 1252	 940 837 1410	 1103 982 1654
Infeed/regenerative feedback current - Rated current I_{n_E} - Maximum current I_{max_E}	 A A	 605 907	 745 1117	 840 1260	 985 1477
Supply voltages - Line voltage - Line frequency - Electronic power supply - DC-link voltage	 V_{ACrms} Hz V_{DC} V_{DC}	 3AC 380 -10% (-15% < 1 min) ... 3AC 480 +10% 47 ... 63Hz 24 (20.4 ... 28.8) 1.5 x U_{line}			
Pulse frequency	kHz	2.5	2.5	2.5	2.5
Current consumption - Electronics current consumption (24 VDC) - Total fan current consumption (at 400 VAC)	 A A	 1.4 3.6	 1.4 3.6	 1.4 3.6	 1.5 5.4
Max. ambient temperature - Without derating - With derating	 ° C ° C	 40 55	 40 55	 40 55	 40 55
DC-link capacitance	µF	12600	15600	16800	18900
Power loss 1) - At 50 Hz 400 V - At 60 Hz 460 V	 kW kW	 6.2 6.6	 7.3 7.7	 7.7 8.2	 10.1 10.8
Cooling air requirement	m^3/s	0.78	0.78	0.78	1.08
Sound pressure level 2) L_{pA} (1 m) at 50/60 Hz	 dB(A)	 70 / 73	 70 / 73	 70 / 73	 71 / 73
Line/load connection		Flat connector for screw			
		M12	M12	M12	M12
Max. connection cross-sections - Line connection (U1, V1, W1) - DC-link connection (DCP, DCN) - PE connection PE1 - PE connection PE2	 mm² mm² mm² mm²	 4 x 240 Busbar 1 x 240 2 x 240	 4 x 240 Busbar 1 x 240 2 x 240	 4 x 240 Busbar 1 x 240 2 x 240	 6 x 240 Busbar 1 x 240 3 x 240
Max. cable length (total of all motor cables and DC link) - Shielded - Unshielded	 m m	 3900 5850	 3900 5850	 3900 5850	 3900 5850
Degree of protection		IP00	IP00	IP00	IP00

Order number	6SL3330–	7TE36–1AA3	7TE37–5AA3	7TE38–4AA3	7TE41–0AA3
Dimensions - Width - Height - Depth	 mm mm mm	 503 1475 540	 503 1475 540	 503 1475 540	 704 1480 550
Frame size		HX	HX	HX	JX
Weight	kg	290	290	290	450
Recommended fuse 3) - Number (connected in parallel) - Rated current - Frame size acc. to IEC 60269		3NE1438-2 1 800 3	3NE1333-2 2 450 2	3NE1334-2 2 500 3	3NE1436-2 2 630 3
Minimum short-circuit current 4)	A	9200	8800	10400	16000

1) The specified power loss is the maximum value at 100% capacity utilization. The value in normal operation is lower.

2) Total sound pressure level of Active Interface Module and Active Line Module.

3) To achieve a UL-approved system, it is absolutely essential to use the fuse types specified in the table.

4) Current required for reliable triggering of the protective devices.

Table 3- 42 Technical data for Active Line Modules, 3 AC 380 V ... 480 V, Part 3

Order number	6SL3330–	7TE41–2AA3	7TE41–4AA3		
Rated output - For I_{n_DC} (50 Hz, 400 V) - For I_{H_DC} (50 Hz, 400 V) - For I_{n_DC} (60 Hz, 460 V) - For I_{H_DC} (60 Hz, 460 V)	 kW kW HP HP	 800 690 1000 900	 900 780 1250 1000		
DC-link current - Rated current I_{n_DC} - Base load current I_{H_DC} - Maximum current I_{max_DC}	 A A A	 1412 1255 2120	 1574 1401 2361		
Infeed/regenerative feedback current - Rated current I_{n_E} - Maximum current I_{max_E}	 A A	 1260 1890	 1405 2107		
Supply voltages - Line voltage - Line frequency - Electronic power supply - DC-link voltage	 V_{ACrms} Hz V_{DC} V_{DC}	 3AC 380 -10% (-15% < 1 min) ... 3AC 480 +10% 47 ... 63Hz 24 (20.4 ... 28.8) 1.5 x U_{line}			
Pulse frequency	kHz	2.5	2.5		
Current consumption - Electronics current consumption (24 VDC) - Total fan current consumption (at 400 VAC)	 A A	 1.7 5.4	 1.7 5.4		
Max. ambient temperature - Without derating - With derating	 ° C ° C	 40 55	 40 55		
DC-link capacitance	μF	26100	28800		
Power loss [1)] - At 50 Hz 400 V - At 60 Hz 460 V	 kW kW	 12.1 13	 13.3 14.2		
Cooling air requirement	m^3/s	1.08	1.08		
Sound pressure level [2)] L_{pA} (1 m) at 50/60 Hz	 dB(A)	 71 / 73	 71 / 73		
Line/load connection		Flat connector for screw			
		M12	M12		
Max. connection cross-sections - Line connection (U1, V1, W1) - DC-link connection (DCP, DCN) - PE connection PE1 - PE connection PE2	 mm² mm² mm² mm²	 6 x 240 Busbar 1 x 240 3 x 240	 6 x 240 Busbar 1 x 240 3 x 240		
Max. cable length (total of all motor cables and DC link) - Shielded - Unshielded	 m m	 3900 5850	 3900 5850		
Degree of protection		IP00	IP00		

Order number	6SL3330–	7TE41–2AA3	7TE41–4AA3		
Dimensions - Width - Height - Depth	 mm mm mm	 704 1480 550	 704 1480 550		
Frame size		JX	JX		
Weight	kg	450	450		
Recommended fuse 3) - Number (connected in parallel) - Rated current - Frame size acc. to IEC 60269		3NE1448-2 2 850 3	3NE1448-2 2 850 3		
Minimum short-circuit current 4)	A	21000	21000		

1) The specified power loss is the maximum value at 100% capacity utilization. The value in normal operation is lower.

2) Total sound pressure level of Active Interface Module and Active Line Module.

3) To achieve a UL-approved system, it is absolutely essential to use the fuse types specified in the table.

4) Current required for reliable triggering of the protective devices.

Table 3- 43 Technical data for Active Line Modules, 3 AC 500 V ... 690 V

Order number	6SL3330–	7TG35–8AA3	7TG37–4AA3	7TG41–0AA3	7TG41–3AA3
Rated power - For I_{n_DC} (50 Hz, 690 V) - For I_{H_DC} (50 Hz, 690 V) - For I_{n_DC} (50 Hz, 500 V) - For I_{H_DC} (50 Hz, 500 V) - For I_{n_DC} (60 Hz, 575 V) - For I_{H_DC} (60 Hz, 575 V)	 kW kW kW kW HP HP	 560 550 435 400 600 450	 800 705 560 510 900 600	 1100 980 780 710 1250 1000	 1400 1215 965 880 1500 1250
DC-link current - Rated current I_{n_DC} - Base load current I_{H_DC} - Maximum current I_{max_DC}	 A A A	 644 573 966	 823 732 1234	 1148 1022 1722	 1422 1266 2133
Infeed/regenerative feedback current - Rated current I_{n_E} - Maximum current I_{max_E}	 A A	 575 862	 735 1102	 1025 1537	 1270 1905
Supply voltages - Line voltage - Line frequency - Electronic power supply - DC-link voltage	 V_{ACrms} Hz V_{DC} V_{DC}	 3AC 500 -10% (-15% < 1 min) ... 3AC 690 +10% 47 ... 63Hz 24 (20.4 ... 28.8) 1.5 x U_{line}			
Pulse frequency	kHz	2.5	2.5	2.5	2.5
Current consumption - Electronics current consumption (24 VDC) - 500 VAC - 690 VAC	 A A A	 1.4 3.0 2.1	 1.5 4.4 3.1	 1.7 4.4 3.1	 1.7 4.4 3.1
Max. ambient temperature - Without derating - With derating	 ° C ° C	 40 55	 40 55	 40 55	 40 55
DC-link capacitance	µF	7400	11100	14400	19200
Power loss [1)] - At 50 Hz 690 V - At 60 Hz 575 V	 kW kW	 6.8 6.2	 10.2 9.6	 13.6 12.9	 16.5 15.3
Cooling air requirement	m^3/s	0.78	1.08	1.08	1.08
Sound pressure level [2)] L_{pA} (1 m) at 50/60 Hz	 dB(A)	 70 / 73	 71 / 73	 71 / 73	 71 / 73
Line/load connection		Flat connector for screw			
		M12	M12	M12	M12
Max. connection cross-sections - Line connection (U1, V1, W1) - DC-link connection (DCP, DCN) - PE connection PE1 - PE connection PE2	 mm² mm² mm² mm²	 4 x 240 Busbar 1 x 240 2 x 240	 6 x 240 Busbar 1 x 240 3 x 240	 6 x 240 Busbar 1 x 240 3 x 240	 6 x 240 Busbar 1 x 240 3 x 240
Max. cable length (total of all motor cables and DC link) - Shielded - Unshielded	 m m	 2250 3375	 2250 3375	 2250 3375	 2250 3375
Degree of protection		IP00	IP00	IP00	IP00

Order number	6SL3330–	7TG35–8AA3	7TG37–4AA3	7TG41–0AA3	7TG41–3AA3
Dimensions - Width - Height - Depth	 mm mm mm	 503 1475 540	 704 1480 550	 704 1480 550	 704 1480 550
Frame size		HX	JX	JX	JX
Weight	kg	290	450	450	450
Recommended fuse [3)] - Number (connected in parallel) - Rated current - Frame size acc. to IEC 60269		3NE1447-2 1 670 3	3NE1448-2 1 850 3	3NE1436-2 2 630 3	3NE1438-2 2 800 3
Minimum short-circuit current [4)]	A	8400	10500	16000	20000

1) The specified power loss is the maximum value at 100% capacity utilization. The value in normal operation is lower.

2) Total sound pressure level of Active Interface Module and Active Line Module.

3) To achieve a UL-approved system, it is absolutely essential to use the fuse types specified in the table.

4) Current required for reliable triggering of the protective devices.

Overload capability

The Active Line Modules have an overload reserve.

The criterion for overload is that the Active Line Module is operated with its base load current before and after the overload occurs (a load duration of 300 s is used as a basis here).

High overload

The base load current for a high overload I_{H_DC} is based on a duty cycle of 150% for 60 s; the max. current I_{max_DC} can flow for 5 s.

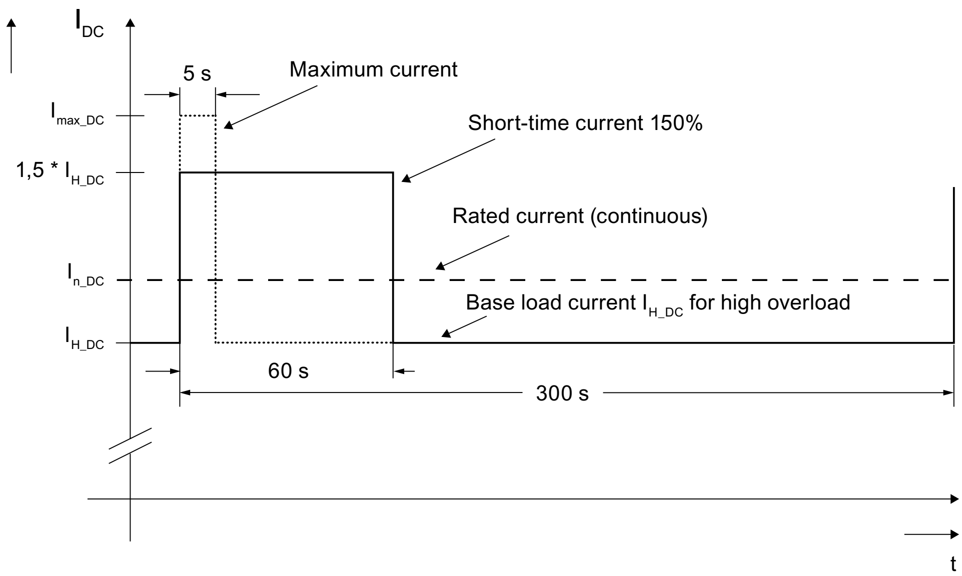


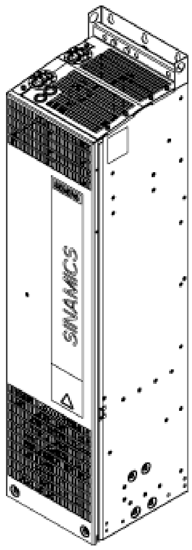
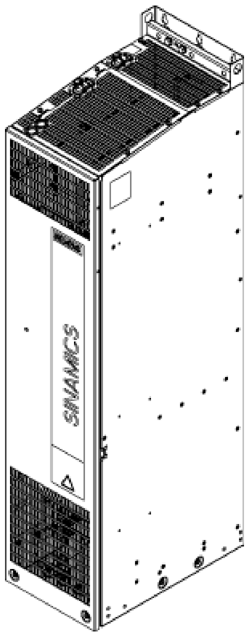
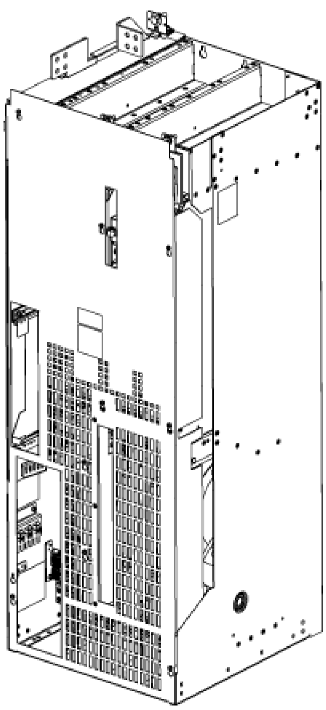
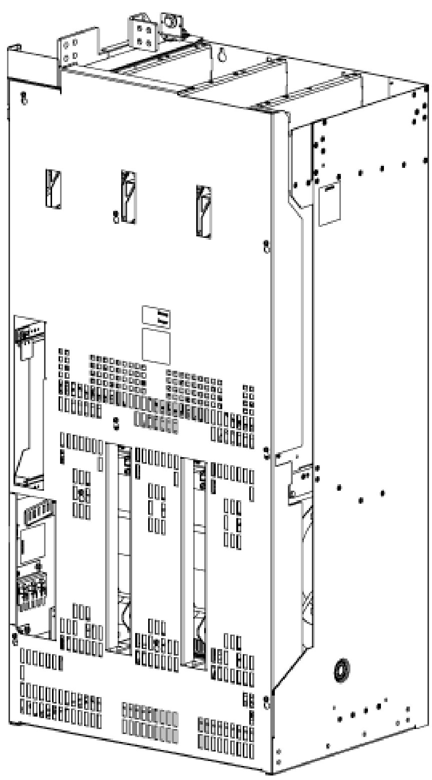
Figure 3-39 High overload

Motor Modules 4

4.1 Description

A Motor Module is a power unit (DC-AC inverter) that provides the power supply for the motor connected to it. Power is supplied by means of the DC link of the drive unit.
A Motor Module must be connected to a Control Unit via DRIVE-CLiQ. The open-loop and closed-loop control functions are stored in the Control Unit.

Table 4- 1 Overview of Motor Modules

			
Frame size FX	Frame size GX	Frame size HX	Frame size JX

Operating principle

Motor Modules are designed for multi-axis drive systems and are controlled by either a CU320-2 or a SIMOTION D Control Unit. Motor Modules are interconnected by means of a shared DC busbar.

One or more Motor Modules are supplied with energy for the motors via the DC link. Both synchronous and induction motors can be operated.

Since the Motor Modules share the same DC link, they can exchange energy with one another, i.e. if one Motor Module operating in generator mode produces energy, the energy can be used by another Motor Module operating in motor mode. The DC link is supplied with line voltage by a Line Module.

Characteristics of the Motor Modules

- Version for 510 VDC to 750 VDC from 210 up to 1405 A

  Version for 675 VDC to 1080 VDC from 85 up to 1270 A
- Internal air cooling
- Short-circuit/ground-fault-proof
- Electronic rating plate
- Operating status and error status via LEDs
- DRIVE-CLiQ interface for communication with the Control Unit and/or other components in the drive line-up.
- Integration in system diagnostics

4.2 Safety information

⚠ WARNING
Dangerous electrical voltage
After disconnecting all the supply voltages, a hazardous voltage will be present in all components for another 5 minutes. Work cannot be carried out until this time has elapsed.
Before starting work, you should also measure the voltage after the 5 minutes have elapsed. The voltage can be measured on DC-link terminals DCP and DCN.

⚠ CAUTION
Danger notice in the local language
The DC-link discharge time hazard warning must be affixed to the component in the relevant local language.

NOTICE
Maintain ventilation clearances
The ventilation clearances above, below, and in front of the component, which are specified in the dimension drawings, must be observed.

⚠ WARNING
Potentially fatal touch voltage
Cable shields and power cable conductors which are not used, must be connected to PE potential in order to discharge charges as a result of capacitive coupling.
Non-observance can cause lethal shock voltages.

⚠ WARNING
Remove linkage levers for frame sizes HX and JX
For Motor Modules of frame sizes HX and JX, the linkage levers marked in red must be removed once the devices have been installed.
Non-observance can cause damage to the device through undershooting the necessary voltage clearances.

4.3 Interface description

4.3.1 Overview

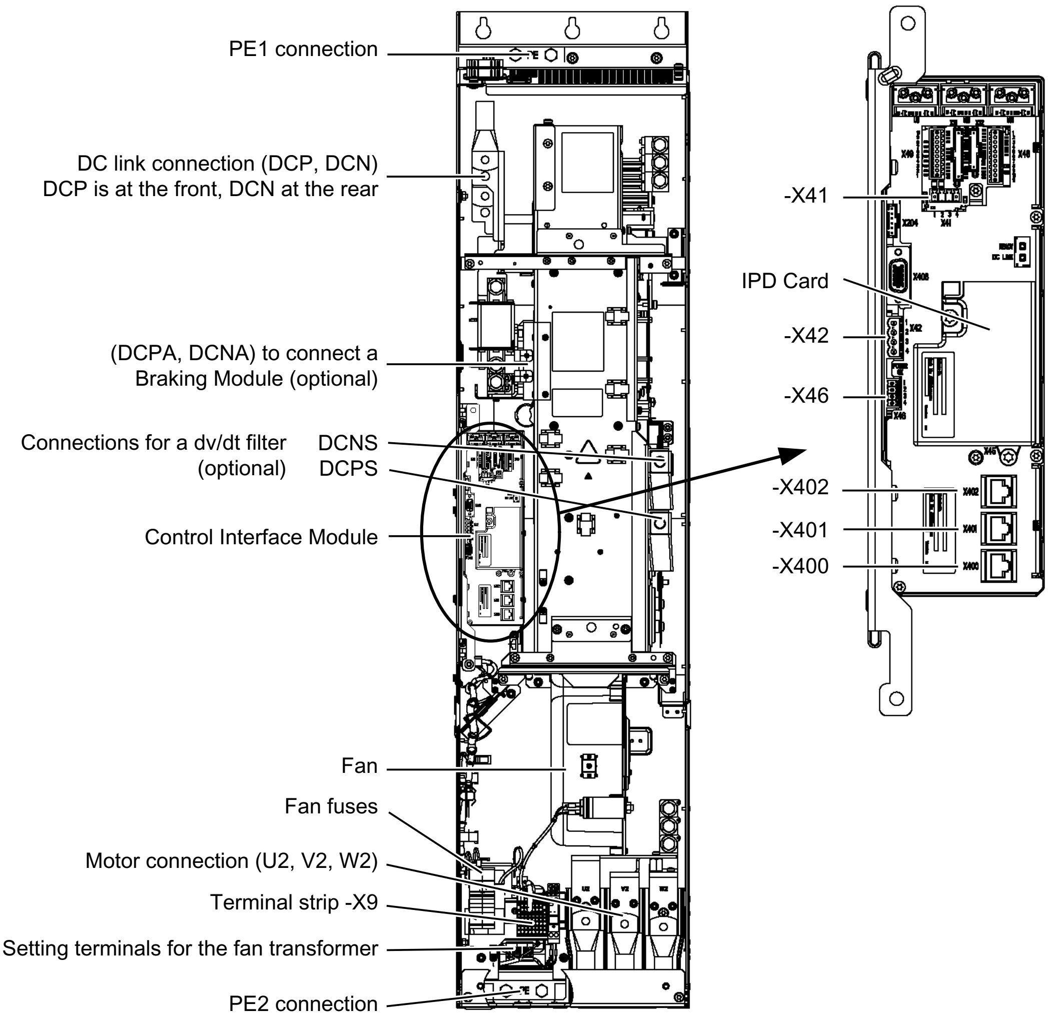


Figure 4-1 Motor Module, frame size FX

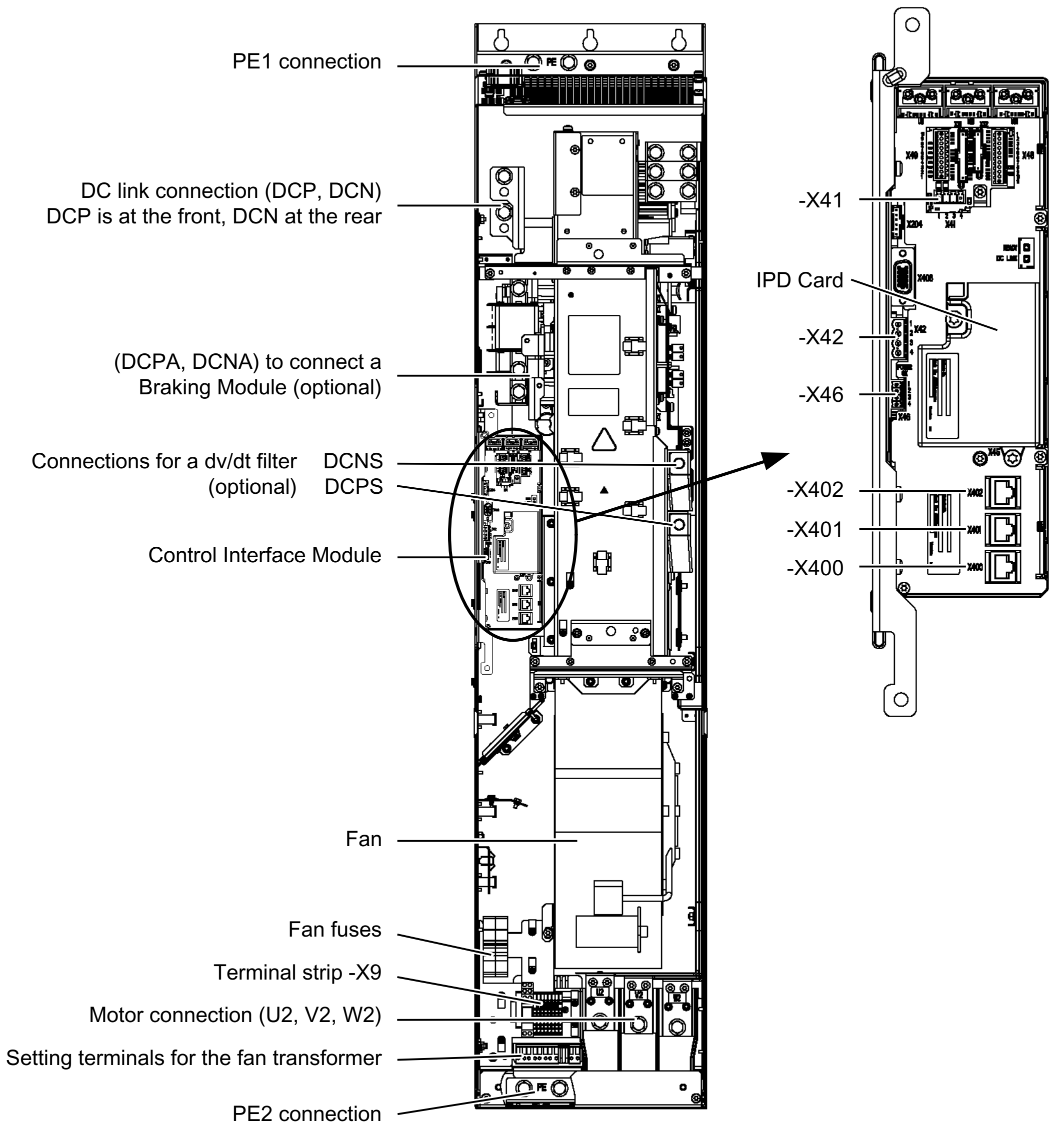


Figure 4-2 Motor Module, frame size GX

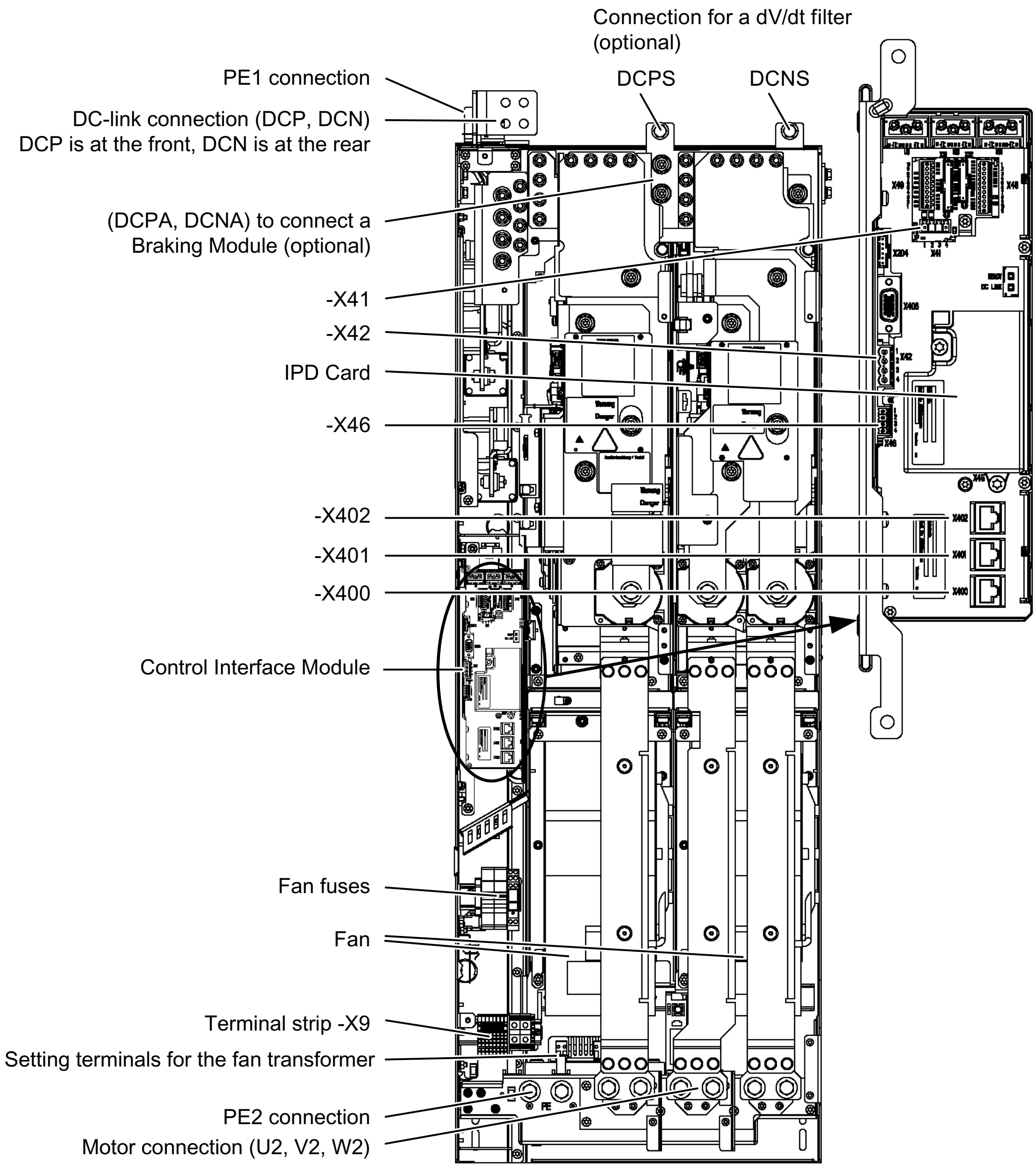


Figure 4-3 Motor Module, frame size HX

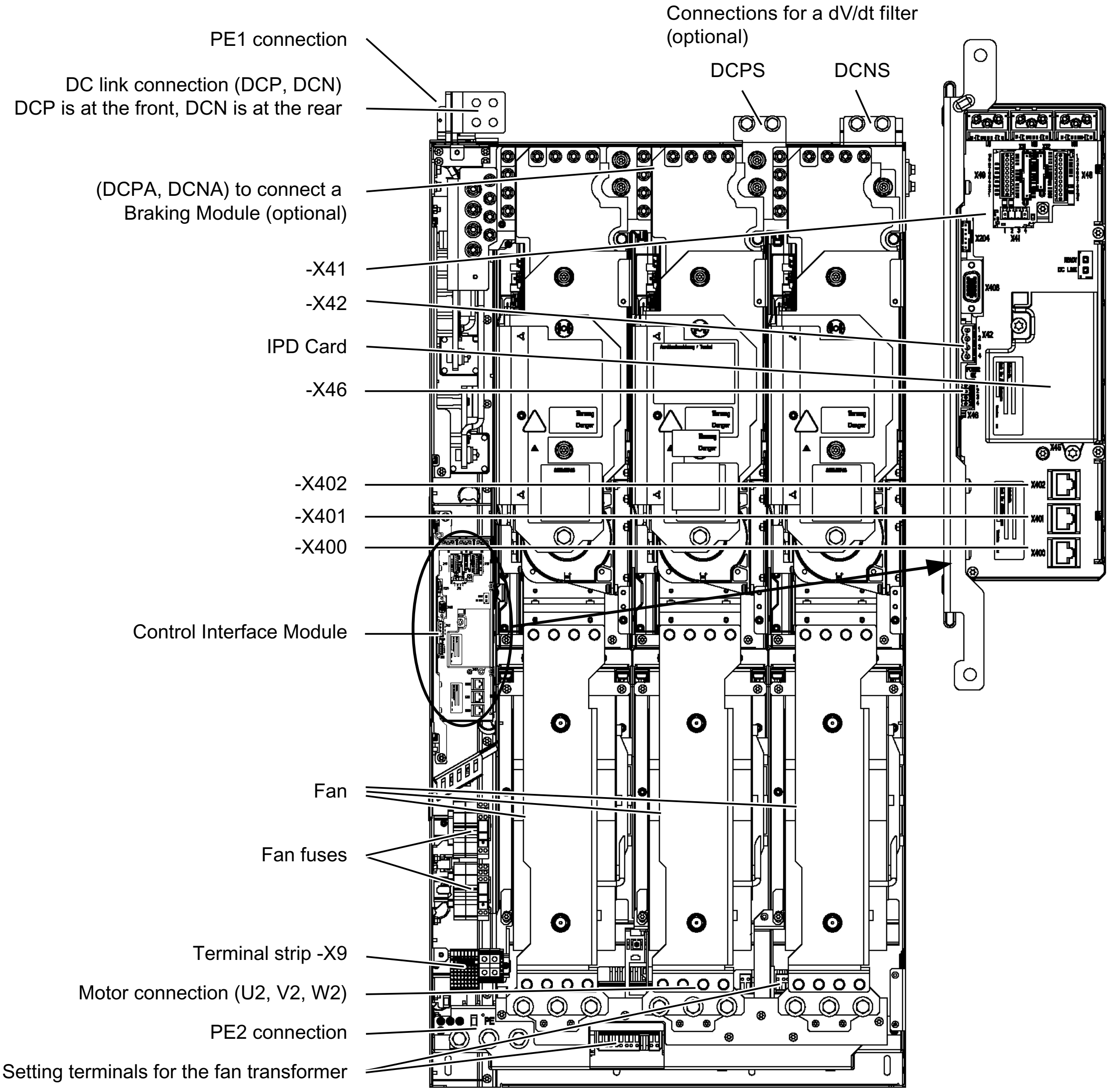


Figure 4-4 Motor Module, frame size JX

4.3.2 Connection example

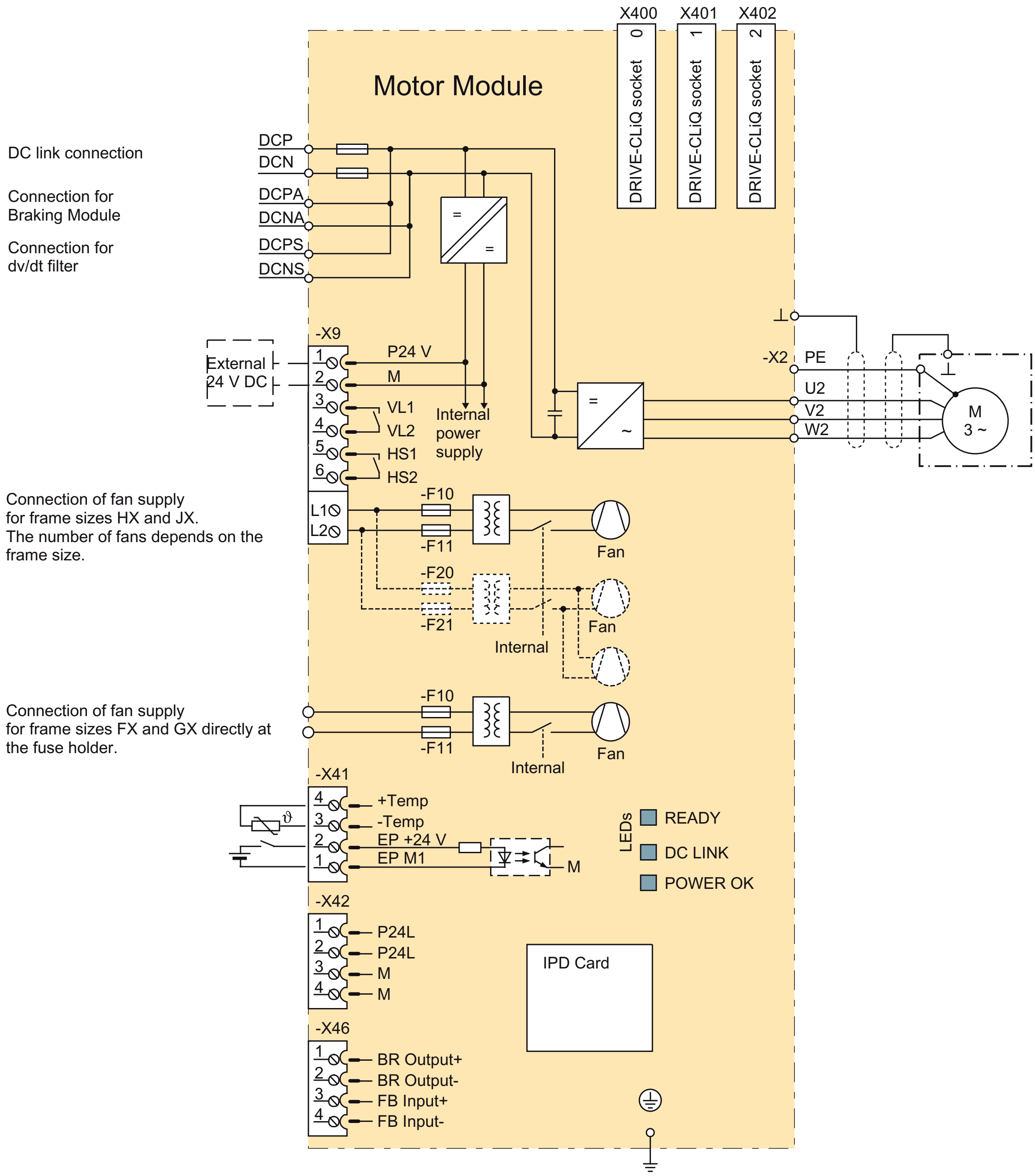


Figure 4-5 Connection example Motor Modules

4.3.3 DC link/motor connection

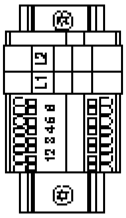
Table 4- 2 DC link/motor connection of the Motor Module

Terminals	Technical specifications
DCP, DCN DC power input	Voltage: • 510 ... 750 V DC • 675 ... 1080 V DC Connections: • Frame sizes FX / GX: Thread M10 / 25 Nm for cable lugs in accordance with DIN 46234 / DIN 46235 [1)] • Frame sizes HX / JX: d = 12 mm (M12/50 Nm) flat connector for busbar
DCPA, DCNA Connection for Braking Module	Voltage: • 510 ... 750 V DC • 675 ... 1080 V DC Connections: • Frame sizes FX / GX: Threaded bolts M6 / 6 Nm for cable lugs in accordance with DIN 46234 / DIN 46235 [1)] • Frame sizes HX / JX: Connection for connection clip
DCPS, DCNS connection for a dV/dt filter plus VPL	Voltage: • 510 ... 750 V DC • 675 ... 1080 V DC Connections: • Frame sizes FX / GX: Thread M8 / 13 Nm for cable lugs in accordance with DIN 46234 / DIN 46235 [1)] • Frame sizes HX / JX: Thread M10 / 25 Nm for cable lugs in accordance with DIN 46234 / DIN 46235 [1)]
U2, V2, W2 3 AC power output	Voltage: • 0 V 3 AC to 0.72 x DC link voltage Connecting thread: • Frame sizes FX / GX: M10 / 25 Nm for cable lugs in accordance with DIN 46234 / DIN 46235 [1)] • Frame sizes HX / JX: M12 / 50 Nm for cable lugs in accordance with DIN 46234 / DIN 46235 [1)]
PE connection PE1, PE2	Connecting thread: • Frame sizes FX / GX: M10 / 25 Nm for cable lugs in accordance with DIN 46234 / DIN 46235 [1)] • Frame sizes HX / JX: M12 / 50 Nm for cable lugs in accordance with DIN 46234 / DIN 46235 [1)]

[1]) Dimensions for connecting alternative cable lugs, see "cable lugs" in the appendix.

4.3.4 X9 terminal strip

Table 4- 3 Terminal strip X9

	Terminal	Signal name	Technical specifications
	1	P24V	Voltage: 24 V DC (20.4 ... 28.8 V) Current consumption: max. 1.4 A
	2	M	
	3	VL1	240 V AC: 8 A max. 24 V DC: max. 1 A isolated
	4	VL2	
	5	HS1	240 V AC: 8 A max. 24 V DC: max. 1 A isolated
	6	HS2	
	L1	Connection for fan supply (frame sizes HX and JX only)	AC 380 ... 480 V / AC 500 ... 690 V Current consumption: See Technical data
	L2		
Max. connectable cross-section: Terminals 1 ... 6: 1.5 mm², Terminals L1 - L2: 35 mm²			

Note

Connecting fan supply, with frame sizes FX and GX

The fan supply for frame sizes FX and GX is connected directly to fuse holders -F10 and -F11.

4.3.5 DCPS, DCNS connection for a dv/dt filter

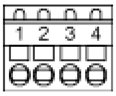
Table 4- 4 DCPS, DCNS

Frame size	Connectable cross-section	Terminal screw
FX	1 x 35 mm²	M8
GX	1 x 70 mm²	M8
HX	1 x 185 mm²	M10
JX	2 x 185 mm²	M10

With frame sizes FX and GX, the connecting cables are routed down through the Motor Module and out.

4.3.6 X41 EP terminal / temperature sensor connection

Table 4- 5 Terminal strip X41

	Terminal	Function	Technical specifications
	1	EP M1 (Enable Pulses)	Supply voltage: 24 VDC (20.4 ... 28.8 V) Current consumption: 10 mA Signal propagation delay times: L → H 100 µs H → L: 1000 µs The pulse inhibit function is only available when Safety Integrated Basic Functions are enabled.
	2	EP +24 V (Enable Pulses)	
	3	- Temp	Temperature sensor connection KTY84-1C130/PTC / PT100
	4	+ Temp	
Max. connectable cross-section 1.5 mm²			

⚠ DANGER

Electrical shock hazard

Only temperature sensors that meet the safety isolation specifications stipulated in EN 61800-5-1 may be connected to terminals "+Temp" and "-Temp". If safe electrical separation cannot be guaranteed (for linear motors or third-party motors, for example), a Sensor Module External (SME120 or SME125) must be used.

If these instructions are not complied with, there is a risk of electric shock!

Note

Connectable sensor

The following probes can be connected to the temperature sensor connection:
KTY84-1C130 / PTC / PT100.

NOTICE

Use shielded cables

The temperature sensor connection must be shielded. The shielding must be attached to the shield support of the Motor Module.

Note

KTY temperature sensor connected with the correct polarity

The KTY temperature sensor must be connected with the correct polarity.
If the polarity is reversed, the sensor will not be able to detect if the motor overheats.

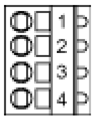
Note

EP terminals only for Safety Integrated Basic Functions

The function of the EP terminals is only available when Safety Integrated Basic Functions are enabled.

4.3.7 X42 terminal strip

Table 4- 6 Terminal strip X42 voltage supply for Control Unit, Sensor Module and Terminal Module

	Terminal	Function	Technical specifications
	1	P24L	Voltage supply for Control Unit, Sensor Module and Terminal Module (18 to 28.8 V) maximum load current: 3 A
	2		
	3	M	
	4		
Max. connectable cross-section 2.5 mm²			

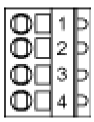
⚠ **CAUTION**

Terminal strip is not intended for free 24 VDC availability

The terminal strip is not intended for free 24V DC availability (for example for supplying further line-side components), as the voltage supply of the Control Interface Module could also be overloaded and operating capability could thus be compromised.

4.3.8 X46 Brake control and monitoring

Table 4- 7 Terminal strip X46 brake control and monitoring

	Terminal	Function	Technical specifications
	1	BR output +	The interface is intended for connection of the Safe Brake Adapter.
	2	BR output -	
	3	FB input +	
	4	FB input -	
Max. connectable cross-section 1.5 mm²			

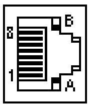
NOTICE

Cable length

The length of the connecting lead at terminal strip X46 must not exceed 10 m, and the lead must not be brought out outside the control cabinet or control cabinet group.

4.3.9 DRIVE-CLiQ interfaces X400, X401, X402

Table 4- 8 DRIVE-CLiQ interfaces X400, X401, X402

	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)	24 V power supply
	B	M (0 V)	Electronics ground
Blanking plate for DRIVE-CLiQ interfaces (50 pcs.) order number: 6SL3066-4CA00-0AA0			

4.3.10 Meaning of the LEDs on the Control Interface Module in the Motor Module

Table 4- 9 Meaning of the LEDs "READY" and "DC LINK" on the Control Interface Module in the Motor Module

LED state		Description
READY	DC LINK	
Off	Off	The electronics power supply is missing or out of tolerance.
Green	Off	The component is ready for operation and cyclic DRIVE-CLiQ communication is taking place.
	Orange	The component is ready for operation and cyclic DRIVE-CLiQ communication is taking place. The DC-link voltage is present.
	Red	The component is ready for operation and cyclic DRIVE-CLiQ communication is taking place. The DC-link voltage is too high.
Orange	Orange	DRIVE-CLiQ communication is being established.
Red	---	At least one fault is present in this component. Note: LED is driven irrespective of the corresponding messages being reconfigured.
Flashing light 0.5 Hz: Green / red	---	Firmware is being downloaded.
2 Hz flashing: Green / red	---	Firmware download is complete. Waiting for POWER ON.
2 Hz flashing: Green / orange or red / orange	---	Component detection using LED is activated (p0124) Note: The two options depend on the LED status when module recognition is activated via p0124 = 1.

Table 4- 10 Meaning of the LED "POWER OK" on the Control Interface Module in the Motor Module

LED	Color	Status	Description
POWER OK	Green	Off	DC-link voltage < 100 V and voltage at -X9:1/2 less than 12 V.
		On	The component is ready for operation.
		Flashing light	There is a fault. If the LED continues to flash after you have performed a POWER ON, please contact your Siemens service center.

⚠WARNING

Hazardous DC-link voltage

Irrespective of the state of the LED "DC LINK", hazardous DC-link voltages can always be present.

The warning information on the component must be carefully observed!

4.4 Dimension drawing

Dimension drawing, frame size FX

The mandatory cooling clearances are indicated by the dotted line.

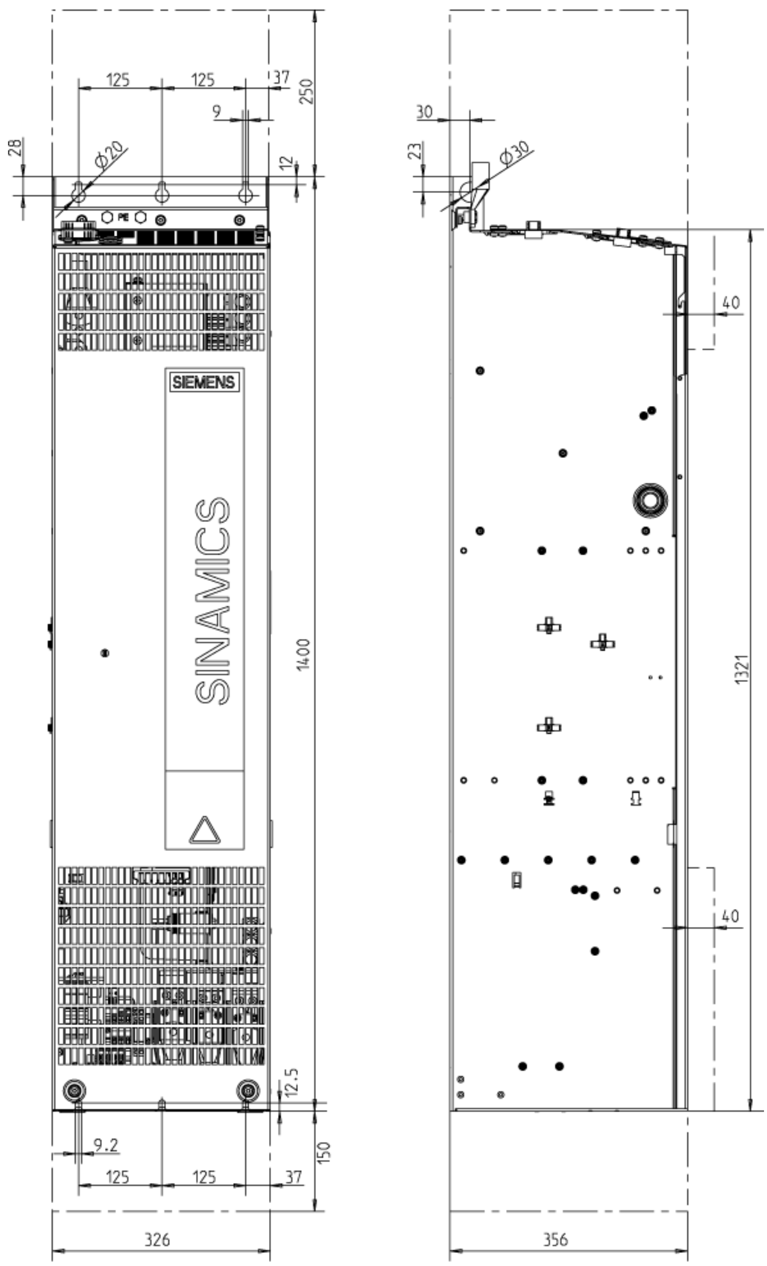


Figure 4-6 Dimension drawing Motor Module, frame size FX Front view, side view

Dimension drawing, frame size GX

The mandatory cooling clearances are indicated by the dotted line.

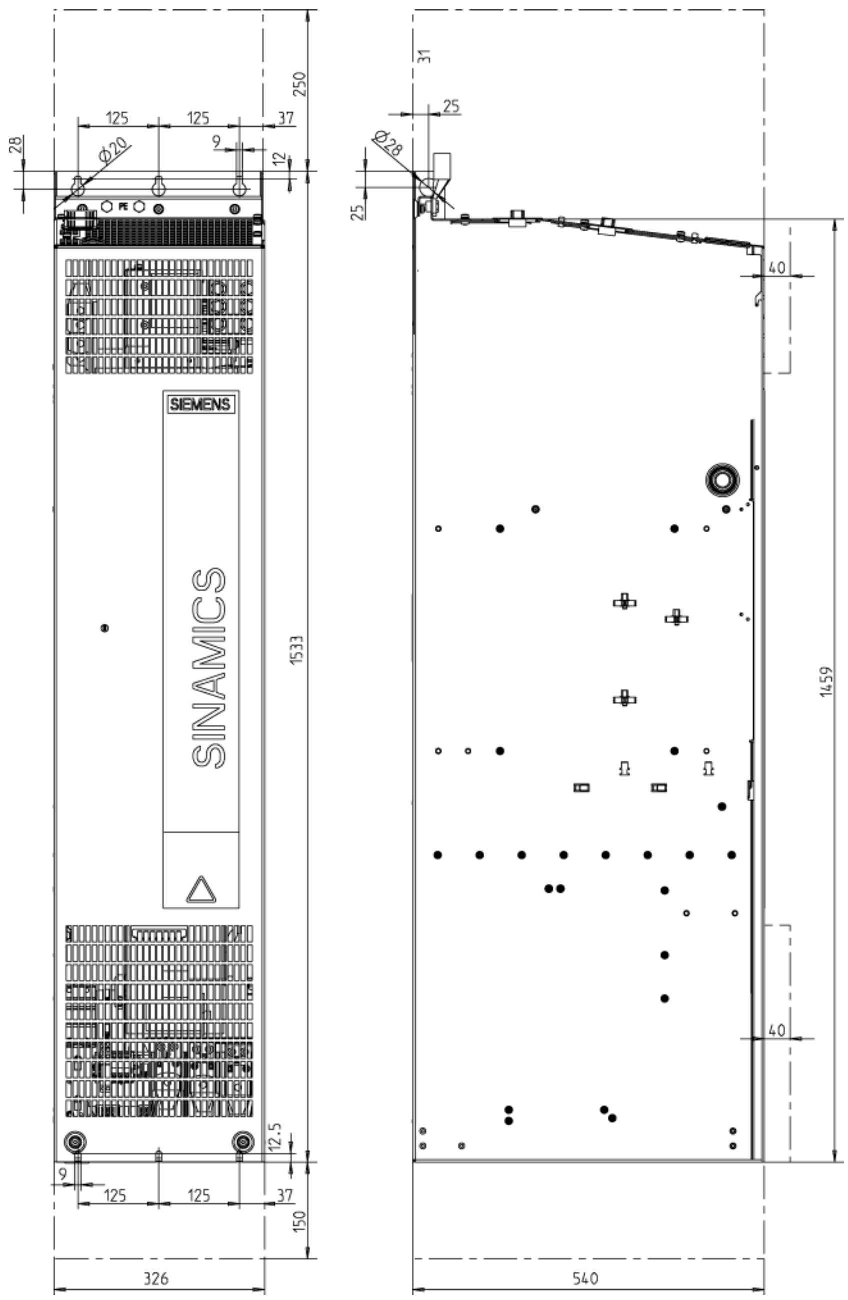


Figure 4-7 Dimension drawing Motor Module, frame size GX Front view, side view

Dimension drawing, frame size HX

The mandatory cooling clearances are indicated by the dotted line.

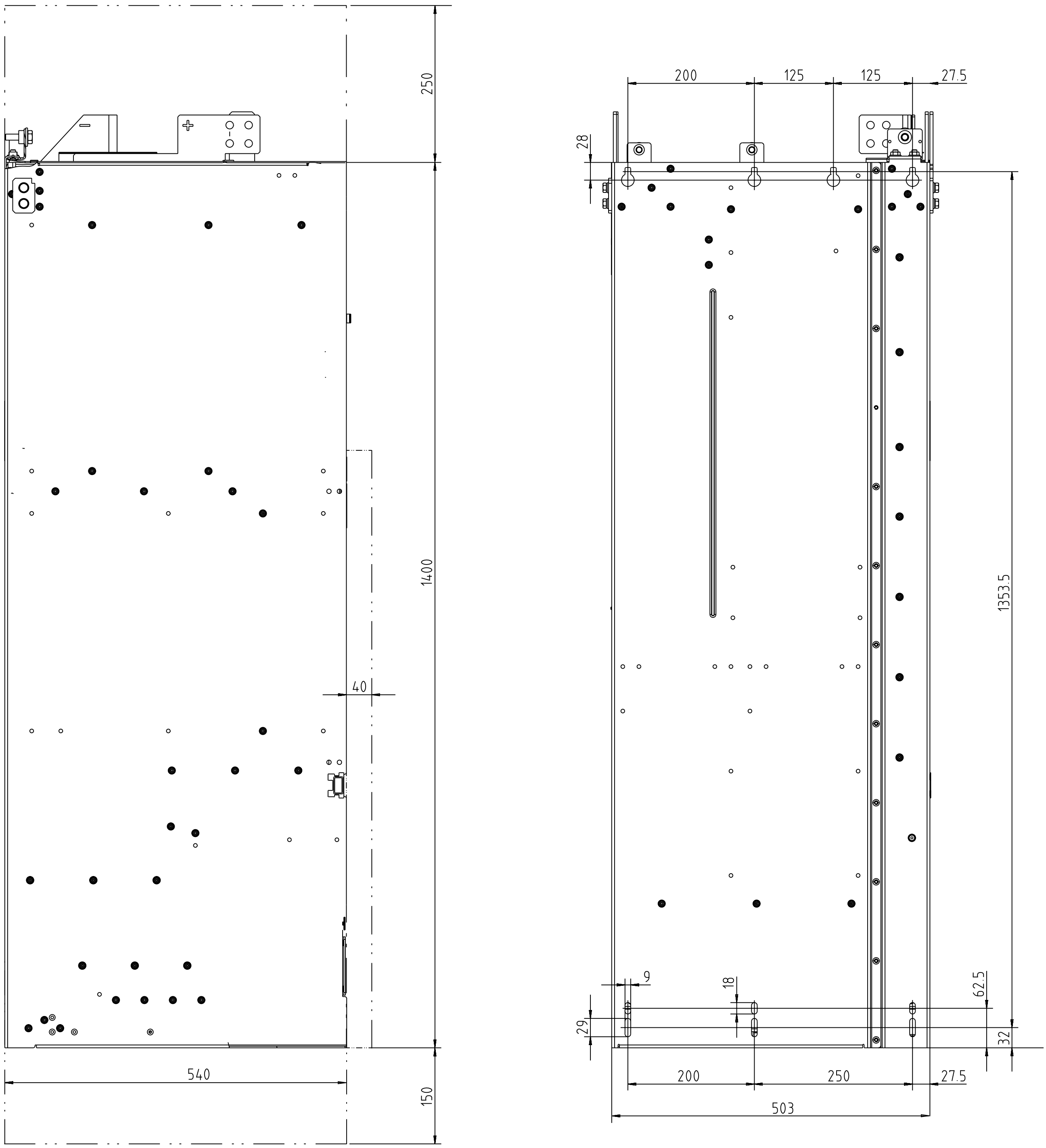


Figure 4-8 Dimension drawing Motor Module, frame size HX Side view, rear view

Dimension drawing, frame size JX

The mandatory cooling clearances are indicated by the dotted line.

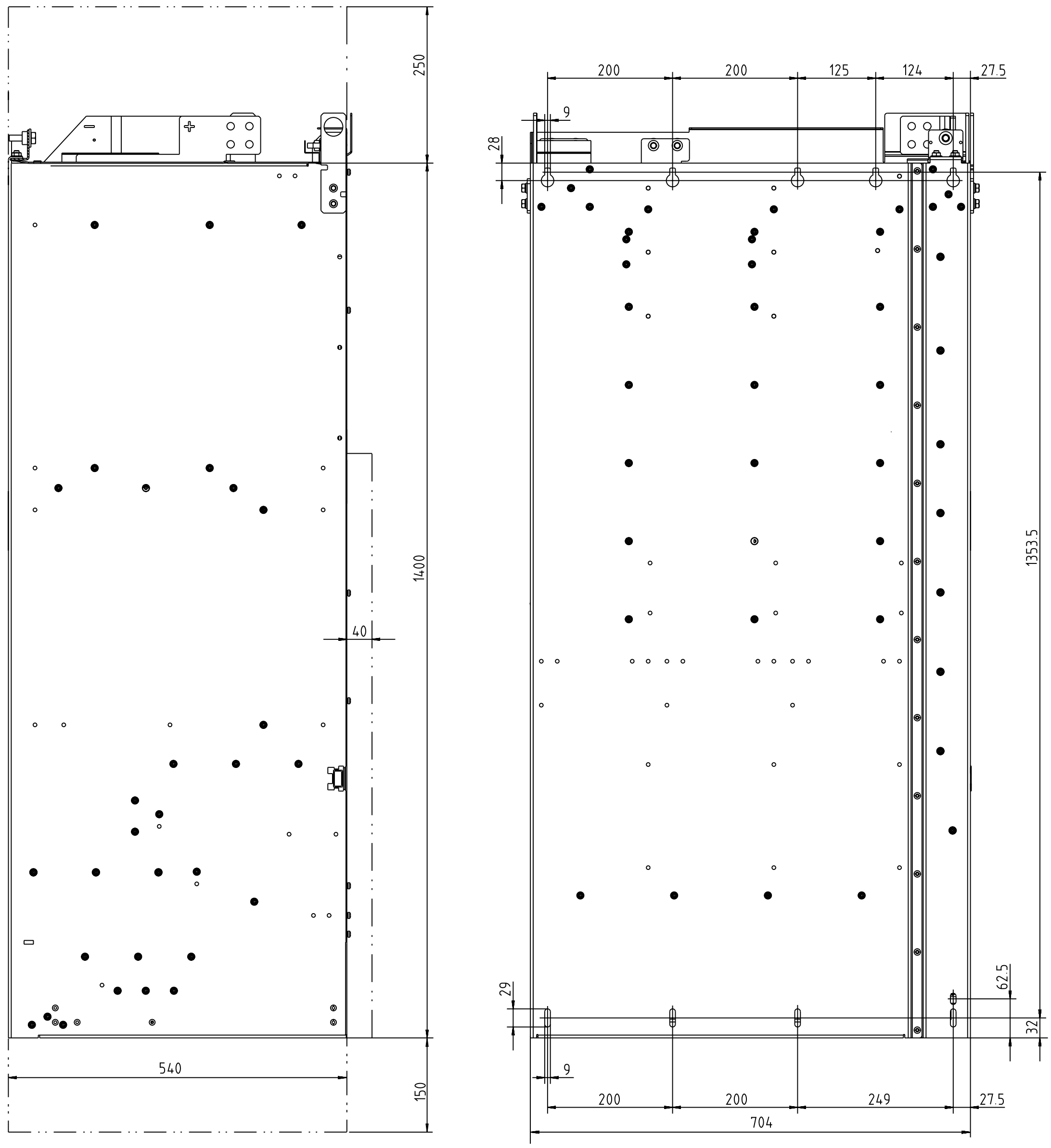


Figure 4-9 Dimension drawing Motor Module, frame size JX Side view, rear view

4.5 Electrical connection

Adjusting the fan voltage (-T10)

The power supply for the device fans (1 AC 230 V) in the Motor Module (-T10) is taken from the line supply using transformers. The installation position of the transformers is indicated in the interface descriptions.

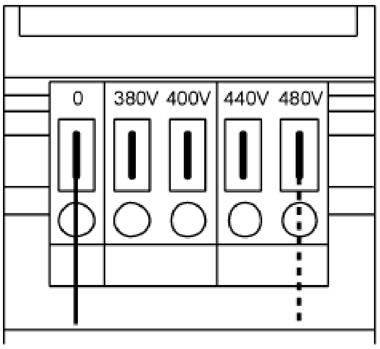
The transformers are fitted with primary taps so that they can be fine-tuned to the line supply voltage.

If necessary, the connection fitted in the factory, shown with a dashed line, must be reconnected to the actual line voltage.

Note

Two transformers for Motor Modules of frame size JX

Two transformers (T10 and -T20) are installed in Motor Modules frame size JX. The two primary-side terminals on each of these devices must be adjusted together.



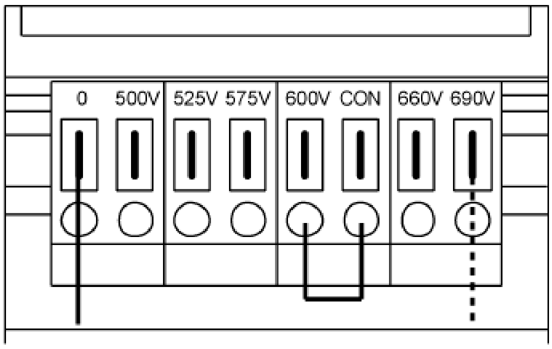


Figure 4-10 Setting terminals for the fan transformers (3 AC 380 to 480 V / 3 AC 500 to 690 V

The supply voltage assignments for making the appropriate setting on the fan transformer are indicated in the following tables (factory presetting: 480 V / 0 V or 690 V / 0 V).

Note

With the 3 AC 500 V to 690 V fan transformer, a jumper is inserted between the "600 V" terminal and "CON" terminal. The jumper between terminal "600 V" and "CON" is for internal use.

NOTICE
Consequences of incorrect voltage setting If the terminals are not reconnected to the actual line voltage: • The required cooling level will not be provided (risk of overheating). • The fan fuses may blow (overload).

Table 4- 11 Line voltage assignment for the setting at the fan transformer (3 AC 380 ... 480 V)

Line voltage	Tap at the fan transformer (-T10)
380 V ± 10%	380 V
400 V ± 10%	400 V
440 V ± 10%	440 V
480 V ± 10%	480 V

Table 4- 12 Line voltage assignment for the setting at the fan transformer (3 AC 500 ... 690 V)

Line voltage	Tap at the fan transformer (-T10)
500 V ± 10%	500 V
525 V ± 10%	525 V
575 V ± 10%	575 V
600 V ± 10%	600 V
660 V ± 10%	660 V
690 V ± 10%	690 V

4.6 Technical specifications

4.6.1 510 V DC – 750 V DC Motor Modules

Table 4- 13 Technical data for Motor Modules, 510 ... 750 VDC, Part 1

Order number	6SL3320–	1TE32–1AA3	1TE32–6AA3	1TE33–1AA3	1TE33–8AA3
Output current					
- Rated current $I_{N\,A}$	A	210	260	310	380
- Base load current I_L	A	205	250	302	370
- Base load current I_H	A	178	233	277	340
- For S6 operation (40%) I_{S6}	A	230	285	340	430
- Max. output current I_{max}	A	307	375	453	555
Type rating					
- Based on I_L (50 Hz 400 V) 1)	kW	110	132	160	200
- Based on I_H (50 Hz 400 V) 1)	kW	90	110	132	160
- Based on I_L (60 Hz 460 V) 2)	HP	150	200	250	300
- Based on I_H (60 Hz 460 V) 2)	HP	150	200	200	250
DC-link current					
-Rated current $I_{N\,DC}$ when fed via					
- Basic/Smart Line Module	A	252	312	372	456
- Active Line Module	A	227	281	335	411
Base load current $I_{L\,DC}$ when fed via					
- Basic/Smart Line Module	A	245	304	362	444
- Active Line Module	A	221	273	326	400
Base load current $I_{H\,DC}$ when fed via					
- Basic/Smart Line Module	A	224	277	331	405
- Active Line Module	A	202	250	298	365
Supply voltages					
- DC-link voltage	V_{DC}	510 ... 750 3)			
- Electronic power supply	V_{DC}	24 (20.4 ... 28.8)			
- Output voltage	V_{ACrms}	0 ... 0.72 x DC-link voltage			
Rated pulse frequency	kHz	2	2	2	2
- Max. pulse frequency without derating	kHz	2	2	2	2
- Max. pulse frequency with derating	kHz	8	8	8	8
Max. ambient temperature					
- Without derating	° C	40	40	40	40
- With derating	° C	55	55	55	55
DC-link capacitance	µF	4200	5200	6300	7800
Current consumption					
- Electronics current consumption (24 VDC)	A	0.8	0.8	0.9	0.9
- Fan supply, at 2 AC 400 V, 50/60 Hz	A	0.63 / 0.95	1.13 / 1.7	1.8 / 2.7	1.8 / 2.7
Power loss, max. 4)					
- At 50 Hz 400 V	kW	1.86	2.5	2.96	3.67
- At 60 Hz 460 V	kW	1.94	2.6	3.1	3.8
Cooling air requirement	m^3/s	0.17	0.23	0.36	0.36
Sound pressure level					
L_{pA} (1 m) at 50/60 Hz	dB(A)	64 / 67	64 / 67	69 / 73	69 / 73

Order number	6SL3320–	1TE32–1AA3	1TE32–6AA3	1TE33–1AA3	1TE33–8AA3
Connections - DC-link connection - Motor connection - PE connection PE1 - PE connection PE2		 M10 M10 M10 M10	 M10 M10 M10 M10	 M10 M10 M10 M10	 M10 M10 M10 M10
Max. conductor cross-sections - DC-link connection (DCP, DCN) - Motor connection (U2, V2, W2) - PE connection PE1 - PE connection PE2	 mm² mm² mm² mm²	 2 x 185 2 x 185 2 x 185 2 x 185	 2 x 185 2 x 185 2 x 185 2 x 185	 2 x 240 2 x 240 2 x 240 2 x 240	 2 x 240 2 x 240 2 x 240 2 x 240
Max. motor cable length - Shielded - Unshielded	 m m	 300 450	 300 450	 300 450	 300 450
Degree of protection		IP20	IP20	IP20	IP20
Dimensions - Width - Height - Depth	 mm mm mm	 326 1400 356	 326 1400 356	 326 1533 545	 326 1533 545
Frame size		FX	FX	GX	GX
Weight	kg	95	95	136	136

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

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

3) Including overshoot capability

4) The specified power loss is the maximum value at 100% capacity utilization. The value in normal operation is lower.

Table 4- 14 Technical data for Motor Modules, 510 ... 750 VDC, Part 2

Order number	6SL3320–	1TE35–0AA3	1TE36–1AA3	1TE37–5AA3	1TE38–4AA3
Output current					
- Rated current $I_{N\ A}$	A	490	605	745	840
- Base load current I_L	A	477	590	725	820
- Base load current I_H	A	438	460	570	700
- For S6 operation (40%) I_{S6}	A	540	--	--	---
- Max. output current I_{max}	A	715	885	1087	1230
Type rating					
- Based on I_L (50 Hz 400 V) [1)]	kW	250	315	400	450
- Based on I_H (50 Hz 400 V) [1)]	kW	200	250	315	400
- Based on I_L (60 Hz 460 V) [2)]	HP	400	500	600	700
- Based on I_H (60 Hz 460 V) [2)]	HP	350	350	450	600
DC-link current					
-Rated current $I_{N\ DC}$ when fed via					
- Basic/Smart Line Module	A	588	726	894	1008
- Active Line Module	A	529	653	805	907
Base load current $I_{L\ DC}$ when fed via					
- Basic/Smart Line Module	A	573	707	871	982
- Active Line Module	A	515	636	784	884
Base load current $I_{H\ DC}$ when fed via					
- Basic/Smart Line Module	A	523	646	795	897
- Active Line Module	A	470	581	716	807
Supply voltages					
- DC-link voltage	V_{DC}	510 ... 750 [3)]			
- Electronic power supply	V_{DC}	24 (20.4 ... 28.8)			
- Output voltage	V_{ACrms}	0 ... 0.72 x DC-link voltage			
Rated pulse frequency	kHz	2	1.25	1.25	1.25
- Max. pulse frequency without derating	kHz	2	1.25	1.25	1.25
- Max. pulse frequency with derating	kHz	8	7.5	7.5	7.5
Max. ambient temperature					
- Without derating	° C	40	40	40	40
- With derating	° C	55	55	55	55
DC-link capacitance	μF	9600	12600	15600	16800
Current consumption					
- Electronics current consumption (24 VDC)	A	0.9	1.0	1.0	1.0
- Fan supply, at 2 AC 400 V, 50/60 Hz	A	1.8 / 2.7	3.6 / 5.4	3.6 / 5.4	3.6 / 5.4
Power loss, max. [4)]					
- At 50 Hz 400 V	kW	4.28	5.84	6.68	7.15
- At 60 Hz 460 V	kW	4.5	6.3	7.3	7.8
Cooling air requirement	m^3/s	0.36	0.78	0.78	0.78
Sound pressure level					
L_{pA} (1 m) at 50/60 Hz	dB(A)	69 / 73	70 / 73	70 / 73	70 / 73
Connections					
- DC-link connection		M10	4 x M10	4 x M10	4 x M10
- Motor connection		M10	2 x M12	2 x M12	2 x M12
- PE connection PE1		M10	M12	M12	M12
- PE connection PE2		M10	2 x M12	2 x M12	2 x M12

Order number	6SL3320–	1TE35–0AA3	1TE36–1AA3	1TE37–5AA3	1TE38–4AA3
Max. conductor cross-sections - DC-link connection (DCP, DCN) - Motor connection (U2, V2, W2) - PE connection PE1 - PE connection PE2	 mm² mm² mm² mm²	 2 x 240 2 x 240 2 x 240 2 x 240	 Busbar 4 x 240 1 x 240 2 x 240	 Busbar 4 x 240 1 x 240 2 x 240	 Busbar 4 x 240 1 x 240 2 x 240
Max. motor cable length - Shielded - Unshielded	 m m	 300 450	 300 450	 300 450	 300 450
Degree of protection		IP20	IP00	IP00	IP00
Dimensions - Width - Height - Depth	 mm mm mm	 326 1533 545	 503 1475 540	 503 1475 540	 503 1475 540
Frame size		GX	HX	HX	HX
Weight	kg	136	290	290	290

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

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

3) Including overshoot capability

4) The specified power loss is the maximum value at 100% capacity utilization. The value in normal operation is lower.

Table 4- 15 Technical data for Motor Modules, 510 ... 750 VDC, Part 3

Order number	6SL3320–	1TE41–0AA3	1TE41–2AA3	1TE41–4AA3	
Output current					
- Rated current $I_{N\ A}$	A	985	1260	1405	
- Base load current I_L	A	960	1230	1370	
- Base load current I_H	A	860	1127	1257	
- For S6 operation (40%) I_{S6}	A	--	--	--	
- Max. output current I_{max}	A	1440	1845	2055	
Type rating					
- Based on I_L (50 Hz 400 V) 1)	kW	560	710	800	
- Based on I_H (50 Hz 400 V) 1)	kW	450	560	710	
- Based on I_L (60 Hz 460 V) 2)	HP	800	1000	1150	
- Based on I_H (60 Hz 460 V) 2)	HP	700	900	1000	
DC-link current					
-Rated current $I_{N\ DC}$ when fed via					
- Basic/Smart Line Module	A	1182	1512	1686	
- Active Line Module	A	1064	1361	1517	
Base load current $I_{L\ DC}$ when fed via					
- Basic/Smart Line Module	A	1152	1474	1643	
- Active Line Module	A	1037	1326	1479	
Base load current $I_{H\ DC}$ when fed via					
- Basic/Smart Line Module	A	1051	1345	1500	
- Active Line Module	A	946	1211	1350	
Supply voltages					
- DC-link voltage	V_{DC}	510 ... 750 3)			
- Electronic power supply	V_{DC}	24 (20.4 ... 28.8)			
- Output voltage	V_{ACrms}	0 ... 0.72 x DC-link voltage			
Rated pulse frequency	kHz	1.25	1.25	1.25	
- Max. pulse frequency without derating	kHz	1.25	1.25	1.25	
- Max. pulse frequency with derating	kHz	7.5	7.5	7.5	
Max. ambient temperature					
- Without derating	° C	40	40	40	
- With derating	° C	55	55	55	
DC-link capacitance	µF	18900	26100	28800	
Current consumption					
- Electronics current consumption (24 VDC)	A	1.25	1.4	1.4	
- Fan supply, at 2 AC 400 V, 50/60 Hz	A	5.4 / 8.1	5.4 / 8.1	5.4 / 8.1	
Power loss, max. 4)					
- At 50 Hz 400 V	kW	9.5	11.1	12.0	
- At 60 Hz 460 V	kW	10.2	12.0	13.0	
Cooling air requirement	m^3/s	1.08	1.08	1.08	
Sound pressure level					
L_{pA} (1 m) at 50/60 Hz	dB(A)	71 / 73	71 / 73	71 / 73	
Connections					
- DC-link connection		4 x M10	4 x M10	4 x M10	
- Motor connection		3 x M12	3 x M12	3 x M12	
- PE connection PE1		M12	M12	M12	
- PE connection PE2		3 x M12	3 x M12	3 x M12	

Order number	6SL3320–	1TE41–0AA3	1TE41–2AA3	1TE41–4AA3	
Max. conductor cross-sections - DC-link connection (DCP, DCN) - Motor connection (U2, V2, W2) - PE connection PE1 - PE connection PE2	 mm² mm² mm² mm²	 Busbar 6 x 240 1 x 240 3 x 240	 Busbar 6 x 240 1 x 240 3 x 240	 Busbar 6 x 240 1 x 240 3 x 240	
Max. motor cable length - Shielded - Unshielded	 m m	 300 450	 300 450	 300 450	
Degree of protection		IP00	IP00	IP00	
Dimensions - Width - Height - Depth	 mm mm mm	 704 1475 540	 704 1475 540	 704 1475 540	
Frame size		JX	JX	JX	
Weight	kg	450	450	450	

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

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

3) Including overshoot capability

4) The specified power loss is the maximum value at 100% capacity utilization. The value in normal operation is lower.

4.6.2 675 V DC – 1080 V DC Motor Modules

Table 4- 16 Technical data for Motor Modules, 675 ... 1080 VDC, Part 1

Order number	6SL3320–	1TG28–5AA3	1TG31–0AA3	1TG31–2AA3	1TG31–5AA3
Output current					
- Rated current $I_{N\,A}$	A	85	100	120	150
- Base load current I_L	A	80	95	115	142
- Base load current I_H	A	76	89	107	134
- Max. output current I_{max}	A	120	142	172	213
Type rating					
- Based on I_L (50 Hz 690 V) 1)	kW	75	90	110	132
- Based on I_H (50 Hz 690 V) 1)	kW	55	75	90	110
- Based on I_L (50 Hz 500 V) 1)	kW	55	55	75	90
- Based on I_H (50 Hz 500 V) 1)	kW	45	55	75	90
- Based on I_L (60 Hz 575 V) 2)	HP	75	75	100	150
- Based on I_H (60 Hz 575 V) 2)	HP	75	75	100	125
DC-link current					
-Rated current $I_{N\,DC}$ when fed via					
- Basic/Smart Line Module	A	102	120	144	180
- Active Line Module	A	92	108	130	162
Base load current $I_{L\,DC}$ when fed via					
- Basic/Smart Line Module	A	99	117	140	175
- Active Line Module	A	89	105	126	157
Base load current $I_{H\,DC}$ when fed via					
- Basic/Smart Line Module	A	90	106	128	160
- Active Line Module	A	81	96	115	144
Supply voltages					
- DC-link voltage	V_{DC}	675 ... 1080 3)			
- Electronic power supply	V_{DC}	24 (20.4 ... 28.8)			
- Output voltage	V_{ACrms}	0 ... 0.72 x DC-link voltage			
Rated pulse frequency	kHz	1.25	1.25	1.25	1.25
- Max. pulse frequency without derating	kHz	1.25	1.25	1.25	1.25
- Max. pulse frequency with derating	kHz	7.5	7.5	7.5	7.5
Max. ambient temperature					
- Without derating	° C	40	40	40	40
- With derating	° C	55	55	55	55
DC-link capacitance	µF	1200	1200	1600	2800
Current consumption					
- Electronics current consumption (24 VDC)	A	0.8	0.8	0.8	0.8
- Fan supply, at 2 AC 690 V, 50/60 Hz	A	0.4 / 0.6	0.4 / 0.6	0.4 / 0.6	0.4 / 0.6
Power loss, max. 4)					
- At 50 Hz 690 V	kW	1.17	1.43	1.89	1.80
- At 60 Hz 575 V	kW	1.1	1.3	1.77	1.62
Cooling air requirement	m^3/s	0.17	0.17	0.17	0.17
Sound pressure level					
L_{pA} (1 m) at 50/60 Hz	dB(A)	64 / 67	64 / 67	64 / 67	64 / 67

Order number	6SL3320–	1TG28–5AA3	1TG31–0AA3	1TG31–2AA3	1TG31–5AA3
Connections - DC-link connection - Motor connection - PE connection PE1 - PE connection PE2		 M10 M10 M10 M10	 M10 M10 M10 M10	 M10 M10 M10 M10	 M10 M10 M10 M10
Max. conductor cross-sections - DC-link connection (DCP, DCN) - Motor connection (U2, V2, W2) - PE connection PE1 - PE connection PE2	 mm² mm² mm² mm²	 2 x 185 2 x 185 2 x 185 2 x 185	 2 x 185 2 x 185 2 x 185 2 x 185	 2 x 185 2 x 185 2 x 185 2 x 185	 2 x 185 2 x 185 2 x 185 2 x 185
Max. motor cable length - Shielded - Unshielded	 m m	 300 450	 300 450	 300 450	 300 450
Degree of protection		IP20	IP20	IP20	IP20
Dimensions - Width - Height - Depth	 mm mm mm	 326 1400 356	 326 1400 356	 326 1400 356	 326 1400 356
Frame size		FX	FX	FX	FX
Weight	kg	95	95	95	95

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

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

3) Including overshoot capability

4) The specified power loss is the maximum value at 100% capacity utilization. The value in normal operation is lower.

Table 4- 17 Technical data for Motor Modules, 675 ... 1080 VDC, Part 2

Order number	6SL3320–	1TG31–8AA3	1TG32–2AA3	1TG32–6AA3	1TG33–3AA3
Output current					
- Rated current $I_{N A}$	A	175	215	260	330
- Base load current I_L	A	171	208	250	320
- Base load current I_H	A	157	192	233	280
- Max. output current I_{max}	A	255	312	375	480
Type rating					
- Based on I_L (50 Hz 690 V) 1)	kW	160	200	250	315
- Based on I_H (50 Hz 690 V) 1)	kW	132	160	200	250
- Based on I_L (50 Hz 500 V) 1)	kW	110	132	160	200
- Based on I_H (50 Hz 500 V) 1)	kW	90	110	132	160
- Based on I_L (60 Hz 575 V) 2)	HP	150	200	250	300
- Based on I_H (60 Hz 575 V) 2)	HP	150	200	200	250
DC-link current					
-Rated current $I_{N DC}$ when fed via					
- Basic/Smart Line Module	A	210	258	312	396
- Active Line Module	A	189	232	281	356
Base load current $I_{L DC}$ when fed via					
- Basic/Smart Line Module	A	204	251	304	386
- Active Line Module	A	184	226	273	347
Base load current $I_{H DC}$ when fed via					
- Basic/Smart Line Module	A	186	229	277	352
- Active Line Module	A	168	206	250	316
Supply voltages					
- DC-link voltage	V_{DC}	675 ... 1080 3)			
- Electronic power supply	V_{DC}	24 (20.4 ... 28.8)			
- Output voltage	V_{ACrms}	0 ... 0.72 x DC-link voltage			
Rated pulse frequency	kHz	1.25	1.25	1.25	1.25
- Max. pulse frequency without derating	kHz	1.25	1.25	1.25	1.25
- Max. pulse frequency with derating	kHz	7.5	7.5	7.5	7.5
Max. ambient temperature					
- Without derating	° C	40	40	40	40
- With derating	° C	55	55	55	55
DC-link capacitance	µF	2800	2800	3900	4200
Current consumption					
- Electronics current consumption (24 VDC)	A	0.9	0.9	0.9	0.9
- Fan supply, at 2 AC 690 V, 50/60 Hz	A	1.0 / 1.5	1.0 / 1.5	1.0 / 1.5	1.0 / 1.5
Power loss, max. 4)					
- At 50 Hz 690 V	kW	2.67	3.09	3.62	4.34
- At 60 Hz 575 V	kW	2.5	2.91	3.38	3.98
Cooling air requirement	m^3/s	0.36	0.36	0.36	0.36
Sound pressure level					
L_{pA} (1 m) at 50/60 Hz	dB(A)	69 / 73	69 / 73	69 / 73	69 / 73
Connections					
- DC-link connection		M10	M10	M10	M10
- Motor connection		M10	M10	M10	M10
- PE connection PE1		M10	M10	M10	M10
- PE connection PE2		M10	M10	M10	M10

Order number	6SL3320–	1TG31–8AA3	1TG32–2AA3	1TG32–6AA3	1TG33–3AA3
Max. conductor cross-sections - DC-link connection (DCP, DCN) - Motor connection (U2, V2, W2) - PE connection PE1 - PE connection PE2	 mm² mm² mm² mm²	 2 x 240 2 x 240 2 x 240 2 x 240	 2 x 240 2 x 240 2 x 240 2 x 240	 2 x 240 2 x 240 2 x 240 2 x 240	 2 x 240 2 x 240 2 x 240 2 x 240
Max. motor cable length - Shielded - Unshielded	 m m	 300 450	 300 450	 300 450	 300 450
Degree of protection		IP20	IP20	IP20	IP20
Dimensions - Width - Height - Depth	 mm mm mm	 326 1533 545	 326 1533 545	 326 1533 545	 326 1533 545
Frame size		GX	GX	GX	GX
Weight	kg	136	136	136	136

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

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

3) Including overshoot capability

4) The specified power loss is the maximum value at 100% capacity utilization. The value in normal operation is lower.

Table 4- 18 Technical data for Motor Modules, 675 ... 1080 VDC, Part 3

Order number	6SL3320–	1TG34–1AA3	1TG34–7AA3	1TG35–8AA3	1TG37–4AA3
Output current					
- Rated current $I_{N\,A}$	A	410	465	575	735
- Base load current I_L	A	400	452	560	710
- Base load current I_H	A	367	416	514	657
- Max. output current I_{max}	A	600	678	840	1065
Type rating					
- Based on I_L (50 Hz 690 V) 1)	kW	400	450	560	710
- Based on I_H (50 Hz 690 V) 1)	kW	315	400	450	630
- Based on I_L (50 Hz 500 V) 1)	kW	250	315	400	500
- Based on I_H (50 Hz 500 V) 1)	kW	200	250	315	450
- Based on I_L (60 Hz 575 V) 2)	HP	400	450	600	700
- Based on I_H (60 Hz 575 V) 2)	HP	350	450	500	700
DC-link current					
-Rated current $I_{N\,DC}$ when fed via					
- Basic/Smart Line Module	A	492	558	690	882
- Active Line Module	A	443	502	621	794
Base load current $I_{L\,DC}$ when fed via					
- Basic/Smart Line Module	A	479	544	672	859
- Active Line Module	A	431	489	605	774
Base load current $I_{H\,DC}$ when fed via					
- Basic/Smart Line Module	A	437	496	614	784
- Active Line Module	A	394	446	552	706
Supply voltages					
- DC-link voltage	V_{DC}	675 ... 1080 3)			
- Electronic power supply	V_{DC}	24 (20.4 ... 28.8)			
- Output voltage	V_{ACrms}	0 ... 0.72 x DC-link voltage			
Rated pulse frequency	kHz	1.25	1.25	1.25	1.25
- Max. pulse frequency without derating	kHz	1.25	1.25	1.25	1.25
- Max. pulse frequency with derating	kHz	7.5	7.5	7.5	7.5
Max. ambient temperature					
- Without derating	° C	40	40	40	40
- With derating	° C	55	55	55	55
DC-link capacitance	µF	7400	7400	7400	11100
Current consumption					
- Electronics current consumption (24 VDC)	A	1.0	1.0	1.0	1.25
- Fan supply, at 2 AC 690 V, 50/60 Hz	A	2.1 / 3.1	2.1 / 3.1	2.1 / 3.1	3.1 / 4.6
Power loss, max. 4)					
- At 50 Hz 690 V	kW	6.13	6.80	10.3	10.9
- At 60 Hz 575 V	kW	5.71	6.32	9.7	10.0
Cooling air requirement	m^3/s	0.78	0.78	0.78	1.08
Sound pressure level					
L_{pA} (1 m) at 50/60 Hz	dB(A)	70 / 73	70 / 73	70 / 73	71 / 73
Connections					
- DC-link connection		4 x M10	4 x M10	4 x M10	4 x M10
- Motor connection		2 x M12	2 x M12	2 x M12	3 x M12
- PE connection PE1		M12	M12	M12	M12
- PE connection PE2		2 x M12	2 x M12	2 x M12	3 x M12

Order number	6SL3320–	1TG34–1AA3	1TG34–7AA3	1TG35–8AA3	1TG37–4AA3
Max. conductor cross-sections - DC-link connection (DCP, DCN) - Motor connection (U2, V2, W2) - PE connection PE1 - PE connection PE2	 mm² mm² mm² mm²	 Busbar 4 x 240 1 x 240 2 x 240	 Busbar 4 x 240 1 x 240 2 x 240	 Busbar 4 x 240 1 x 240 2 x 240	 Busbar 6 x 240 1 x 240 3 x 240
Max. motor cable length - Shielded - Unshielded	 m m	 300 450	 300 450	 300 450	 300 450
Degree of protection		IP00	IP00	IP00	IP00
Dimensions - Width - Height - Depth	 mm mm mm	 503 1475 547	 503 1475 547	 503 1475 547	 704 1475 550
Frame size		HX	HX	HX	JX
Weight	kg	290	290	290	450

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

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

3) Including overshoot capability

4) The specified power loss is the maximum value at 100% capacity utilization. The value in normal operation is lower.

Table 4- 19 Technical data for Motor Modules, 675 ... 1080 VDC, Part 4

Order number	6SL3320–	1TG38–1AA3	1TG38–8AA3	1TG41–0AA3	1TG41–3AA3
Output current					
- Rated current $I_{N A}$	A	810	910	1025	1270
- Base load current I_L	A	790	880	1000	1230
- Base load current I_H	A	724	814	917	1136
- Max. output current I_{max}	A	1185	1320	1500	1845
Type rating					
- Based on I_L (50 Hz 690 V) 1)	kW	800	900	1000	1200
- Based on I_H (50 Hz 690 V) 1)	kW	710	800	900	1000
- Based on I_L (50 Hz 500 V) 1)	kW	560	630	710	900
- Based on I_H (50 Hz 500 V) 1)	kW	500	560	630	800
- Based on I_L (60 Hz 575 V) 2)	HP	800	900	1000	1250
- Based on I_H (60 Hz 575 V) 2)	HP	700	800	900	1000
DC-link current					
-Rated current $I_{N DC}$ when fed via					
- Basic/Smart Line Module	A	972	1092	1230	1524
- Active Line Module	A	875	983	1107	1372
Base load current $I_{L DC}$ when fed via					
- Basic/Smart Line Module	A	947	1064	1199	1485
- Active Line Module	A	853	958	1079	1337
Base load current $I_{H DC}$ when fed via					
- Basic/Smart Line Module	A	865	971	1094	1356
- Active Line Module	A	778	874	985	1221
Supply voltages					
- DC-link voltage	V_{DC}	675 ... 1080 3)			
- Electronic power supply	V_{DC}	24 (20.4 ... 28.8)			
- Output voltage	V_{ACrms}	0 ... 0.72 x DC-link voltage			
Rated pulse frequency	kHz	1.25	1.25	1.25	1.25
- Max. pulse frequency without derating	kHz	1.25	1.25	1.25	1.25
- Max. pulse frequency with derating	kHz	7.5	7.5	7.5	7.5
Max. ambient temperature					
- Without derating	° C	40	40	40	40
- With derating	° C	55	55	55	55
DC-link capacitance	µF	11100	14400	14400	19200
Current consumption					
- Electronics current consumption (24 VDC)	A	1.25	1.4	1.4	1.4
- Fan supply, at 2 AC 690 V, 50/60 Hz	A	3.1 / 4.6	3.1 / 4.6	3.1 / 4.6	3.1 / 4.6
Power loss, max. 4)					
- At 50 Hz 690 V	kW	11.5	11.7	13.2	16.0
- At 60 Hz 575 V	kW	10.5	10.6	12.0	14.2
Cooling air requirement	m^3/s	1.08	1.08	1.08	1.08
Sound pressure level					
L_{pA} (1 m) at 50/60 Hz	dB(A)	71 / 73	71 / 73	71 / 73	71 / 73
Connections					
- DC-link connection		4 x M10	4 x M10	4 x M10	4 x M10
- Motor connection		3 x M12	3 x M12	3 x M12	3 x M12
- PE connection PE1		M12	M12	M12	M12
- PE connection PE2		3 x M12	3 x M12	3 x M12	3 x M12

Order number	6SL3320–	1TG38–1AA3	1TG38–8AA3	1TG41–0AA3	1TG41–3AA3
Max. conductor cross-sections					
- DC-link connection (DCP, DCN)	mm²	Busbar	Busbar	Busbar	Busbar
- Motor connection (U2, V2, W2)	mm²	6 x 240	6 x 240	6 x 240	6 x 240
- PE connection PE1	mm²	1 x 240	1 x 240	1 x 240	1 x 240
- PE connection PE2	mm²	3 x 240	3 x 240	3 x 240	3 x 240
Max. motor cable length					
- Shielded	m	300	300	300	300
- Unshielded	m	450	450	450	450
Degree of protection		IP00	IP00	IP00	IP00
Dimensions					
- Width	mm	704	704	704	704
- Height	mm	1475	1475	1475	1475
- Depth	mm	550	550	550	550
Frame size		JX	JX	JX	JX
Weight	kg	450	450	450	450

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

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

3) Including overshoot capability

4) The specified power loss is the maximum value at 100% capacity utilization. The value in normal operation is lower.

4.6.3 Overload capability

The Motor Modules have an overload reserve e.g. to handle breakaway torques.

In the case of drives with overload requirements, the appropriate base-load current must, therefore, be used as a basis for the required load.

The criterion for overload is that the Motor Module is operated with its base load current before and after the overload occurs (a load duration of 300 s is used as a basis here).

Low overload

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

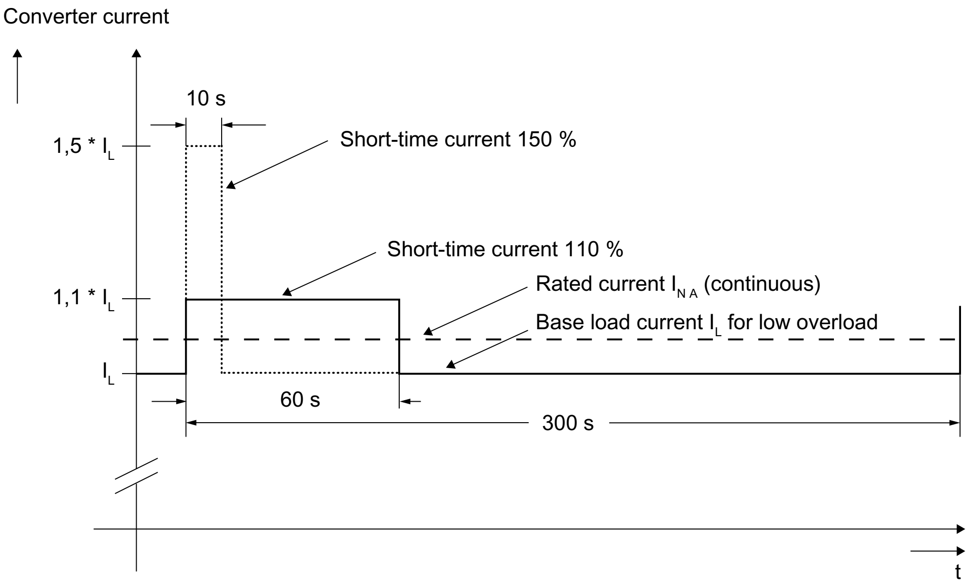


Figure 4-11 Low overload

High overload

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

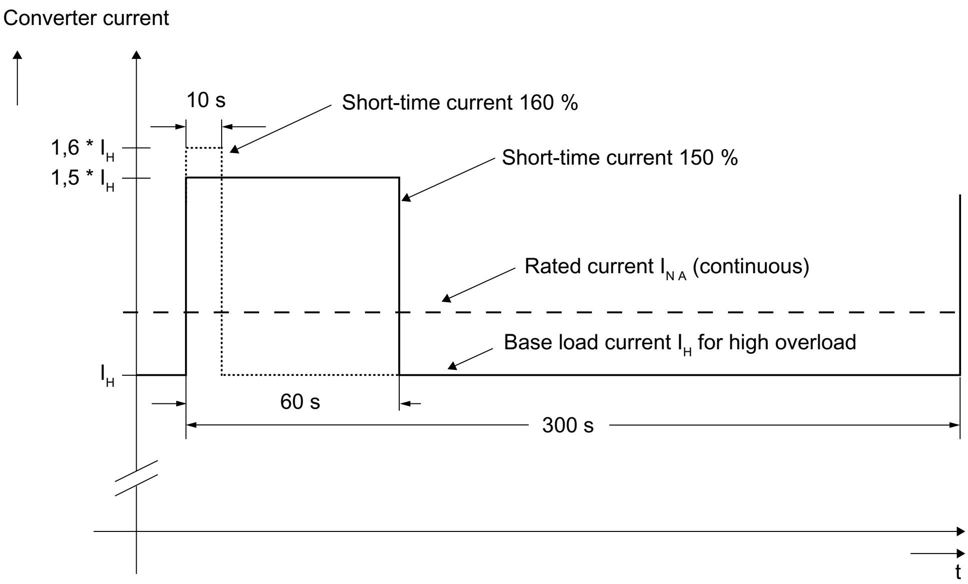


Figure 4-12 High overload

4.6.4 Current de-rating depending on the pulse frequency

When the pulse frequency is increased, the derating factor of the output current must be taken into account. This derating factor must be applied to the currents specified in the technical data for Motor Modules.

Table 4- 20 Derating factor of the output current as a function of the pulse frequency for devices with a rated pulse frequency of 2 kHz

Order No.	Type rating	Output current at 2 kHz	Derating factor at the pulse frequency				
6SL3320-...	[kW]	[A]	2.5 kHz	4 kHz	5 kHz	7.5 kHz	8 kHz
Supply voltage 510 – 750 VDC							
1TE32-1AAx	110	210	95 %	82 %	74 %	54 %	50 %
1TE32-6AAx	132	260	95 %	83 %	74 %	54 %	50 %
1TE33-1AAx	160	310	97 %	88 %	78 %	54 %	50 %
1TE33-8AAx	200	380	96 %	87 %	77 %	54 %	50 %
1TE35-0AAx	250	490	94 %	78 %	71 %	53 %	50 %

Table 4- 21 Derating factor of the output current as a function of the pulse frequency for devices with a rated pulse frequency of 1.25 kHz

Order No.	Type rating	Output current at 1.25 kHz	Derating factor at the pulse frequency				
6SL3320-...	[kW]	[A]	2 kHz	2.5 kHz	4 kHz	5 kHz	7.5 kHz
Supply voltage 510 – 750 VDC							
1TE36-1AAx	315	605	83 %	72 %	64 %	60 %	40 %
1TE37-5AAx	400	745	83 %	72 %	64 %	60 %	40 %
1TE38-4AAx	450	840	87 %	79 %	64 %	55 %	40 %
1TE41-0AAx	560	985	92 %	87 %	70 %	60 %	50 %
1TE41-2AAx	710	1260	92 %	87 %	70 %	60 %	50 %
1TE41-4AAx	800	1405	97 %	95 %	74 %	64 %	50 %
Supply voltage 675 – 1080 VDC							
1TG28-5AAx	75	85	93 %	89 %	71 %	60 %	40 %
1TG31-0AAx	90	100	92 %	88 %	71 %	60 %	40 %
1TG31-2AAx	110	120	92 %	88 %	71 %	60 %	40 %
1TG31-5AAx	132	150	90 %	84 %	66 %	55 %	35 %
1TG31-8AAx	160	175	92 %	87 %	70 %	60 %	40 %
1TG32-2AAx	200	215	92 %	87 %	70 %	60 %	40 %
1TG32-6AAx	250	260	92 %	88 %	71 %	60 %	40 %
1TG33-3AAx	315	330	89 %	82 %	65 %	55 %	40 %
1TG34-1AAx	400	410	89 %	82 %	65 %	55 %	35 %
1TG34-7AAx	450	465	92 %	87 %	67 %	55 %	35 %
1TG35-8AAx	560	575	91 %	85 %	64 %	50 %	35 %
1TG37-4AAx	710	735	87 %	79 %	64 %	55 %	35 %
1TG38-1AAx	800	810	97 %	95 %	71 %	55 %	35 %
1TG38-8AAx	900	910	92 %	87 %	67 %	55 %	33 %
1TG41-0AAx	1000	1025	91 %	86 %	64 %	50 %	30 %
1TG41-3AAx	1200	1270	87 %	79 %	55 %	40 %	25 %

Note

Derating factors for pulse frequencies in the range between two fixed values

For pulse frequencies in the range between the specified fixed values, the relevant derating factors can be determined by linear interpolation.

Maximum output frequencies achieved by increasing the pulse frequency

By multiplying the rated pulse frequency with a multiple integer, the following output frequencies can be achieved taking into account the derating factors:

Table 4- 22 Maximum output frequencies achieved by increasing the pulse frequency in VECTOR mode

Pulse frequency [kHz]	Maximum output frequency [Hz]
1.25	100
2	160
2.5	200
4	320
5	400

Table 4- 23 Maximum output frequencies achieved by increasing the pulse frequency in SERVO mode

Pulse frequency [kHz]	Maximum output frequency [Hz]
2	300
4	300 / 650 [1)]

[1)] The maximum output frequency of 650 Hz can only be achieved for a current controller clock cycle of 125 μs (factory setting: 250 μs).

4.6.5 Parallel connection of Motor Modules

The following rules must be observed when connecting Motor Modules in parallel:

- Up to four identical Motor Modules can be connected in parallel.
- A common Control Unit is required whenever the modules are connected in parallel.
- The motor supply cables must have the same length (symmetrical design).
- Power must be supplied to the Motor Modules from a common DC link.
- For motors with a single winding system, supply cables with a minimum length or motor reactors must be used. The cable lengths are listed in the following tables.
- A derating factor of 5% must be taken into consideration, regardless of the number of Motor Modules connected in parallel.

Note

Mixed operation is not possible

It is only possible to connect identical power units in parallel if all power units have the same hardware version. Mixed operation between a power unit with Control Interface Module (order number 6SL33xx-xxxxx–xAA3) and a power unit with Control Interface Board (order number 6SL33xx-xxxxx–xAA0) is not possible.

Minimum cable lengths for parallel connection and connection to a motor with a single-winding system

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Note

Minimum cable lengths

The minimum cable lengths specified in the tables below must be observed when two or more Motor Modules are connected in parallel and there is a connection to a motor with a single-winding system. If the cable length required for the application cannot be achieved, a motor reactor must be provided.

Table 4- 24 Motor Modules, 510 to 750 VDC

Order number	Type rating [kW]	Output current [A]	Minimum cable length [m]
6SL3320-1TE32-1AAx	110	210	30
6SL3320-1TE32-6AAx	132	260	27
6SL3320-1TE33-1AAx	160	310	20
6SL3320-1TE33-8AAx	200	380	17
6SL3320-1TE35-0AAx	250	490	15
6SL3320-1TE36-1AAx	315	605	13
6SL3320-1TE37-5AAx	400	745	10
6SL3320-1TE38-4AAx	450	840	9
6SL3320-1TE41-0AAx	560	985	8
6SL3320-1TE41-2AAx	710	1260	6
6SL3320-1TE41-4AAx	800	1405	5

Table 4- 25 Motor Modules, 675 to 1080 VDC

Order number	Type rating [kW]	Output current [A]	Minimum cable length [m]
6SL3320-1TG28-5AAx	75	85	100
6SL3320-1TG31-0AAx	90	100	90
6SL3320-1TG31-2AAx	110	120	80
6SL3320-1TG31-5AAx	132	150	70
6SL3320-1TG31-8AAx	160	175	60
6SL3320-1TG32-2AAx	200	215	50
6SL3320-1TG32-6AAx	250	260	40
6SL3320-1TG33-3AAx	315	330	30
6SL3320-1TG34-1AAx	400	410	25
6SL3320-1TG34-7AAx	450	465	25
6SL3320-1TG35-8AAx	560	575	20
6SL3320-1TG37-4AAx	710	735	18
6SL3320-1TG38-1AAx	800	810	15
6SL3320-1TG38-8AAx	900	910	12
6SL3320-1TG41-0AAx	1000	1025	10
6SL3320-1TG41-3AAx	1200	1270	8

DC link components 5

5.1 Braking Module

5.1.1 Description

A Braking Module and an external braking resistor are required to bring drives to a controlled standstill in the event of a power failure (e.g. emergency retraction or EMERGENCY STOP category 1) or limit the DC-link voltage if the generator is operated for a short period of time, for example because there is no regenerative feedback capability into the supply network when a Basic Line Module is used. The Braking Module contains the power electronics and the associated control.

During operation the DC-link energy is converted into heat loss in an external braking resistor outside of the control cabinet. Braking Modules function autonomously. Parallel operation of several braking modules is possible. In this case, each Braking Module must have its own braking resistor.

Up to three slots are available depending on the size of the Basic Line Module, Smart Line Module, Active Line Module, or Motor Module:

Frame sizes FB, GB, GD, FX, GX:	1 mounting location
Frame size HX:	2 mounting locations
Frame size JX:	3 mounting locations

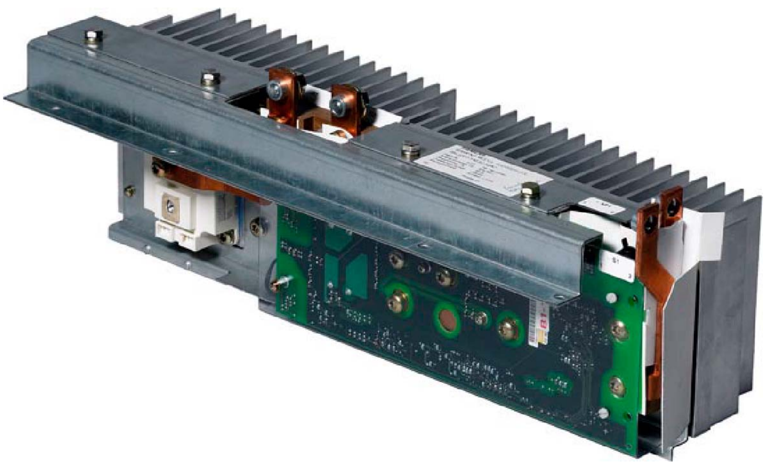


Figure 5-1 Braking Module

Layout

The Braking Module in chassis format is inserted in a mounting location inside the Basic Line Modules, Smart Line Modules, Active Line Modules, or Motor Modules, the fan of which ensures forced cooling. The supply voltage for the electronics is drawn from the DC link. The Braking Module is connected to the DC link by means of the busbar sets and flexible cables, which are supplied as standard.

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

The Braking Module has as standard, the following interfaces:

- The DC link is connected through busbars and flexible cables
- Connecting terminal for external braking resistor
- 1 digital input (inhibit Braking Module with high signal / acknowledge error with negative edge high-low)
- 1 digital output (Braking Module inhibited)
- 1 DIP switch for adjusting the activation threshold

Note

Installing a Braking Module of frame size GX in a Basic Line Module of frame size GB or GD

To install a frame size GX Braking Module in a frame size GB or GD Basic Line Module a cable harness set is required, which is available under order number 6SL3366-2NG00-0AA0.

5.1.2 Safety information

WARNING

Dangerous electrical voltage

After disconnecting all the supply voltages, a hazardous voltage will be present in all components for another 5 minutes. Work may not be carried out on the components until after this time has elapsed.

Before starting work, you should also measure the voltage after the 5 minutes have elapsed. The voltage can be measured on DC-link terminals DCP and DCN.

CAUTION

Danger notice in the local language

The DC-link discharge voltage hazard warning must be affixed to the modules in the local language.

WARNING

Risk of fire and damage to equipment due to short-circuit / ground fault

The cables to the braking resistor must be routed so that a ground fault or short-circuit can be ruled out. A ground fault can result in fire with smoke.

- Protect the cables from mechanical damage.
- Comply with local installation regulations that enable this fault to be ruled out.

In addition, apply one of the following measures:

- Use cables with double insulation.
- Maintain adequate clearance, using spacers, for example.
- Route the cables in separate cable ducts or pipes.

Note

Use only released braking resistors

If braking resistors are used that have not been released by SIEMENS for SINAMICS, then the braking resistors could be destroyed.

5.1.3 Interface description

5.1.3.1 Braking Module for frame sizes FX, FB

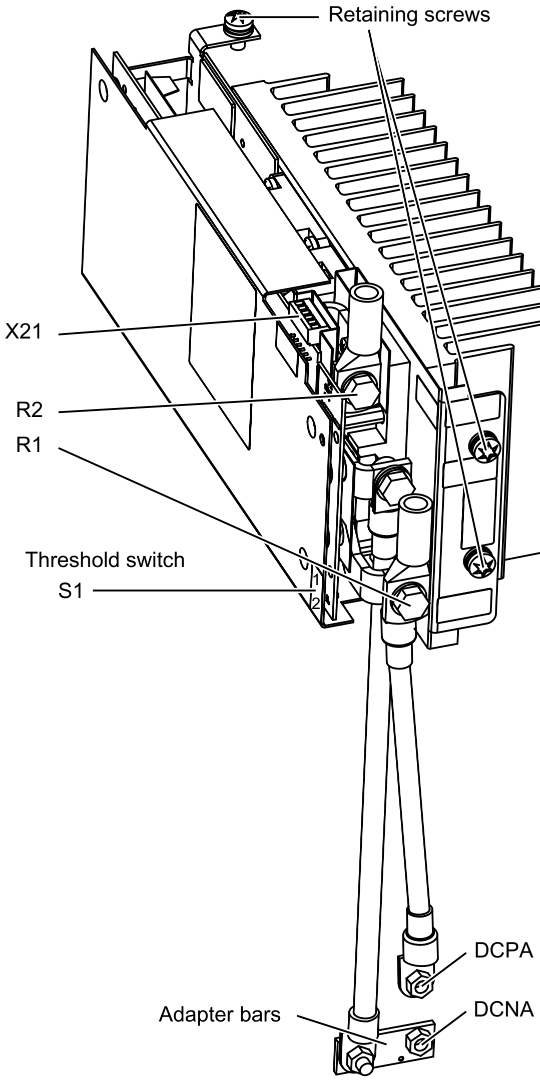


Figure 5-2 Braking Module for Active Line Module / Motor Module, frame size FX and for Basic Line Module, frame size FB

Note

Common connection for the R1 and DCPA

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

5.1.3.2 Braking Module for frame sizes GX, GB, GD

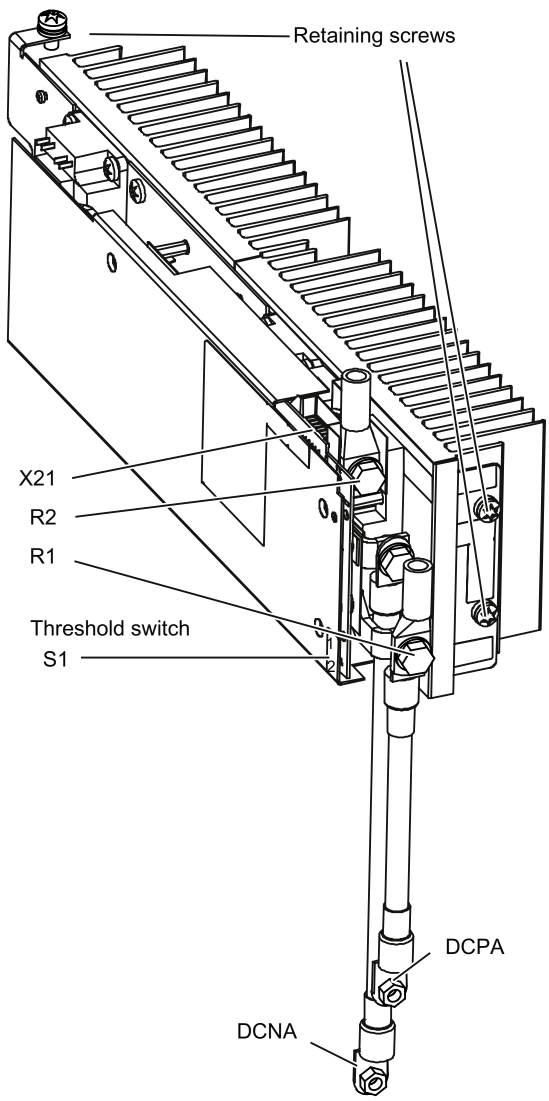


Figure 5-3 Braking Module for Smart Line Module / Active Line Module / Motor Module, frame size GX and for Basic Line Module, frame size GB, GD

Note

Common connection for the R1 and DCPA

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

5.1.3.3 Braking Module for frame sizes HX, JX

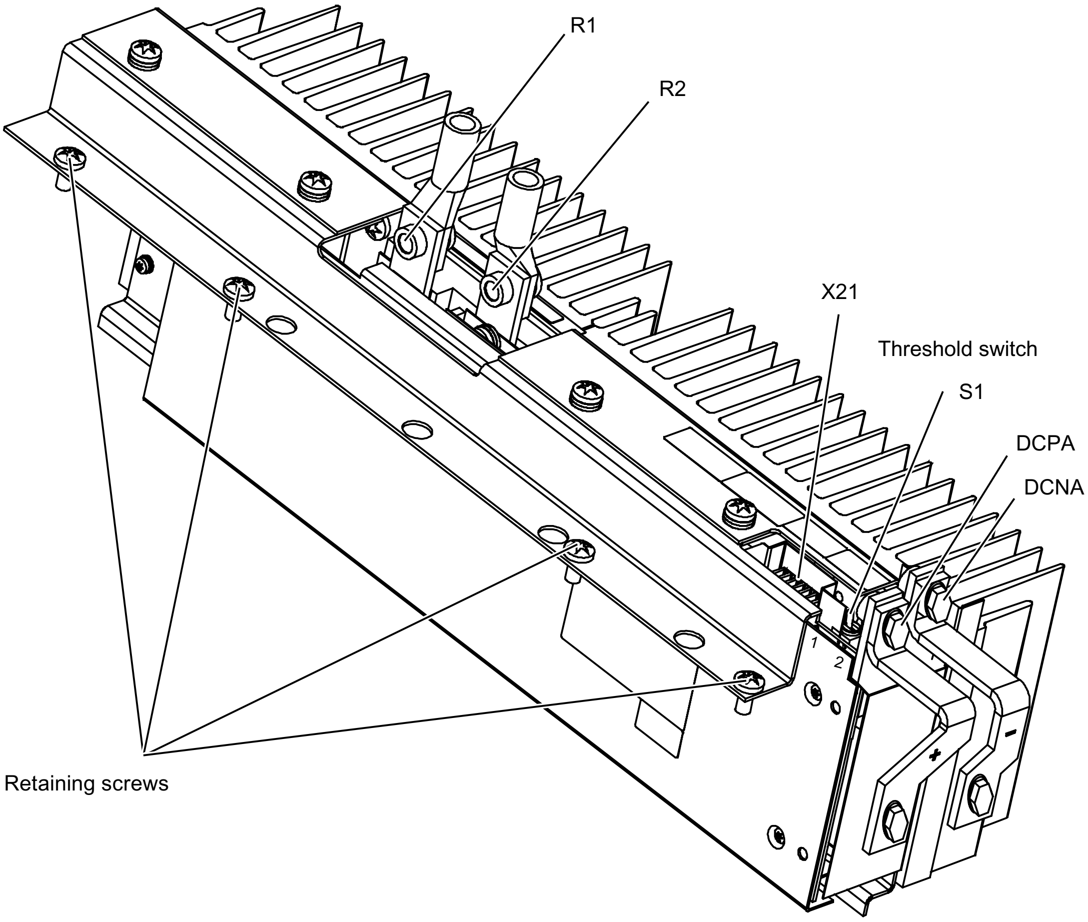


Figure 5-4 Braking Module for Smart Line Module / Active Line Module / Motor Module, frame sizes HX / JX

5.1.3.4 Connection example

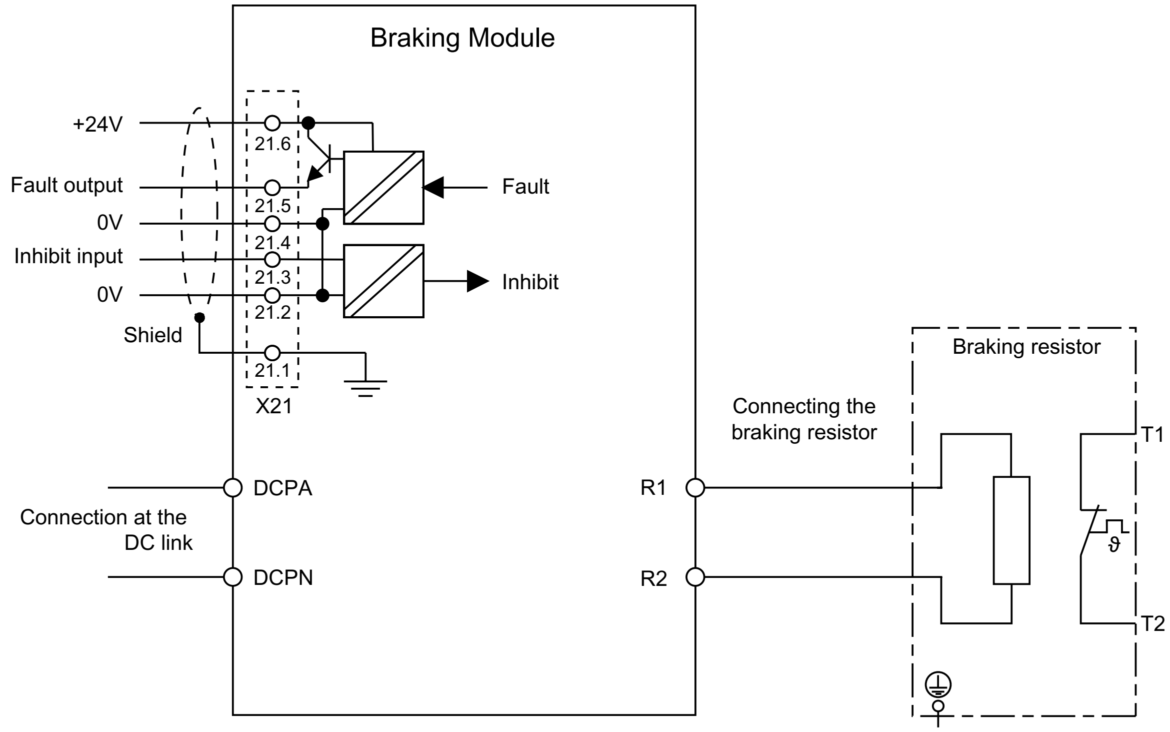


Figure 5-5 Connection example for Braking Module

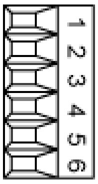
5.1.3.5 Braking resistor connection

Table 5- 1 Braking resistor connection

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

5.1.3.6 X21 digital inputs/outputs

Table 5- 2 X21 terminal strip

	Terminal	Designation 1)	Technical specifications
	1	Shield	Shield connection for terminals 2 ... 6
	2	0 V	High level: +15 ... 30 V current consumption: 2 ... 15 mA Low level: -3 ... 5 V
	3	DI inhibit input	
	4	0 V	High signal: No fault Low signal: Fault present Voltage: 24 VDC Load current: 0.5 ... 0.6 A
	5	DO fault output	
	6	+24 V	Voltage: +18 ... 30 V Typical current consumption (intrinsic current consumption): 10 mA at 24 VDC
Max. connectable cross-section 1.5 mm²			

1) DI: Digital input; DO: Digital output

Note

Position of the terminals

The position of the individual terminals of terminal strip X21 on the Braking Module are as follows when the module is installed: Terminal "1" is at the back, terminal "6" is at the front.

Note

Signal characteristics of terminal X21.3

Applying a high signal to terminal X21.3 inhibits the Braking Module. On a falling edge, pending error signals are acknowledged.

Note

Notes on setting

You will find setting instructions for wiring the signals in the SINAMICS S120 Function Manual.

5.1.3.7 S1 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
>
> **Actuate threshold switch only when device is turned off**
>
> The threshold switch must only be used when the Basic Line, Smart Line, Active Line, or Motor Module are switched off and the DC-link capacitors are discharged.

Table 5- 3 Response thresholds of the Braking Modules

Voltage	Response threshold	Switch position	Remark
3 AC 380 ... 480 V	673 V	1	774 V is the default factory setting. For line voltages of between 3 AC 380 V and 400 V, 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 AC 500 ... 600 V	841 V	1	967 V is the default factory setting. With a supply voltage of 3 AC 500 V, 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 AC 660 ... 690 V	1070 V	1	1158 V is the default factory setting. With a supply voltage of 3 AC 660 V, 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, FB, GX, GB, GD: Position "1" is at the top; position "2" is at the bottom
- Braking Modules for frame sizes HX and JX: Position "1" is at the back; position "2" is at the front

NOTICE

"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).

5.1.4 Installation

5.1.4.1 Installing the Braking Module in an Active Line Module / Motor Module, frame size FX

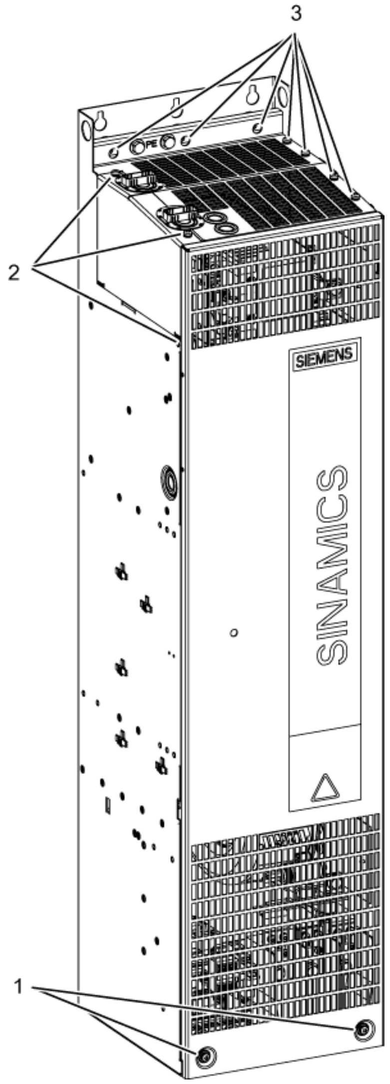


Figure 5-6 Installing the Braking Module in an Active Line Module / Motor Module, frame size FX – steps 1 - 3

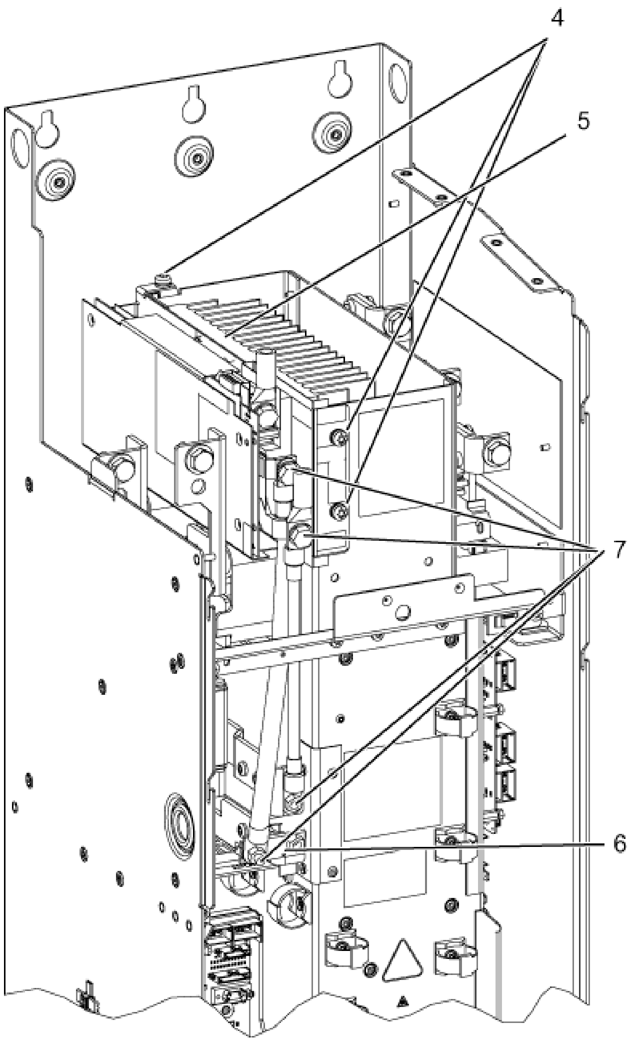


Figure 5-7 Installing the Braking Module in an Active Line Module / Motor Module, frame size FX – steps 4 - 7

Installing the Braking Module

The steps for the installation procedure are numbered in accordance with the diagrams in front of them.

1. Unscrew the two M6 screws from the front cover and lift off the cover.
2. Unscrew the two screws from the upper cover plate.

   Loosen the M6 nut on the left

   Remove the left cover
3. Unscrew the four screws from the upper cover plate.

   Unscrew the three screws from the rear cut-out sections

   Remove the top covers.

4. Unscrew the three screws of the blanking plate.

   Remove the plate.
5. Insert the Braking Module where the cover used to be and secure it using the three screws (from step 4).
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 two screws (Braking Module connection) and two 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.

NOTICE
Pay attention to the tightening torques
The tightening torques specified in the table "Tightening torques for screw connections" must be observed.

5.1.4.2 Installing the Braking Module in a Smart Line Module / Active Line Module / Motor Module, frame size GX

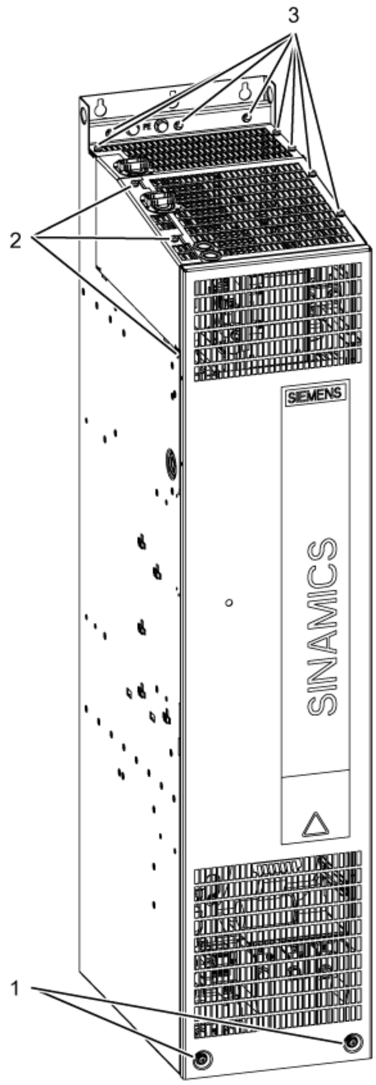


Figure 5-8 Installing the Braking Module in a Smart Line Module / Active Line Module / Motor Module, frame size GX – steps 1 - 3

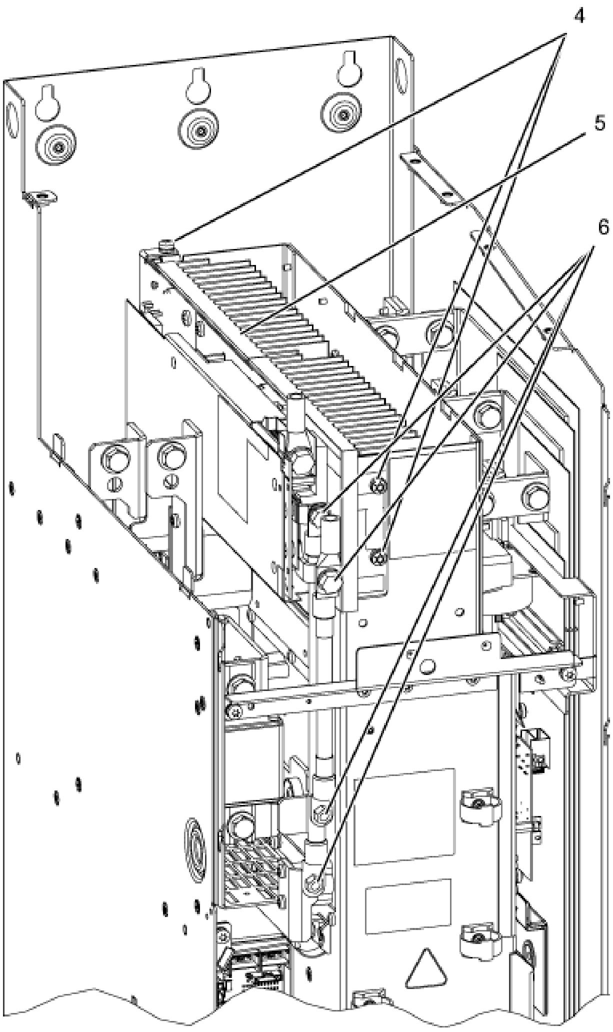


Figure 5-9 Installing the Braking Module in a Smart Line Module / Active Line Module / Motor Module, frame size GX – steps 4 - 6

Installing the Braking Module

The steps for the installation procedure are numbered in accordance with the diagrams in front of them.

1. Unscrew the two M6 screws from the front cover and lift off the cover.
2. Unscrew the two screws from the upper cover plate.

   Loosen the M6 nut on the left.

   Remove the left cover
3. Unscrew the four screws from the upper cover plate.

   Unscrew the three screws from the rear cut-out sections.

   Remove the top covers.

4. Unscrew the three screws of the blanking plate.

   Remove the plate.
5. Insert the Braking Module where the cover used to be and secure it using the three screws (from step 4).
6. Secure the connecting cable to the DC link with two screws (Braking Module connection) and two 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.

NOTICE
Pay attention to the tightening torques The tightening torques specified in the table "Tightening torques for screw connections" must be observed.

5.1.4.3 Installing the Braking Module in a Smart Line Module / Active Line Module / Motor Module, frame size HX

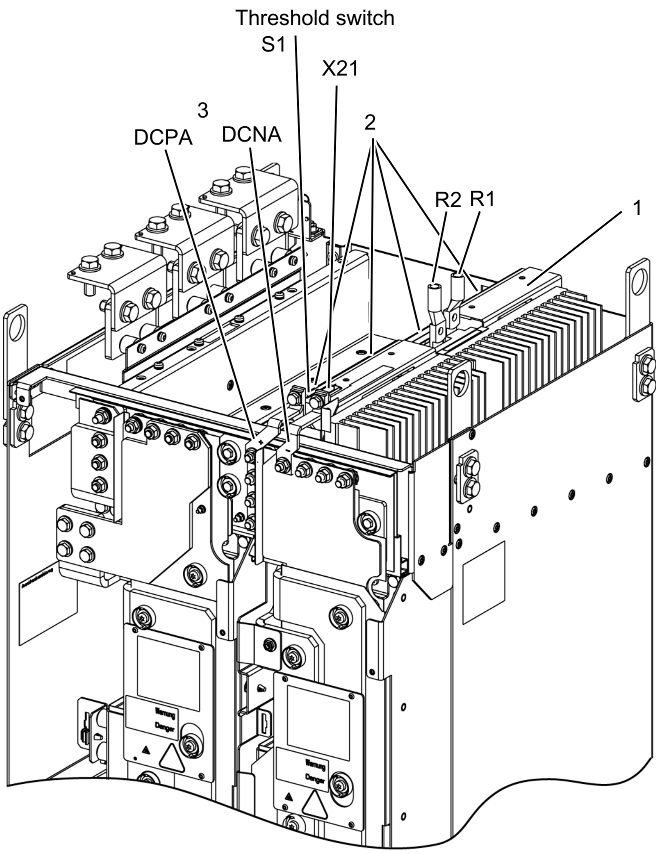


Figure 5-10 Installing the Braking Module in a Smart Line Module / Active Line Module / Motor Module, frame size HX

Installing the Braking Module

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

1. Insert the Braking Module.
2. Tighten the 4 retaining screws for 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).

NOTICE
The tightening torques specified in the table "Tightening torques for screw connections" must be observed.

5.1.4.4 Installing the Braking Module in a Smart Line Module / Active Line Module / Motor Module, frame size JX

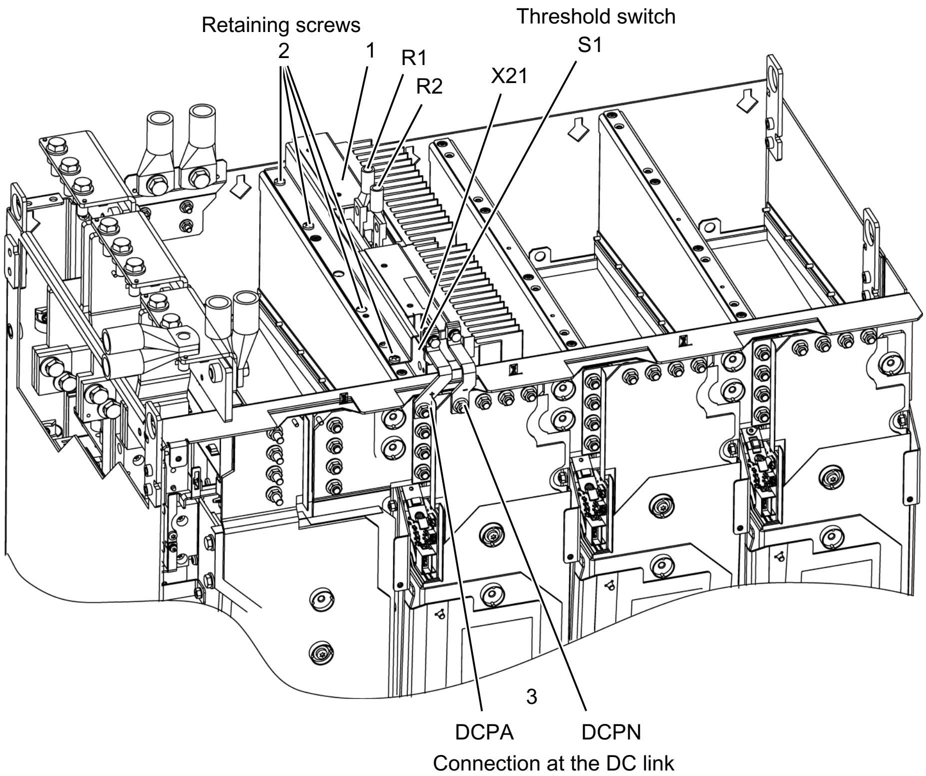


Figure 5-11 Installing the Braking Module in a Smart Line Module / Active Line Module / Motor Module, frame size JX

Installing the Braking Module

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

1. Insert the Braking Module.
2. Tighten the four retaining screws for 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).

NOTICE
Pay attention to the tightening torques The tightening torques specified in the table "Tightening torques for screw connections" must be observed.

5.1.4.5 Installing the Braking Module in a Basic Line Module, frame size FB

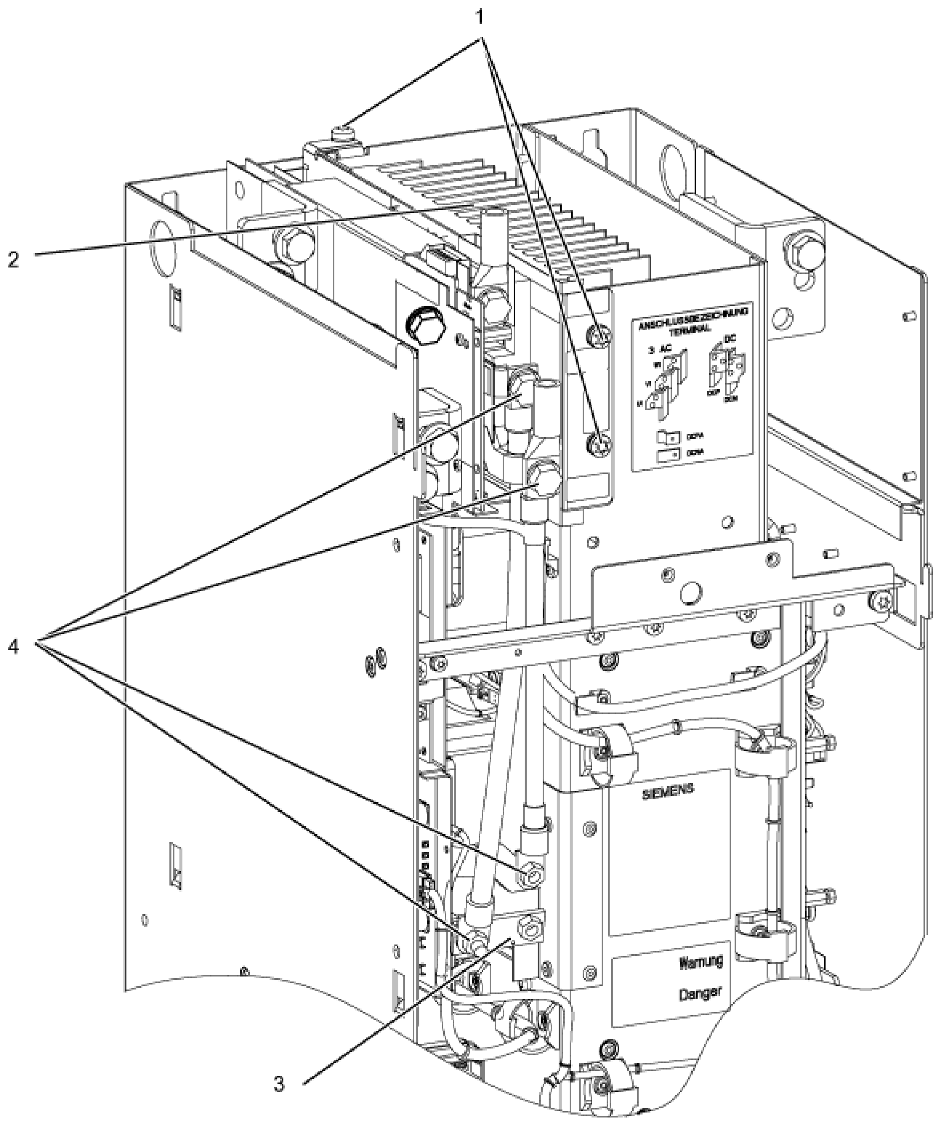


Figure 5-12 Installing the Braking Module in a Basic Line Module, frame size FB

Installing the Braking Module

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

1. Unscrew the three screws of the blanking plate.

   Remove the plate.
2. Insert the Braking Module where the cover used to be and secure it using the three screws (from step 1).
3. 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.
4. Secure the connecting cable to the DC link with two screws (Braking Module connection) and two nuts (DC-link connection).

NOTICE
Pay attention to the tightening torques The tightening torques specified in the table "Tightening torques for screw connections" must be observed.

5.1.4.6 Installing the Braking Module in a Basic Line Module, frame size GB, GD

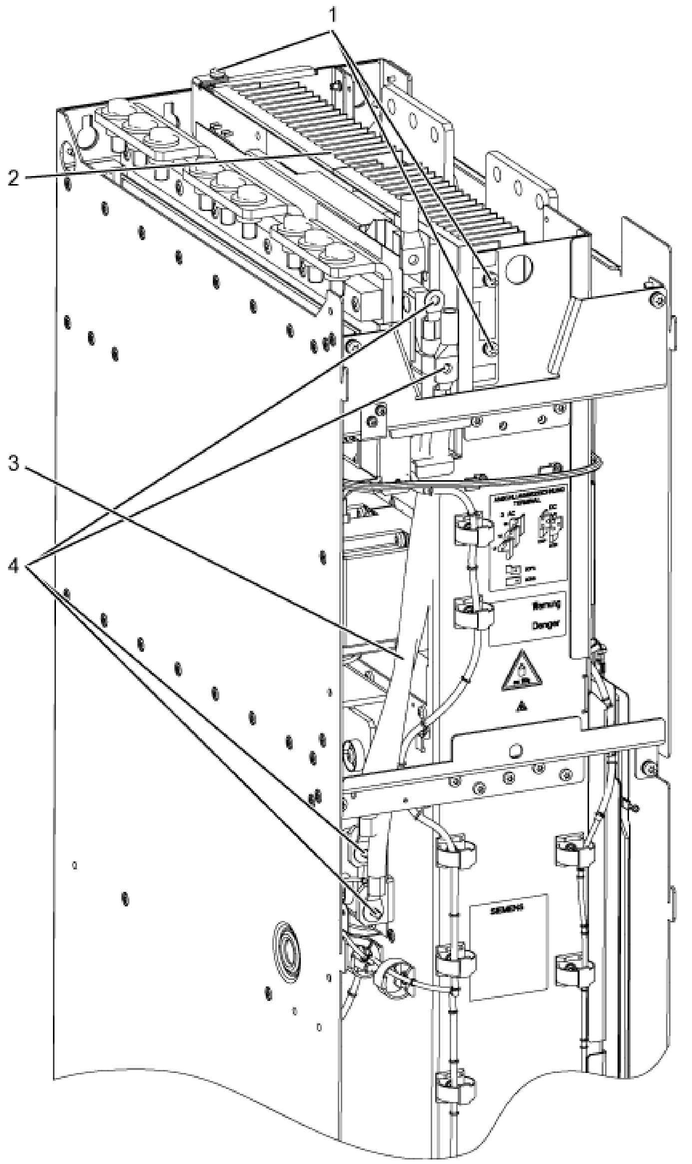


Figure 5-13 Installing the Braking Module in a Basic Line Module, frame size GB, GD

Installing the Braking Module

Note

To install a frame size GX Braking Module in a frame size GB or GD Basic Line Module a cable harness set is required, which is available under order number 6SL3366-2NG00-0AA0.

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

1. Unscrew the three screws of the blanking plate.

   Remove the plate.
2. Insert the Braking Module where the cover used to be and secure it using the three screws (from step 1).
3. Use the connecting cable in the cable harness set (order number 6SL3366-2NG00-0AA0).
4. Secure the connecting cable to the DC link with two screws (Braking Module connection) and two nuts (DC-link connection).

NOTICE
Pay attention to the tightening torques The tightening torques specified in the table "Tightening torques for screw connections" must be observed.

5.1.5 Technical specifications

Table 5- 4 Technical data, Braking Modules, 3 AC 380 V ... 480 V

Braking Module 6SL3300-	1AE31-3AA0	1AE32-5AA0	1AE32-5BA0
Suitable for installation in: Smart Line Module / Active Line Module / Motor Module, frame size Basic Line Module, frame size	FX FB	GX GB, GD	HX / JX --
P_{DB} power (rated power)	25 kW	50 kW	50 kW
P_{15} power (peak 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)		
Digital input			
Voltage	-3 ... 30 V		
Low level (an open digital input is interpreted as "low")	-3 ... 5 V		
High level	15 ... 30 V		
Current consumption (typical at 24 VDC)	10 mA		
Max. connectable cross-section	1.5 mm²		
Digital output (continuously short-circuit proof)			
Voltage	24 VDC		
Max. load current of the digital output	500 mA		
Max. connectable cross-section	1.5 mm²		
R1/R2 connection	M8 screw	M8 screw	M8 screw
Max. conductor cross-section R1/R2	35 mm²	50 mm²	50 mm²
Weight, approx.	3.6 kg	7.3 kg	7.5 kg

Table 5- 5 Technical data, Braking Modules, 3 AC 500 V ... 600 V

Braking Module 6SL3300-	1AF31-3AA0	1AF32-5AA0	1AF32-5BA0
Suitable for installation in: Smart Line Module / Active Line Module / Motor Module, frame size Basic Line Module, frame size	 FX FB	 GX GB, GD	 HX / JX --
P_{DB} power (rated power)	25 kW	50 kW	50 kW
P_{15} power (peak 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	967 V (841 V)		
Digital input			
Voltage	-3 ... 30 V		
Low level (an open digital input is interpreted as "low")	-3 ... 5 V		
High level	15 ... 30 V		
Current consumption (typical at 24 VDC)	10 mA		
Max. connectable cross-section	1.5 mm²		
Digital output (continuously short-circuit proof)			
Voltage	24 VDC		
Max. load current of the digital output	500 mA		
Max. connectable cross-section	1.5 mm²		
R1/R2 connection	M8 screw	M8 screw	M8 screw
Max. conductor cross-section R1/R2	35 mm²	50 mm²	50 mm²
Weight, approx.	3.6 kg	7.3 kg	7.5 kg

Table 5- 6 Technical data, Braking Modules, 3 AC 660 V ... 690 V

Braking Module 6SL3300-	1AH31-3AA0	1AH32-5AA0	1AH32-5BA0
Suitable for installation in: Smart Line Module / Active Line Module / Motor Module, frame size Basic Line Module, frame size	 FX FB	 GX GB, GD	 HX / JX
P_{DB} power (rated power)	25 kW	50 kW	50 kW
P_{15} power (peak 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	1158 V (1070 V)		
Digital input			
Voltage	-3 ... 30 V		
Low level (an open digital input is interpreted as "low")	-3 ... 5 V		
High level	15 ... 30 V		
Current consumption (typical at 24 VDC)	10 mA		
Max. connectable cross-section	1.5 mm²		
Digital output (continuously short-circuit proof)			
Voltage	24 VDC		
Max. load current of the digital output	500 mA		
Max. connectable cross-section	1.5 mm²		
R1/R2 connection	M8 screw	M8 screw	M8 screw
Max. conductor cross-section R1/R2	35 mm²	50 mm²	50 mm²
Weight, approx.	3.6 kg	7.3 kg	7.5 kg

5.2 Braking resistors

5.2.1 Description

The excess energy of the DC link is dissipated via the braking resistor.

The braking resistor is connected to a Braking Module. The braking resistor is positioned outside the cabinet unit or switchgear room. This enables the resulting heat loss around the Basic Line Modules, Smart Line Modules, Active Line Modules, or Motor Modules to be dissipated. This reduces the level of air conditioning required.

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

Greater outputs can be implemented by connecting Braking Modules and braking resistors in parallel. In this case, the Braking Modules are installed in the air duct of the Line Modules and Motor Modules. Depending on the size of the respective module, up to three mounting locations are available.

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 thermostatic switch monitors the braking resistor for overtemperature and issues a signal on a floating contact if the limit value is exceeded.

5.2.2 Safety information

NOTICE

Maintain ventilation clearances

A ventilation clearance of 200 m must be maintained on all sides of the component (with ventilation meshes).

⚠ WARNING

Risk of fire and damage to equipment due to short-circuit / ground fault

The cables to the braking resistor must be routed so that a ground fault or short-circuit can be ruled out. A ground fault can result in fire with smoke.

- Protect the cables from mechanical damage.
- Comply with local installation regulations that enable this fault to be ruled out.

In addition, apply one of the following measures:

- Use cables with double insulation.
- Maintain adequate clearance, using spacers, for example.
- Route the cables in separate cable ducts or pipes.

Note

Notes regarding the installation

The connecting cables to the Braking Module in the Line Module or Motor Module must be kept as short as possible (max. 100 m).

The braking resistors are only suitable for floor mounting.

Sufficient space must be available for dissipating the energy converted by the braking resistor.

A sufficient distance from flammable objects must be ensured.

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 should be provided to protect the braking resistor against precipitation (in accordance with degree of protection IP20).

⚠ CAUTION

Hot surfaces

The surface temperature of the braking resistors may exceed 80° C.

5.2.3 Dimension drawing

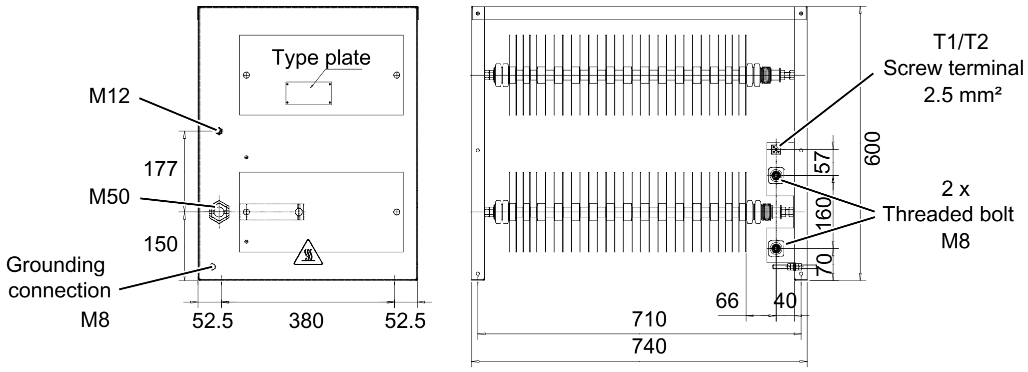


Figure 5-14 Dimension drawing braking resistor 25 kW/125 kW

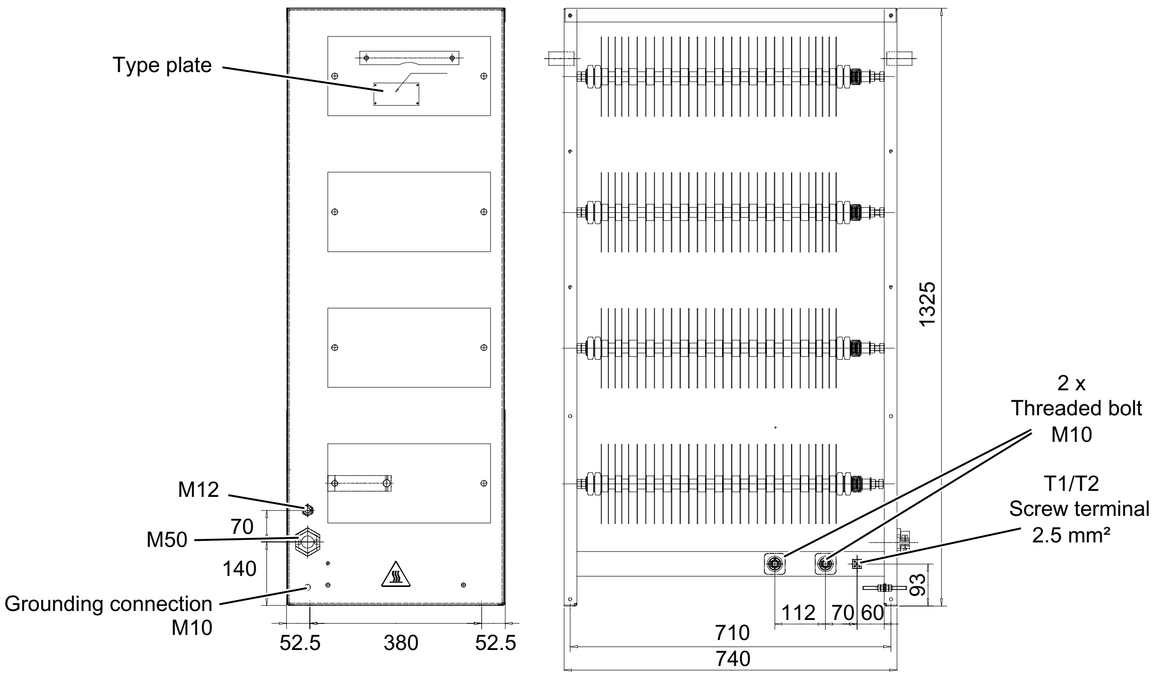


Figure 5-15 Dimension drawing braking resistor 50 kW/250 kW

5.2.4 Electrical connection

⚠ WARNING
Connect only when the device is switched off
The Braking Module must only be connected when the Line Module or Motor Module has been disconnected from the power supply and the DC-link capacitors have been discharged.

⚠ WARNING
Risk of fire and damage to equipment due to short-circuit / ground fault
The cables to the braking resistor must be routed so that a ground fault or short-circuit can be ruled out. A ground fault can result in fire with smoke. • Protect the cables from mechanical damage. • Comply with local installation regulations that enable this fault to be ruled out. In addition, apply one of the following measures: • Use cables with double insulation. • Maintain adequate clearance, using spacers, for example. • Route the cables in separate cable ducts or pipes.

NOTICE
Maximum cable lengths
The length of the connecting cables between the Braking Module and external braking resistor must not exceed 100 m.

Recommended cable 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 the line side.

Table 5- 7 Thermostatic switch connection

Terminal	Function	Technical specifications
T1	Thermostatic switch connection	Voltage: 250 VAC Load current: Max. 1 A
T2	Thermostatic switch connection	

Max. connectable cross-section: 2.5 mm²

5.2.5 Technical data

Table 5- 8 Technical data, braking resistors, 380 V ... 480 V 3 AC

Order number	Unit	6SL3000-1BE31-3AA0	6SL3000-1BE32-5AA0
P_{DB} (rated power)	kW	25	50
P_{15} (peak power)	kW	125	250
Max. current	A	189	378
Resistance	Ω	4.4 (± 7,5 %)	2.2 (± 7,5 %)
Cable entry		via M50 cable gland	via M50 cable gland
Power connection		via M8 bolt-type terminal	via M10 bolt-type terminal
Max. connectable cable cross-section	mm²	50	70
Degree of protection		IP20	IP20
Width x height x depth	mm	740 x 605 x 485	810 x 1325 x 485
Weight, approx.	kg	50	120

Table 5- 9 Technical data, braking resistors, 500 V ... 600 V 3 AC

Order number	Unit	6SL3000-1BF31-3AA0	6SL3000-1BF32-5AA0
P_{DB} (rated power)	kW	25	50
P_{15} (peak power)	kW	125	250
Max. current	A	153	306
Resistance	Ω	6.8 (± 7,5 %)	3.4 (± 7,5 %)
Cable entry		via M50 cable gland	via M50 cable gland
Power connection		via M8 bolt-type terminal	via M10 bolt-type terminal
Max. connectable cable cross-section	mm²	50	70
Degree of protection		IP20	IP20
Width x height x depth	mm	740 x 605 x 485	810 x 1325 x 485
Weight, approx.	kg	50	120

Table 5- 10 Technical data, braking resistors, 660 V ... 690 V 3 AC

Order number	Unit	6SL3000-1BH31-3AA0	6SL3000-1BH32-5AA0
P_{DB} (rated power)	kW	25	50
P_{15} (peak power)	kW	125	250
Max. current	A	125	255
Resistance	Ω	9.8 (± 7,5 %)	4.9 (± 7,5 %)
Cable entry		via M50 cable gland	via M50 cable gland
Power connection		via M8 bolt-type terminal	via M10 bolt-type terminal
Max. connectable cable cross-section	mm²	50	70
Degree of protection		IP20	IP20
Width x height x depth	mm	740 x 605 x 485	810 x 1325 x 485
Weight, approx.	kg	50	120

Duty cycle

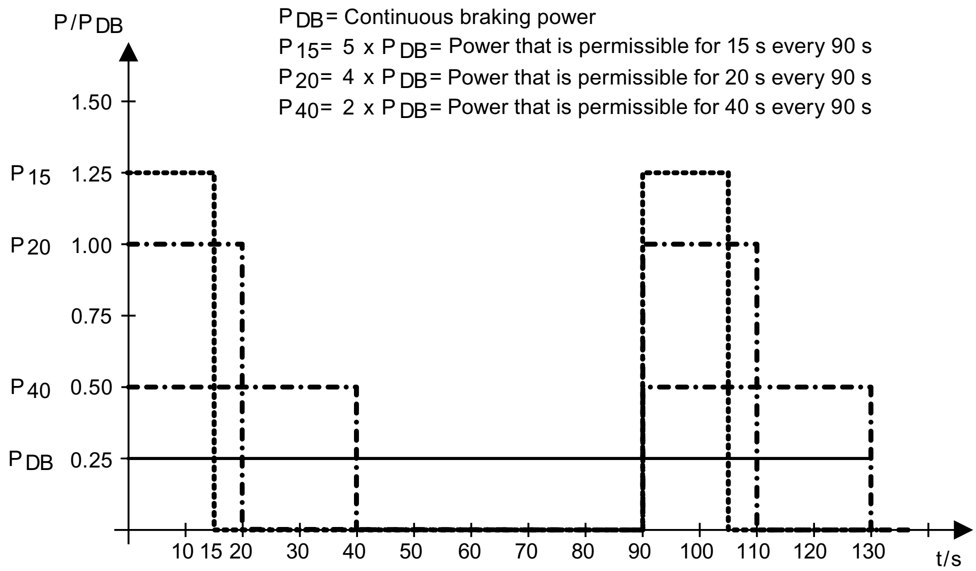


Figure 5-16 Duty cycle for braking resistors

Motor-side power components 6

6.1 Sine-wave filter

6.1.1 Description

If a sine-wave filter is connected to the output of the Motor Module, the voltage between the motor terminals is virtually sinusoidal. This reduces the voltage load on the motor windings and prevents motor noise that would be induced by the pulse frequency.

Sine-wave filters are available up to a converter type power rating of 250 kW (without consideration for derating).

The pulse frequency of the Motor Modules must be set to 4 kHz for the sine-wave filters. This reduces the output current of the Motor Module.

When a sine-wave filter is used, the available output voltage decreases by 15 %.

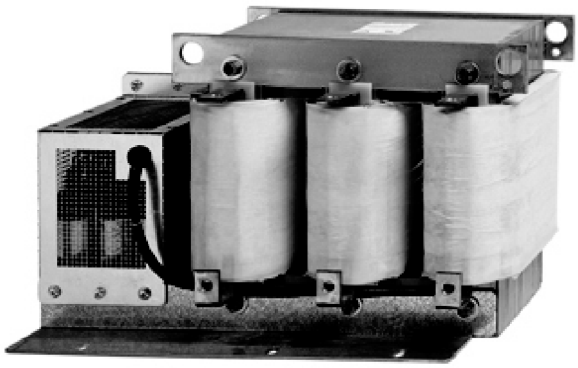


Figure 6-1 Sine-wave filter

6.1.2 Safety information

NOTICE

Maintain ventilation clearances

The 100 mm ventilation clearances above and to the side of the components must be observed.

Note

Cable lengths

The connecting cables to the Motor Module must be kept as short as possible (max. 5 m).

NOTICE

Do not interchange the I/Os

The connections must not be interchanged:

- Incoming cable to the Motor Modules 1U1, 1V1, 1W1, and
- Outgoing cable to the load 1U2, 1V2, 1W2.

Non-observance may damage the sine-wave filter.

NOTICE

Use only approved sine-wave filters

If sine-wave filters are used that have not been approved for SINAMICS by SIEMENS, the Motor Modules may be damaged or may malfunction.

⚠ CAUTION

Hot surfaces

The surface temperature of the sine-wave filters can exceed 80° C.

NOTICE

Activation during commissioning

If a sine-wave filter is connected to the Motor Module, the converter must be activated during commissioning (p0230 = 3) to prevent the filter from being destroyed.

If a sine-wave filter is connected to the Motor Module, the Motor Module must not be operated without a connected motor because otherwise the filter can be destroyed.

NOTICE

Maximum permissible output frequency

The maximum permissible output frequency when sine-wave filters are used is 150 Hz.

6.1.3 Dimension drawing

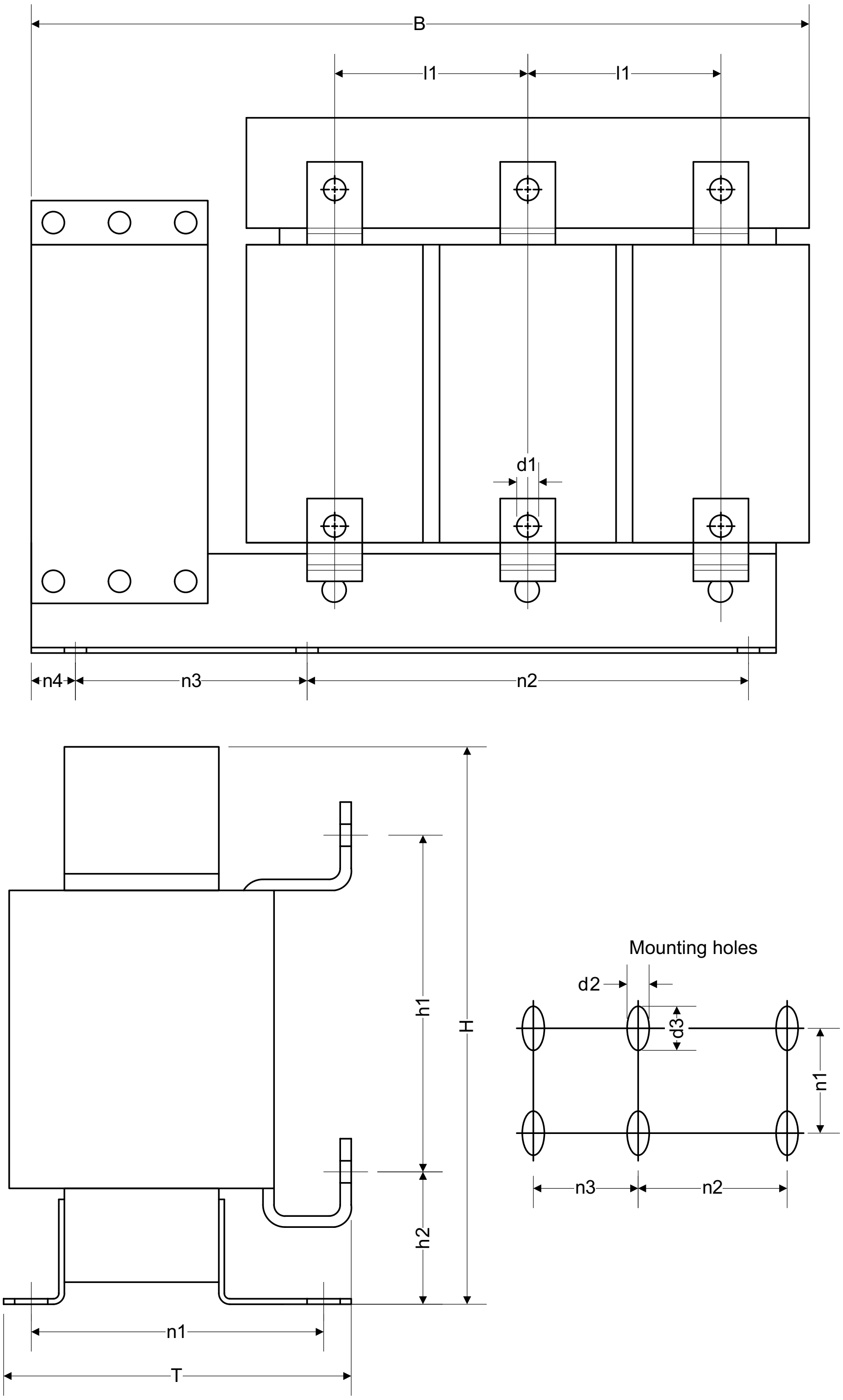


Figure 6-2 Dimension drawing, sine-wave filter

Table 6- 1 Dimensions of the sine-wave filter (all values in mm)

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

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

6.1.4 Technical data

Table 6- 2 Technical data of sine-wave filters 380 V ... 480 V 3 AC

Order number	6SL3000-	2CE32-3AA0	2CE32-3AA0	2CE32-8AA0	2CE33-3AA0	2CE34-1AA0
Suitable for Motor Module	6SL3320-	1TE32-1AAx	1TE32-6AAx	1TE33-1AAx	1TE33-8AAx	1TE35-0AAx
Rated current (type rating) of the Motor Module with sine-wave filter at a pulse frequency of 4 kHz		170 A (90 kW)	215 A (110 kW)	270 A (132 kW)	330 A (160 kW)	380 A (200 kW)
Rated current	A	225	225	276	333	408
Maximum output frequency	Hz	150	150	150	150	150
Power loss - at 50 Hz - at 150 Hz	 kW kW	 0.35 0.6	 0.35 0.6	 0.4 0.69	 0.245 0.53	 0.38 0.7
Connections - to the Motor Module - load		 M10 connecting lugs M10 connecting lugs				
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 Height Depth	 mm mm mm	 620 300 320	 620 300 320	 620 300 320	 620 370 360	 620 370 360
Weight	kg	124	124	127	136	198

6.2 Motor reactors

6.2.1 Description

Motor reactors reduce the voltage stress on the motor windings by reducing the voltage gradients at the motor terminals that occur when motors are fed from drive converters. At the same time, the capacitive charge/discharge currents that also occur on the output of the Motor Module when long motor cables are used are reduced.

6.2.2 Safety information

NOTICE
Maintain ventilation clearances
The 100 mm ventilation clearances above and to the side of the components must be observed.

Note

Cable lengths

The connecting cables to the Motor Module must be kept as short as possible (max. 5 m).

NOTICE
Use only released motor reactors
Using motor reactors not approved by SIEMENS for SINAMICS can result in thermal damage to the reactor.

⚠ CAUTION
Hot surfaces
The surface temperature of the motor reactors can exceed 80° C.

NOTICE
Activation during commissioning
If a motor reactor is connected to the Motor Module, it is essential that it is activated during commissioning (p0230 = 1).

NOTICE
Maximum permissible output frequency
The maximum permissible output frequency when sine-wave filters are used is 150 Hz.

NOTICE
Maximum pulse frequency The maximum permissible pulse frequency when motor reactors are used is 2.5 Hz or 4 kHz.

6.2.3 Dimension drawing

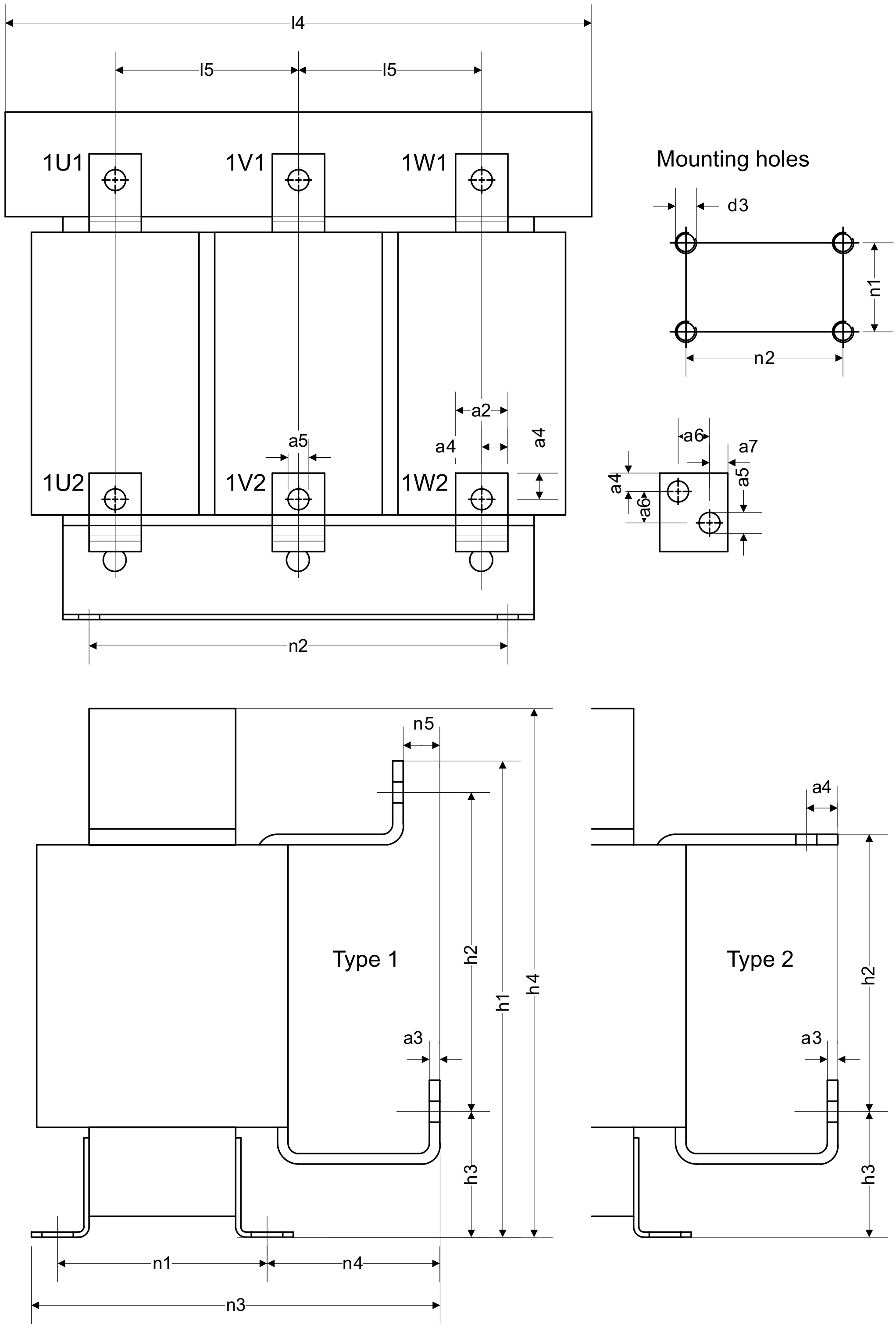


Figure 6-3 Dimension drawing, motor reactor

Table 6- 3 Dimensions of motor reactors, 3 AC 380 V ... 480 V, Part 1 (all specifications in mm)

6SL3000-	2BE32-1AA0	2BE32-6AA0	2BE33-2AA0	2BE33-8AA0	2BE35-0AA0
Connection type	Type 1	Type 1	Type 1	Type 1	Type 2
a2	25	25	25	25	30
a3	5	5	5	5	6
a4	12.5	12.5	12.5	12.5	15
a5	11	11	11	11	14
l4	300	300	300	300	300
l5	100	100	100	100	100
h1	-	-	-	-	-
h2	194	227	194	194	245
h3	60	60	60	60	60
h4	285	315	285	285	365
n1 [1)]	163	183	163	183	183
n2 [1)]	224	224	224	224	224
n3	257	277	257	277	277
n4	79	79	79	79	79
d3	M8	M8	M8	M8	M8

[1)] Lengths n1 and n2 correspond to the distance between holes

Table 6- 4 Dimensions of motor reactors, 3 AC 380 V ... 480 V, Part 2 (all specifications in mm)

6SL3000-	2AE36-1AA0	2AE38-4AA0	2AE41-0AA0	2AE41-4AA0	
Connection type	Type 1	Type 1	Type 1	Type 1	
a2	40	40	40	60	
a3	8	8	8	12	
a4	20	20	20	17	
a5	14	14	14	14	
a6	-	-	-	22	
a7	-	-	-	19	
l4	410	410	410	460	
l5	140	140	140	160	
h1	392	392	392	392	
h2	252	252	252	255	
h3	120	120	120	120	
h4	385	385	385	385	
n1 [1)]	191	191	206	212	
n2 [1)]	316	316	316	356	
n3	292	292	302	326	
n4	84.5	84.5	79.5	94.5	
n5	30	30	-	-	
d3	M10	M10	M10	M10	

[1)] Lengths n1 and n2 correspond to the distance between holes

Table 6- 5 Dimensions of motor reactors, 3 AC 500 V ... 690 V, 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
d3	M8	M8	M8	M8	M8

1) Lengths n1 and n2 correspond to the distance between holes

Table 6- 6 Dimensions of motor reactors, 3 AC 500 V ... 690 V, 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 distance between holes

Table 6- 7 Dimensions of motor reactors, 3 AC 500 V ... 690 V, Part 3 (all specifications in mm)

6SL3000-	2AH41-0AA0	2AH41-1AA0	2AH41-3AA0		
Connection type	Type 1	Type 1	Type 1		
a2	40	50	60		
a3	8	8	12		
a4	20	14	17		
a5	14	14	14		
a6	-	22	22		
a7	-	-	19		
l4	410	410	460		
l5	140	140	160		
h1	392	392	392		
h2	252	258	255		
h3	120	120	120		
h4	385	385	385		
n1 [1)]	183	206	182		
n2 [1)]	316	316	356		
n3	279	317	296		
n4	79.5	94.5	94.5		
d3	M10	M10	M10		

1) Lengths n1 and n2 correspond to the distance between holes

6.2.4 Technical data

Table 6- 8 Technical data of motor reactors, 3 AC 380 V ... 480 V, Part 1

Order number	6SL3000-	2BE32-1AA0	2BE32-6AA0	2BE33-2AA0	2BE33-8AA0
Suitable for Motor Module	6SL3320-	1TE32-1AAx	1TE32-6AAx	1TE33-1AAx	1TE33-8AAx
Type rating of the Motor Module	kW	110	132	160	200
Rated current	A	210	260	310	380
Power loss - At 50 Hz - At 150 Hz	 kW kW	 0.436 0.486	 0.454 0.5	 0.422 0.47	 0.447 0.5
Connections - To the Motor Module (1U1, 1V1, 1W1) - Load (1U2, 1V2, 1W2) - PE		M10 M10 M8	M10 M10 M8	M10 M10 M8	M10 M10 M8
Max. permissible cable length between motor reactor and motor - With one motor reactor - With two motor reactors in series	 m m	300 (shielded) / 450 (unshielded) 525 (shielded) / 787 (unshielded)			
Degree of protection		IP00	IP00	IP00	IP00
Dimensions Width Height Depth	 mm mm mm	 300 285 257	 300 315 277	 300 285 257	 300 285 277
Weight, approx.	kg	66	66	66	73

Table 6- 9 Technical data of motor reactors, 3 AC 380 ... 480 V, Part 2

Order number	6SL3000-	2BE35-0AA0	2AE36-1AA0	2AE38-4AA0	2AE38-4AA0
Suitable for Motor Module	6SL3320-	1TE35-0AAx	1TE36-1AAx	1TE37-5AAx	1TE38-4AAx
Type rating of the Motor Module	kW	250	315	400	450
Rated current	A	490	605	840	840
Power loss - At 50 Hz - At 150 Hz	 kW kW	 0.448 0.5	 0.798 0.9	 0.75 0.84	 0.834 0.943
Connections - To the Motor Module (1U1, 1V1, 1W1) - Load (1U2, 1V2, 1W2) - PE		M12 M12 M8	M12 M12 M10	M12 M12 M10	M12 M12 M10
Max. permissible cable length between motor reactor and motor - With one motor reactor - With two motor reactors in series	 m m	300 (shielded) / 450 (unshielded) 525 (shielded) / 787 (unshielded)			
Degree of protection		IP00	IP00	IP00	IP00
Dimensions Width Height Depth	 mm mm mm	 300 365 277	 410 392 292	 410 392 292	 410 392 292
Weight, approx.	kg	100	130	140	140

Table 6- 10 Technical data of motor reactors, 3 AC 380 ... 480 V, Part 3

Order number	6SL3000-	2AE41-0AA0	2AE41-4AA0	2AE41-4AA0	
Suitable for Motor Module	6SL3320-	1TE41-0AAx	1TE41-2AAx	1TE41-4AAx	
Type rating of the Motor Module	kW	560	710	800	
Rated current	A	985	1405	1405	
Power loss - At 50 Hz - At 150 Hz	 kW kW	 0.939 1.062	 0.81 0.9	 0.946 1.054	
Connections - To the Motor Module (1U1, 1V1, 1W1) - Load (1U2, 1V2, 1W2) - PE		 M12 M12 M10	 2 x M12 2 x M12 M10	 2 x M12 2 x M12 M10	
Max. permissible cable length between motor reactor and motor - With one motor reactor - With two motor reactors in series	 m m	300 (shielded) / 450 (unshielded) 525 (shielded) / 787 (unshielded)			
Degree of protection		IP00	IP00	IP00	
Dimensions Width Height Depth	 mm mm mm	 410 392 302	 460 392 326	 460 392 326	
Weight, approx.	kg	146	179	179	

Table 6- 11 Technical data of motor reactors, 3 AC 500 ... 690 V, Part 1

Order number	6SL3000-	2AH31-0AA0	2AH31-0AA0	2AH31-5AA0	2AH31-5AA0
Suitable for Motor Module	6SL3320-	1TG28-5AAx	1TG31-0AAx	1TG31-2AAx	1TG31-5AAx
Type rating of the Motor Module	kW	75	90	110	132
Rated current	A	100	100	150	150
Power loss - At 50 Hz - At 150 Hz	 kW kW	 0.215 0.26	 0.269 0.3	 0.237 0.26	 0.296 0.332
Connections - To the Motor Module (1U1, 1V1, 1W1) - Load (1U2, 1V2, 1W2) - PE		 M10 M10 M6	 M10 M10 M6	 M10 M10 M6	 M10 M10 M6
Max. permissible cable length between motor reactor and motor - With one motor reactor - With two motor reactors in series	 m m	300 (shielded) / 450 (unshielded) 525 (shielded) / 787 (unshielded)			
Degree of protection		IP00	IP00	IP00	IP00
Dimensions Width Height Depth	 mm mm mm	 270 248 200	 270 248 200	 270 248 200	 270 248 200
Weight, approx.	kg	25	25	25.8	25.8

Table 6- 12 Technical data of motor reactors, 3 AC 500 ... 690 V, Part 2

Order number	6SL3000-	2AH31-8AA0	2AH32-4AA0	2AH32-6AA0	2AH33-6AA0
Suitable for Motor Module	6SL3320-	1TG31-8AAx	1TG32-2AAx	1TG32-6AAx	1TG33-3AAx
Type rating of the Motor Module	kW	160	200	250	315
Rated current	A	175	215	260	330
Power loss - At 50 Hz - At 150 Hz	 kW kW	 0.357 0.403	 0.376 0.425	 0.389 0.441	 0.4 0.454
Connections - To the Motor Module (1U1, 1V1, 1W1) - Load (1U2, 1V2, 1W2) - PE		 M10 M10 M6	 M10 M10 M6	 M10 M10 M6	 M10 M10 M6
Max. permissible cable length between motor reactor and motor - With one motor reactor - With two motor reactors in series	 m m	 300 (shielded) / 450 (unshielded) 525 (shielded) / 787 (unshielded)			
Degree of protection		IP00	IP00	IP00	IP00
Dimensions Width Height Depth	 mm mm mm	 300 285 212	 300 285 212	 300 285 212	 300 285 212
Weight, approx.	kg	34	34	40	46

Table 6- 13 Technical data of motor reactors, 3 AC 500 ... 690 V, Part 3

Order number	6SL3000-	2AH34-5AA0	2AH34-7AA0	2AH35-8AA0	2AH38-1AA0
Suitable for Motor Module	6SL3320-	1TG34-1AAx	1TG34-7AAx	1TG35-8AAx	1TG37-4AAx
Type rating of the Motor Module	kW	400	450	560	710
Rated current	A	410	465	575	810
Power loss - At 50 Hz - At 150 Hz	 kW kW	 0.481 0.545	 0.631 0.723	 0.705 0.801	 0.78 0.91
Connections - To the Motor Module (1U1, 1V1, 1W1) - Load (1U2, 1V2, 1W2) - PE		 M12 M12 M8	 M12 M12 M8	 M12 M12 M8	 M12 M12 M8
Max. permissible cable length between motor reactor and motor - With one motor reactor - With two motor reactors in series	 m m	 300 (shielded) / 450 (unshielded) 525 (shielded) / 787 (unshielded)			
Degree of protection		IP00	IP00	IP00	IP00
Dimensions Width Height Depth	 mm mm mm	 350 330 215	 410 392 292	 410 392 292	 410 392 279
Weight, approx.	kg	68	80	80	146

Table 6- 14 Technical data of motor reactors, 3 AC 500 ... 690 V, Part 4

Order number	6SL3000-	2AH38-1AA0	2AH41-0AA0	2AH41-1AA0	2AH41-3AA0
Suitable for Motor Module	6SL3320-	1TG38-1AAx	1TG38-8AAx	1TG41-0AAx	1TG41-3AAx
Type rating of the Motor Module	kW	800	900	1000	1200
Rated current	A	810	910	1025	1270
Power loss - At 50 Hz - At 150 Hz	 kW kW	 0.877 1.003	 0.851 0.965	 0.927 1.052	 0.862 0.952
Connections - To the Motor Module (1U1, 1V1, 1W1) - Load (1U2, 1V2, 1W2) - PE		 M12 M12 M8	 M12 M12 M8	 M12 M12 M8	 M12 M12 M8
Max. permissible cable length between motor reactor and motor - With one motor reactor - With two motor reactors in series	 m m	 300 (shielded) / 450 (unshielded) 525 (shielded) / 787 (unshielded)			
Degree of protection		IP00	IP00	IP00	IP00
Dimensions Width Height Depth	 mm mm mm	 410 392 279	 410 392 279	 410 392 317	 460 392 296
Weight, approx.	kg	146	150	163	153

6.3 dv/dt filter plus Voltage Peak Limiter

6.3.1 Description

The dV/dt filter plus voltage peak limiter comprises two components: The dV/dt reactor and the voltage-limiting network (voltage peak limiter) which cuts of the voltage peaks and returns 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 V/μs and the typical voltage peaks with rated line voltages to the values below:

< 1000 V at U_{line} < 575 V

< 1250 V at 660 V < U_{line} < 690 V.

Components

The order numbers of the individual components (dV/dt reactor and voltage peak limiter) are listed in the following table:

Table 6- 15 dV/dt filter plus voltage peak limiter, order numbers of the individual components

dV/dt filter plus voltage peak limiter	dV/dt reactor	Voltage peak limiter
380 ... 480 V line voltage		
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
500 ... 690 V line voltage		
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
6SL3000-2DH41-3AA0	2 x 6SL3000-2DH41-3DA0	6SL3000-2DH41-3BA0

⚠ WARNING

Risk of destruction during operation with increased pulse frequency

When a dV/dt filter is used, the pulse frequency of the Motor Module must not exceed 2.5 kHz or 4 kHz. If a higher pulse frequency is set, then this could destroy the dV/dt filter.

Table 6- 16 Max. pulse frequency when a dV/dt filter is used in units with a rated pulse frequency of 2 kHz

Order no. 6SL3320-...	Power [kW]	Output current for a pulse frequency of 2 kHz [A]	Max. pulse frequency when a dV/dt filter is used
Supply voltage 510 – 750 VDC			
1TE32-1AAx	110	210	4 kHz
1TE32-6AAx	132	260	4 kHz
1TE33-1AAx	160	310	4 kHz
1TE33-8AAx	200	380	4 kHz
1TE35-0AAx	250	490	4 kHz

Table 6- 17 Max. pulse frequency when a dV/dt filter is used in units with a rated pulse frequency of 1.25 kHz

Order no. 6SL3320-...	Power [kW]	Output current for a pulse frequency of 1.25 kHz [A]	Max. pulse frequency when a dV/dt filter is used
Supply voltage 510 – 750 VDC			
1TE36-1AAx	315	605	2.5 kHz
1TE37-5AAx	400	745	2.5 kHz
1TE38-4AAx	450	840	2.5 kHz
1TE41-0AAx	560	985	2.5 kHz
1TE41-2AAx	710	1260	2.5 kHz
1TE41-4AAx	800	1405	2.5 kHz
Supply voltage 675 – 1080 VDC			
1TG28-5AAx	75	85	2.5 kHz
1TG31-0AAx	90	100	2.5 kHz
1TG31-2AAx	110	120	2.5 kHz
1TG31-5AAx	132	150	2.5 kHz
1TG31-8AAx	160	175	2.5 kHz
1TG32-2AAx	200	215	2.5 kHz
1TG32-6AAx	250	260	2.5 kHz
1TG33-3AAx	315	330	2.5 kHz
1TG34-1AAx	400	410	2.5 kHz
1TG34-7AAx	450	465	2.5 kHz
1TG35-8AAx	560	575	2.5 kHz
1TG37-4AAx	710	735	2.5 kHz
1TG38-1AAx	800	810	2.5 kHz
1TG38-8AAx	900	910	2.5 kHz
1TG41-0AAx	1000	1025	2.5 kHz
1TG41-3AAx	1200	1270	2.5 kHz

6.3.2 Safety information

NOTICE

Maintain ventilation clearances

The ventilation clearances of 100 mm above and below the components must be observed.

Note

Cable lengths

The connecting cables to the Motor Module must be kept as short as possible (max. 5 m).

NOTICE

Do not interchange the I/Os

The terminals on the voltage limiting network (voltage peak limiter) must always be connected as follows:

- Cable from the DC link to the Motor Module at DCPS, DCNS and
- Cable to the dV/dt reactor 1U2, 1V2, 1W2.

Failure to connect the terminals correctly could damage the voltage peak limiter.

NOTICE

Use only approved dV/dt filters

When using dV/dt filters that SIEMENS has not approved for SINAMICS, then these dV/dt filters can be thermally damaged.

⚠ CAUTION

Hot surfaces

The surface temperature of the dV/dt reactors may exceed 80° C.

NOTICE

Activation during commissioning

If a dV/dt filter plus voltage peak limiter is connected to the Motor Module, it is essential that it is activated during commissioning (p0230 = 2).

NOTICE

No operation without connected motor

When a dV/dt filter plus voltage peak limiter is used, the drive must not be operated without a connected motor, otherwise the filter can be destroyed.

NOTICE
Maximum permissible output frequency
The maximum permissible output frequency when using dV/dt filters is 150 Hz.

6.3.3 Interface description

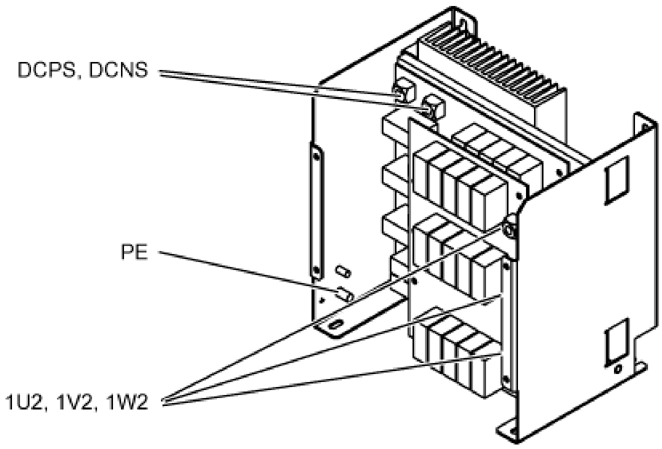


Figure 6-4 Interface overview, voltage peak limiter, type 1

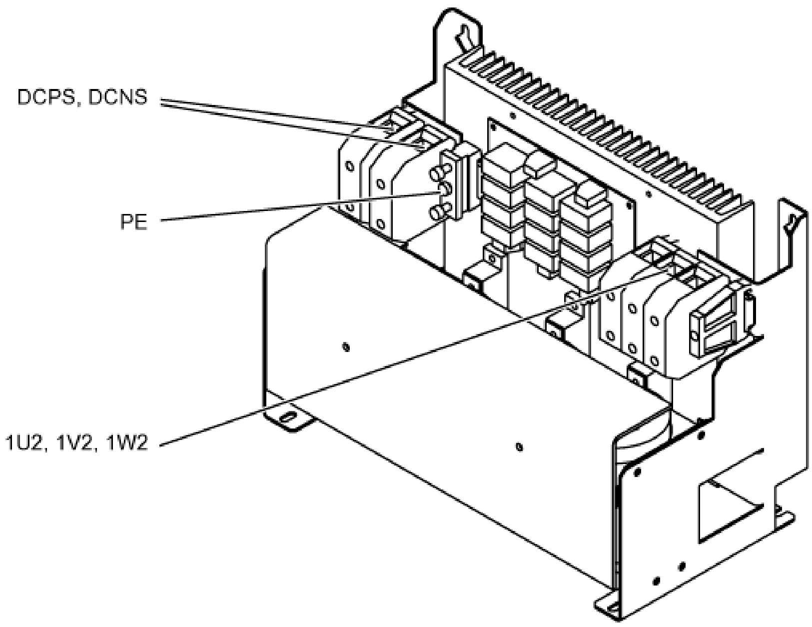


Figure 6-5 Interface overview, voltage peak limiter, type 2

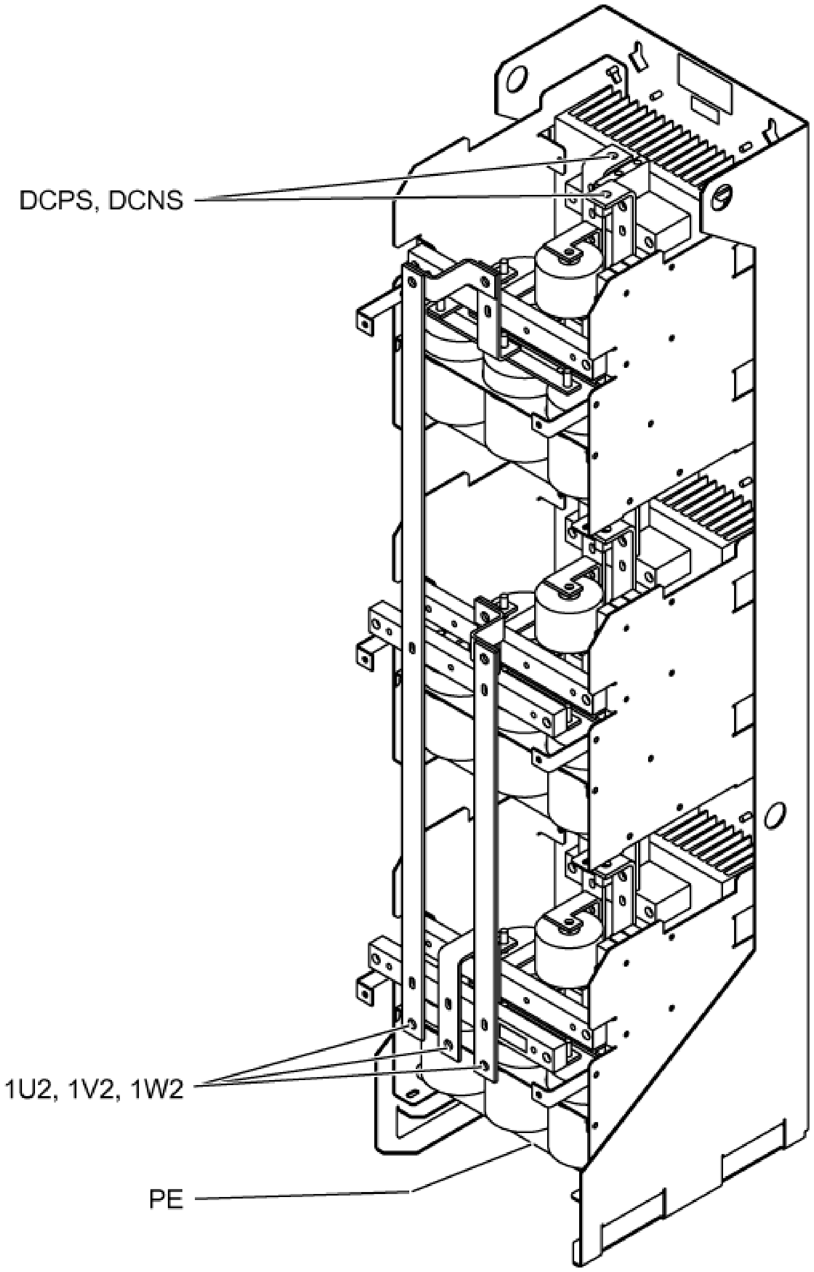


Figure 6-6 Interface overview, voltage peak limiter, type 3

6.3.4 Connecting the dv/dt filter plus Voltage Peak Limiter

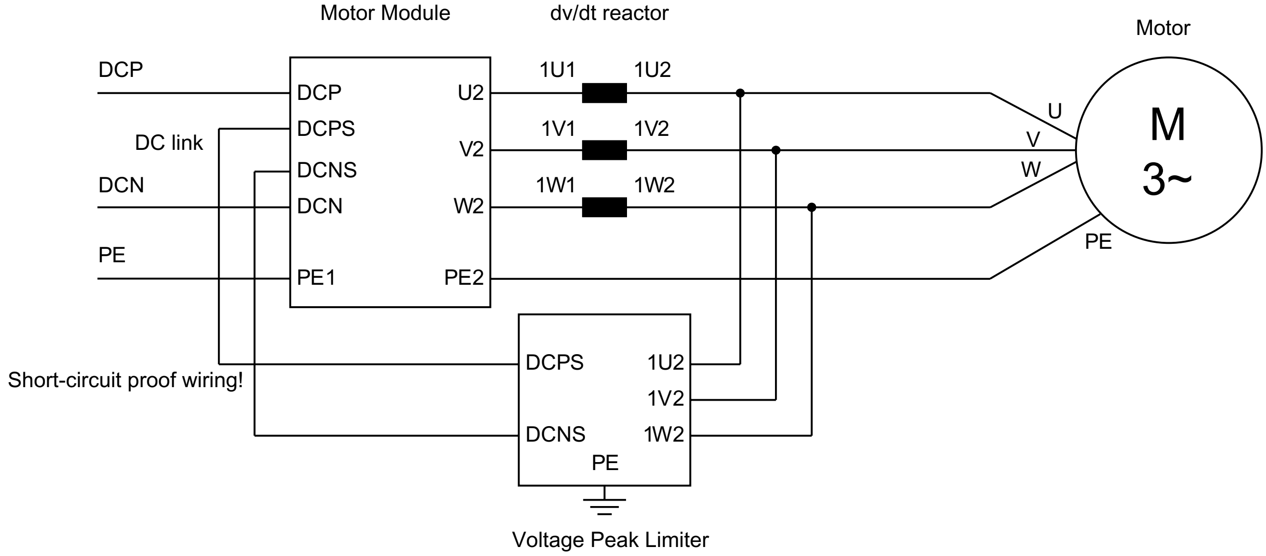


Figure 6-7 Connecting a dV/dt filter plus voltage peak limiter for versions with one dV/dt reactor

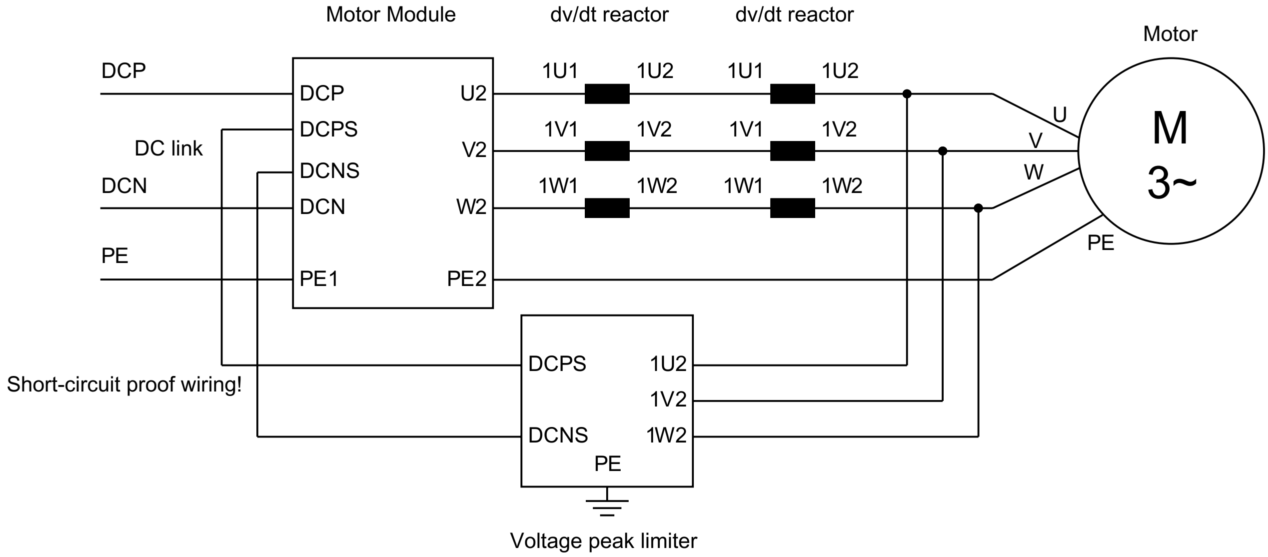


Figure 6-8 Connecting a dV/dt filter plus voltage peak limiter for versions with two dV/dt reactors

Cable cross-sections

Table 6- 18 Cable cross-sections for connections between the dV/dt filter plus voltage peak limiter and Motor Module

dV/dt filter plus voltage peak limiter	Connection to the DC link (DCPS/DCNS) [mm²]	Connection between dV/dt reactor and voltage peak limiter (1U2, 1V2, 1W2) [mm²]
380 ... 480 V line voltage		
6SL3000-2DE32-6AA0	35	10
6SL3000-2DE35-0AA0	70	16
6SL3000-2DE38-4AA0	2 x 50	50
6SL3000-2DE41-4AA0	2 x 120	120
500 ... 690 V line voltage		
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
6SL3000-2DH41-3AA0	2 x 120	120

⚠ WARNING

Risk of fire and damage to equipment due to short-circuit / ground fault

The cables to the DC link of the Motor Modules must be routed so that a ground fault or short-circuit can be ruled out. A ground fault can result in fire with smoke.

- Protect the cables from mechanical damage.
- Comply with local installation regulations that enable this fault to be ruled out.

In addition, apply one of the following measures:

- Use cables with double insulation.
- Maintain adequate clearance, using spacers, for example.
- Route the cables in separate cable ducts or pipes.

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.

6.3.5 Dimension drawing, dv/dt reactor

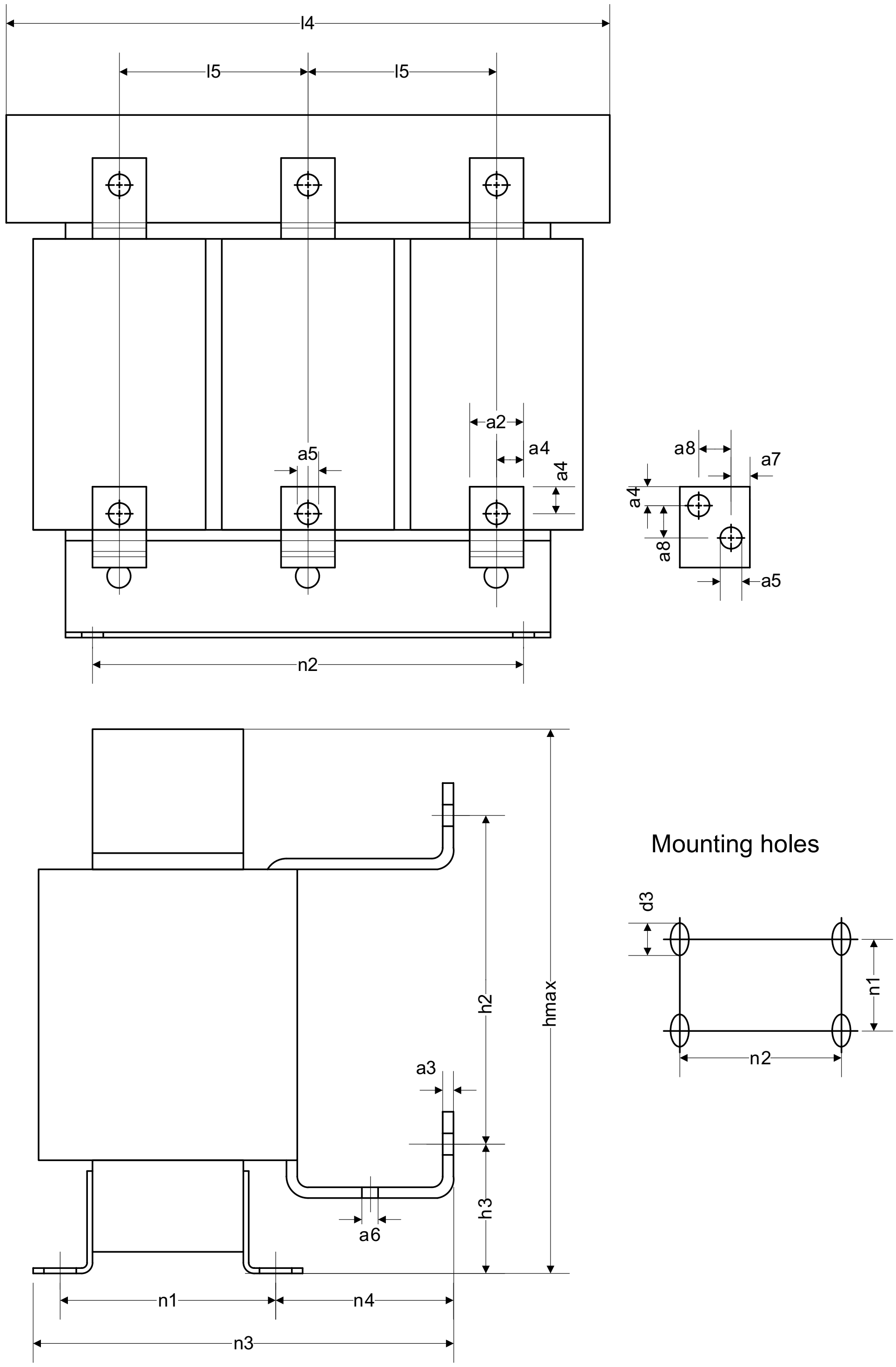


Figure 6-9 Dimension drawing, dV/dt reactor

Table 6- 19 Dimensions of dV/dt reactor, 380 V ... 480 V 3 AC (all dimensions 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 distance between holes

Table 6- 20 Dimensions of dV/dt reactor, 500 V ... 690 V 3 AC, part 1 (all dimensions in mm)

6SL3000-	2DH31-0CA0	2DH31-5CA0	2DH32-2CA0	2DH33-3CA0	2DH34-1CA0
a2	25	25	25	25	30
a3	6	6	5	5	6
a4	14	14	14	14	17
a5	10.5 x 14	10.5 x 14	10.5 x 14	10.5 x 14	14 x 18
a6	7	7	7	9	11
a7	-	-	-	-	-
a8	-	-	-	-	-
l4	350	350	460	460	460
l5	120	120	152.5	152.5	152.5
hmax	320	320	360	360	385
h2	215	215	240	240	280
h3	70	70	86	86	83
n1 [1)]	138	138	155	212	212
n2 [1)]	264	264	356	356	356
n3	227	227	275	275	312
n4	74	74	101	42	78
d3	M8	M8	M12 (15 x 22)	M12 (15 x 22)	M12 (15 x 22)

1) Lengths n1 and n2 correspond to the distance between holes

Table 6- 21 Dimensions of dV/dt reactor, 500 V ... 690 V 3 AC, part 2 (all dimensions in mm)

6SL3000-	2DH35-8CA0	2DH38-1DA0	2DH41-3DA0		
a2	40	50	60		
a3	8	8	10		
a4	22	16	19		
a5	14 x 18	14 x 18	14 x 18		
a6	11	11	11		
a7	-	14	17		
a8	-	22	26		
l4	460	445	445		
l5	152.5	145	145		
hmax	385	385	385		
h2	280	255	250		
h3	78	114	121		
n1 [1)]	212	212	212		
n2 [1)]	356	341	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 distance between holes

6.3.6 Dimension drawing of the Voltage Peak Limiter

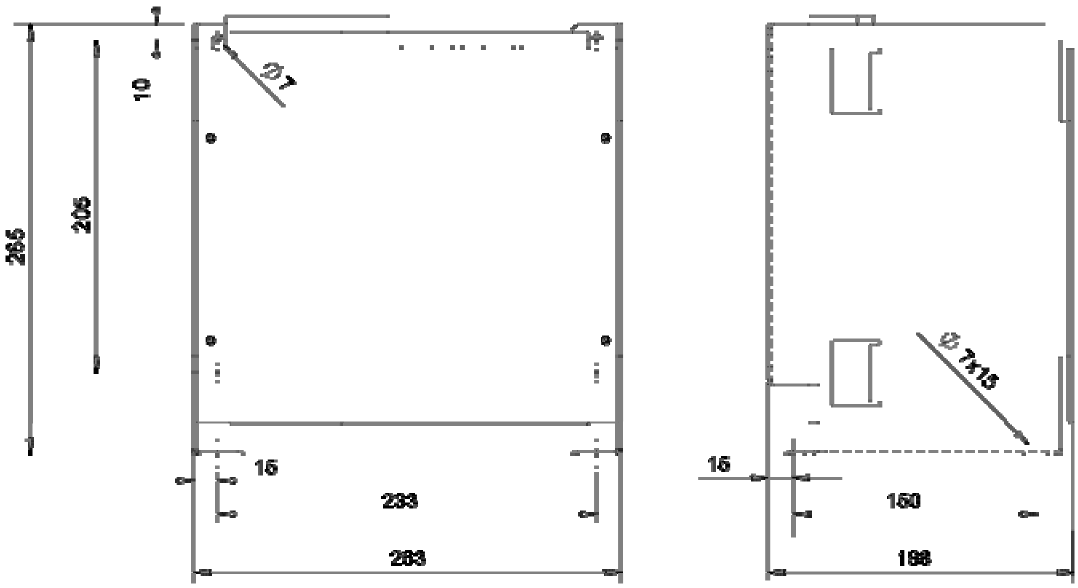


Figure 6-10 Dimension drawing of the voltage peak limiter, type 1

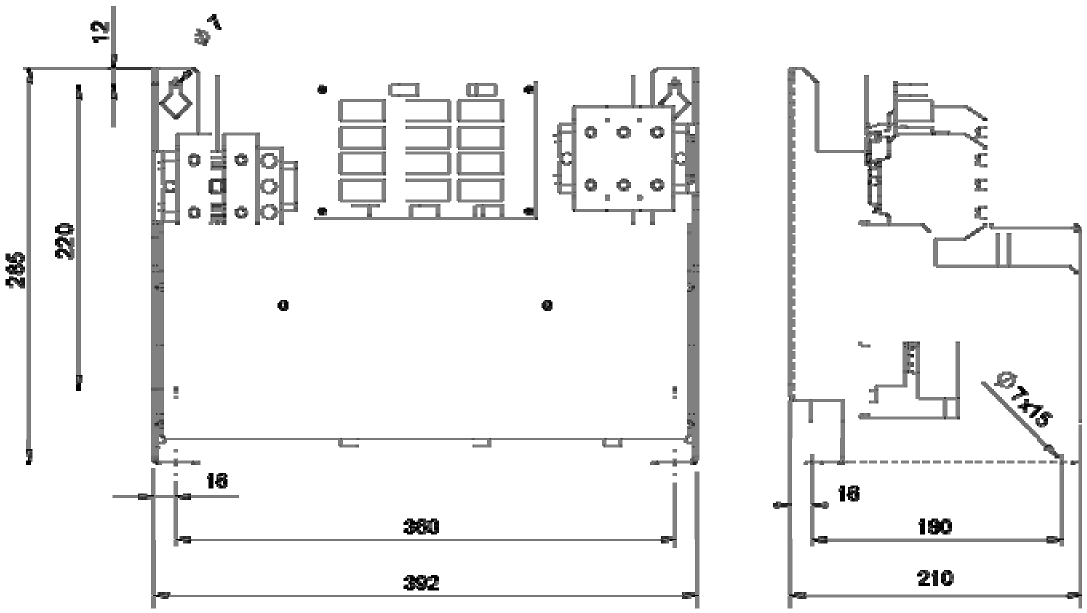


Figure 6-11 Dimension drawing of the voltage peak limiter, type 2

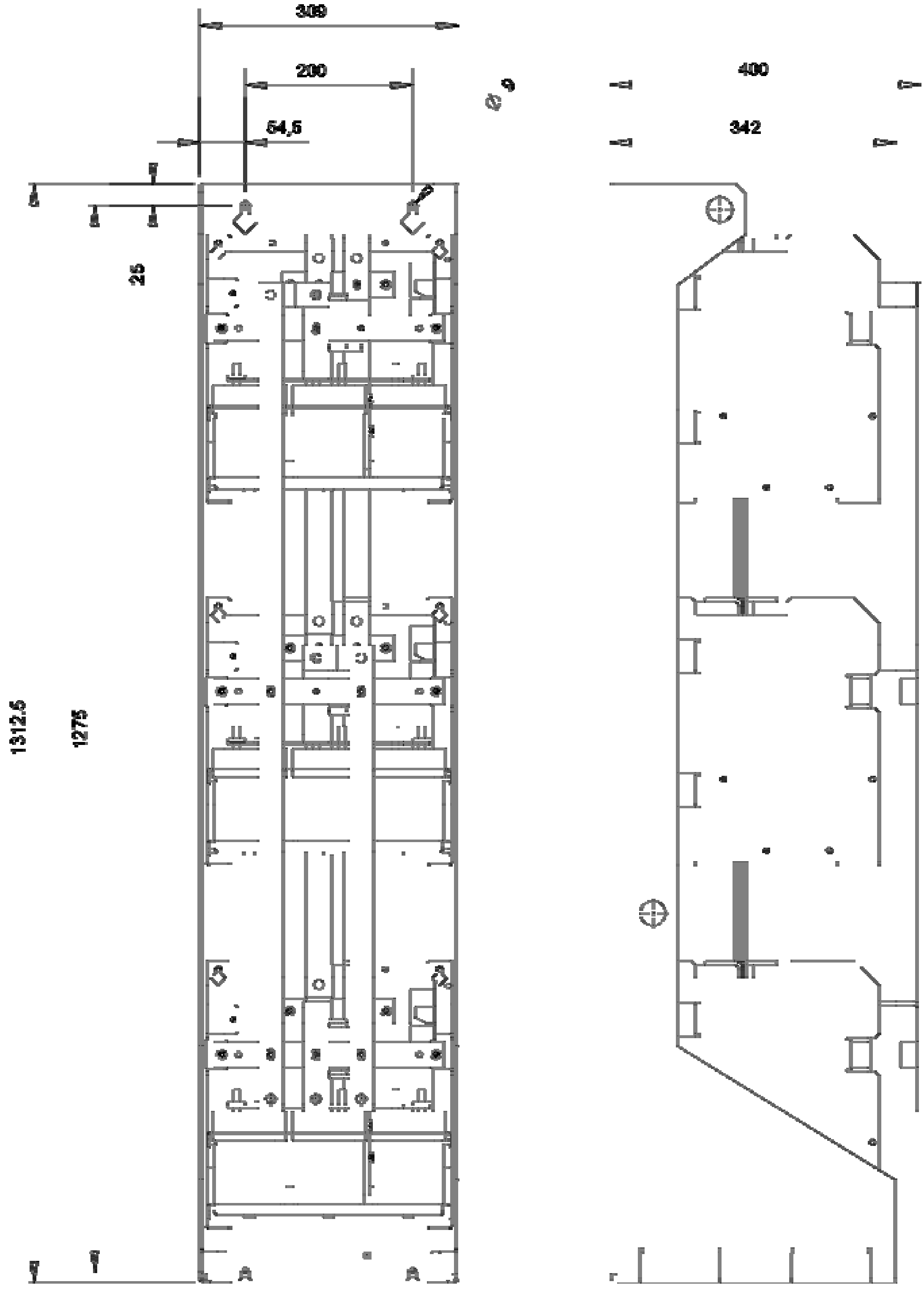


Figure 6-12 Dimension drawing of the voltage peak limiter, type 3

Table 6- 22 Assigning voltage peak limiter to dimension drawings

Voltage peak limiter	Dimension drawing type
380 ... 480 V line voltage	
6SL3000-2DE32-6BA0	Type 1
6SL3000-2DE35-0BA0	Type 2
6SL3000-2DE38-4BA0	Type 3
6SL3000-2DE41-4BA0	Type 3
500 ... 690 V line voltage	
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
6SL3000-2DH41-3BA0	Type 3

6.3.7 Technical data

Table 6- 23 Technical data of the dV/dt filter plus voltage peak limiter, 3 AC 380 ... 480 V, Part 1

Order number	6SL3000-	2DE32-6AA0	2DE32-6AA0	2DE35-0AA0	2DE35-0AA0
Suitable for Motor Module	6SL3320-	1TE32-1AAx	1TE32-6AAx	1TE33-1AAx	1TE33-8AAx
Type rating of the Motor Module	kW	110	132	160	200
I_{thmax}	A	260	260	490	490
Degree of protection		IP00	IP00	IP00	IP00
dV/dt reactor					
Power loss - At 50 Hz - At 60 Hz - At 150 Hz	 kW kW kW	 0.701 0.729 0.78	 0.701 0.729 0.78	 0.874 0.904 0.963	 0.874 0.904 0.963
Connections - To the Motor Module - Load - PE		 M10 M10 M6	 M10 M10 M6	 M12 M12 M6	 M12 M12 M6
Max. permissible cable length between dV/dt reactor and motor	m	300 (shielded) 450 (unshielded)			
Dimensions Width Height Depth	 mm mm mm	 410 370 229	 410 370 229	 460 370 275	 460 370 275
Weight, approx.	kg	66	66	122	122
Voltage peak limiter					
Power loss - At 50 Hz - At 60 Hz - At 150 Hz	 kW kW kW	 0.029 0.027 0.025	 0.029 0.027 0.025	 0.042 0.039 0.036	 0.042 0.039 0.036
Connections - To the dV/dt reactor - DC - PE		 M8 M8 M8	 M8 M8 M8	 Terminal 70 mm² Terminal 70 mm² Terminal 35 mm²	 Terminal 70 mm² Terminal 70 mm² Terminal 35 mm²
Dimensions Width Height Depth	 mm mm mm	 263 265 188	 263 265 188	 392 285 210	 392 285 210
Weight, approx.	kg	6	6	16	16

Table 6- 24 Technical data of the dV/dt filter plus voltage peak limiter, 3 AC 380 ... 480 V, Part 2

Order number	6SL3000-	2DE35-0AA0	2DE38-4AA0	2DE38-4AA0	2DE38-4AA0
Suitable for Motor Module	6SL3320-	1TE35-0AAx	1TE36-1AAx	1TE37-5AAx	1TE38-4AAx
Type rating of the Motor Module	kW	250	315	400	450
I_{thmax}	A	490	840	840	840
Degree of protection		IP00	IP00	IP00	IP00
dV/dt reactor					
Power loss - At 50 Hz - At 60 Hz - At 150 Hz	 kW kW kW	 0.874 0.904 0.963	 1.106 1.115 1.226	 1.106 1.115 1.226	 1.106 1.115 1.226
Connections - To the Motor Module - Load - PE		 M12 M12 M6	 M12 M12 M6	 M12 M12 M6	 M12 M12 M6
Max. permissible cable length between dV/dt reactor and motor	m	300 (shielded) 450 (unshielded)			
Dimensions Width Height Depth	 mm mm mm	 460 370 275	 460 385 312	 460 385 312	 460 385 312
Weight, approx.	kg	122	149	149	149
Voltage peak limiter					
Power loss - At 50 Hz - At 60 Hz - At 150 Hz	 kW kW kW	 0.042 0.039 0.036	 0.077 0.072 0.066	 0.077 0.072 0.066	 0.077 0.072 0.066
Connections - To the dV/dt reactor - DC - PE		 Terminal 70 mm² Terminal 70 mm² Terminal 35 mm²	 M8 M8 M8	 M8 M8 M8	 M8 M8 M8
Dimensions Width Height Depth	 mm mm mm	 392 285 210	 309 1312.5 400	 309 1312.5 400	 309 1312.5 400
Weight, approx.	kg	16	48	48	48

Table 6- 25 Technical data of the dV/dt filter plus voltage peak limiter, 3 AC 380 ... 480 V, Part 3

Order number	6SL3000-	2DE41-4AA0 1)	2DE41-4AA0 1)	2DE41-4AA0 1)	
Suitable for Motor Module	6SL3320-	1TE41-0AAx	1TE41-2AAx	1TE41-4AAx	
Type rating of the Motor Module	kW	560	710	800	
I_{thmax}	A	1405	1405	1405	
Degree of protection		IP00	IP00	IP00	
dV/dt reactor					
Power loss - At 50 Hz - At 60 Hz - At 150 Hz	 kW kW kW	 1.111 1.154 1.23	 1.111 1.154 1.23	 1.111 1.154 1.23	
Connections - To the Motor Module - Load - PE		 2 x M12 2 x M12 M6	 2 x M12 2 x M12 M6	 2 x M12 2 x M12 M6	
Max. permissible cable length between dV/dt reactor and motor	m	300 (shielded) 450 (unshielded)			
Dimensions Width Height Depth	 mm mm mm	 445 385 312	 445 385 312	 445 385 312	
Weight, approx.	kg	158	158	158	
Voltage peak limiter					
Power loss - At 50 Hz - At 60 Hz - At 150 Hz	 kW kW kW	 0.134 0.125 0.114	 0.134 0.125 0.114	 0.134 0.125 0.114	
Connections - To the dV/dt reactor - DC - PE		 M10 M10 M8	 M10 M10 M8	 M10 M10 M8	
Dimensions Width Height Depth	 mm mm mm	 309 1312.5 400	 309 1312.5 400	 309 1312.5 400	
Weight, approx.	kg	72	72	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 two dV/dt reactors

For versions with 2 dV/dt reactors, the cable lengths specified in the table do not change.

Table 6- 26 Technical data of the dV/dt filter plus voltage peak limiter, 3 AC 500 ... 690 V, Part 1

Order number	6SL3000-	2DH31-0AA0	2DH31-0AA0	2DH31-5AA0	2DH31-5AA0
Suitable for Motor Module	6SL3320-	1TG28-5AAx	1TG31-0AAx	1TG31-2AAx	1TG31-5AAx
Type rating of the Motor Module	kW	75	90	110	132
I_{thmax}	A	100	100	150	150
Degree of protection		IP00	IP00	IP00	IP00
dV/dt reactor					
Power loss - At 50 Hz - At 60 Hz - At 150 Hz	 kW kW kW	 0.49 0.508 0.541	 0.49 0.508 0.541	 0.389 0.408 0.436	 0.389 0.408 0.436
Connections - To the Motor Module - Load - PE		 M10 M10 M6	 M10 M10 M6	 M10 M10 M6	 M10 M10 M6
Max. permissible cable length between dV/dt reactor and motor	m	300 (shielded) 450 (unshielded)			
Dimensions Width Height Depth	 mm mm mm	 350 320 227	 350 320 227	 350 320 227	 350 320 227
Weight, approx.	kg	48	48	50	50
Voltage peak limiter					
Power loss - At 50 Hz - At 60 Hz - At 150 Hz	 kW kW kW	 0.016 0.015 0.013	 0.016 0.015 0.013	 0.020 0.019 0.018	 0.020 0.019 0.018
Connections - To the dV/dt reactor - DC - PE		 M8 M8 M8	 M8 M8 M8	 M8 M8 M8	 M8 M8 M8
Dimensions Width Height Depth	 mm mm mm	 263 265 188	 263 265 188	 263 265 188	 263 265 188
Weight, approx.	kg	6	6	6	6

Table 6- 27 Technical data of the dV/dt filter plus voltage peak limiter, 3 AC 500 ... 690 V, Part 2

Order number	6SL3000-	2DH32-2AA0	2DH32-2AA0	2DH33-3AA0	2DH33-3AA0
Suitable for Motor Module	6SL3320-	1TG31-8AAx	1TG32-2AAx	1TG32-6AAx	1TG33-3AAx
Type rating of the Motor Module	kW	160	200	250	315
I_{thmax}	A	215	215	330	330
Degree of protection		IP00	IP00	IP00	IP00
dV/dt reactor					
Power loss - At 50 Hz - At 60 Hz - At 150 Hz	 kW kW kW	 0.578 0.604 0.645	 0.578 0.604 0.645	 0.595 0.62 0.661	 0.595 0.62 0.661
Connections - To the Motor Module - Load - PE		 M10 M10 M6	 M10 M10 M6	 M10 M10 M6	 M10 M10 M6
Max. permissible cable length between dV/dt reactor and motor	m	300 (shielded) 450 (unshielded)			
Dimensions Width Height Depth	 mm mm mm	 460 360 275	 460 360 275	 460 360 275	 460 360 275
Weight, approx.	kg	83	83	135	135
Voltage peak limiter					
Power loss - At 50 Hz - At 60 Hz - At 150 Hz	 kW kW kW	 0.032 0.03 0.027	 0.032 0.03 0.027	 0.042 0.039 0.036	 0.042 0.039 0.036
Connections - To the dV/dt reactor - DC - PE		 Terminal 70 mm² Terminal 70 mm² Terminal 35 mm²	 Terminal 70 mm² Terminal 70 mm² Terminal 35 mm²	 Terminal 70 mm² Terminal 70 mm² Terminal 35 mm²	 Terminal 70 mm² Terminal 70 mm² Terminal 35 mm²
Dimensions Width Height Depth	 mm mm mm	 392 285 210	 392 285 210	 392 285 210	 392 285 210
Weight, approx.	kg	16	16	16	16

Table 6- 28 Technical data of the dV/dt filter plus voltage peak limiter, 3 AC 500 ... 690 V, Part 3

Order number	6SL3000-	2DH34-1AA0	2DH35-8AA0	2DH35-8AA0	2DH38-1AA0 [1)]
Suitable for Motor Module	6SL3320-	1TG34-1AAx	1TG34-7AAx	1TG35-8AAx	1TG37-4AAx
Type rating of the Motor Module	kW	400	450	560	710
I_{thmax}	A	410	575	575	810
Degree of protection		IP00	IP00	IP00	IP00
dV/dt reactor					
Power loss - At 50 Hz - At 60 Hz - At 150 Hz	 kW kW kW	 0.786 0.826 0.884	 0.862 0.902 0.964	 0.862 0.902 0.964	 0.828 0.867 0.927
Connections - To the Motor Module - Load - PE		 M12 M12 M6	 M12 M12 M6	 M12 M12 M6	 2 x M12 2 x M12 M6
Max. permissible cable length between dV/dt reactor and motor	m	300 (shielded) 450 (unshielded)			
Dimensions Width Height Depth	 mm mm mm	 460 385 312	 460 385 312	 460 385 312	 445 385 312
Weight, approx.	kg	147	172	172	160
Voltage peak limiter					
Power loss - At 50 Hz - At 60 Hz - At 150 Hz	 kW kW kW	 0.051 0.048 0.043	 0.063 0.059 0.054	 0.063 0.059 0.054	 0.106 0.1 0.091
Connections - To the dV/dt reactor - DC - PE		 M8 M8 M8	 M8 M8 M8	 M8 M8 M8	 M10 M10 M8
Dimensions Width Height Depth	 mm mm mm	 309 1312.5 400	 309 1312.5 400	 309 1312.5 400	 309 1312.5 400
Weight, approx.	kg	48	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 two dV/dt reactors

For versions with 2 dV/dt reactors, the cable lengths specified in the table do not change.

Table 6- 29 Technical data of the dV/dt filter plus voltage peak limiter, 3 AC 500 ... 690 V, Part 4

Order number	6SL3000-	2DH38-1AA0 1)	2DH41-3AA0 1)	2DH41-3AA0 1)	2DH41-3AA0 1)
Suitable for Motor Module	6SL3320-	1TG38-1AAx	1TG38-8AAx	1TG41-0AAx	1TG41-3AAx
Type rating of the Motor Module	kW	800	900	1000	1200
I_{thmax}	A	810	1270	1270	1270
Degree of protection		IP00	IP00	IP00	IP00
dV/dt reactor					
Power loss - At 50 Hz - At 60 Hz - At 150 Hz	 kW kW kW	 0.828 0.867 0.927	 0.865 0.904 0.966	 0.865 0.904 0.966	 0.865 0.904 0.966
Connections - To the Motor Module - Load - PE		 2 x M12 2 x M12 M6	 2 x M12 2 x M12 M6	 2 x M12 2 x M12 M6	 2 x M12 2 x M12 M6
Max. permissible cable length between dV/dt reactor and motor	m	300 (shielded) 450 (unshielded)			
Dimensions Width Height Depth	 mm mm mm	 445 385 312	 445 385 312	 445 385 312	 445 385 312
Weight, approx.	kg	160	164	164	164
Voltage peak limiter					
Power loss - At 50 Hz - At 60 Hz - At 150 Hz	 kW kW kW	 0.106 0.1 0.091	 0.15 0.14 0.128	 0.15 0.14 0.128	 0.15 0.14 0.128
Connections - To the dV/dt reactor - DC - PE		 M10 M10 M8	 M10 M10 M8	 M10 M10 M8	 M10 M10 M8
Dimensions Width Height Depth	 mm mm mm	 309 1312.5 400	 309 1312.5 400	 309 1312.5 400	 309 1312.5 400
Weight, approx.	kg	72	72	72	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 two dV/dt reactors

For versions with 2 dV/dt reactors, the cable lengths specified in the table do not change.

6.4 dv/dt filter compact plus Voltage Peak Limiter

6.4.1 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.

The dV/dt filters compact plus voltage peak limiter limit the voltage load on the motor cables to values in accordance with the limit value curve A as per IEC/TS 60034-25:2007.

The rate of voltage rise is limited to < 1600 V/μs, the peak voltages are limited to < 1400 V.

⚠ WARNING

Danger of thermal destruction during continuous operation at low output frequencies

When a dV/dt filter compact plus voltage peak limiter is used, the drive must not be continuously operated with an output frequency less than 10 Hz.

A maximum load duration of 5 minutes at an output frequency less than 10 Hz is permissible, provided that the converter is then operated with an output frequency higher than 10 Hz for a period of 5 minutes.

Continuous operation at an output frequency less than 10 Hz can produce thermal overload and destroy the dV/dt filter.

⚠ WARNING

Risk of destruction during operation with increased pulse frequency

When a dV/dt filter compact plus voltage peak limiter is used, the pulse frequency of the Motor Module must not exceed 2.5 kHz or 4 kHz. If a higher pulse frequency is set, then this could destroy the dV/dt filter.

Note

Setting range for pulse frequencies

It is permissible to set pulse frequencies in the range between the rated pulse frequency and the relevant maximum pulse frequency when a dV/dt filter compact plus voltage peak limiter is used.

Note

Current derating at increased pulse frequency

For current derating with increased pulse frequency, the derating of the associated Motor Module is the decisive factor.

Note

Components of the dV/dt filter

The dV/dt filters compact plus voltage peak limiter of types 1 to 3 consist of a single component. Type 4 consists of two separate components, the dV/dt reactor and the voltage peak limiter.

Table 6- 30 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

Order no. of the Motor Module 6SL3320-...	Type 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
Supply voltage 510 – 750 VDC			
1TE32-1AAx	110	210	4 kHz
1TE32-6AAx	132	260	4 kHz
1TE33-1AAx	160	310	4 kHz
1TE33-8AAx	200	380	4 kHz
1TE35-0AAx	250	490	4 kHz

Table 6- 31 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

Order no. of the Motor Module 6SL3320-...	Type 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
Supply voltage 510 – 750 VDC			
1TE36-1AAx	315	605	2.5 kHz
1TE37-5AAx	400	745	2.5 kHz
1TE38-4AAx	450	840	2.5 kHz
1TE41-0AAx	560	985	2.5 kHz
1TE41-2AAx	710	1260	2.5 kHz
1TE41-4AAx	800	1405	2.5 kHz
Supply voltage 675 – 1080 VDC			
1TG28-5AAx	75	85	2.5 kHz
1TG31-0AAx	90	100	2.5 kHz
1TG31-2AAx	110	120	2.5 kHz
1TG31-5AAx	132	150	2.5 kHz
1TG31-8AAx	160	175	2.5 kHz
1TG32-2AAx	200	215	2.5 kHz
1TG32-6AAx	250	260	2.5 kHz
1TG33-3AAx	315	330	2.5 kHz
1TG34-1AAx	400	410	2.5 kHz
1TG34-7AAx	450	465	2.5 kHz
1TG35-8AAx	560	575	2.5 kHz
1TG37-4AAx	710	735	2.5 kHz
1TG38-1AAx	800	810	2.5 kHz
1TG38-8AAx	900	910	2.5 kHz
1TG41-0AAx	1000	1025	2.5 kHz
1TG41-3AAx	1200	1270	2.5 kHz

6.4.2 Safety information

NOTICE

Maintain ventilation clearances

The ventilation clearances of 100 mm above and below the components must be observed.

The dV/dt filters compact plus voltage peak limiter must only be installed upright, to ensure that cooling air flows from bottom to top through the heatsinks on the voltage peak limiter.

Note

Cable lengths

The motor cables between the Motor Module and dV/dt filter compact, and the cables to the DC link must be kept as short as possible (max. 5 m).

NOTICE

Terminals for order numbers 6SL3000-2DE41-4EA0, 6SL3000-2DG38-1EA0 and 6SL3000-2DG41-3EA0

The terminals on the voltage limiting network (voltage peak limiter) must always be connected as follows:

- Cable from the DC link to the Motor Module at DCPS, DCNS and
- Cable to the dV/dt reactor 1U2, 1V2, 1W2.

Failure to connect the terminals correctly could damage the voltage peak limiter.

NOTICE

Use only approved dV/dt filters

When using dV/dt filters that SIEMENS has not approved for SINAMICS, then these dV/dt filters can be thermally damaged.

⚠ CAUTION

Hot surfaces

The surface temperature of the dV/dt filters compact may exceed 80° C.

NOTICE

Activation during commissioning

If a dV/dt filter compact plus voltage peak limiter is connected to the Motor Module, it is essential that it is activated during commissioning (p0230 = 2).

NOTICE
No operation without connected motor
When a dV/dt filter compact plus voltage peak limiter is used, the drive must not be operated without a connected motor, otherwise the filter could be destroyed.

NOTICE
Maximum permissible output frequency
The maximum permissible output frequency when using dV/dt filters compact plus voltage peak limiter is 150 Hz.

⚠ DANGER
PE connection
Each component must be grounded using the specially marked PE connection.

6.4.3 Interface description

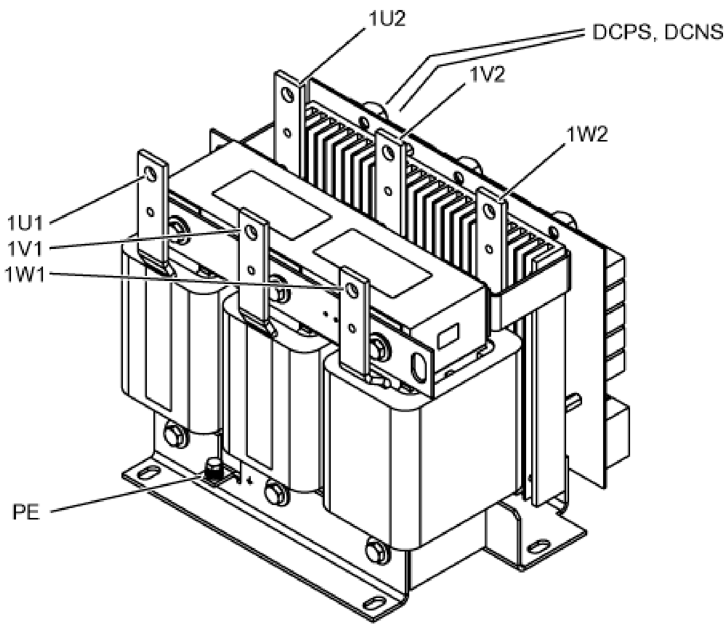


Figure 6-13 Interface overview for dv/dt filter compact plus Voltage Peak Limiter, Type 1

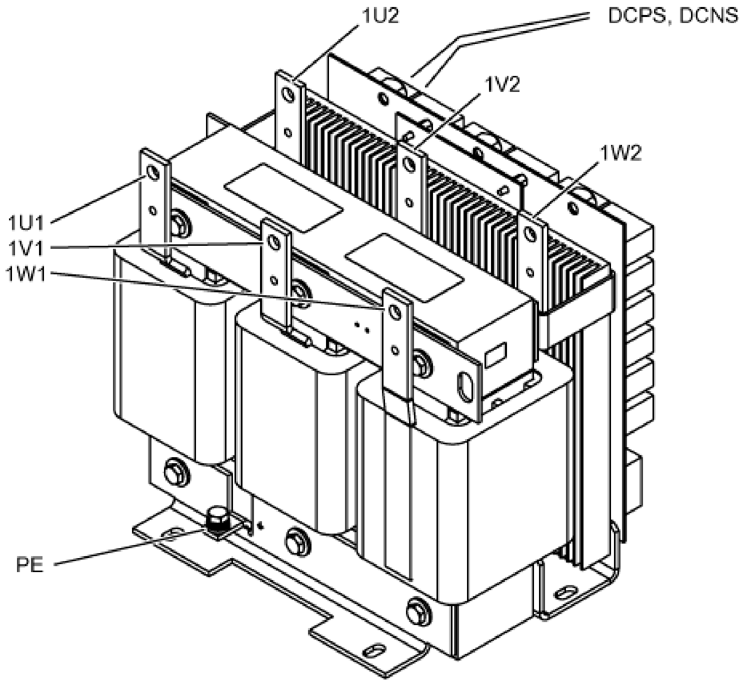


Figure 6-14 Interface overview for dv/dt filter compact plus Voltage Peak Limiter, Type 2

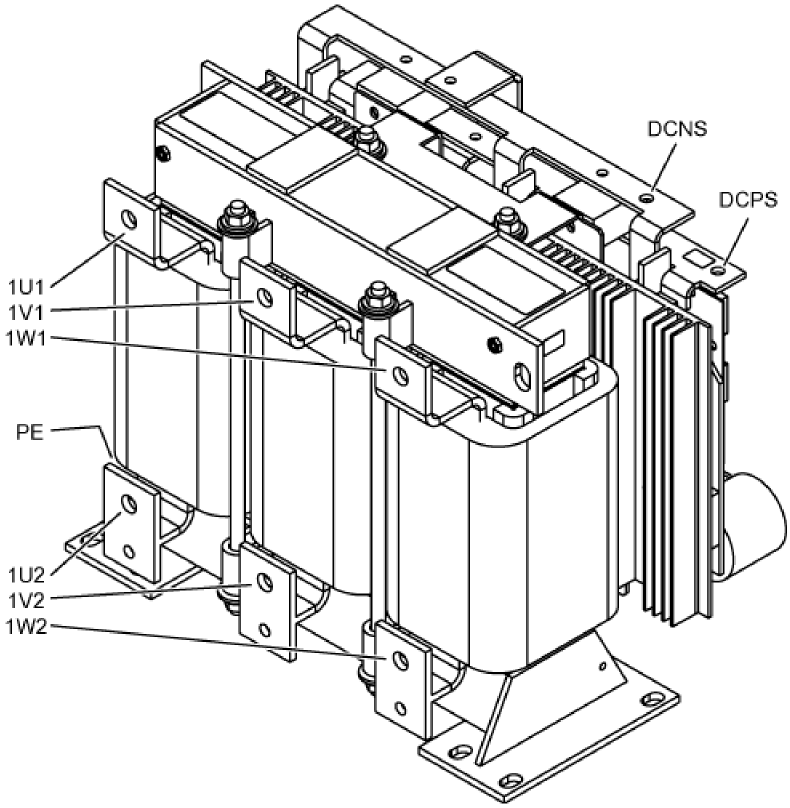


Figure 6-15 Interface overview for dv/dt filter compact plus Voltage Peak Limiter, Type 3

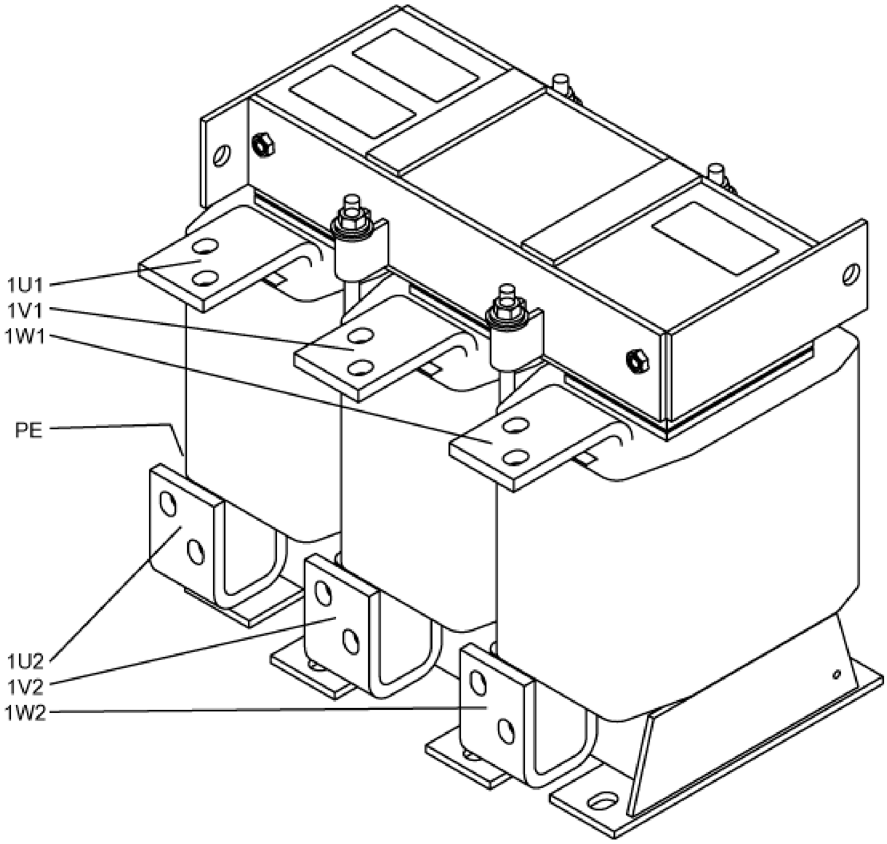


Figure 6-16 Interface overview for dv/dt filter compact plus Voltage Peak Limiter, Type 4 dv/dt reactor

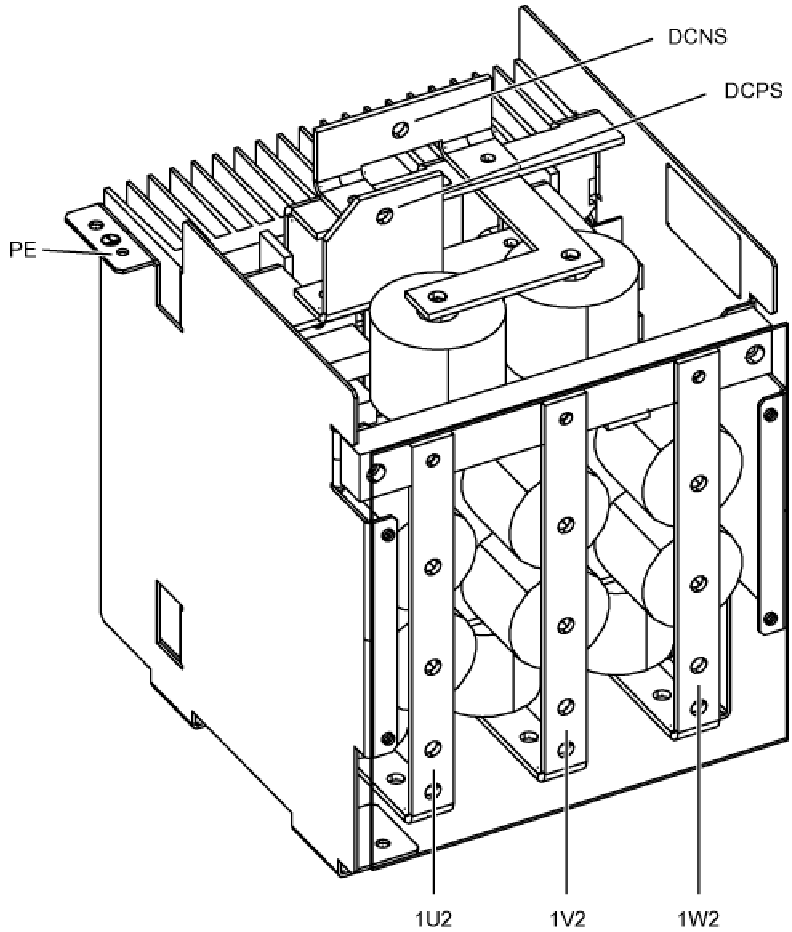


Figure 6-17 Interface overview for dv/dt filter compact plus Voltage Peak Limiter, Type 4 Voltage Peak Limiter

6.4.4 Connecting the dv/dt filter compact plus Voltage Peak Limiter

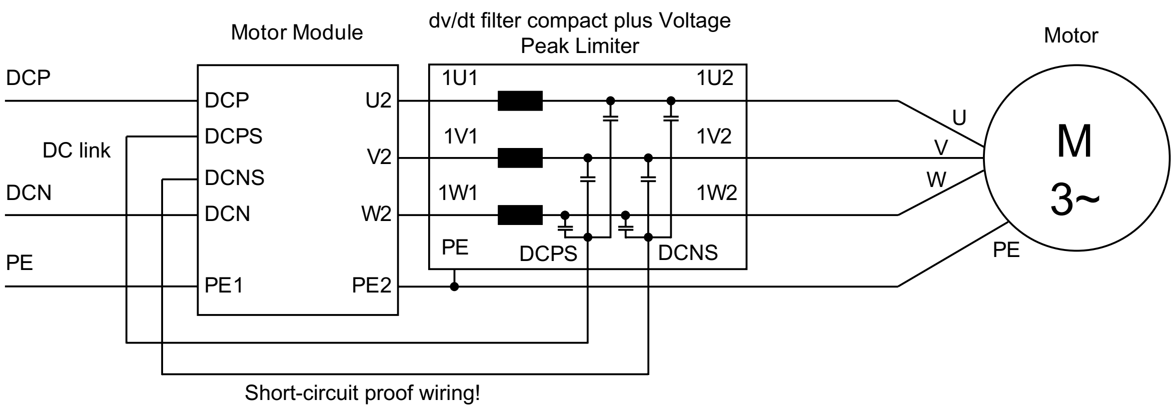


Figure 6-18 Connecting the dV/dt filter compact plus voltage peak limiter - integrated unit

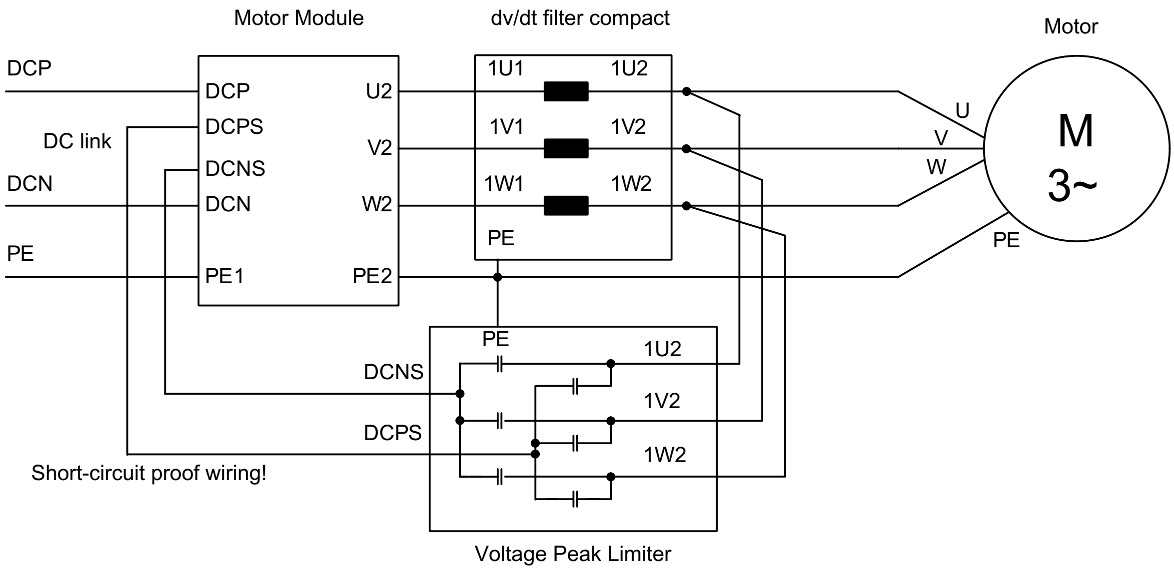


Figure 6-19 Connecting the dV/dt filter compact plus voltage peak limiter - separate components

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 6- 32 Cable cross-sections for connections between a dV/dt filter and Motor Module

dV/dt filter compact plus voltage peak limiter	Cross-section [mm²]	Connection on dV/dt filter
Type 1	16	Screw M8 / 12 Nm
Type 2	25	Screw M8 / 12 Nm
Type 3	50	Copper bar for M8 bolt / 12 Nm
Type 4	95	Copper bar for M8 bolt / 12 Nm

Table 6- 33 Connection cable enclosed for connecting dV/dt reactor and voltage peak limiter

Voltage peak limiter	Cross-section [mm²]	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

⚠ WARNING

Risk of fire and damage to equipment due to short-circuit / ground fault

The cables to the DC link of the Motor Modules must be routed so that a ground fault or short-circuit can be ruled out. A ground fault can result in fire with smoke.

- Protect the cables from mechanical damage.
- Comply with local installation regulations that enable this fault to be ruled out.

In addition, apply one of the following measures:

- Use cables with double insulation.
- Maintain adequate clearance, using spacers, for example.
- Route the cables in separate cable ducts or pipes.

Note

Maximum cable lengths

The connections should be kept as short as possible.
The maximum cable length between Motor Module and 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.

⚠ WARNING

Avoid mechanical load on connections

The connections at the dV/dt filter compact are not designed for direct mechanical connection to the motor cables.

The customer is responsible for ensuring that mechanical loading caused by connected cables cannot bend the terminals.

6.4.5 Dimension drawing for dv/dt filter compact plus Voltage Peak Limiter

dV/dt filter compact plus voltage peak limiter, type 1

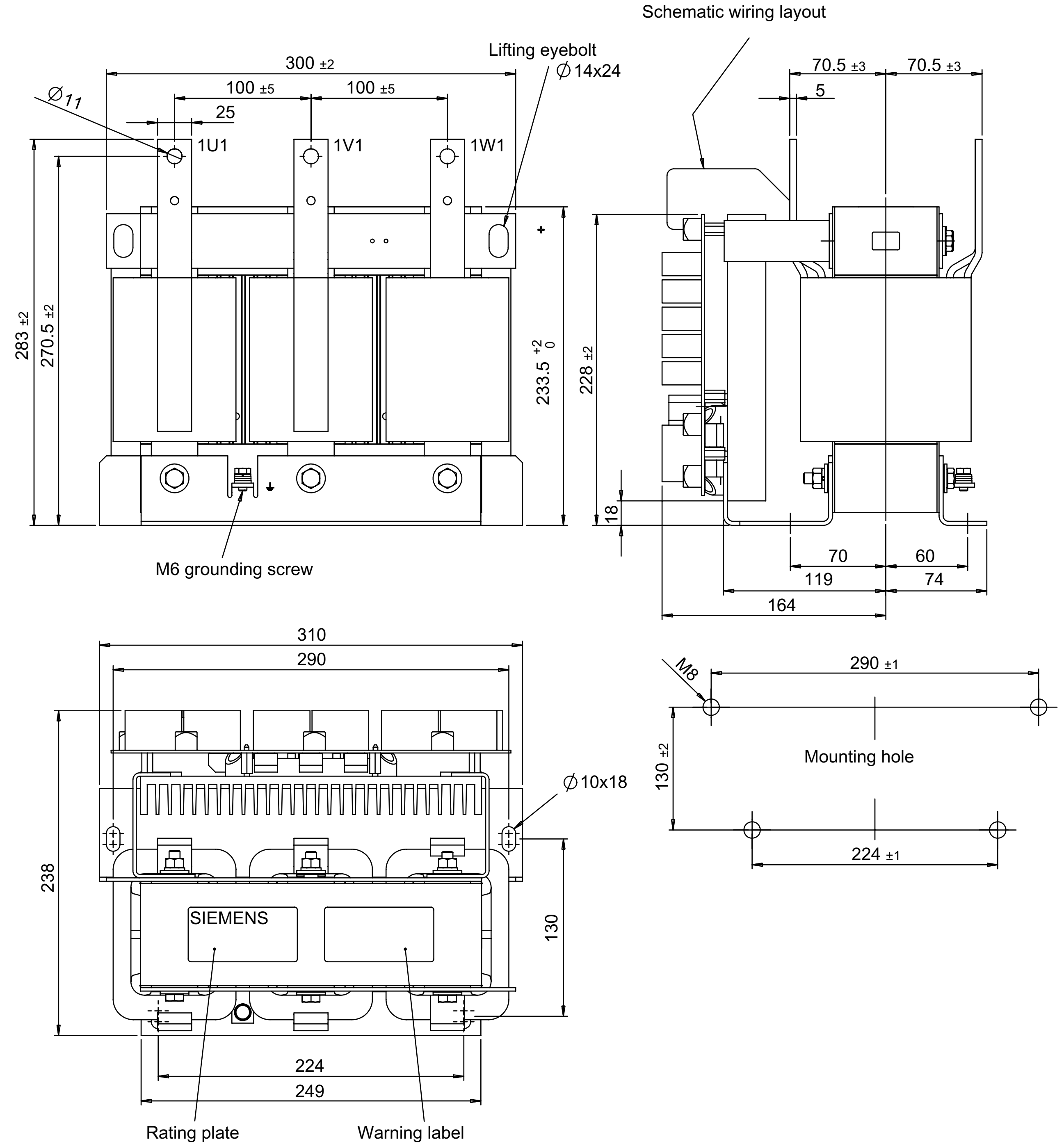


Figure 6-20 Dimension drawing for dV/dt filter compact plus voltage peak limiter, type 1

dV/dt filter compact plus voltage peak limiter, type 2

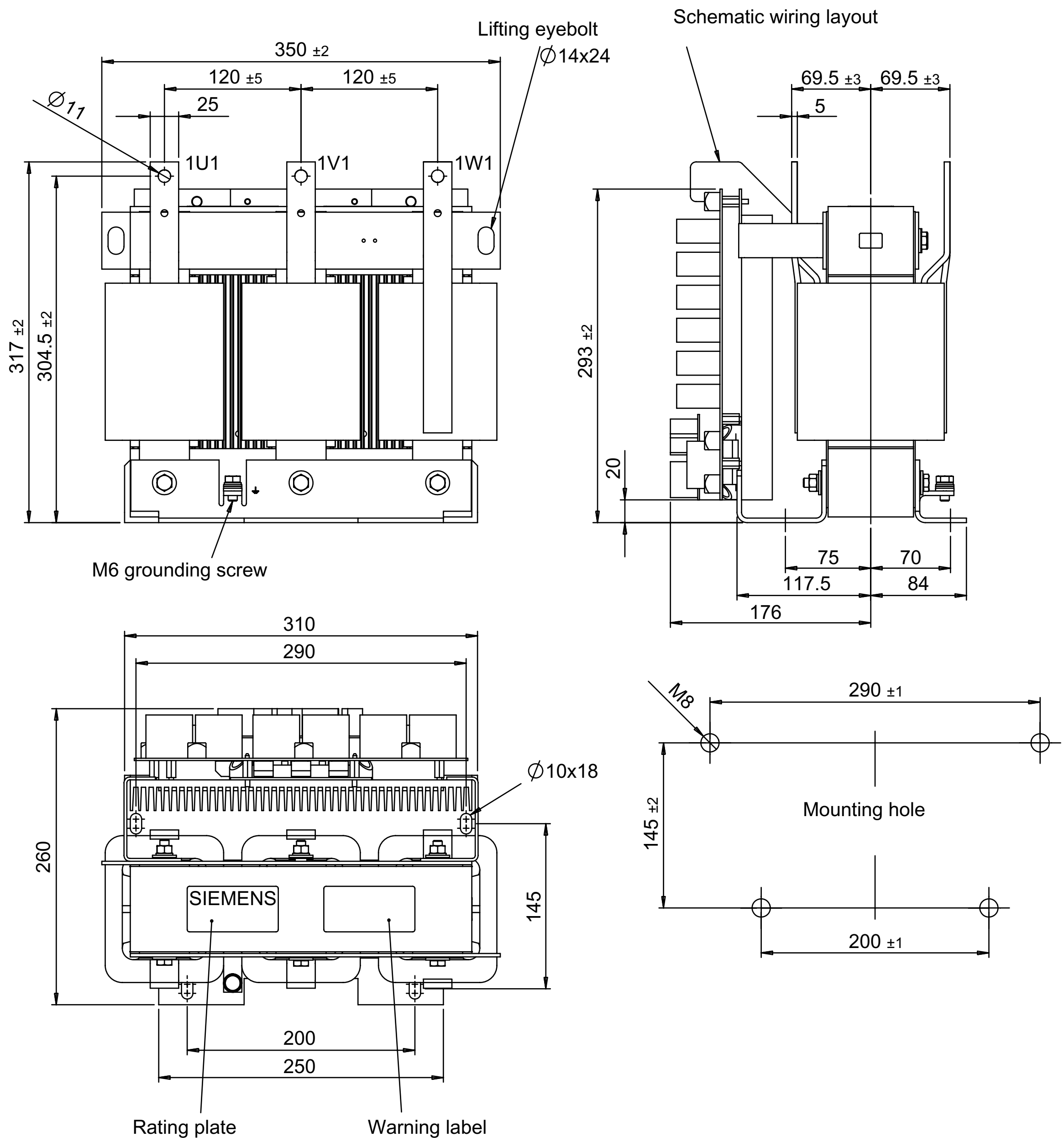


Figure 6-21 Dimension drawing for dV/dt filter compact plus voltage peak limiter, type 2

dV/dt filter compact plus voltage peak limiter, type 3

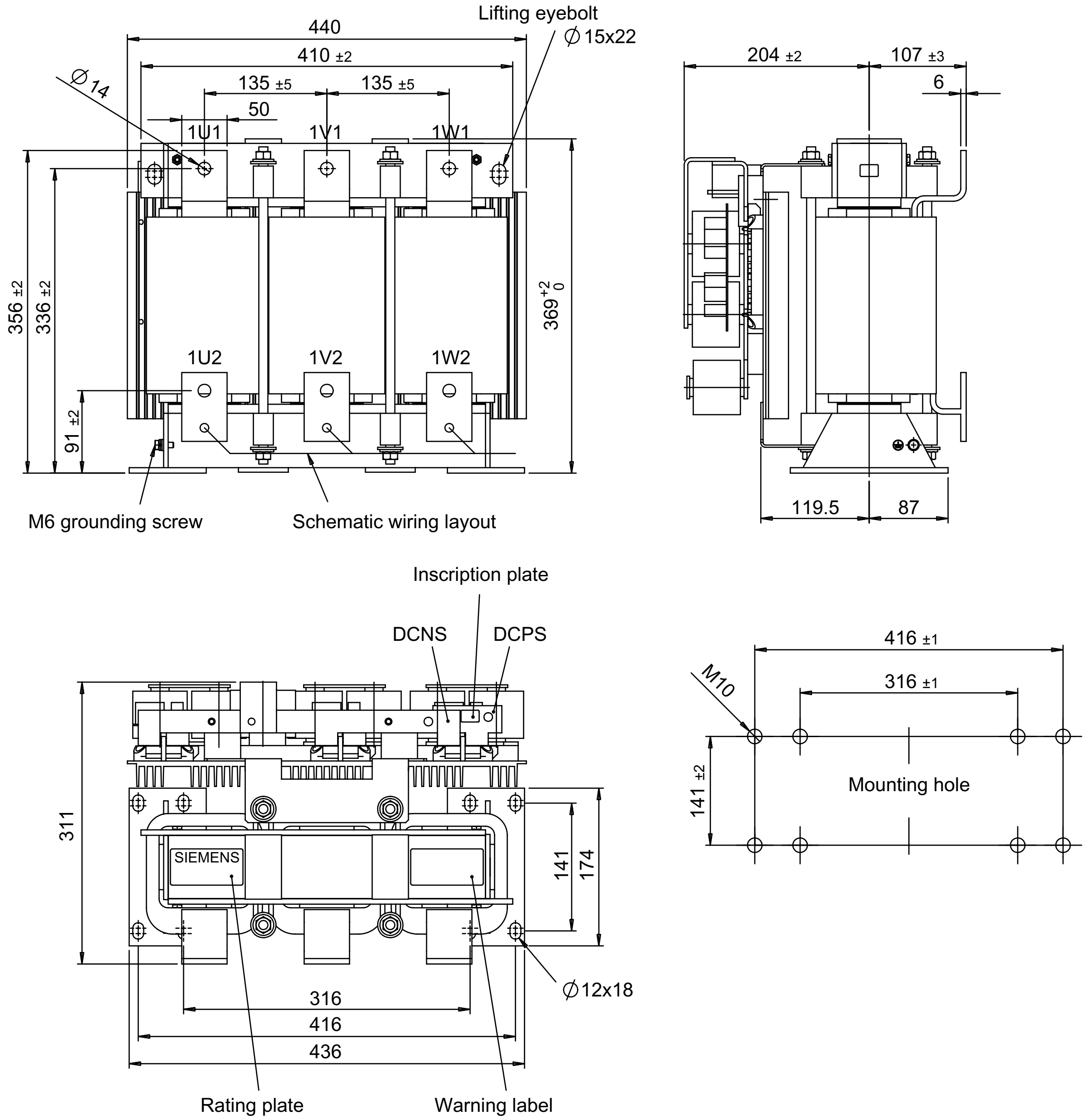


Figure 6-22 Dimension drawing for dV/dt filter compact plus voltage peak limiter, type 3

dV/dt filter compact plus voltage peak limiter, type 4

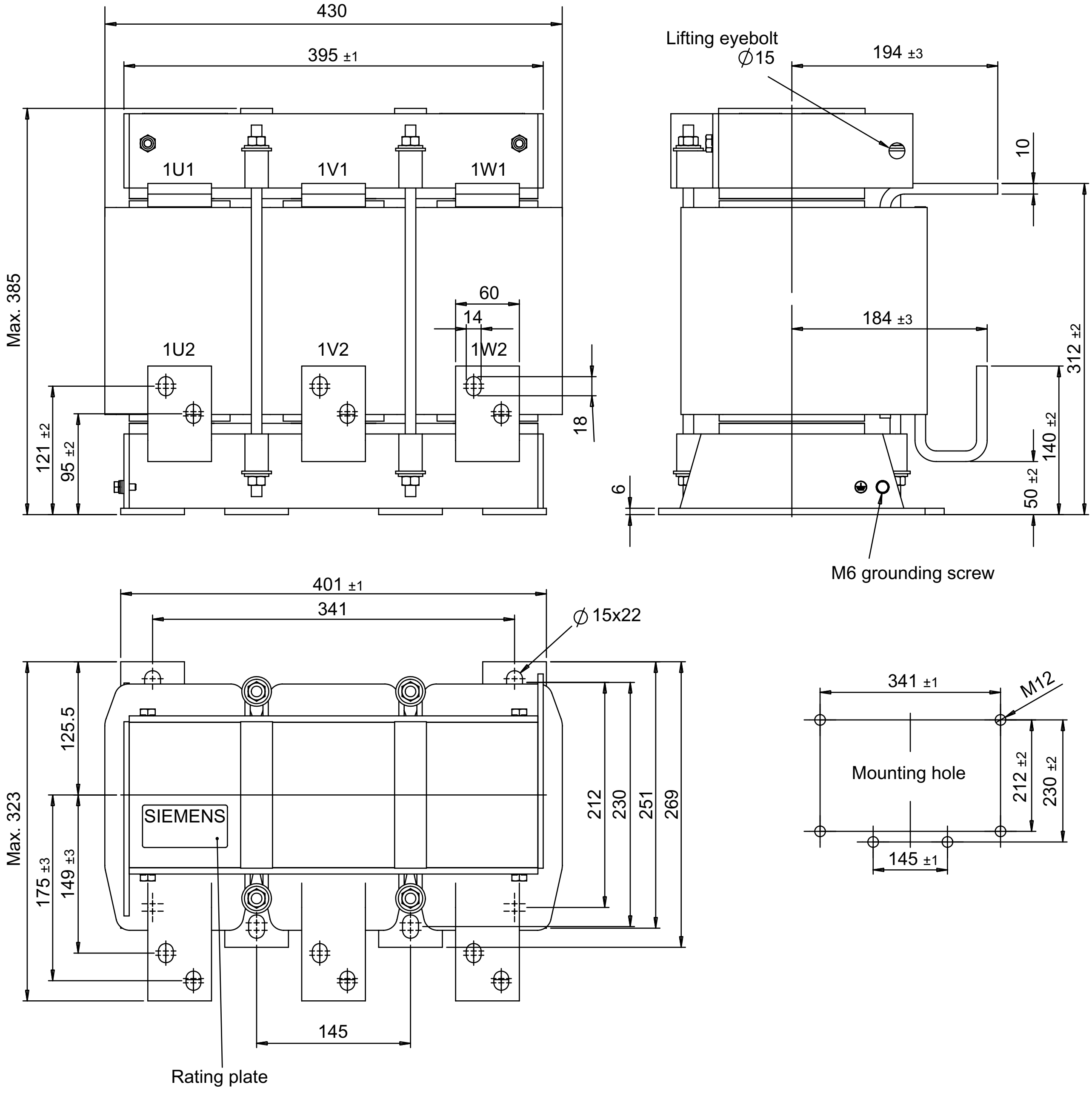


Figure 6-23 Dimension drawing for dV/dt filter compact plus voltage peak limiter, type 4 dV/dt reactor

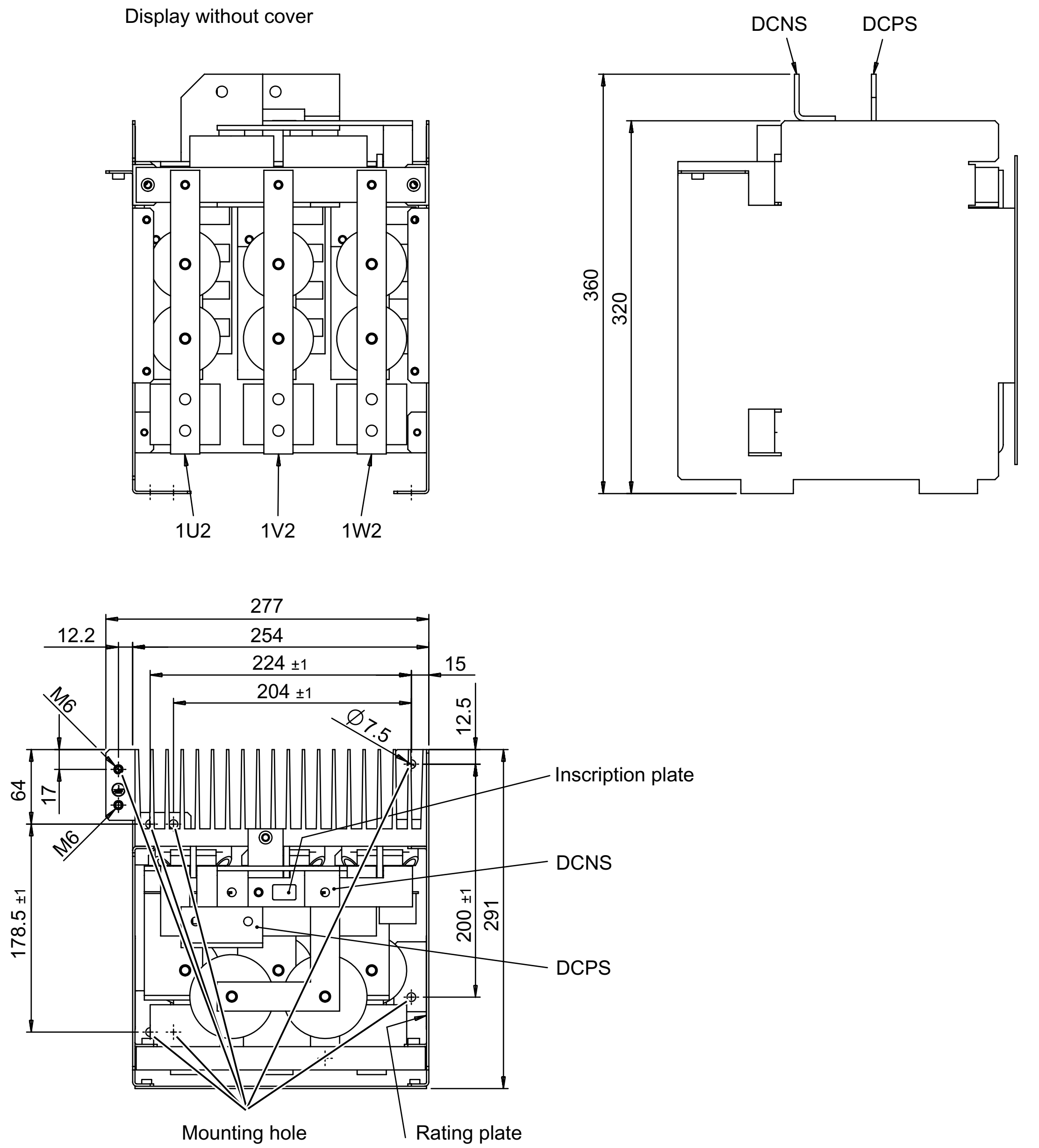


Figure 6-24 Dimension drawing for dV/dt filter compact plus voltage peak limiter, type 4 Voltage peak limiter

Table 6- 34 Assignment of dV/dt filters compact plus voltage peak limiter to the dimension drawings

dV/dt filter compact plus voltage peak limiter	Dimension drawing type
Line supply voltage 3-ph. 380...480 V AC	
6SL3000-2DE32-6EA0	Type 1
6SL3000-2DE35-0EA0	Type 2
6SL3000-2DE38-4EA0	Type 3
6SL3000-2DE41-4EA0	Type 4
Line supply voltage 3-ph. 500...690 V 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
6SL3000-2DG41-3EA0	Type 4

6.4.6 Technical data

Table 6- 35 Technical data of the dV/dt filter compact plus voltage peak limiter, 380 V ... 480 V 3 AC, Part 1

Order number	6SL3000-	2DE32-6EA0	2DE35-0EA0	2DE38-4EA0
Suitable for Motor Module (unit rating)	6SL3320-	1TE32-1AAx (110 kW) 1TE32-6AAx (132 kW)	1TE33-1AAx (160 kW) 1TE33-8AAx (200 kW) 1TE35-0AAx (250 kW)	1TE36-1AAx (315 kW) 1TE37-5AAx (400 kW) 1TE38-4AAx (450 kW)
I_{thmax}	A	260	490	840
Degree of protection		IP00	IP00	IP00
Power loss - at 50 Hz - at 60 Hz - at 150 Hz	 kW kW kW	 0.210 0.215 0.255	 0.290 0.296 0.344	 0.518 0.529 0.609
Terminals - 1U1/1V1/1W1 - DCPS/DCNS - 1U2/1V2/1W2 - PE		 for M10 bolt for M8 screw for M10 bolt M6 screw	 for M10 bolt for M8 screw for M10 bolt M6 screw	 for M12 bolt for M8 bolt for M12 bolt M6 screw
Max. permissible cable length between dV/dt filter and motor	m	100 (shielded) 150 (unshielded)		
Dimensions Width Height Depth	 mm mm mm	 310 283 238	 350 317 260	 440 369 311
Weight, approx.	kg	41	61	103

Table 6- 36 Technical data of the dV/dt filter compact plus voltage peak limiter, 380 V ... 480 V 3 AC, Part 2

Order number	6SL3000-	2DE41-4EA0		
Suitable for Motor Module (unit rating)	6SL3320-	1TE41-0AAx (560 kW) 1TE41-2AAx (710 kW) 1TE41-4AAx (800 kW)		
I_{thmax}	A	1405		
Degree of protection		IP00		
Power loss - at 50 Hz - at 60 Hz - at 150 Hz	 kW kW kW	 1.154 1.197 1.444		
Max. permissible cable length between dV/dt filter and motor	m	100 (shielded) 150 (unshielded)		
dV/dt reactor				
Terminals - 1U1/1V1/1W1 - 1U2/1V2/1W2 - PE		 for 2 x M12 bolts for 2 x M12 bolts M6 screw		
Dimensions Width Height Depth	 mm mm mm	 430 385 323		
Weight, approx.	kg	168.8		
Voltage peak limiter				
Terminals - DCPS/DCNS - 1U2/1V2/1W2 - PE		 for M8 bolt for M8 bolt for M6 screw		
Dimensions Width Height Depth	 mm mm mm	 277 360 291		
Weight, approx.	kg	19.2		

Table 6- 37 Technical data of the dV/dt filter compact plus voltage peak limiter, 500 V ... 690 V 3 AC, Part 1

Order number	6SL3000-	2DG31-0EA0	2DG31-5EA0	2DG32-2EA0
Suitable for Motor Module (unit rating)	6SL3320-	1TG28-5AAx (75 kW) 1TG31-0AAx (90 kW)	1TG31-2AAx (110 kW) 1TG31-5AAx (132 kW)	1TG31-8AAx (160 kW) 1TG32-2AAx (200 kW)
I_{thmax}	A	100	150	215
Degree of protection		IP00	IP00	IP00
Power loss - at 50 Hz - at 60 Hz - at 150 Hz	 kW kW kW	 0.227 0.236 0.287	 0.270 0.279 0.335	 0.305 0.316 0.372
Terminals - 1U1/1V1/1W1 - DCPS/DCNS - 1U2/1V2/1W2 - PE		 for M10 bolt for M8 screw for M10 bolt M6 screw	 for M10 bolt for M8 screw for M10 bolt M6 screw	 for M10 bolt for M8 screw for M10 bolt M6 screw
Max. permissible cable length between dV/dt filter and motor	m	100 (shielded) 150 (unshielded)		
Dimensions Width Height Depth	 mm mm mm	 310 283 238	 310 283 238	 350 317 260
Weight, approx.	kg	34	36	51

Table 6- 38 Technical data of the dV/dt filter compact plus voltage peak limiter, 500 V ... 690 V 3 AC, Part 2

Order number	6SL3000-	2DG33-3EA0	2DG34-1EA0	2DG35-8EA0
Suitable for Motor Module (unit rating)	6SL3320-	1TG32-6AAx (250 kW) 1TG33-3AAx (315 kW)	1TG34-1AAx (400 kW)	1TG34-7AAx (450 kW) 1TG35-8AAx (560 kW)
I_{thmax}	A	330	410	575
Degree of protection		IP00	IP00	IP00
Power loss - at 50 Hz - at 60 Hz - at 150 Hz	 kW kW kW	 0.385 0.399 0.480	 0.550 0.568 0.678	 0.571 0.586 0.689
Terminals - 1U1/1V1/1W1 - DCPS/DCNS - 1U2/1V2/1W2 - PE		 for M10 bolt for M8 screw for M10 bolt M6 screw	 for M12 bolt for M8 bolt for M12 bolt M6 screw	 for M12 bolt for M8 bolt for M12 bolt M6 screw
Max. permissible cable length between dV/dt filter and motor	m	100 (shielded) 150 (unshielded)		
Dimensions Width Height Depth	 mm mm mm	 350 317 260	 440 369 311	 440 369 311
Weight, approx.	kg	60	87	100

Table 6- 39 Technical data of the dV/dt filter compact plus voltage peak limiter, 500 V ... 690 V 3 AC, Part 3

Order number	6SL3000-	2DG38-1EA0	2DG41-3EA0	
Suitable for Motor Module (unit rating)	6SL3320-	1TG37-4AAx (710 kW) 1TG38-1AAx (800 kW)	1TG38-8AAx (900 kW) 1TG41-0AAx (1000 kW) 1TG41-3AAx (1200 kW)	
I_{thmax}	A	810	1270	
Degree of protection		IP00	IP00	
Power loss - at 50 Hz - at 60 Hz - at 150 Hz	 kW kW kW	 0.964 0.998 1.196	 1.050 1.104 1.319	
Max. permissible cable length between dV/dt filter and motor	m	100 (shielded) 150 (unshielded)		
dV/dt reactor				
Terminals - 1U1/1V1/1W1 - 1U2/1V2/1W2 - PE		 for 2 x M12 bolts for 2 x M12 bolts M6 screw	 for 2 x M12 bolts for 2 x M12 bolts M6 screw	
Dimensions Width Height Depth	 mm mm mm	 430 385 323	 430 385 323	
Weight, approx.	kg	171.2	175.8	
Voltage peak limiter				
Terminals - DCPS/DCNS - 1U2/1V2/1W2 - PE		 for M8 bolt for M8 bolt for M6 screw	 for M8 bolt for M8 bolt for M6 screw	
Dimensions Width Height Depth	 mm mm mm	 277 360 291	 277 360 291	
Weight, approx.	kg	18.8	19.2	

7 Cabinet design and EMC

7.1 Information

7.1.1 General

The modular concept of SINAMICS S120 allows a wide range of potential device combinations. For this reason, it is impossible to describe each individual combination. This section instead aims to provide some basic information and general rules on the basis of which special device combinations can be constructed and to ensure electromagnetic compatibility.

The SINAMICS S120 components are designed for installation in enclosures, which can take the form of cabinet units or control boxes made of steel that provide protection against shock and other environmental influences. They are also part of the EMC concept.

7.1.2 Safety information

WARNING

Hazards during transport and replacement of components

When transporting the devices and replacing components, note the following:

- Some of the devices and components are heavy or top heavy.
- Due to their weight, the devices must be handled with care by trained personnel.

Serious injury or even death and substantial material damage can occur if the devices are not lifted or transported properly.

Note

Notes regarding transportation

- The devices are packaged by the manufacturer in accordance with the climatic conditions and stress encountered during transit and in the recipient country.
- The notes on the packaging for transportation, storage, and proper handling must be observed.
- For transportation using forklifts, the devices must be set down on a wooden pallet.
- When the devices are unpacked, they can be transported using the transport eyebolts attached. The load must be distributed evenly. Chains attached to the transport eyebolts must only be loaded vertically from above. Heavy blows or impacts must be avoided during transit and when the devices are being set down, for example.

Note

Prevent the ingress of foreign bodies into the device

When installing the cabinet unit, make sure that no foreign bodies – especially metallic objects, such as drill swarf, wire end ferrules, or cable cut-offs – fall into the device. If necessary, cover the ventilation slots.

Note

Comply with all safety regulations

Safety regulations governing shock protection must be observed. See also EN 60204-1.

NOTICE

Only use original Siemens accessories

To ensure that the entire system functions properly, you are advised to use original Siemens accessories.

Only original DRIVE-CLiQ cables may be used for wiring the DRIVE-CLiQ nodes.

Before commissioning, check the tightening torque of all the terminal screws.

WARNING

Potentially fatal touch voltage

Cable shields and unused cores/conductors of the power cables must be connected to PE potential.

Non-observance can cause lethal shock voltages.

NOTICE
Limiting of overvoltages On systems with a grounded phase conductor and a line voltage >600 VAC, line-side components should be installed to limit overvoltages to overvoltage category II according to IEC 61800-5-1.

Maximum cable lengths

Table 7- 1 Maximum cable lengths

Type	Maximum length [m]
24 VDC power cables [1)]	10
24 V signal cables [1)]	30
Power cable between the Motor Module and motor when using two motor reactors in series	300 (shielded) 450 (unshielded) 525 (shielded) 787 (unshielded)
DRIVE-CLiQ cables • Inside cabinet unit, e.g. connection between CU320 and the first Motor Module or between the Motor Modules • DRIVE-CLiQ MOTION-CONNECT connecting cables for external components	 70 100
Power cable between Braking Module and braking resistor	100

1) For longer lengths, suitable wiring must be provided by the user for overvoltage protection.

Table 7- 2 Recommendations for overvoltage protection

DC supply	24 V signal cables
Weidmüller Type: PU DS 24 V Order number: 8682100000	Weidmüller Type no.: MCZ OVP TAZ 24 V Order number: 8449160000
Weidmüller GmbH & Co. KG	

7.1.3 Insulation test

Insulation test

In accordance with EN 60204-1, an insulation test must be performed on the machine/system.

The test may be done with one of the following tests:

- Insulation resistance test
- Voltage test

⚠ WARNING
Disconnect from the power supply
Disconnect the machine/system from the line supply prior to testing.

Insulation resistance testing

Insulation resistance testing should be preferably carried out. The insulation resistance when carrying out the test must not be less than 1 MΩ Testing is carried out with 500 V DC between the main-circuit conductors [1)] and the protective conductor system. Testing may be carried out on individual sections of the system.

Exception: A lower resistance value is permissible for certain components of the electrical equipment; however, the value must not be lower than 50 kΩ.

SINAMICS components are covered by this exception. They must therefore be disconnected during testing and tested separately.

Voltage test

⚠ WARNING
Use test equipment according to EN 61180-2
Test equipment to EN 61180-2 should be used for voltage testing.

The rated frequency for the test voltage must be 50 Hz or 60 Hz.

The maximum test voltage must be either twice the rated voltage value for the equipment power supply or 1000 V. The higher of the two values should be used. The maximum test voltage must be applied between the conductors of the main circuits [1)] and the protective conductor system for approx. 1 s.

Components and devices that are not rated to withstand this test voltage must be disconnected prior to testing.

Components and devices that have been voltage tested according to their product standard may be disconnected during testing.

The SINAMICS components are voltage tested in accordance with EN 61800-5-1 and are to be disconnected during this test.
If they cannot be disconnected, input and output terminals must be short-circuited and a bypass installed. In this case, a DC voltage that is 1.5 times the AC test voltage should be used for testing.

1) Main circuits are circuits that are electrically connected to the line voltage.

7.1.4 Directives

The product satisfies the protection targets of the following EU Directives applicable within the European Union:

Table 7- 3 Directives

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

7.2 EMC-compliant design and control cabinet configuration

For detailed configuration instructions regarding the EMC-compliant design of drives and control cabinet configuration, refer to the "SINAMICS Low Voltage Configuration Manual".

7.3 Cabinet air conditioning

7.3.1 General

The minimum dimensions listed below for ventilation clearances must be observed. No other components or cables may be installed in or laid through these areas.

NOTICE
Avoid the reduction of service life
If the guidelines for installing SINAMICS S120 Chassis devices are not observed, this can significantly reduce the service life of the components and result in premature component failure.

You must take into account the following specifications when using a SINAMICS S120 Chassis drive line-up:

- Ventilation clearance
- Cabling
- Air guidance

Table 7- 4 Ventilation clearances for the components

Component	Frame size	Clearance (front) [mm]	Clearance (above) [mm]	Clearance (below) [mm]
Basic Line Module	FB, GB, GD	40 1)	250	150
Active Interface Module	FI	40 1)	250	150
Active Interface Module	GI	50 1)	250	150
Active Interface Module	HI, JI	40 1)	250	0
Smart Line Module	GX, HX, JX	40 1)	250	150
Active Line Module	FX, GX, HX, JX	40 1)	250	150
Motor Module	FX, GX, HX, JX	40 1)	250	150

1) The clearances refer to the area around the ventilation slots on the front cover.

Note

Notes on the dimensions

The dimensions refer to the outer edges of the devices.

Dimension drawings are available in the relevant chapters.

7.3.2 Ventilation

The SINAMICS S120 Chassis devices are forced-ventilated by means of integrated fans. To ensure an adequate air supply, suitable openings for the inlet air (e.g. ventilation slots in the cabinet door) and discharged air (e.g. by means of a hood) must be provided.

The cooling air must flow through the components vertically from bottom (cooler region) to top (region heated by operation).

You must ensure that the air is flowing in the right direction. You must also ensure that the warm air can escape at the top. The specified ventilation clearances must be observed.

Note

Cables must not be routed directly on the components. The ventilation grilles must not be covered.

Cold air must not be allowed to blow directly onto electronic equipment.

NOTICE
Air guidance note Air guidance, as well as the arrangement of and settings for the cooling equipment, must be chosen in such a way as to prevent condensation even with the highest relative humidity. If necessary, cabinet enclosure heating may have to be installed.

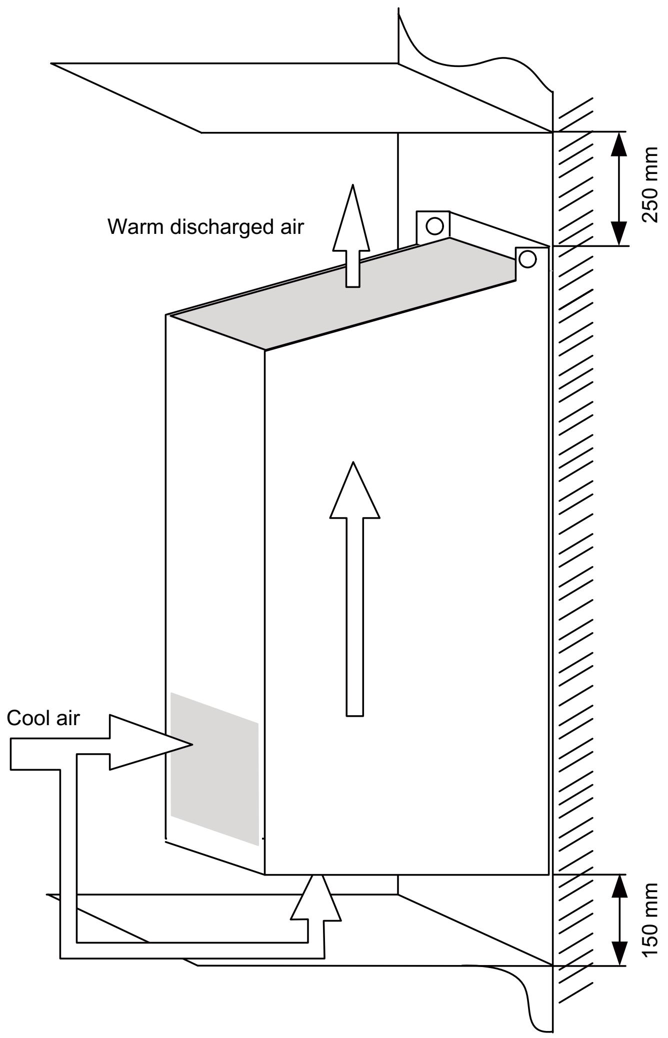


Figure 7-1 Air guidance for Active Interface Module, frame sizes FI, GI

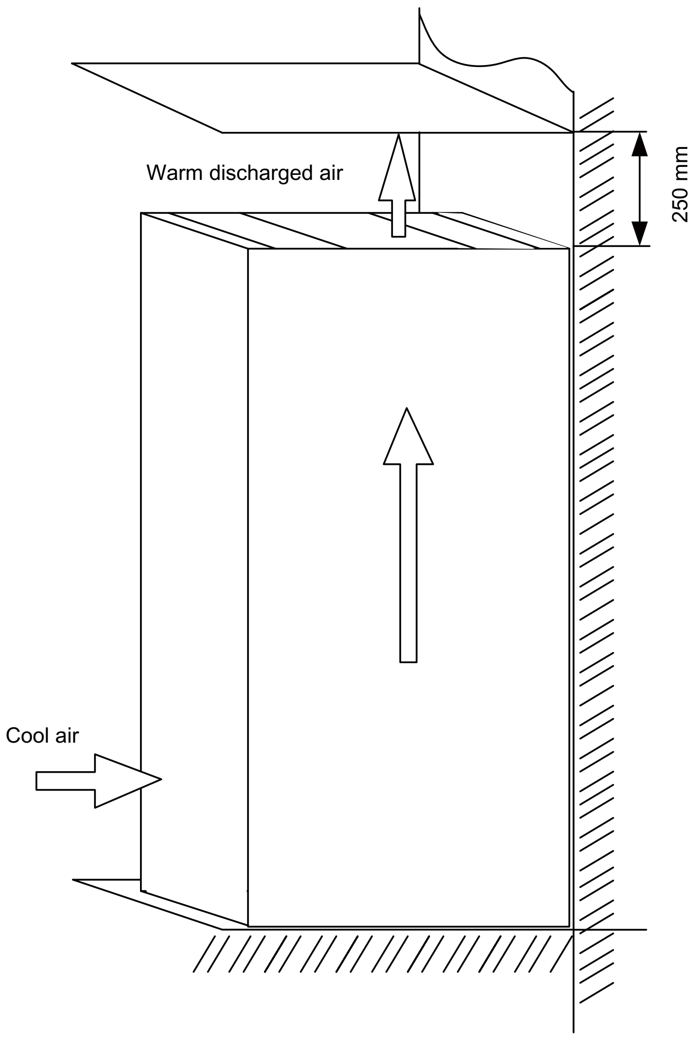


Figure 7-2 Air guidance for Active Interface Module, frame sizes HI, JI

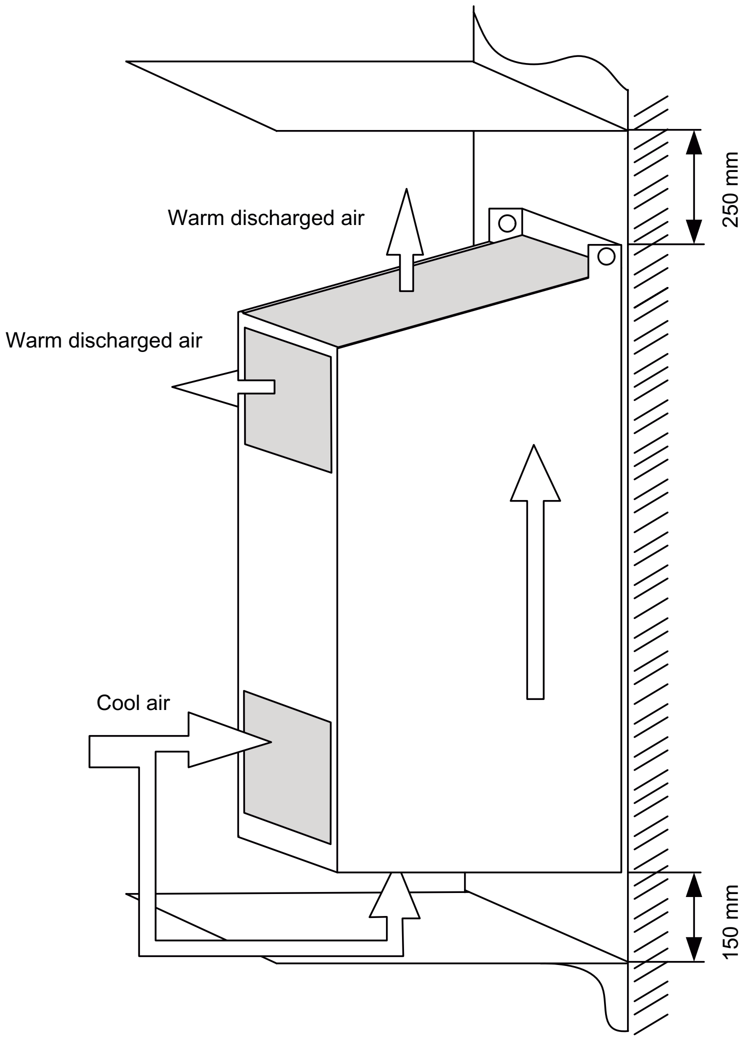


Figure 7-3 Air guidance for Smart Line Module, Active Line Module, Motor Module, frame sizes FX, GX

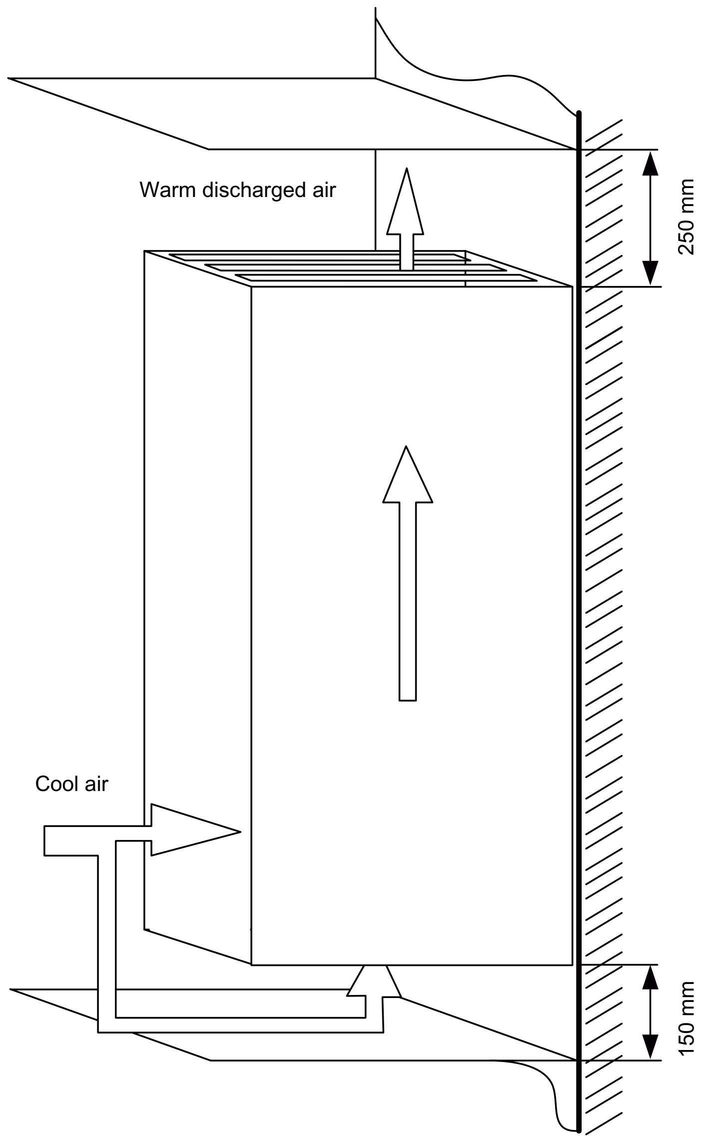


Figure 7-4 Air guidance for Smart Line Module, Active Line Module, Motor Module, frame sizes HX, JX

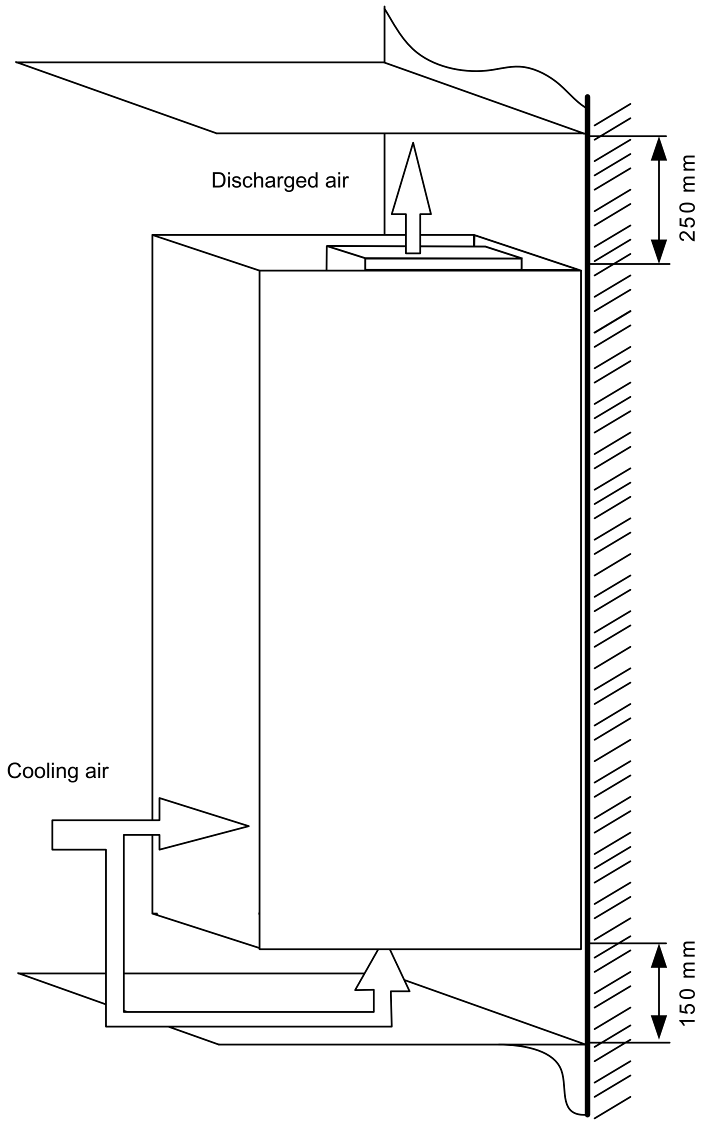


Figure 7-5 Air guidance for Basic Line Module, frame sizes FB, GB, GD

Devices must not be operated in an "air short-circuit", since this can damage equipment or cause it to fail.

The drawn air of the fan causes negative pressure to build up at the ventilation openings in the cabinet doors. The pressure is dependent on the volume flow rate and the hydraulic cross-section of the openings.

The air, which blows out of the top of the device, accumulates under the top cover/hood, resulting in overpressure.

The difference between the overpressure at the top of the cabinet and the negative pressure at the bottom creates a flow of air (air short-circuit). This can vary in strength depending on the cross-section of the door and cover openings and the volumetric flow of the fan.

Due to the flow of air within the cabinet, the device fan draws in pre-heated air. This heats up the components considerably and the fan does not function effectively.

NOTICE
To prevent an air short-circuit
Devices must not be operated in an air short-circuit, since this can cause it to fail.
Suitable barriers must be in place to prevent an air short-circuit.

Barriers must be installed in such a way that no air can flow along the outer sides on the top and bottom of the devices. In particular, air must be prevented from flowing from the top (warm discharged air) to the bottom (cold cooling air). Suitable plates can be used as barriers. The barriers must reach up to the side panels or cabinet doors. They must be set up in such a way that the outgoing air current is not forced into the cabinet cross-beams, but is instead diverted around them. Barriers must be in place for all degrees of protection higher than IP20.

The cabinets adjacent to the converter cabinets must also be taken into account when barriers are installed.

To ensure adequate ventilation of the equipment, the minimum opening sizes specified in the following table must be observed.

The specified opening cross-sections comprise several small openings. To ensure that pressure loss is kept to a minimum and that the flow resistance does not become too high at these mesh-type openings, the cross sectional area of each opening must be at least 190 mm² (e.g. 7.5 mm x 25 mm or 9.5 mm x 20 mm).

To ensure that the devices operate continuously, suitable measures must be taken to prevent the ingress of dirt and dust. Wire lattices (wire fabric DIN 4189-St-vzk-1x0.28) or filter mats (min. filter class G2) must be used for this purpose. The choice of filter mats depends on the required degree of protection and the ambient conditions. If cabinets are installed in an environment containing fine dust particles or oil vapors, micro-filter mats must be used to prevent the devices from becoming contaminated.

If dirt filters are used, the specified opening cross-sections and the filter areas must be adjusted upwards.

NOTICE
Note dirt filter replacement intervals
If dirt filters are used, the specified replacement intervals must be observed.

If the filter mats are heavily contaminated, the volume of air drawn is reduced due to the increased flow resistance. This can cause the fans integrated in the devices to overload, or it could cause the devices themselves to overheat and become damaged.

The opening cross-sections specified in the table refer in each case to one device. If more than one device is installed in a cabinet, the opening cross-section increases accordingly. If the required openings cannot be made in the cabinet, the devices must be distributed across several cabinets which are separated from each other by means of partitions.

The warm air must be discharged via the top cover/hood or via side openings in the cabinet at the level of the device top. The size of the opening cross-section must also be taken into account here.

With degrees of protection higher than IP20 and if a hood is used, it may be necessary to use an "active" hood. An "active" hood contains fans that blow the air current forwards. The hood is closed, with the exception of the air outlet point.

If you choose an "active" hood, you must ensure that the fans are sufficiently powerful to prevent air from accumulating in the cabinet. If air accumulates, the cooling capacity is reduced. This can overheat and destroy the devices. The air capacity of the fans should at least be equivalent to the device fan data.

Table 7- 5 Volume flow rate, opening cross-sections

Active Interface Modules						
Order number	6SL3300-	7TE32-6AA0	7TE33-8AA0 7TE35-0AA0	7TE38-4AA0 7TE41-4AA0 7TG35-8AA0 7TG37-4AA0 7TG41-3AA0		
Cooling air requirement	[m³/s]	0.24	0.47	0.4		
Min. opening cross-section in cabinet inlet outlet	[m²] [m²]	0.1 0.1	0.25 0.25	0.2 0.2		
Basic Line Modules						
Order number	6SL3330-	1TE34-2AAx 1TE35-3AAx 1TE38-2AAx 1TG33-0AAx 1TG34-3AAx 1TG36-8AAx	1TE41-2AAx 1TE41-5AAx 1TE41-6AAx 1TG41-1AAx 1TG41-4AAx 1TG41-8AAx			
Cooling air requirement	[m³/s]	0.17	0.36			
Min. opening cross-section in cabinet inlet outlet	[m²] [m²]	0.1 0.1	0.19 0.19			

Smart Line Modules						
Order number	6SL3330-	6TE35-5AAx 6TE37-3AAx 6TG35-5AAx	6TE41-1AAx 6TG38-8AAx	6TE41-3AAx 6TE41-7AAx 6TG41-2AAx 6TG41-7AAx		
Cooling air requirement	[m³/s]	0.36	0.78	1.08		
Min. opening cross-section in cabinet inlet outlet	[m²] [m²]	0.19 0.19	0.28 0.28	0.38 0.38		
Active Line Modules						
Order number	6SL3330-	7TE32-1AAx	7TE32-6AAx	7TE33-8AAx 7TE35-0AAx	7TE36-1AAx 7TE37-5AAx 7TE38-4AAx	7TE41-0AAx 7TE41-2AAx 7TE41-4AAx 7TG37-4AAx 7TG41-0AAx 7TG41-3AAx
Cooling air requirement	[m³/s]	0.17	0.23	0.36	0.78	1.08
Min. opening cross-section in cabinet inlet outlet	[m²] [m²]	0.1 0.1	0.1 0.1	0.19 0.19	0.28 0.28	0.38 0.38
Motor Modules						
Order number	6SL3320-	1TE32-1AAx 1TG28-5AAx 1TG31-0AAx 1TG31-2AAx 1TG31-5AAx	1TE32-6AAx	1TE33-1AAx 1TE33-8AAx 1TE35-0AAx 1TG31-8AAx 1TG32-2AAx 1TG32-6AAx 1TG33-3AAx	1TE36-1AAx 1TE37-5AAx 1TE38-4AAx 1TG34-1AAx 1TG34-7AAx 1TG35-8AAx	1TE41-0AAx 1TE41-2AAx 1TE41-4AAx 1TG37-4AAx 1TG38-1AAx 1TG38-8AAx 1TG41-0AAx 1TG41-3AAx
Cooling air requirement	[m³/s]	0.17	0.23	0.36	0.78	1.08
Min. opening cross-section in cabinet inlet outlet	[m²] [m²]	0,1 0,1	0,1 0,1	0,19 0,19	0,28 0,28	0,38 0,38

Maintenance and Servicing 8

8.1 Chapter content

This chapter provides information on the following:

- Maintenance and servicing procedures that have to be carried out on a regular basis to ensure the availability of the components.
- Exchanging device components when the unit is serviced
- Forming the DC-link capacitors

⚠ DANGER
Dangerous electrical voltage Before carrying out any maintenance or repair work on the de-energized unit, wait for 5 minutes after switching off the supply voltage. This allows the capacitors to discharge to a harmless level (< 25 V) after the supply voltage has been switched off. Before starting work, you should also measure the voltage after the 5 minutes have elapsed. The voltage can be measured on DC-link terminals DCP and DCN.

⚠ DANGER
External supply voltages When the external power supply or the external 230 VAC auxiliary supply is connected, dangerous voltages are still present in components even when the main circuit-breaker is open.

8.2 Maintenance

The devices comprise mostly electronic components. Apart from the fan(s), therefore, they contain hardly any components that are subject to wear or that require maintenance or servicing. Maintenance is intended to ensure that the equipment remains in the specified condition. Dirt and contamination must be removed regularly and parts subject to wear replaced.

The following points must generally be observed.

Cleaning

Dust deposits

Dust deposits inside the device must be removed at regular intervals (or at least once a year) by qualified personnel in line with the relevant safety regulations. The unit must be cleaned using a brush and vacuum cleaner, and dry compressed air (max. 1 bar) for areas that cannot be easily reached.

Ventilation

The ventilation openings in the devices must never be obstructed. The fans must be checked to make sure that they are functioning correctly.

Cable and screw terminals

Cable and screw terminals must be checked regularly to ensure that they are secure in position, and if necessary, retightened. Cabling must be checked for defects. Defective parts must be replaced immediately.

Note

Maintenance intervals

The actual intervals at which maintenance procedures are to be performed depend on the installation conditions (cabinet environment) and the operating conditions.

Siemens offers its customers support in the form of a service contract. For further details, contact your regional office or sales office.

8.3 Maintenance

Servicing involves activities and procedures for maintaining and restoring the specified condition of the devices.

Required tools

The following tools are required for replacing components:

- Spanner or socket spanner (w/f 10)
- Spanner or socket spanner (w/f 13)
- Spanner or socket spanner (w/f 16/17)
- Spanner or socket spanner (w/f 18/19)
- Hexagon-socket spanner (size 8)
- Torque wrench
- Screwdriver size 1/2
- Screwdriver Torx T20/T25/T30

A socket wrench set with two long extensions is recommended.

Tightening torques for screw connections

The following tightening torques apply when tightening connections of operating current-conducting parts (DC-link/motor connections, general busbars), non-operating current-conducting parts (ground connections, ground terminal connections), and general steel threaded connections.

Table 8- 1 Tightening torques for screw connections

Thread	Ground connections, protective conductor connections, steel threaded connections (fault current-conducting)	Plastic, busbars (operating current-conducting)
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

NOTICE

Screw connections for protective covers

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

8.3.1 Installation device

Description

The installation device is used for installing and removing the power blocks for the Basic Line Modules, Smart Line Modules, Active Line Modules, and Motor Modules in chassis format.

It is used as a mounting aid and is placed in front of and secured to the module. The telescopic rails allow the withdrawable device to be adjusted according to the height at which the power blocks are installed. Once the mechanical and electrical connections have been undone, the power block can be removed from the module, whereby the power block is guided and supported by the guide rails on the withdrawable devices.

Figure 8-1 Installation device

Order number

The order number for the installation device is 6SL3766-1FA00-0AA0.

8.3.2 Using crane lifting lugs to transport power blocks

Crane lifting lugs

The power blocks are fitted with crane lifting lugs for transportation on a lifting harness in the context of replacement.

The positions of the crane lifting lugs are illustrated by arrows in the figures below.

⚠ WARNING
Hazards during improper transport
A lifting harness with vertical ropes or chains must be used to prevent any risk of damage to the housing.

NOTICE
Do not apply mechanical loads to the busbars
The power block busbars must not be used to support or secure lifting harnesses for the purpose of transportation.

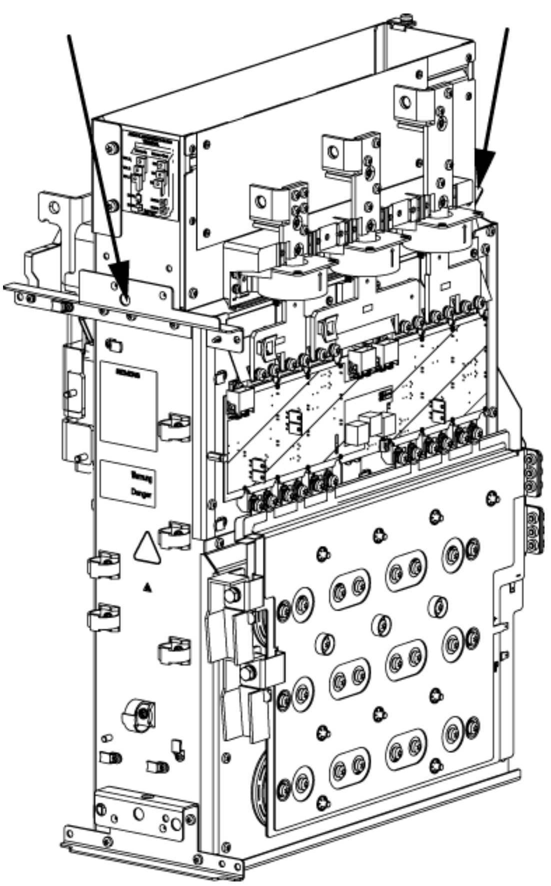


Figure 8-2 Crane lifting lugs on power block frame size FX, GX, FB

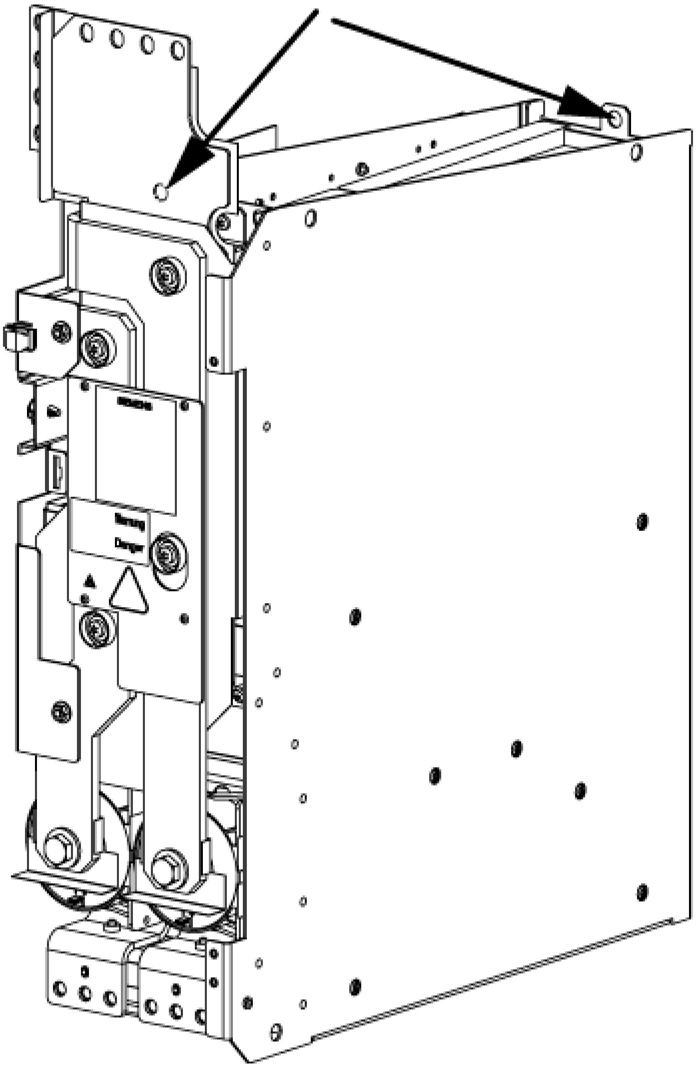


Figure 8-3 Crane lifting lugs on HX, JX power block

Note

Crane lifting lugs on HX, JX power block

On HX and JX power blocks, the front crane lifting lug is located behind the busbar.

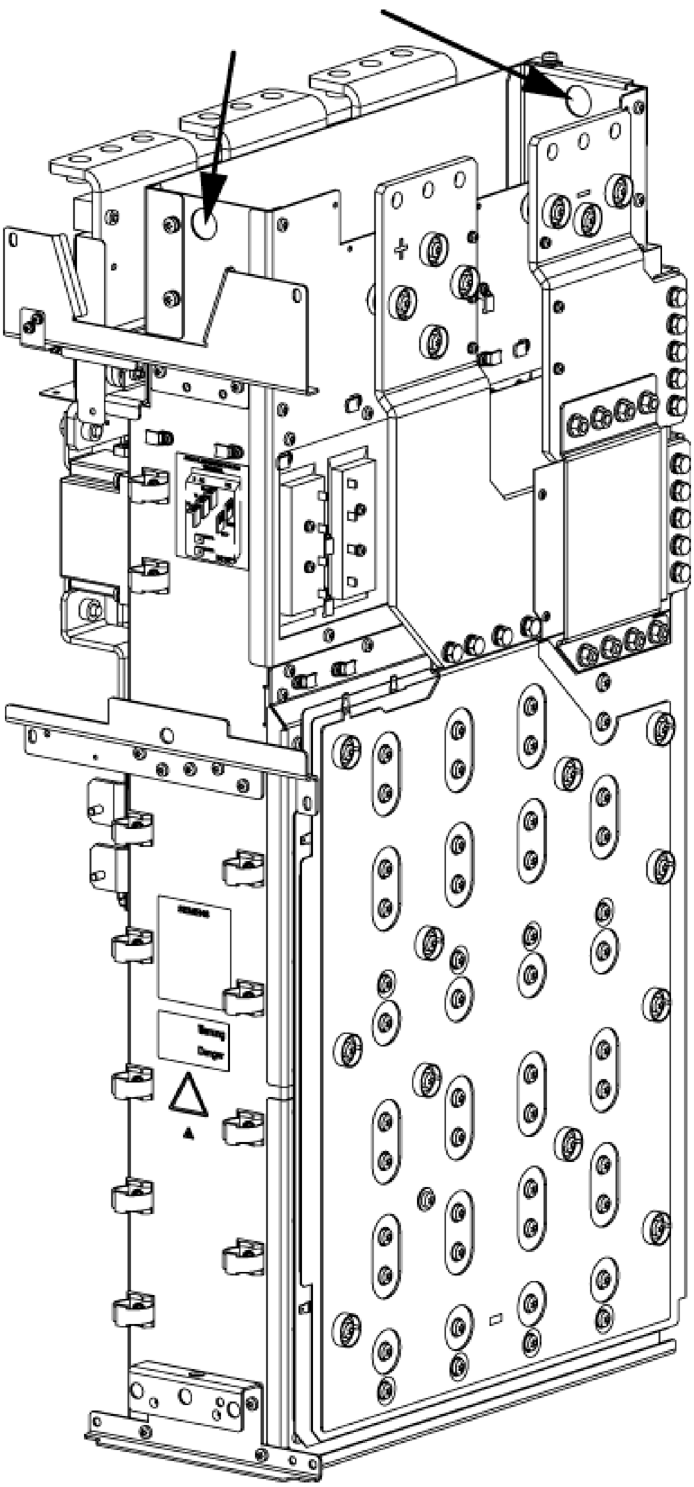


Figure 8-4 Crane lifting lugs on power block frame size GB, GD

8.4 Replacing components

8.4.1 Safety information

WARNING

Hazards during transport and replacement of components

When transporting the devices and replacing components, note the following:

- Some of the devices and components are heavy (e.g. > 30 Kg) and top heavy.
- Due to their weight, the devices must be handled with care by trained personnel.
- Serious injury or even death and substantial material damage can occur if the devices are not lifted or transported properly.

WARNING

Dangerous electrical voltage

The devices are operated with high voltages.

All connection work must be carried out when the cabinet is de-energized!

All work on the device must be carried out by trained personnel only. Death, serious injury, or substantial material damage can result if these warnings are not taken into account.

Work on an open device must be carried out with extreme caution because external supply voltages may be present. The power and control terminals may be live even when the motor is not running.

Dangerously high voltage levels are still present in the device up to five minutes after it has been disconnected due to the DC-link capacitors. For this reason, the cabinet should not be opened until a reasonable period of time has elapsed.

DANGER

Five safety rules

When carrying out any kind of work on electrical devices, the "five safety rules" according to EN 50110 must always be observed:

1. Disconnect the system.
2. Protect against reconnection.
3. Make sure that the equipment is de-energized.
4. Ground and short-circuit.
5. Cover or enclose adjacent components that are still live.

8.4.2 Replacing the power block, Active Line Module, and Motor Module, frame size FX

Replacing the power block

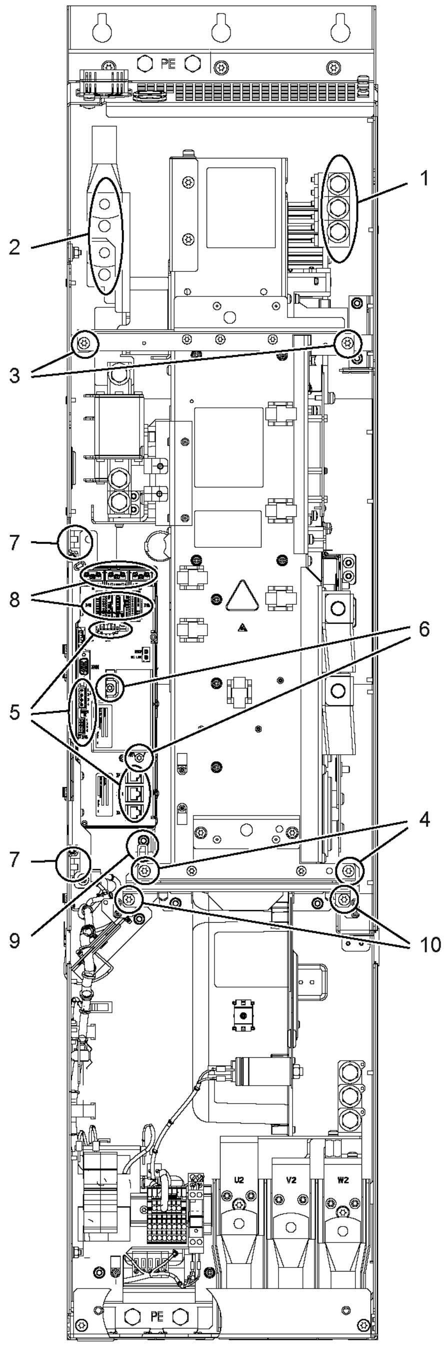


Figure 8-5 Replacing the power block, Active Line Module, and Motor Module (type FX)

Preparatory steps

- Disconnect the drive line-up from the power supply
- Allow unimpeded access to the power block
- Remove the front cover

Removal

The removal steps are numbered in accordance with the numbers in the diagram.

1. Unscrew the connection to the line or to the motor (three screws).
2. Unscrew the connection to the DC link (four screws).
3. Remove the retaining screws at the top (two screws).
4. Remove the retaining screws at the bottom (two screws).
5. Remove DRIVE-CLiQ cables and connections at –X41/–X42/–X46 (six connectors).
   The DRIVE-CLiQ cables should be marked to ensure that they are subsequently correctly inserted.
6. Take out the retaining screws for the IPD card (two screws) and remove the IPD card from plug -X45 on the Control Interface Module.
7. Remove the mounts for the Control Interface Module (two nuts) and carefully pull out the Control Interface Module.

   When removing the Control Interface Module, you have to disconnect five additional plugs one after the other (two at the top, three below).
8. Disconnect the plug-in connections for the fiber-optic cables and signal cables (five connectors).
9. Disconnect the plug for the thermocouple.
10. Unscrew the two retaining screws for the fan and attach the equipment for assembling the power block at this position.

You can now remove the power block.

> ⚠ CAUTION
>
> **Caution when removing**
>
> The power block weighs approx. 66 kg!
>
> When removing the power block, ensure that you do not damage any signal cables.

Installation steps

Installing is the same as removing, however in the reverse order.

NOTICE
Specifications for the installation The tightening torques specified in the table "Tightening torques for screw connections" must be observed. Carefully insert the plug connections and ensure that they are secure. The fiber optic cable plugs must be remounted at their original slot. Fiber optic cables and sockets are accordingly labeled for correct assignment (U11, U21, U31).

8.4.3 Replacing the power block, Smart Line Module, Active Line Module, and Motor Module, frame size GX

Replacing the power block

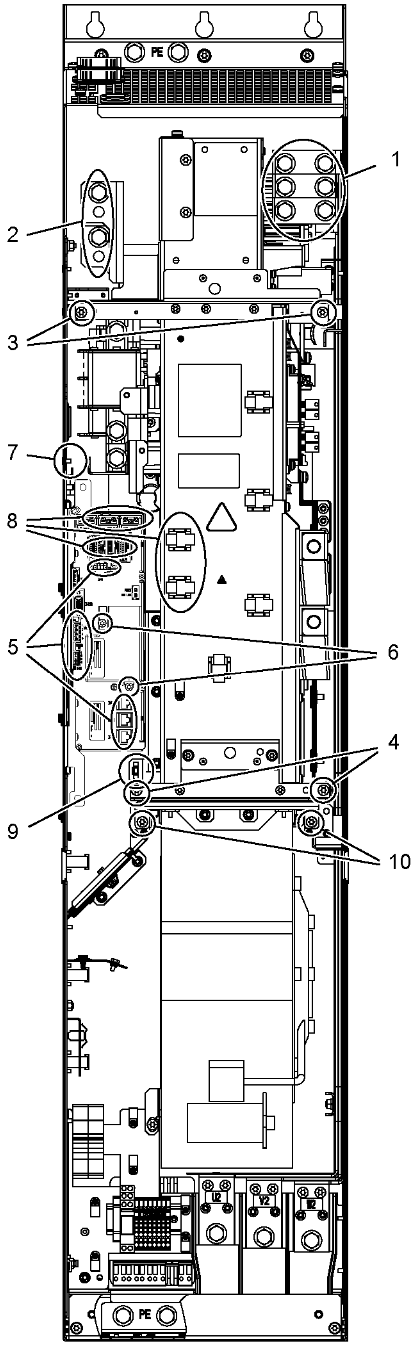


Figure 8-6 Replacing the power block, Smart Line Module, Active Line Module, and Motor Module, frame size GX

Preparatory steps

- Disconnect the drive line-up from the power supply
- Allow unimpeded access to the power block
- Remove the front cover

Removal

The removal steps are numbered in accordance with the numbers in the diagram.

1. Unscrew the connection to the line or to the motor (three screws).
2. Unscrew the connection to the DC link (four screws).
3. Remove the retaining screws at the top (two screws).
4. Remove the retaining screws at the bottom (two screws).
5. Remove DRIVE-CLiQ cables and connections at –X41/–X42/–X46 (six connectors).
   The DRIVE-CLiQ cables should be marked to ensure that they are subsequently correctly inserted.
6. Take out the retaining screws for the IPD card (two screws) and remove the IPD card from plug -X45 on the Control Interface Module.
7. Remove the mount for the Control Interface Module (one nut) and carefully pull out the Control Interface Module.

   When removing the Control Interface Module, you have to disconnect five additional plugs one after the other (two at the top, three below).
8. Disconnect the plug-in connections for the fiber optic cables and signal cables
   (five connectors) and release the cable connectors for the signal cables (two connectors).
9. Disconnect the plug for the thermocouple.
10. Unscrew the two retaining screws for the fan and attach the equipment for assembling the power block at this position.

You can now remove the power block.

⚠ CAUTION
Caution when removing
The power block weighs approx. 89 kg!
When removing the power block, ensure that you do not damage any signal cables.

Installation steps

Installing is the same as removing, however in the reverse order.

> NOTICE
>
> **Caution when removing**
>
> The tightening torques specified in the table "Tightening torques for screw connections" must be observed.
>
> Carefully insert the plug connections and ensure that they are secure.
>
> The fiber optic cable plugs must be remounted at their original slot. Fiber optic cables and sockets are accordingly labeled for correct assignment (U11, U21, U31).

> Note
>
> **Connection clip for the interference suppression capacitor on the Smart Line Module, frame size GX**
>
> The connection clip to the interference suppression capacitor is mounted on the spare power block together with a yellow warning label.
>
> Please note the information in the chapter "Electrical connection" of the corresponding device.

8.4.4 Replacing the power block, Smart Line Module, Active Line Module, and Motor Module, frame size HX

Replacing the left-hand power block

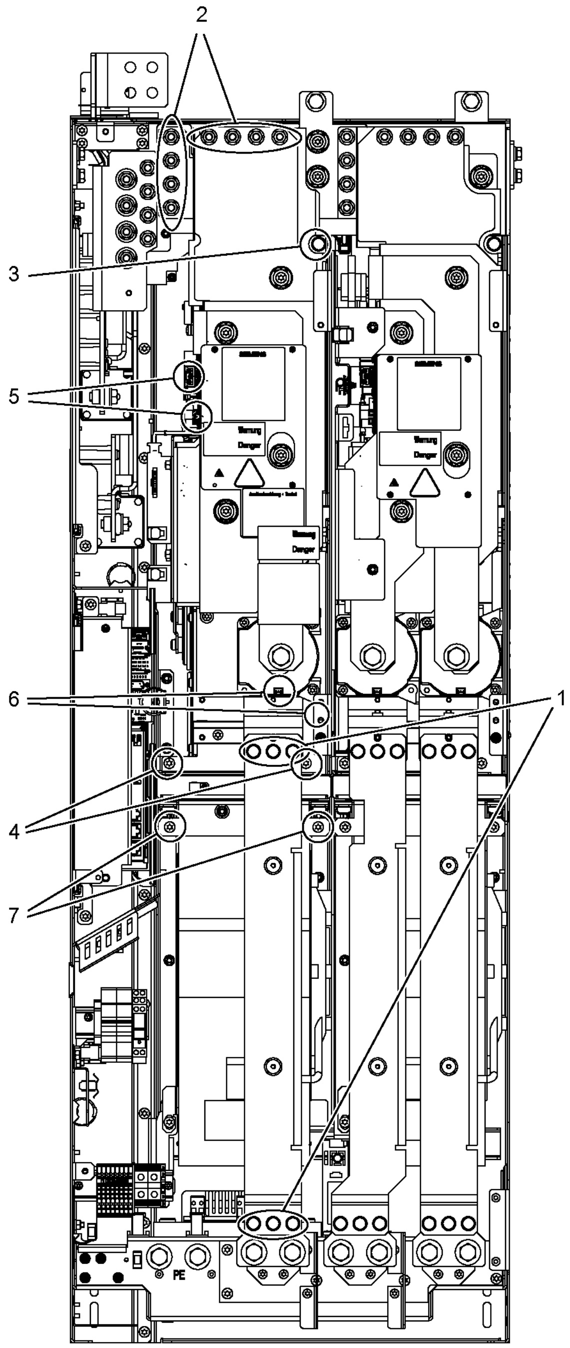


Figure 8-7 Replacing the power block, Smart Line Module, Active Line Module, and Motor Module, frame size HX - left power block

Preparatory steps

- Disconnect the drive line-up from the power supply
- Allow unimpeded access to the power block
- Remove the protective cover

Removal

The removal steps are numbered in accordance with the numbers in the diagram.

1. Remove the busbar (six screws).
2. Unscrew the connection to the DC link (eight nuts).
3. Remove the retaining screw at the top (one screw).
4. Remove the retaining screws at the bottom (two screws).
5. Disconnect the plug-in connections for the fiber-optic cables and signal cables (two connectors).
6. Remove the connection for the current transformer and associated PE connection (one connector).
7. Unscrew the two retaining screws for the fan and attach the equipment for assembling the power block at this position.

You can now remove the power block.

⚠ CAUTION
Caution when removing
The power block weighs approx. 64 kg!
When removing the power block, ensure that you do not damage any signal cables.

Installation steps

Installing is the same as removing, however in the reverse order.

NOTICE
Specifications for the installation
The tightening torques specified in the table "Tightening torques for screw connections" must be observed.
Carefully insert the plug connections and ensure that they are secure.
The fiber optic cable plugs must be remounted at their original slot. Fiber optic cables and sockets are accordingly labeled for correct assignment (U11, U21, U31).

Replacing the right-hand power block

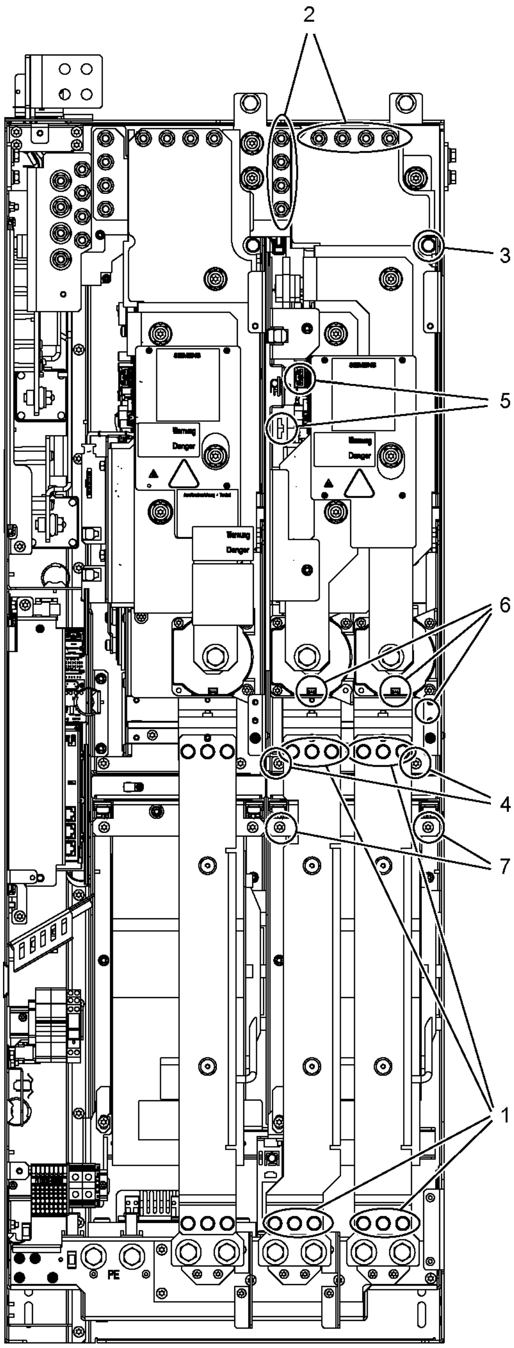


Figure 8-8 Replacing the power block, Smart Line Module, Active Line Module, and Motor Module, frame size HX - right power block

Preparatory steps

- Disconnect the drive line-up from the power supply
- Allow unimpeded access to the power block
- Remove the protective cover

Removal

The removal steps are numbered in accordance with the numbers in the diagram.

1. Remove the busbar (twelve screws).
2. Unscrew the connection to the DC link (eight nuts).
3. Remove the retaining screw at the top (one screw).
4. Remove the retaining screws at the bottom (two screws).
5. Disconnect the plug-in connections for the fiber-optic cables and signal cables (two connectors).

   The second plug connection for the fiber optic cables cannot be disconnected until the power block has been pulled out slightly.
6. Remove the connection for the current transformer and associated PE connection (two connectors).
7. Unscrew the two retaining screws for the fan and attach the equipment for assembling the power block at this position.

You can now remove the power block.

> ⚠ CAUTION
>
> **Caution when removing**
>
> The power block weighs approx. 86 kg!
>
> When removing the power block, ensure that you do not damage any signal cables.
>
> The second plug connection for the fiber optic cables cannot be disconnected until the power block has been pulled out slightly (see Step 5).

Installation steps

Installing is the same as removing, however in the reverse order.

NOTICE
Specifications for the installation
The tightening torques specified in the table "Tightening torques for screw connections" must be observed.
Carefully insert the plug connections and ensure that they are secure.
The fiber optic cable plugs must be remounted at their original slot. Fiber optic cables and sockets are accordingly labeled for correct assignment (U11, U21, U31).

8.4.5 Replacing the power block, Smart Line Module, Active Line Module, and Motor Module, frame size JX

Replacing the power block

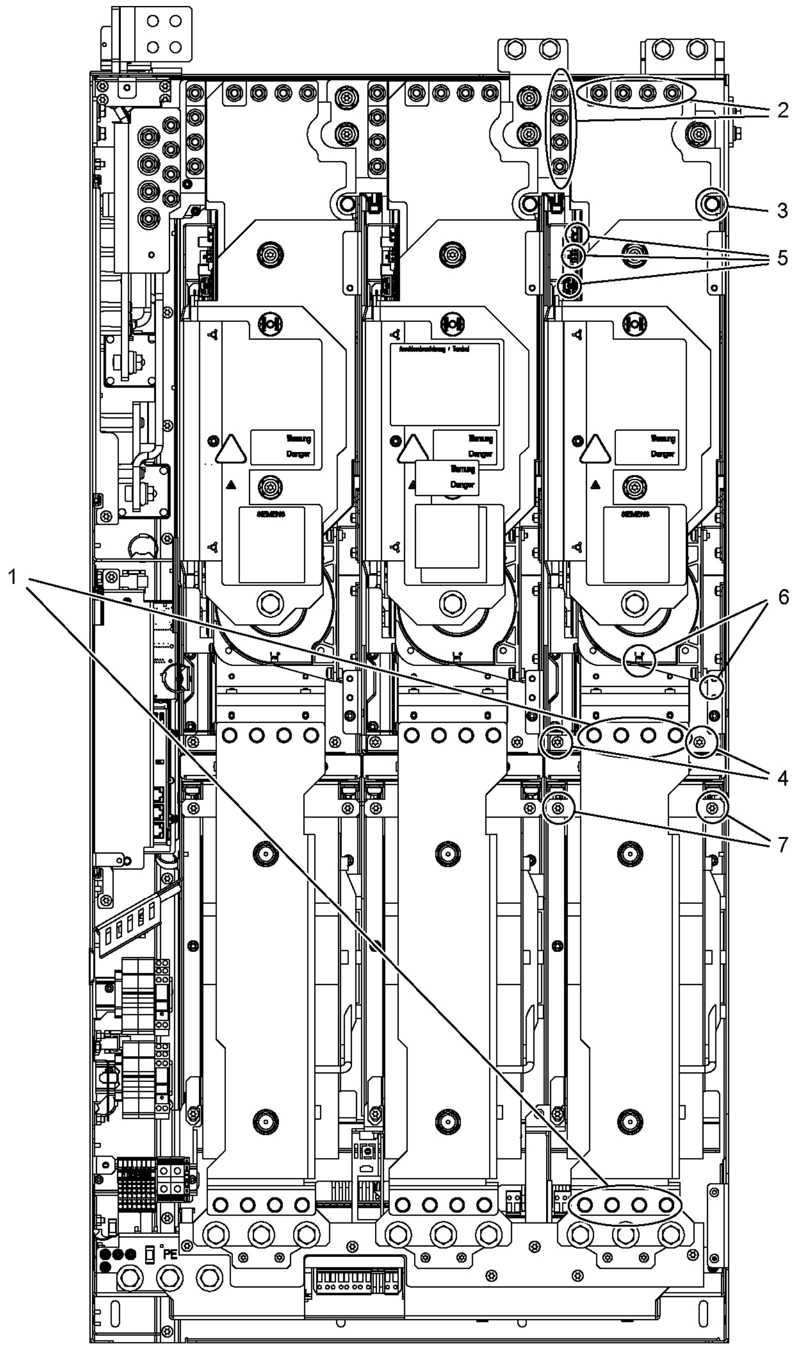


Figure 8-9 Replacing the power block, Smart Line Module, Active Line Module, and Motor Module, frame size JX

Preparatory steps

- Disconnect the drive line-up from the power supply
- Allow unimpeded access to the power block
- Remove the protective cover

Removal

The removal steps are numbered in accordance with the numbers in the diagram.

1. Unscrew the connection to the line or to the motor (eight screws).
2. Unscrew the connection to the DC link (eight nuts).
3. Remove the retaining screw at the top (one screw).
4. Remove the retaining screws at the bottom (two screws).
5. Disconnect the plug-in connections for the fiber-optic cables and signal cables (three connectors).
6. Remove the connection for the current transformer and associated PE connection (one connector).
7. Unscrew the two retaining screws for the fan and attach the equipment for assembling the power block at this position.

You can now remove the power block.

⚠ CAUTION
Caution when removing
The power block weighs approx. 90 kg!
When removing the power block, ensure that you do not damage any signal cables.

Installation steps

Installing is the same as removing, however in the reverse order.

NOTICE
Specifications for the installation
The tightening torques specified in the table "Tightening torques for screw connections" must be observed.
Carefully insert the plug connections and ensure that they are secure.
The fiber optic cable plugs must be remounted at their original slot. Fiber optic cables and sockets are accordingly labeled for correct assignment (U11, U21, U31).

8.4.6 Replacing the power block, Basic Line Module, frame size FB

Replacing the power block

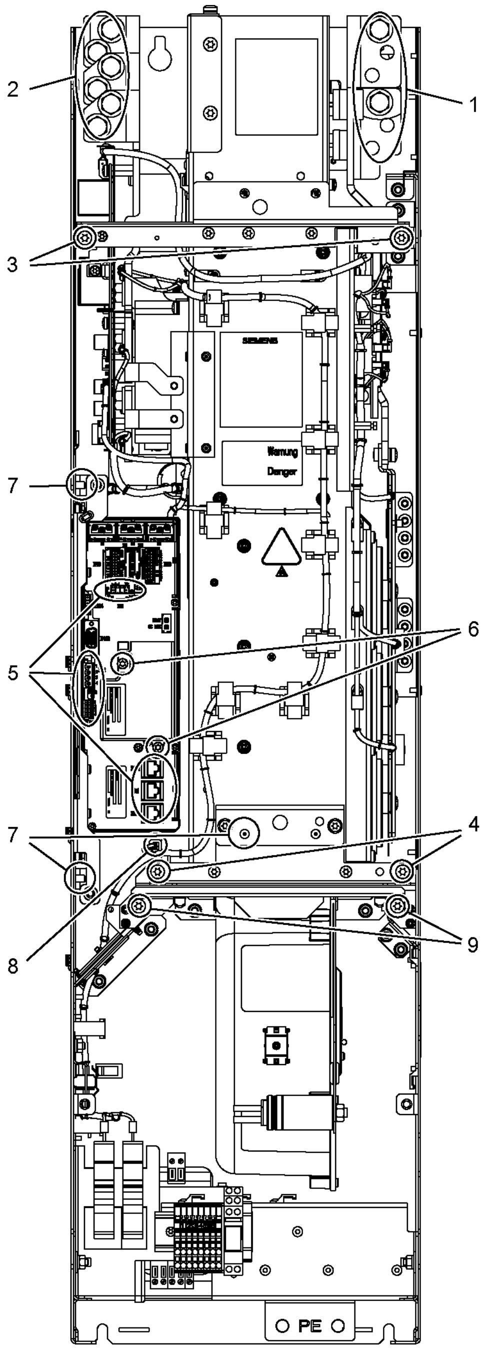


Figure 8-10 Replacing the power block, Basic Line Module, frame size FB

Preparatory steps

- Disconnect the drive line-up from the power supply
- Allow unimpeded access to the power block
- Remove the protective cover

Removal

The removal steps are numbered in accordance with the numbers in the diagram.

1. Unscrew the connection to the DC link (four screws).
2. Unscrew the connection to the line connection (six screws).
3. Remove the retaining screws at the top (two screws).
4. Remove the retaining screws at the bottom (two screws).
5. Remove DRIVE-CLiQ cables and connections at –X41/–X42/–X46 (six connectors).
   The DRIVE-CLiQ cables should be marked to ensure that they are subsequently correctly inserted.
6. Take out the retaining screws for the IPD card (two screws) and remove the IPD card from plug -X45 on the Control Interface Module.
7. Remove the mounts for the Control Interface Module (one screw and two nuts) and carefully pull out the Control Interface Module.

   When removing the Control Interface Module, you have to disconnect five additional plugs one after the other (two at the top, three below).
8. Disconnect the plug for the thermocouple.
9. Unscrew the two retaining screws for the fan and attach the equipment for assembling the power block at this position.

You can now remove the power block.

⚠ CAUTION
Caution when removing
The power block weighs approx. 65 kg!
When removing the power block, ensure that you do not damage any signal cables.

Installation steps

Installing is the same as removing, however in the reverse order.

NOTICE

Specifications for the installation

The tightening torques specified in the table "Tightening torques for screw connections" must be observed.

Carefully insert the plug connections and ensure that they are secure.

Note

Connection clip for the interference-suppression capacitor

The connection clip to the interference suppression capacitor is mounted on the spare power block together with a yellow warning label.

Please note the information in the chapter "Electrical connection" of the corresponding device.

8.4.7 Replacing the power block, Basic Line Module GB, GD

Replacing the power block

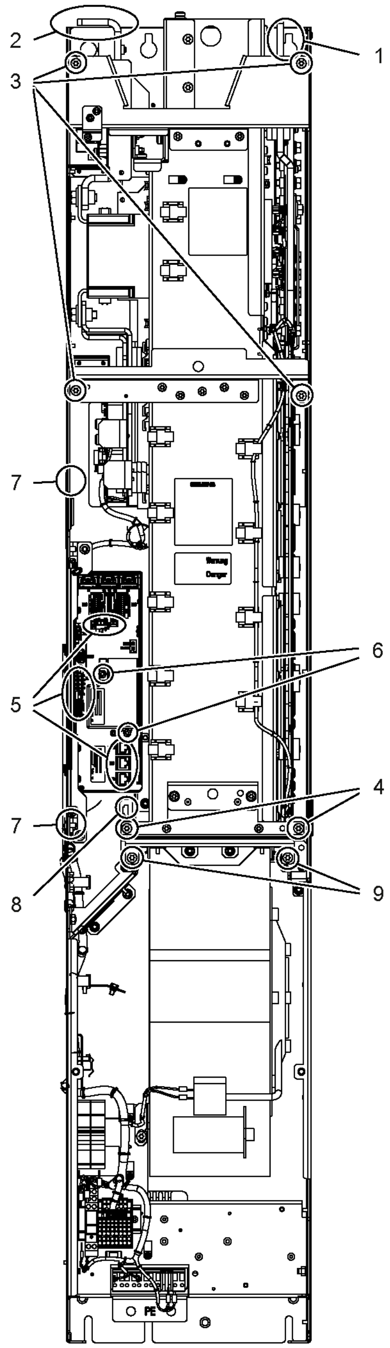


Figure 8-11 Replacing the power block, Basic Line Module, frame sizes GB, GD

Preparatory steps

- Disconnect the drive line-up from the power supply
- Allow unimpeded access to the power block
- Remove the protective cover

Removal

The removal steps are numbered in accordance with the numbers in the diagram.

1. Unscrew the connection to the DC link (six screws).
2. Unscrew the connection to the line connection (nine screws).
3. Remove the retaining screws at the top (four screws).
4. Remove the retaining screws at the bottom (two screws).
5. Remove DRIVE-CLiQ cables and connections at –X41/–X42/–X46 (six connectors).
   The DRIVE-CLiQ cables should be marked to ensure that they are subsequently correctly inserted.
6. Take out the retaining screws for the IPD card (two screws) and remove the IPD card from plug -X45 on the Control Interface Module.
7. Remove the mounts for the Control Interface Module (two nuts) and carefully pull out the Control Interface Module.

   When removing the Control Interface Module, you have to disconnect five additional plugs one after the other (two at the top, three below).
8. Disconnect the plug for the thermocouple.
9. Unscrew the two retaining screws for the fan and attach the equipment for assembling the power block at this position.

You can now remove the power block.

⚠ CAUTION
Caution when removing
The power block weighs approx. 135 kg!
When removing the power block, ensure that you do not damage any signal cables.

Installation steps

Installing is the same as removing, however in the reverse order.

NOTICE
Specifications for the installation
The tightening torques specified in the table "Tightening torques for screw connections" must be observed.
Carefully insert the plug connections and ensure that they are secure.

Note

Connection clip for the interference-suppression capacitor

The connection clip to the interference suppression capacitor is mounted on the spare power block together with a yellow warning label.

Please note the information in the chapter "Electrical connection" of the corresponding device.

8.4.8 Replacing the Control Interface Module, Active Line Module and Motor Module, frame size FX

Replacing the Control Interface Module

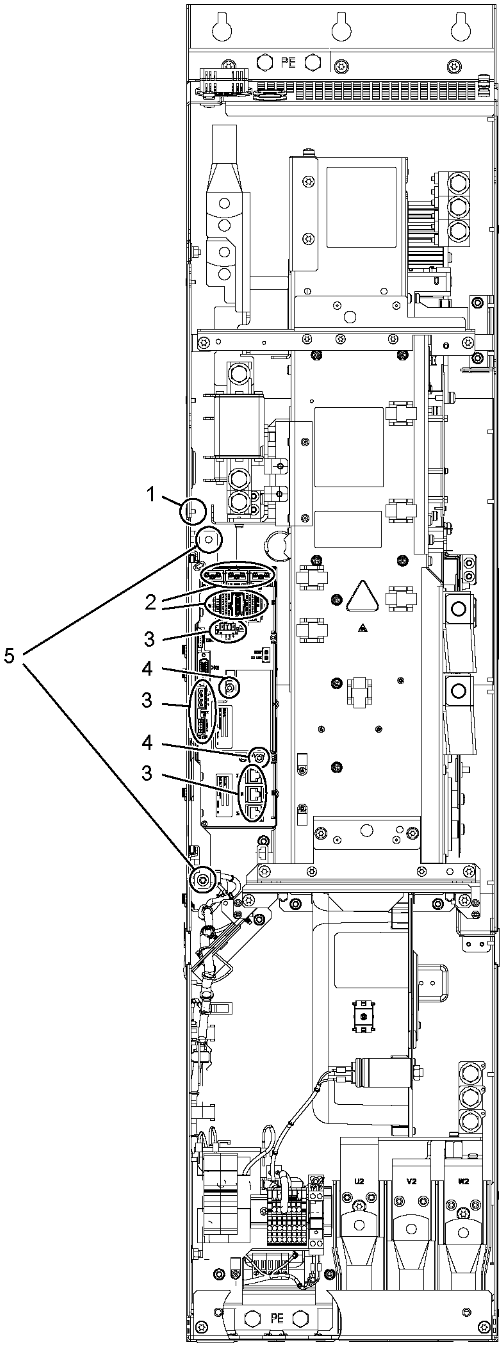


Figure 8-12 Replacing the Control Interface Module, Active Line Module and Motor Module, frame size FX

Preparatory steps

- Disconnect the drive line-up from the power supply
- Allow unimpeded access
- Remove the front cover

Removal

The removal steps are numbered in accordance with the numbers in the diagram.

1. Remove the mount for the CU320 (one nut).
2. Disconnect the plug-in connections for the fiber-optic cables and signal cables (five connectors).
3. Remove DRIVE-CLiQ cables and connections at –X41/–X42/–X46 (six connectors).
   The DRIVE-CLiQ cables should be marked to ensure that they are subsequently correctly inserted.
4. Take out the retaining screws for the IPD card (two screws) and remove the IPD card from plug -X45 on the Control Interface Module.
5. Remove the retaining screws for the Control Interface Module (two screws).

When removing the Control Interface Module, you have to disconnect five additional plugs one after the other (two at the top, three below).

NOTICE
Do not damage any signal cables
When removing, ensure that you do not damage any signal cables.

Installation steps

Installing is the same as removing, however in the reverse order.

NOTICE
Specifications for the installation
The tightening torques specified in the table "Tightening torques for screw connections" must be observed.
Carefully insert the plug connections and ensure that they are secure.
The fiber optic cable plugs must be remounted at their original slot. Fiber optic cables and sockets are accordingly labeled for correct assignment (U11, U21, U31).

8.4.9 Replacing the Control Interface Module, Smart Line Module, Active Line Module, and Motor Module, frame size GX

Replacing the Control Interface Module

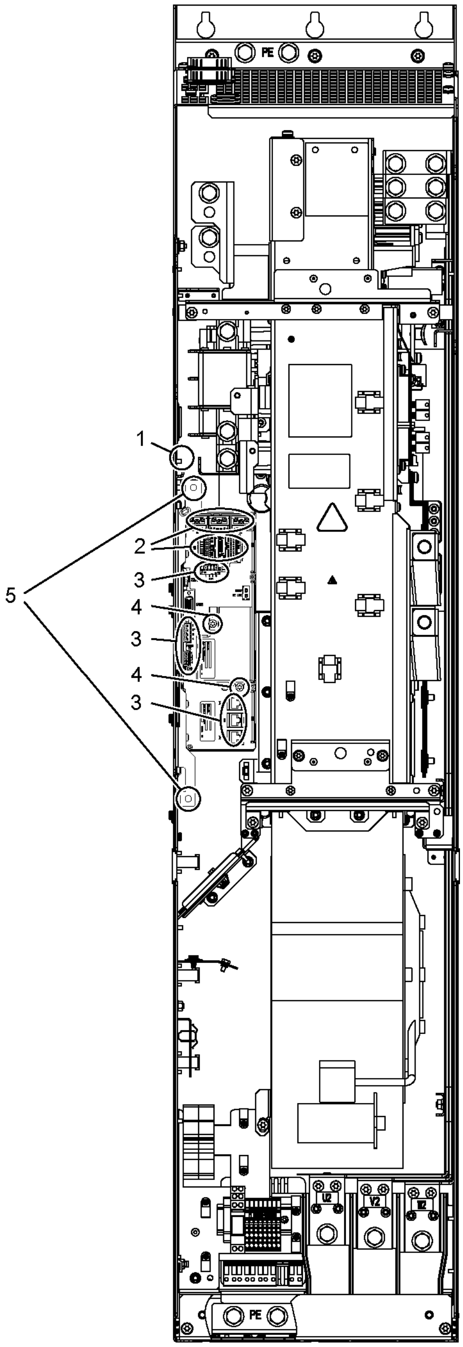


Figure 8-13 Replacing the Control Interface Module, Smart Line Module, Active Line Module, and Motor Module, frame size GX

Preparatory steps

- Disconnect the drive line-up from the power supply
- Allow unimpeded access
- Remove the front cover

Removal

The removal steps are numbered in accordance with the numbers in the diagram.

1. Remove the mount for the CU320 (one nut).
2. Disconnect the plug-in connections for the fiber-optic cables and signal cables (five connectors).
3. Remove DRIVE-CLiQ cables and connections at –X41/–X42/–X46 (six connectors). The DRIVE-CLiQ cables should be marked to ensure that they are subsequently correctly inserted.
4. Take out the retaining screws for the IPD card (two screws) and remove the IPD card from plug -X45 on the Control Interface Module.
5. Remove the retaining screws for the Control Interface Module (two screws).

When removing the Control Interface Module, you have to disconnect five additional plugs one after the other (two at the top, three below).

NOTICE
Do not damage any signal cables
When removing, ensure that you do not damage any signal cables.

Installation steps

Installing is the same as removing, however in the reverse order.

NOTICE
Specifications for the installation
The tightening torques specified in the table "Tightening torques for screw connections" must be observed.
Carefully insert the plug connections and ensure that they are secure.
The fiber optic cable plugs must be remounted at their original slot. Fiber optic cables and sockets are accordingly labeled for correct assignment (U11, U21, U31).

8.4.10 Replacing the Control Interface Module, Smart Line Module, Active Line Module, and Motor Module, frame size HX

Replacing the Control Interface Module

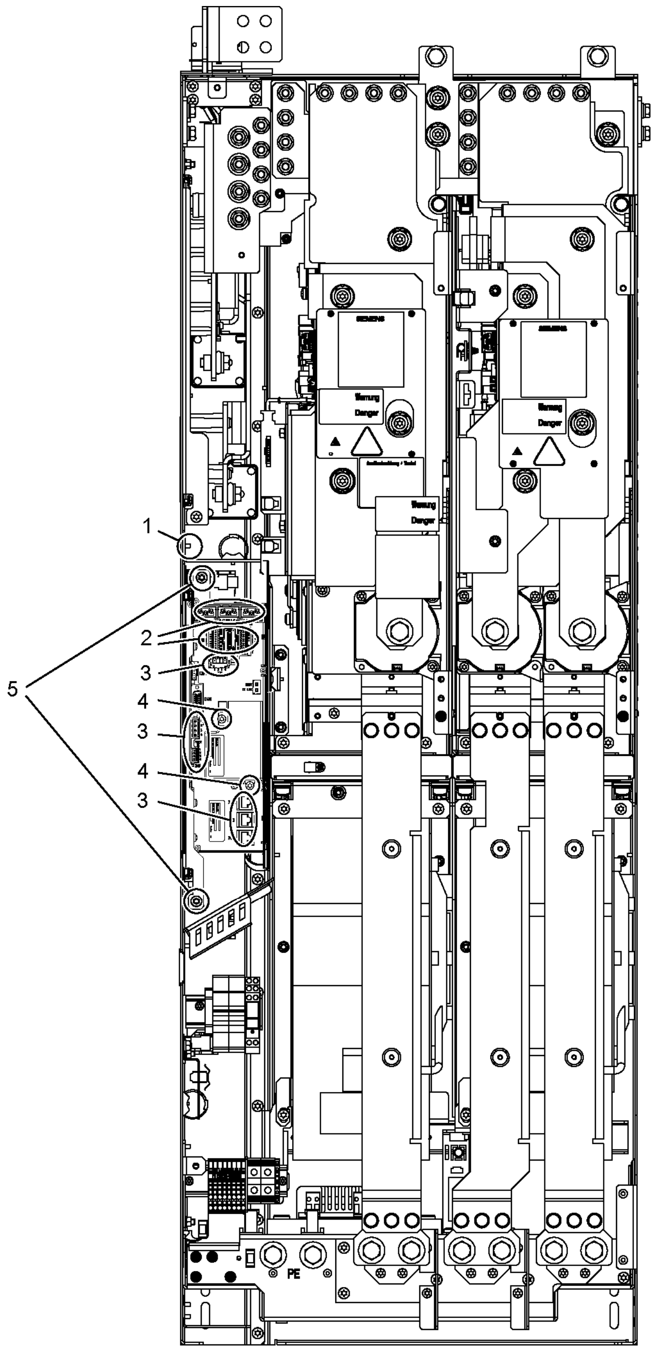


Figure 8-14 Replacing the Control Interface Module, Smart Line Module, Active Line Module, and Motor Module, frame size HX

Preparatory steps

- Disconnect the drive line-up from the power supply
- Allow unimpeded access
- Remove the protective cover

Removal

The removal steps are numbered in accordance with the numbers in the diagram.

1. Remove the mount for the CU320 (one nut).
2. Disconnect the plug-in connections for the fiber-optic cables and signal cables (five connectors).
3. Remove DRIVE-CLiQ cables and connections at –X41/–X42/–X46 (six connectors). The DRIVE-CLiQ cables should be marked to ensure that they are subsequently correctly inserted.
4. Take out the retaining screws for the IPD card (two screws) and remove the IPD card from plug -X45 on the Control Interface Module.
5. Remove the retaining screws for the Control Interface Module (two screws).

When removing the Control Interface Module, you have to disconnect five additional plugs one after the other (two at the top, three below).

NOTICE
Do not damage any signal cables
When removing, ensure that you do not damage any signal cables.

Installation steps

Installing is the same as removing, however in the reverse order.

NOTICE
Specifications for the installation
The tightening torques specified in the table "Tightening torques for screw connections" must be observed.
Carefully insert the plug connections and ensure that they are secure.
The fiber optic cable plugs must be remounted at their original slot. Fiber optic cables and sockets are accordingly labeled for correct assignment (U11, U21, U31).

8.4.11 Replacing the Control Interface Module, Smart Line Module, Active Line Module, and Motor Module, frame size JX

Replacing the Control Interface Module

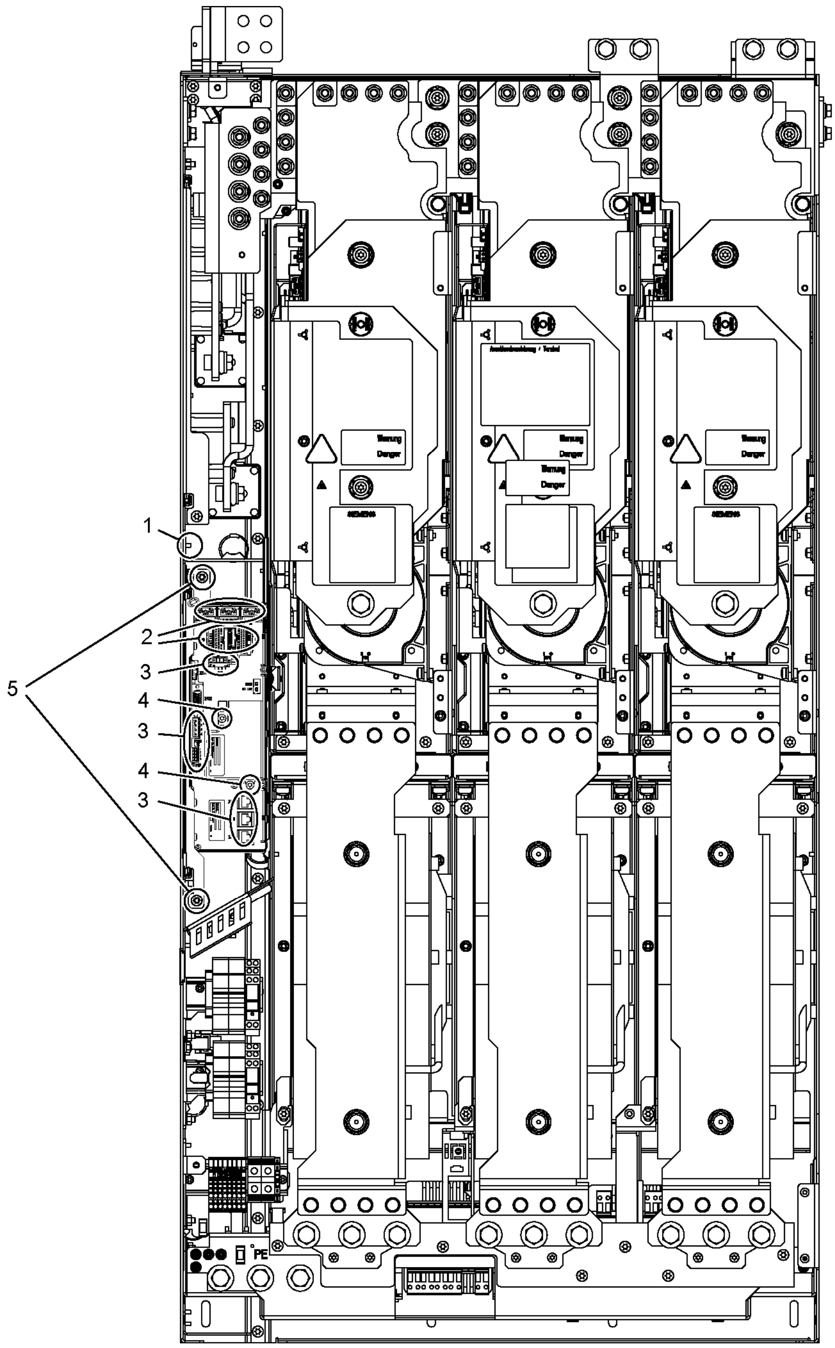


Figure 8-15 Replacing the Control Interface Module, Smart Line Module, Active Line Module, and Motor Module, frame size JX

Preparatory steps

- Disconnect the drive line-up from the power supply
- Allow unimpeded access
- Remove the protective cover

Removal

The removal steps are numbered in accordance with the numbers in the diagram.

1. Remove the mount for the CU320 (one nut).
2. Disconnect the plug-in connections for the fiber-optic cables and signal cables (five connectors).
3. Remove DRIVE-CLiQ cables and connections at –X41/–X42/–X46 (six connectors).
   The DRIVE-CLiQ cables should be marked to ensure that they are subsequently correctly inserted.
4. Take out the retaining screws for the IPD card (two screws) and remove the IPD card from plug -X45 on the Control Interface Module.
5. Remove the retaining screws for the Control Interface Module (two screws).

When removing the Control Interface Module, you have to disconnect five additional plugs one after the other (two at the top, three below).

NOTICE
Do not damage any signal cables
When removing, ensure that you do not damage any signal cables.

Installation steps

Installing is the same as removing, however in the reverse order.

NOTICE
Specifications for the installation
The tightening torques specified in the table "Tightening torques for screw connections" must be observed.
Carefully insert the plug connections and ensure that they are secure.
The fiber optic cable plugs must be remounted at their original slot. Fiber optic cables and sockets are accordingly labeled for correct assignment (U11, U21, U31).

8.4.12 Replacing the Control Interface Module, Basic Line Module, frame size FB

Replacing the Control Interface Module

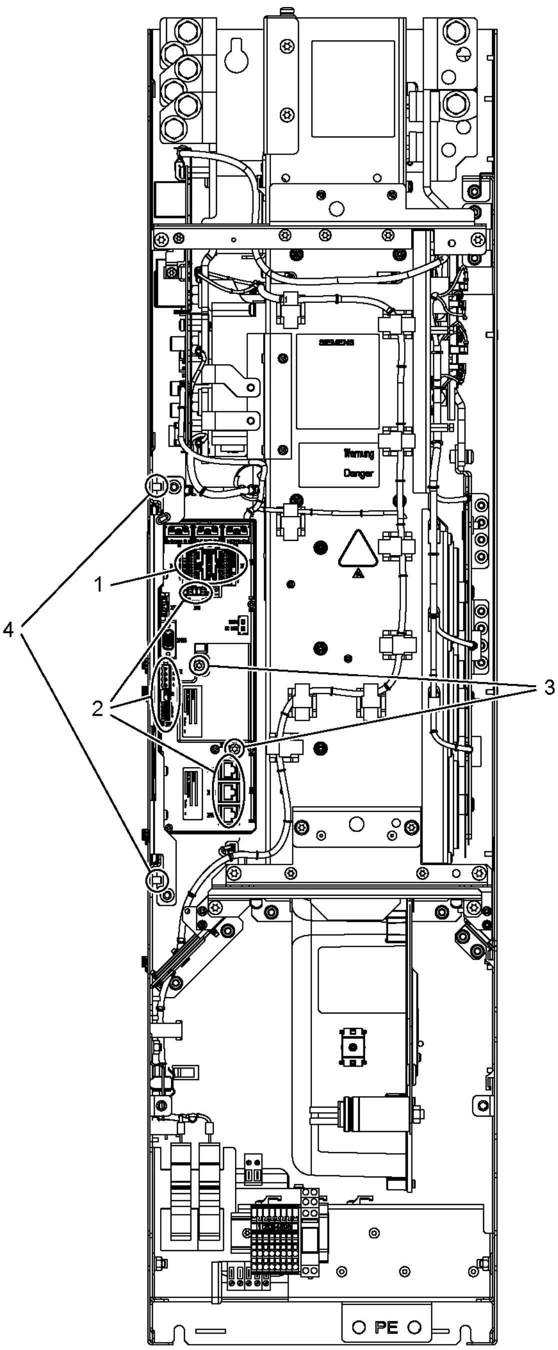


Figure 8-16 Replacing the Control Interface Module, Basic Line Module, frame size FB

Preparatory steps

- Disconnect the drive line-up from the power supply
- Allow unimpeded access
- Remove the front cover

Removal

The removal steps are numbered in accordance with the numbers in the diagram.

1. Disconnect the plugs for the signal cables (two connectors).
2. Remove DRIVE-CLiQ cables and connections at –X41/–X42/–X46 (six connectors). The DRIVE-CLiQ cables should be marked to ensure that they are subsequently correctly inserted.
3. Take out the retaining screws for the IPD card (two screws) and remove the IPD card from plug -X45 on the Control Interface Module.
4. Remove the retaining screws for the Control Interface Module (two screws).

When removing the Control Interface Module, you have to disconnect five additional plugs one after the other (two at the top, three below).

NOTICE
Do not damage any signal cables
When removing, ensure that you do not damage any signal cables.

Installation steps

Installing is the same as removing, however in the reverse order.

NOTICE
Specifications for the installation
The tightening torques specified in the table "Tightening torques for screw connections" must be observed.
Carefully insert the plug connections and ensure that they are secure.

8.4.13 Replacing the Control Interface Module, Basic Line Module, frame size GB, GD

Replacing the Control Interface Module

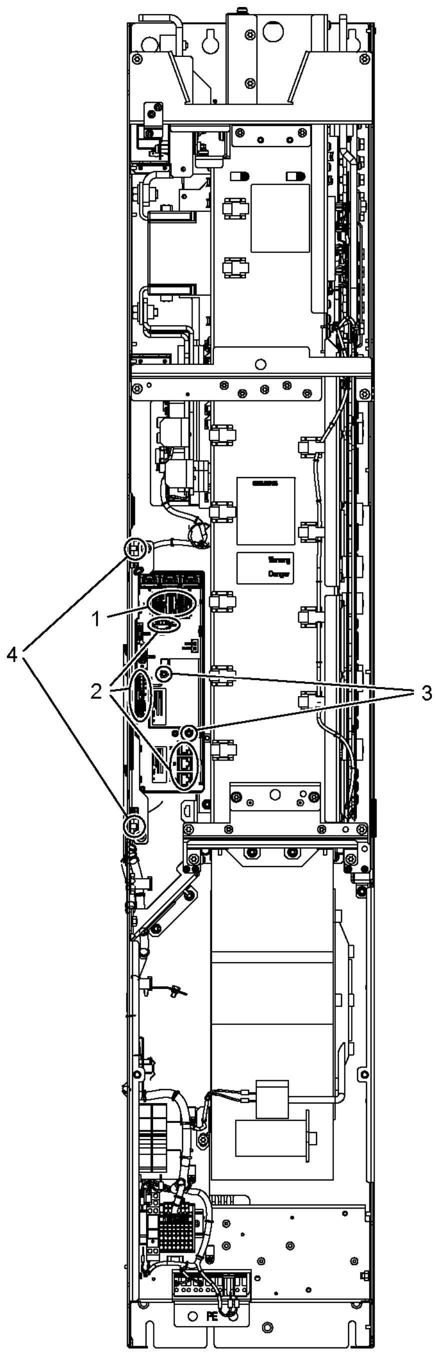


Figure 8-17 Replacing the Control Interface Module, Basic Line Module, frame sizes GB, GD

Preparatory steps

- Disconnect the drive line-up from the power supply
- Allow unimpeded access
- Remove the front cover

Removal

The removal steps are numbered in accordance with the numbers in the diagram.

1. Disconnect the plugs for the signal cables (two connectors).
2. Remove DRIVE-CLiQ cables and connections at –X41/–X42/–X46 (six connectors).
   The DRIVE-CLiQ cables should be marked to ensure that they are subsequently correctly inserted.
3. Take out the retaining screws for the IPD card (two screws) and remove the IPD card from plug -X45 on the Control Interface Module.
4. Remove the retaining screws for the Control Interface Module (two screws).

When removing the Control Interface Module, you have to disconnect five additional plugs one after the other (two at the top, three below).

NOTICE
Do not damage any signal cables
When removing, ensure that you do not damage any signal cables.

Installation steps

Installing is the same as removing, however in the reverse order.

NOTICE
Specifications for the installation
The tightening torques specified in the table "Tightening torques for screw connections" must be observed.
Carefully insert the plug connections and ensure that they are secure.

8.4.14 Replacing the fan, Smart Line Module, Active Line Module, and Motor Module, frame sizes FX, GX

Replacing the fan

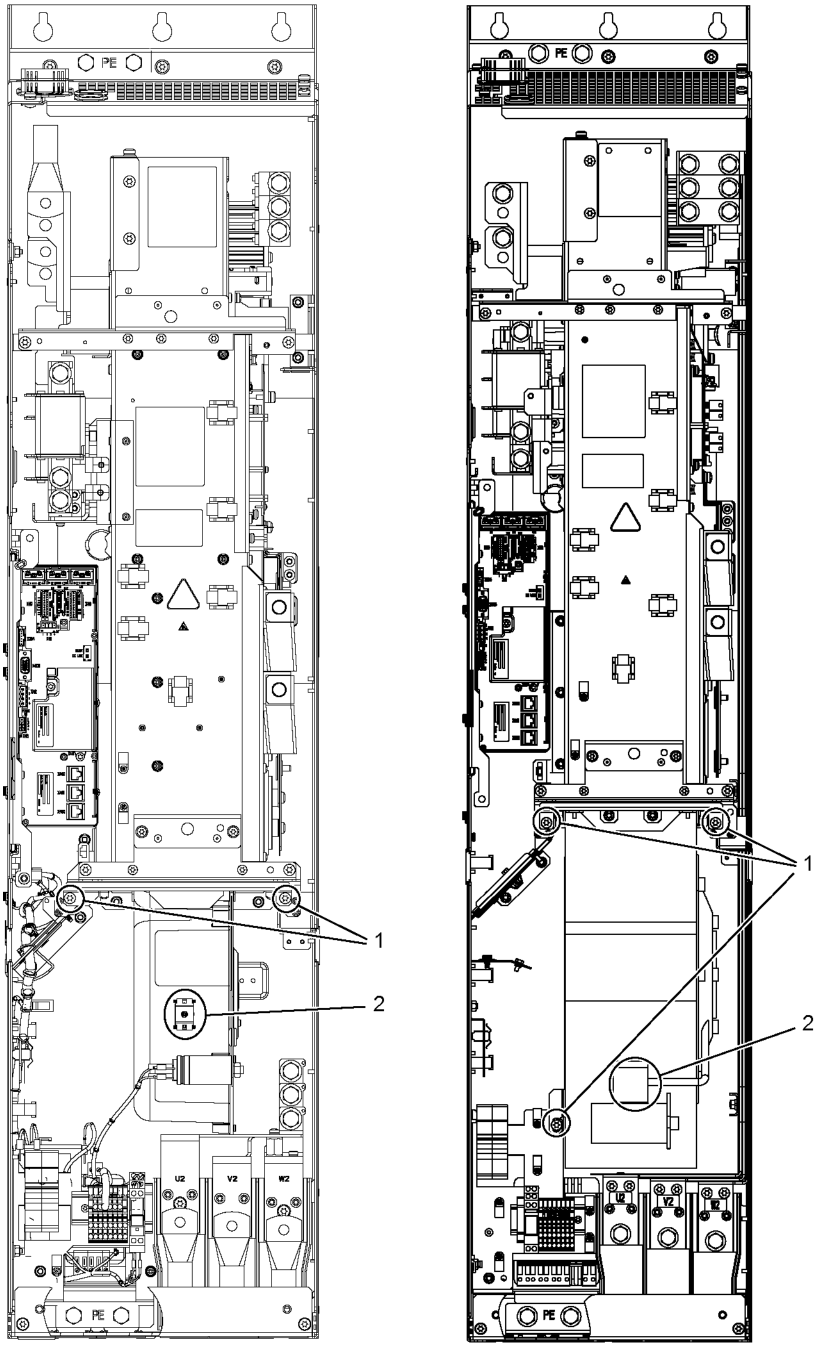


Figure 8-18 Replacing the fan, Smart Line Module, Active Line Module, and Motor Module, frame sizes FX, GX

Description

The average service life of the device fans is 50,000 hours. In practice, however, the service life depends on other variables (e.g. ambient temperature, degree of cabinet protection, etc.) and, therefore, may deviate from this value.

The fans must be replaced in good time to ensure that the device is available.

Preparatory steps

- Disconnect the drive line-up from the power supply
- Allow unimpeded access
- Remove the front cover

Removal

The removal steps are numbered in accordance with the numbers in the diagram.

1. Remove the retaining screws for the fan

   (2 for FX; 3 for GX).
2. Disconnect the supply cables (1 x "L", 1 x "N").

You can now carefully remove the fan.

NOTICE
Do not damage any signal cables
When removing the fan, ensure that the signal cables are not damaged.

Installation steps

Installing is the same as removing, however in the reverse order.

NOTICE
Pay attention to the tightening torques
The tightening torques specified in the table "Tightening torques for screw connections" must be observed.

8.4.15 Replacing the fan, Smart Line Module, Active Line Module, and Motor Module, frame size HX

Replacing the fan (left-hand power block)

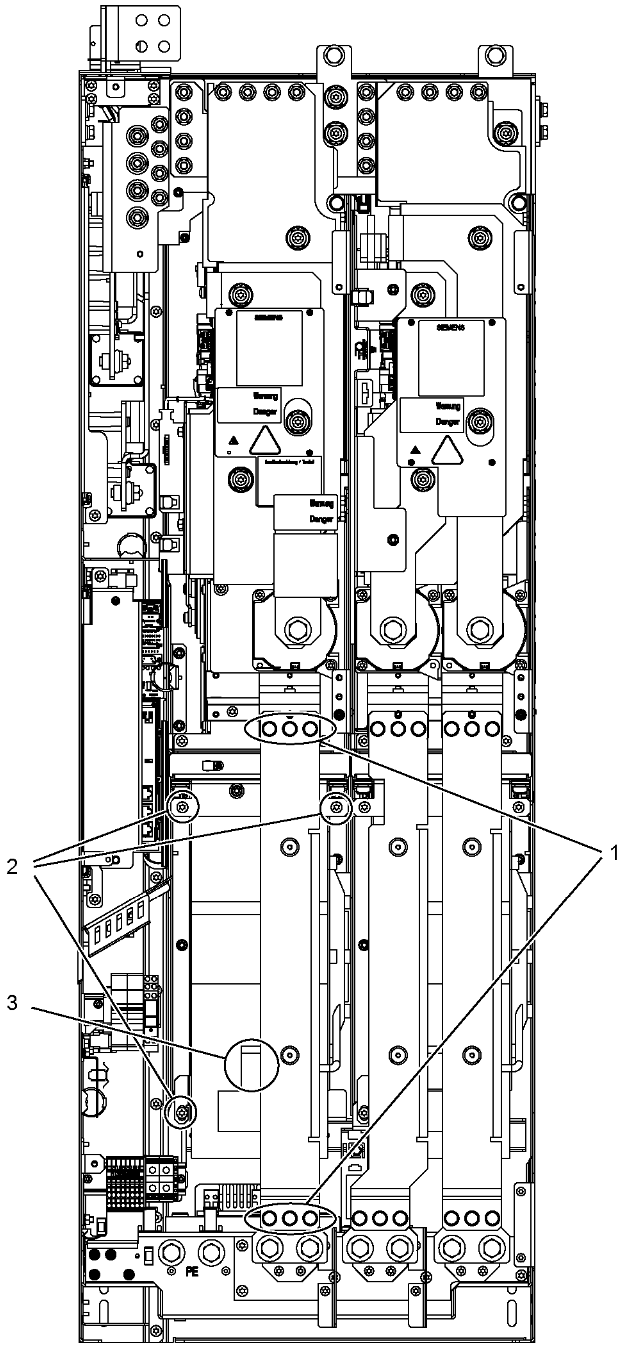


Figure 8-19 Replacing the fan, Smart Line Module, Active Line Module, and Motor Module, frame size HX - left power block

Description

The average service life of the device fans is 50,000 hours. In practice, however, the service life depends on other variables (e.g. ambient temperature, degree of cabinet protection, etc.) and, therefore, may deviate from this value.

The fans must be replaced in good time to ensure that the device is available.

Preparatory steps

- Disconnect the drive line-up from the power supply
- Allow unimpeded access
- Remove the protective cover

Removal

The removal steps are numbered in accordance with the numbers in the diagram.

1. Remove the busbar (six screws).
2. Remove the retaining screws for the fan (three screws).
3. Disconnect the supply cables (1 x "L", 1 x "N").

You can now carefully remove the fan.

NOTICE
Do not damage any signal cables
When removing the fan, ensure that the signal cables are not damaged.

Installation steps

Installing is the same as removing, however in the reverse order.

NOTICE
Pay attention to the tightening torques
The tightening torques specified in the table "Tightening torques for screw connections" must be observed.

Replacing the fan (right-hand power block)

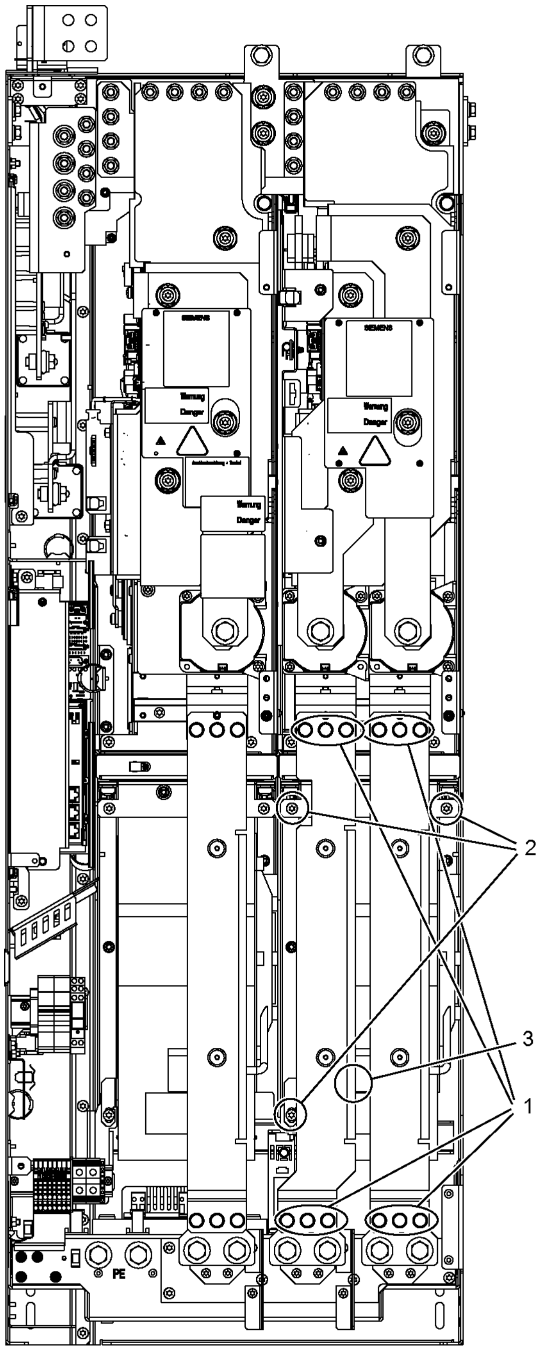


Figure 8-20 Replacing the fan, Smart Line Module, Active Line Module, and Motor Module, frame size HX - right power block

Description

The average service life of the device fans is 50,000 hours. In practice, however, the service life depends on other variables (e.g. ambient temperature, degree of cabinet protection, etc.) and, therefore, may deviate from this value.

The fans must be replaced in good time to ensure that the device is available.

Preparatory steps

- Disconnect the drive line-up from the power supply
- Allow unimpeded access
- Remove the protective cover

Removal

The removal steps are numbered in accordance with the numbers in the diagram.

1. Remove the busbars (twelve screws).
2. Remove the retaining screws for the fan (three screws).
3. Disconnect the supply cables (1 x "L", 1 x "N").

You can now carefully remove the fan.

NOTICE
Do not damage any signal cables
When removing the fan, ensure that the signal cables are not damaged.

Installation steps

Installing is the same as removing, however in the reverse order.

NOTICE
Pay attention to the tightening torques
The tightening torques specified in the table "Tightening torques for screw connections" must be observed.

8.4.16 Replacing the fan, Smart Line Module, Active Line Module, and Motor Module, frame size JX

Replacing the fan

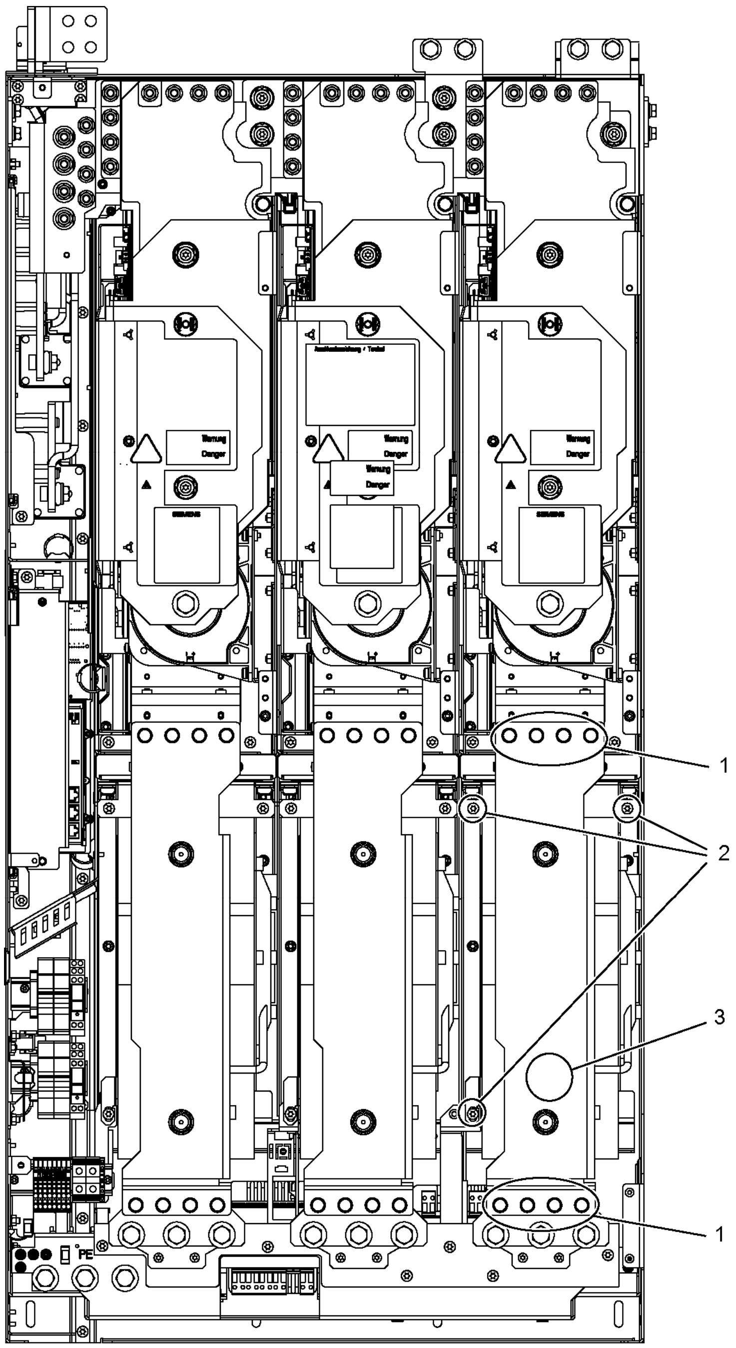


Figure 8-21 Replacing the fan, Smart Line Module, Active Line Module, and Motor Module, frame size JX

Description

The average service life of the device fans is 50,000 hours. In practice, however, the service life depends on other variables (e.g. ambient temperature, degree of cabinet protection, etc.) and, therefore, may deviate from this value.

The fans must be replaced in good time to ensure that the device is available.

Preparatory steps

- Disconnect the drive line-up from the power supply
- Allow unimpeded access
- Remove the protective cover

Removal

The removal steps are numbered in accordance with the numbers in the diagram.

1. Remove the busbar (eight screws).
2. Remove the retaining screws for the fan (three screws).
3. Disconnect the supply cables (1 x "L", 1 x "N").

You can now carefully remove the fan.

NOTICE
Do not damage any signal cables
When removing the fan, ensure that the signal cables are not damaged.

Installation steps

Installing is the same as removing, however in the reverse order.

NOTICE
Pay attention to the tightening torques
The tightening torques specified in the table "Tightening torques for screw connections" must be observed.

8.4.17 Replacing the fan, Active Interface Module, frame size FI

Replacing the fan

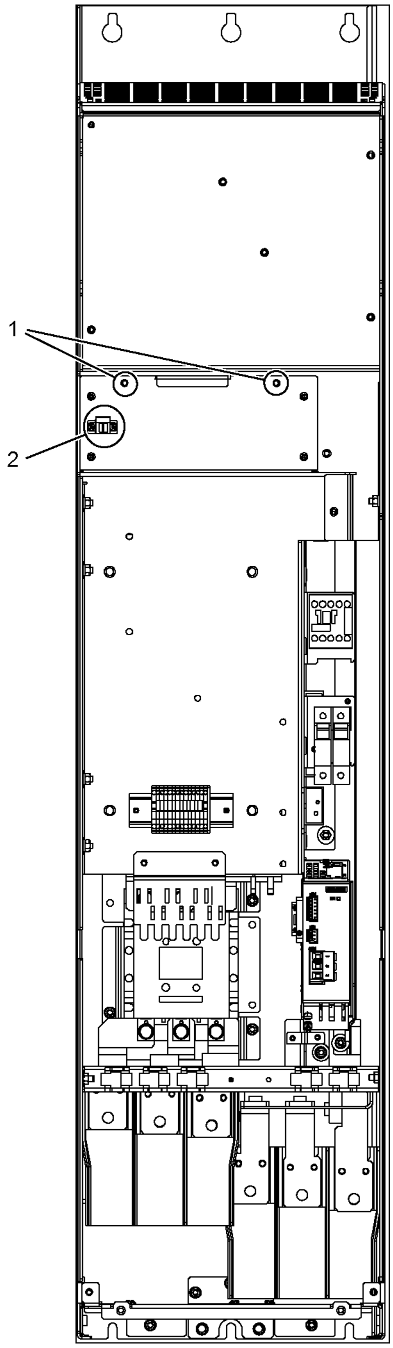


Figure 8-22 Replacing the fan, Active Interface Module, frame size FI

Description

The average service life of the device fans is 50,000 hours. In practice, however, the service life depends on other variables (e.g. ambient temperature, degree of cabinet protection, etc.) and, therefore, may deviate from this value.

The fans must be replaced in good time to ensure that the device is available.

Preparatory steps

- Disconnect the drive line-up from the power supply
- Allow unimpeded access
- Remove the protective cover

Removal

The removal steps are numbered in accordance with the numbers in the diagram.

1. Remove the retaining screws for the fan unit (two screws).
2. Unplug connector –X630.

You can now carefully remove the fan.

NOTICE
Do not damage any signal cables
When removing the fan, ensure that the signal cables are not damaged.

Installation steps

Installing is the same as removing, however in the reverse order.

NOTICE
Specifications for the installation
The tightening torques specified in the table "Tightening torques for screw connections" must be observed.

8.4.18 Replacing the fan, Active Interface Module, frame size GI

Replacing the fan

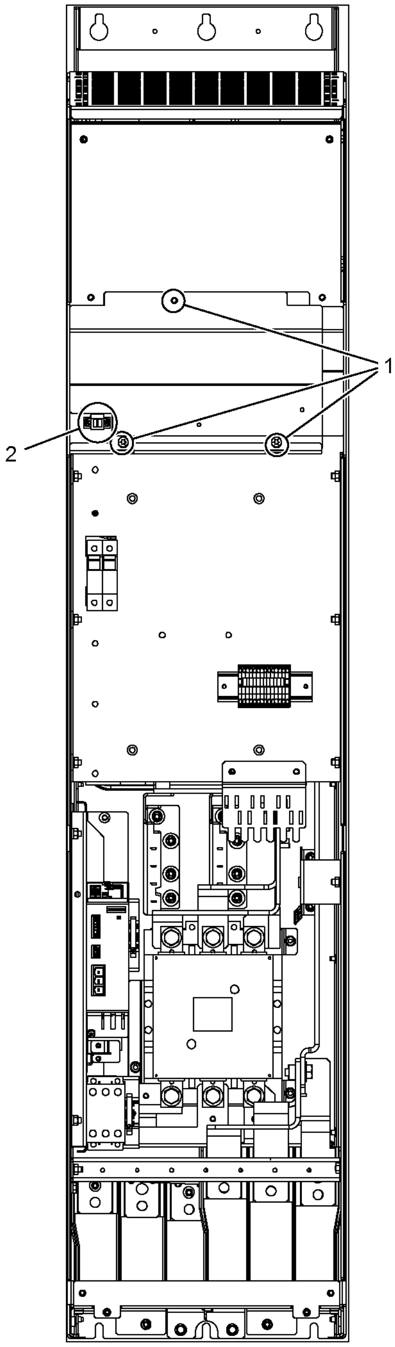


Figure 8-23 Replacing the fan, Active Interface Module, frame size GI

Description

The average service life of the device fans is 50,000 hours. In practice, however, the service life depends on other variables (e.g. ambient temperature, degree of cabinet protection, etc.) and, therefore, may deviate from this value.

The fans must be replaced in good time to ensure that the device is available.

Preparatory steps

- Disconnect the drive line-up from the power supply.
- Allow unimpeded access
- Remove the protective cover

Removal

The removal steps are numbered in accordance with the numbers in the diagram.

1. Remove the retaining screws for the fan unit (3 screws).
2. Unplug connector –X630.

You can now carefully remove the fan.

NOTICE
Do not damage any signal cables
When removing the fan, ensure that the signal cables are not damaged.

Installation steps

Installing is the same as removing, however in the reverse order.

NOTICE
Pay attention to the tightening torques
The tightening torques specified in the table "Tightening torques for screw connections" must be observed.

8.4.19 Replacing the fan, Active Interface Module, frame size HI

Replacing the fan

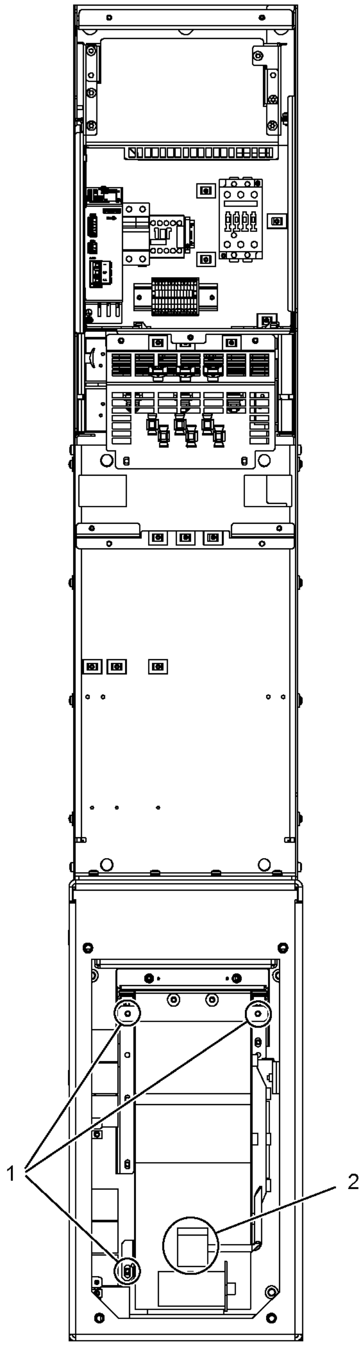


Figure 8-24 Replacing the fan, Active Interface Module, frame size HI

Description

The average service life of the device fans is 50,000 hours. In practice, however, the service life depends on other variables (e.g. ambient temperature, degree of cabinet protection, etc.) and, therefore, may deviate from this value.

The fans must be replaced in good time to ensure that the device is available.

Preparatory steps

- Disconnect the drive line-up from the power supply
- Allow unimpeded access
- Remove the protective cover

Removal

The removal steps are numbered in accordance with the numbers in the diagram.

1. Remove the retaining screws for the fan unit (3 screws).
2. Disconnect the supply cables (1 x "L", 1 x "N").

You can now carefully remove the fan.

NOTICE
Do not damage any signal cables
When removing the fan, ensure that the signal cables are not damaged.

Installation steps

Installing is the same as removing, however in the reverse order.

NOTICE
Pay attention to the tightening torques
The tightening torques specified in the table "Tightening torques for screw connections" must be observed.

8.4.20 Replacing the fan, Active Interface Module, frame size JI

Replacing the fan

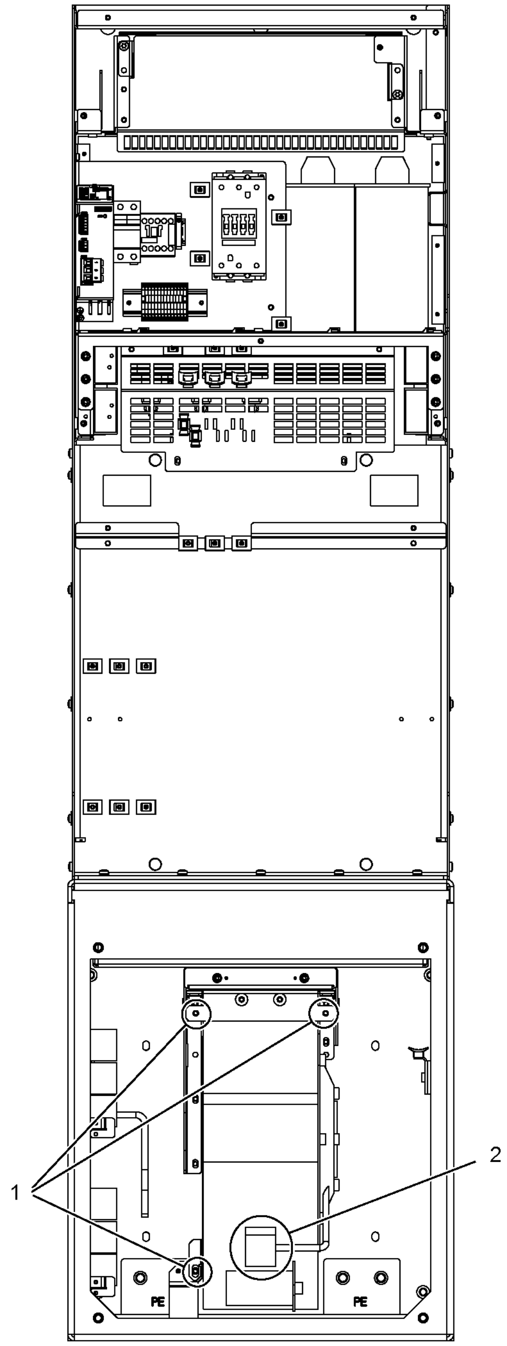


Figure 8-25 Replacing the fan, Active Interface Module, frame size JI

Description

The average service life of the device fans is 50,000 hours. In practice, however, the service life depends on other variables (e.g. ambient temperature, degree of cabinet protection, etc.) and, therefore, may deviate from this value.

The fans must be replaced in good time to ensure that the device is available.

Preparatory steps

- Disconnect the drive line-up from the power supply
- Allow unimpeded access
- Remove the protective cover

Removal

The removal steps are numbered in accordance with the numbers in the diagram.

1. Remove the retaining screws for the fan unit (3 screws).
2. Disconnect the supply cables (1 x "L", 1 x "N").

You can now carefully remove the fan.

NOTICE
Do not damage any signal cables
When removing the fan, ensure that the signal cables are not damaged.

Installation steps

Installing is the same as removing, however in the reverse order.

NOTICE
Pay attention to the tightening torques
The tightening torques specified in the table "Tightening torques for screw connections" must be observed.

8.4.21 Replacing the fan, Basic Line Module, frame sizes FB, GB, GD

Replacing the fan

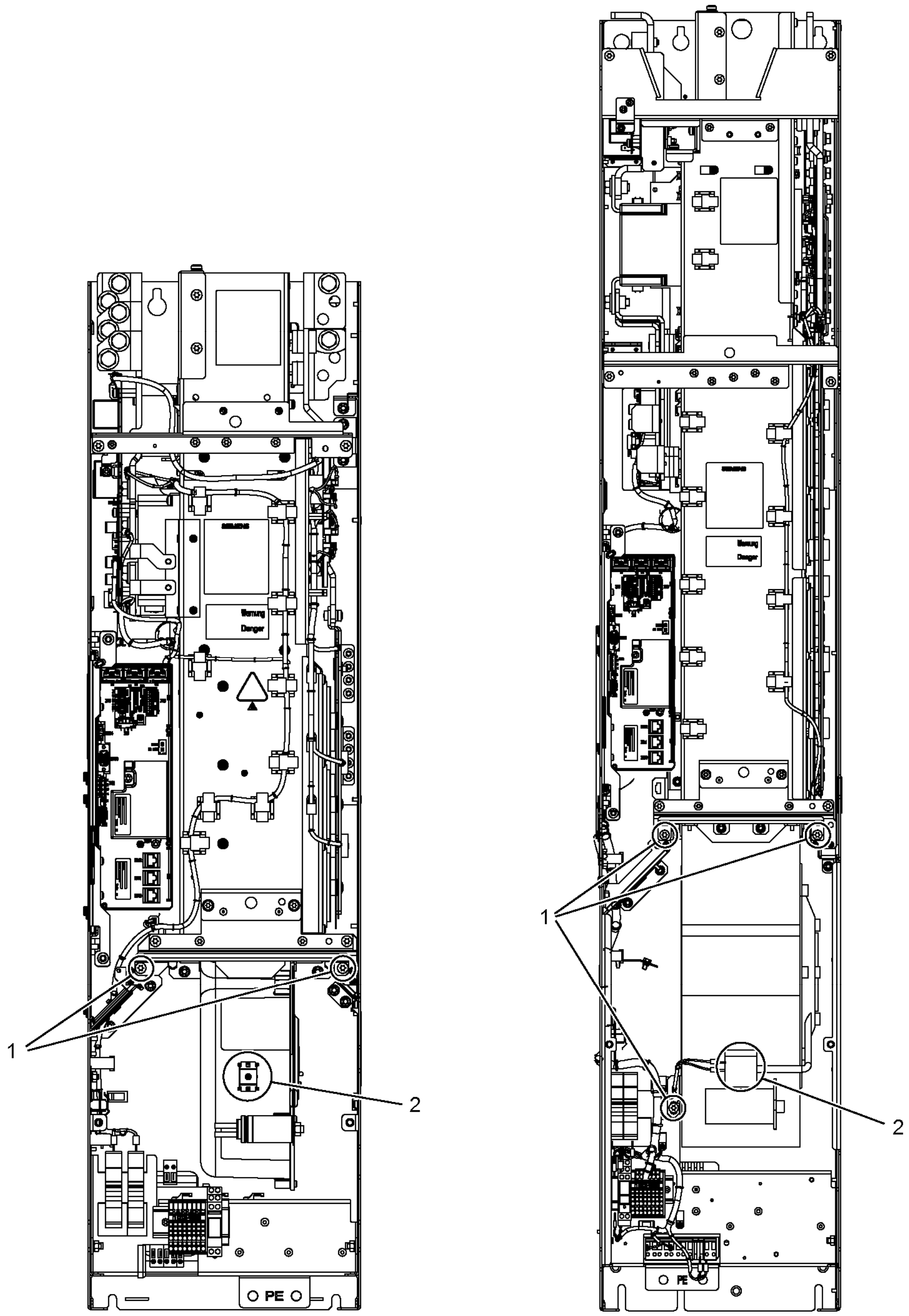


Figure 8-26 Replacing the fan, Basic Line Module, frame sizes FB, GB and GD

Description

The average service life of the device fans is 50,000 hours. In practice, however, the service life depends on other variables (e.g. ambient temperature, degree of cabinet protection, etc.) and, therefore, may deviate from this value.

The fans must be replaced in good time to ensure that the device is available.

Preparatory steps

- Disconnect the drive line-up from the power supply
- Allow unimpeded access
- Remove the protective cover

Removal

The removal steps are numbered in accordance with the numbers in the diagram.

1. Remove the retaining screws for the fan

   (two screws for frame size FB, three screws for frame size GB)
2. Disconnect the supply cables (1 x "L", 1 x "N").

You can now carefully remove the fan.

NOTICE
Do not damage any signal cables
When removing the fan, ensure that the signal cables are not damaged.

Installation steps

Installing is the same as removing, however in the reverse order.

NOTICE
Pay attention to the tightening torques
The tightening torques specified in the table "Tightening torques for screw connections" must be observed.

8.4.22 Replacing the DC fuses, Smart Line Module, Active Line Module, and Motor Module, frame size HX

Replacing the DC fuses

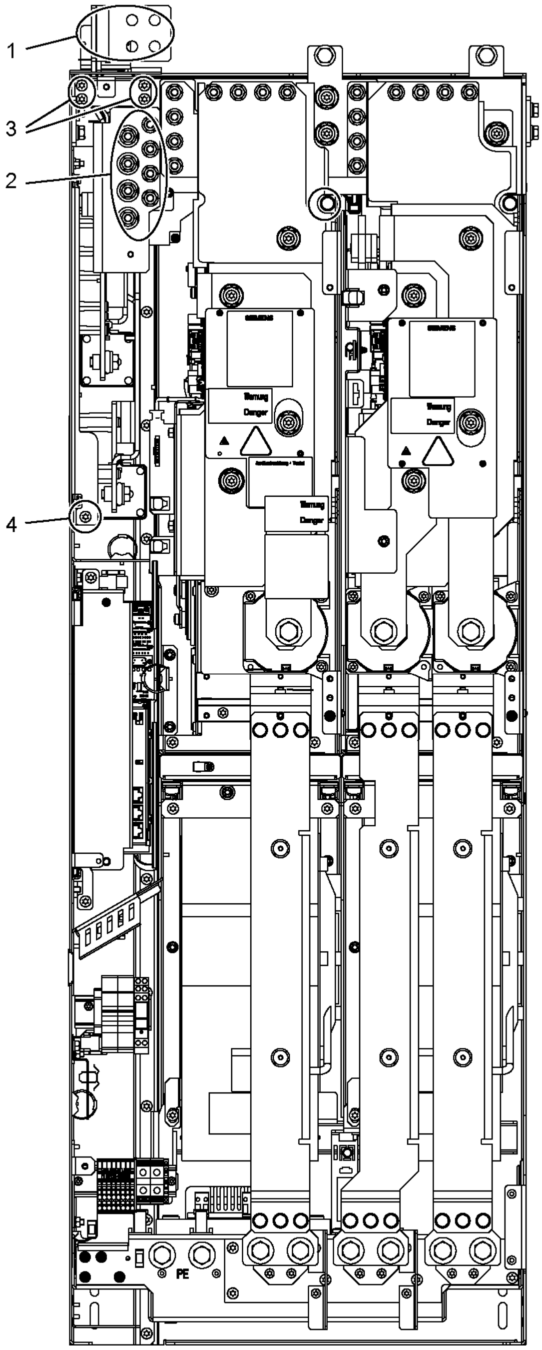


Figure 8-27 Replacing the DC fuses, Smart Line Module, Active Line Module, and Motor Module, frame size HX

Description

The DC fuses are installed in a fuse insert. To replace the fuses, the fuse insert be removed.

NOTICE
Replace all DC fuses at the same time
After a DC fuse trips, always replace all DC fuses at the same time. Only fuses of the same type may be installed.

Preparatory steps

- Disconnect the drive line-up from the power supply
- Allow unimpeded access
- Remove the protective cover

Removal

The removal steps are numbered in accordance with the numbers in the diagram.

1. Release the DC connections at DCP and DCN (four screws each)
2. Remove nuts (eight screws).
3. Remove the retaining screws for the connection plate of the housing (four screws) and remove the connection plate.
4. Remove the retaining screws for the fuse insert (one screw).

You can now remove the fuse insert.

NOTICE
Do not damage any signal cables or plastic parts
When removing the fuse insert, make sure that no signal cables or plastic parts are damaged.

You can then replace the DC fuses.

Installation steps

Installing is the same as removing, however in the reverse order.

NOTICE
Pay attention to the tightening torques
The tightening torques specified in the table "Tightening torques for screw connections" must be observed.

8.4.23 Replacing the DC fuses, Smart Line Module, Active Line Module, and Motor Module, frame size JX

Replacing the DC fuses

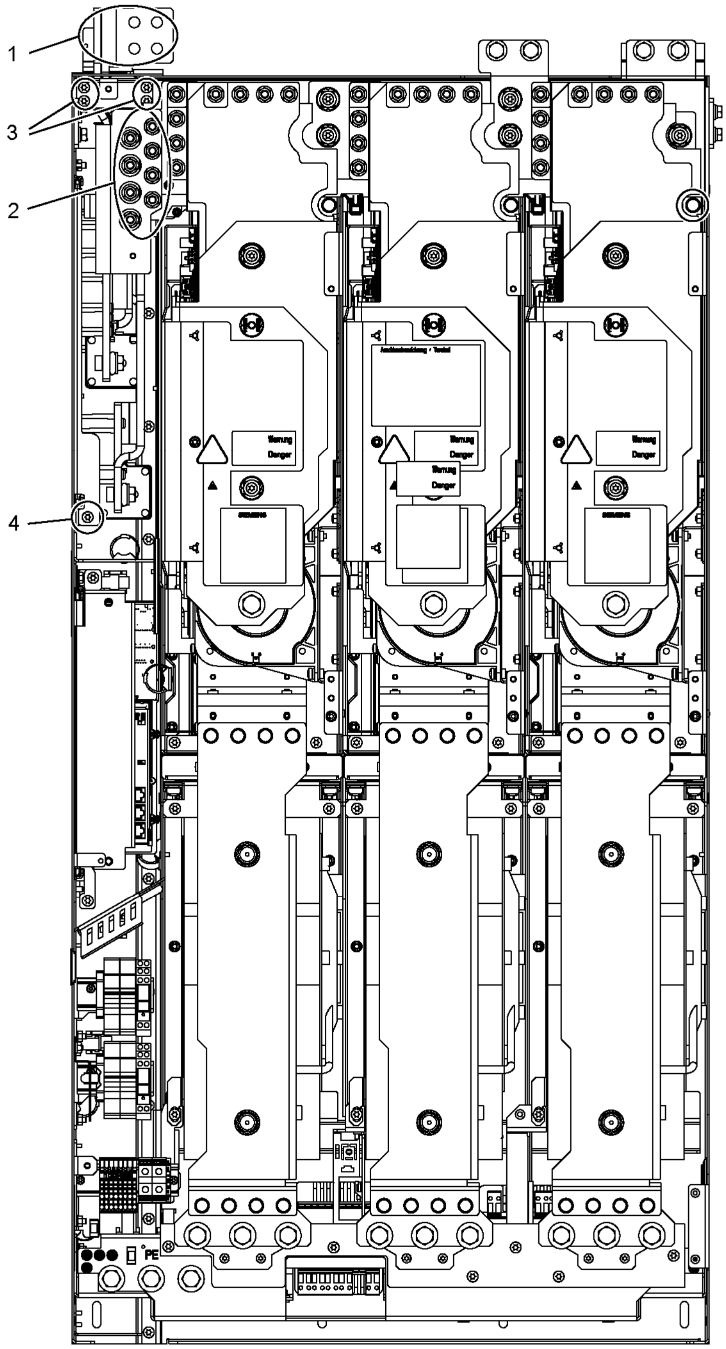


Figure 8-28 Replacing the DC fuses, Smart Line Module, Active Line Module, and Motor Module, frame size JX

Description

The DC fuses are installed in a fuse insert. To replace the fuses, the fuse insert be removed.

NOTICE
Replace all DC fuses at the same time
After a DC fuse trips, always replace all DC fuses at the same time. Only fuses of the same type may be installed.

Preparatory steps

- Disconnect the drive line-up from the power supply
- Allow unimpeded access
- Remove the protective cover

Removal

The removal steps are numbered in accordance with the numbers in the diagram.

1. Release the DC connections at DCP and DCN (four screws each)
2. Remove nuts (eight screws).
3. Remove the retaining screws for the connection plate of the housing (four screws) and remove the connection plate.
4. Remove the retaining screws for the fuse insert (one screw).

You can now remove the fuse insert.

NOTICE
Do not damage any signal cables or plastic parts
When removing the fuse insert, make sure that no signal cables or plastic parts are damaged.

You can then replace the DC fuses.

Installation steps

Installing is the same as removing, however in the reverse order.

NOTICE
Pay attention to the tightening torques
The tightening torques specified in the table "Tightening torques for screw connections" must be observed.

8.4.24 Replacing the fan fuses (-F10/-F11)

The order numbers for replacement fan fuses can be found in the spare parts list.

> ⚠ WARNING
>
> **Removing fault causes**
>
> Make sure that the cause of the fault is found before the fuse is replaced.

8.5 Forming the DC link capacitors

Description

If the Basic Line Module, Smart Line Module, Active Line Module, and Motor Module have not been used for more than two years, the DC-link capacitors must be reformed. If this is not carried out, the units could be damaged when the DC-link voltage is connected under load.

If the cabinet is commissioned within two years of its date of manufacture, the DC-link capacitors do not need to be re-formed. The date of manufacture can be taken from the serial number on the rating plate.

Note

Storage period

It is important that the storage period is calculated from the date of manufacture and not from the date that the equipment was shipped.

Rating plate

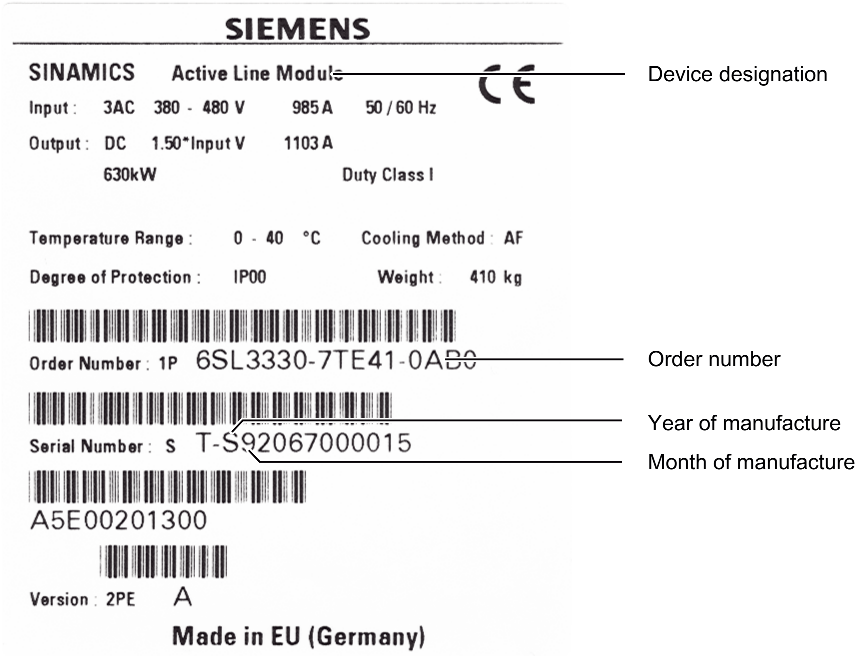


Figure 8-29 Rating plate using an Active Line Module as example

Date of manufacture

The date of manufacture can be determined as follows:

Table 8- 2 Production year and month

Character	Year of manufacture		Character	Month of manufacture
S	2004		1 ... 9	January to September
T	2005		O	October
U	2006		N	November
V	2007		D	December
W	2008			
X	2009			
A	2010			
B	2011			
C	2012			
D	2013			
E	2014			

Procedure in the event of repair or replacement

A replacement Line Module or Motor Module or the corresponding replacement power block has to be re-formed after being in storage for a period of more than two years.

The DC-link capacitors are re-formed by applying the rated voltage without load for at least 30 minutes.
To do this, the DC link must be precharged (i.e. the Line Modules switched on), while the controller for the existing Motor Modules must not be enabled for the specified length of time.

Procedure for re-forming outside the drive line-up

Replacement power units which have to be held ready for immediate use in the event of repair or replacement can also be re-formed individually and outside the drive line-up.

For this, the equipment must be connected to the forming circuits described in the following.

Components for the forming circuit (recommendation)

- One fuse switch 3 AC 400 V / 10 A or 690 V / 10 A
- Three incandescent lamps 230 V / 100 W for a line voltage of 3 AC 380 to 480 V.
  Alternatively, use three resistors of 1 kΩ / 100 W each (e.g. GWK150J1001KLX000 from Vishay) instead of the incandescent lamps.
- Six incandescent lamps 230 V / 100 W for a line voltage of 3 AC 500 to 690 V, where two incandescent lamps must be connected in series in each supply phase.
  Alternatively, use three resistors of 1 kΩ / 160 W each (e.g. GWK200J1001KLX000 from Vishay) instead of the incandescent lamps.
- Various small components, such as lamp sockets, cable 1.5 mm^2, etc.

CAUTION

Install lamp sockets with insulation

For a line voltage of 3 AC 500 to 690 V, the two lamp sockets connected in series must be insulated and protected from touch, because the insulation of the sockets is not designed for this high voltage.

Forming circuit for Line Modules

Note

Forming the Line Modules

Voltage must be supplied to Line Modules via a connected Motor Module and the associated DC link.

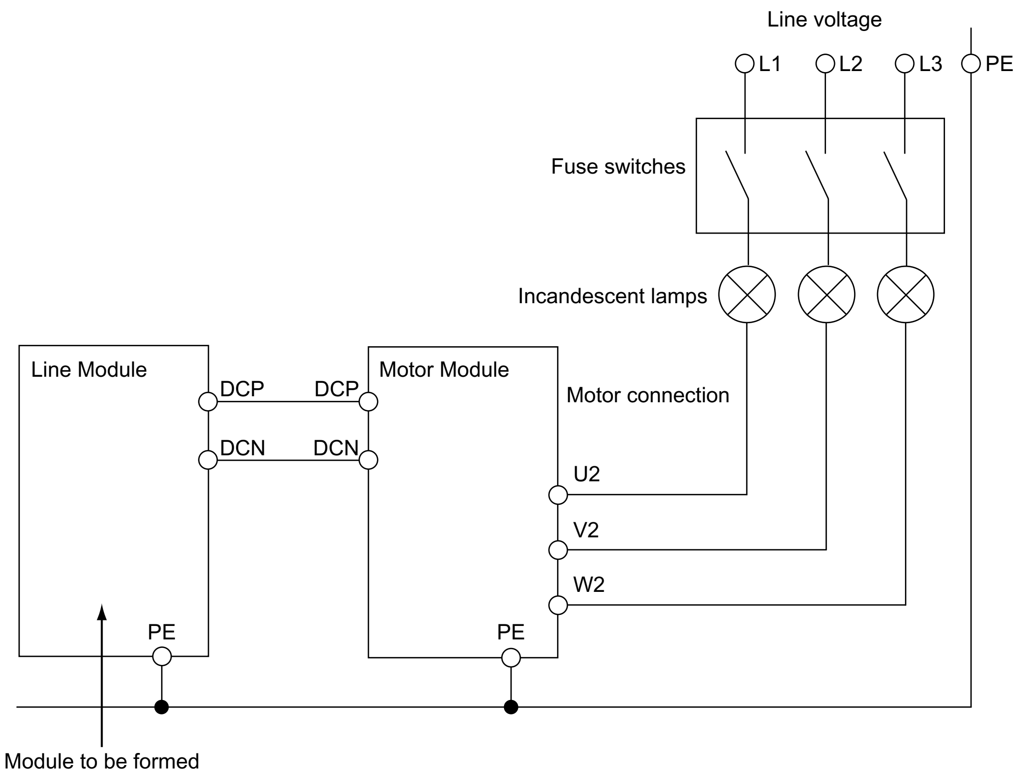


Figure 8-30 Forming circuit for Line Modules

Forming circuit for Motor Modules

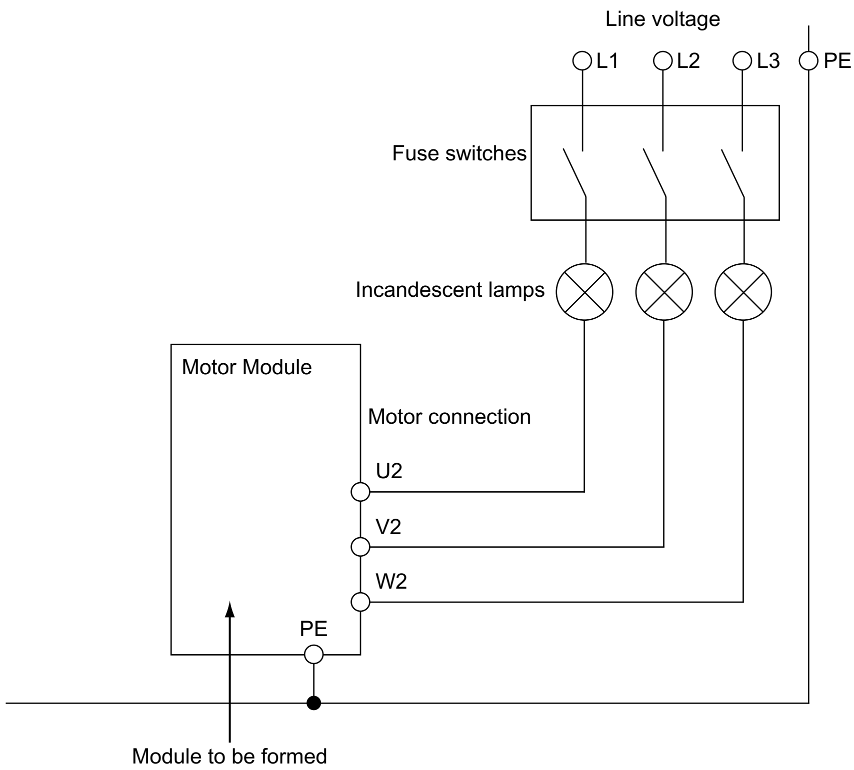


Figure 8-31 Forming circuit for Motor Modules

Procedure

- The unit being formed must not receive a power-on command (e.g. from the keyboard, BOP20 or terminal block).
- Connect the appropriate forming circuit.
- During the forming process, the incandescent lamps must become less bright or go completely dark. If the incandescent lamps continue to be brightly lit, a fault has occurred in the drive unit or in the wiring.

Maintaining the operational readiness of individual power blocks for servicing

It is recommended that during the planned downtimes, the power blocks positioned on the line side are replaced in order to guarantee the correct functioning of the power blocks during servicing.

Appendix A

A.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.

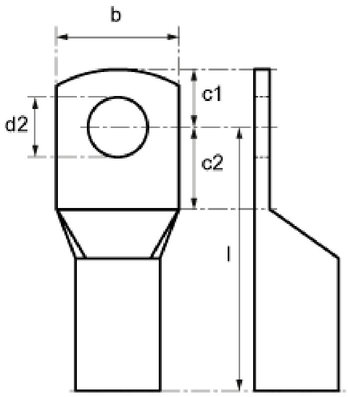


Figure A-1 Dimensions of the cable lugs

Table A- 1 Dimensions of the cable lugs

Screw / bolts	Connection cross-section [mm²]	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

A.2 List of abbreviations

Table A- 2 List of abbreviations

Abbreviation	Meaning, German	Meaning, English
A		
A...	Warnung	Alarm
AC	Wechselstrom	Alternating Current
ADC	Analog-Digital-Konverter	Analog Digital Converter
AI	Analogeingang	Analog Input
AO	Analogausgang	Analog Output
AOP	Advanced Operator Panel	Advanced Operator Panel
ASCII	Amerikanische Code-Norm für den Informationsaustausch	American Standard Code for Information Interchange
B		
BB	Betriebsbedingung	Operating condition
BERO	Firmenname für einen Näherungsschalter	Tradename for a type of proximity switch
BI	Binektoreingang	Binector Input
BIA	Berufsgenossenschaftliches Institut für Arbeitssicherheit	Berufsgenossenschaftliches Institut für Arbeitssicherheit (German Institute for Occupational Safety)
BICO	Binektor-Konnektor-Technologie	Binector Connector Technology
BOP	Basic Operator Panel	Basic Operator Panel
C		
C	Kapazität	Capacity
CAN	Serielles Bussystem	Controller Area Network
CBC	Kommunikationsbaugruppe CAN	Communication Board CAN
CBP	Kommunikationsbaugruppe PROFIBUS	Communication Board PROFIBUS
CD	Compact Disc	Compact Disc
CDS	Befehlsdatensatz	Command Data Set
CI	Konnektoreingang	Connector Input
CIB	Control Interface Board	Control Interface Board
CNC	Computerunterstützte numerische Steuerung	Computer Numerical Control
CO	Konnektorausgang	Connector Output
CO/BO	Konnektor-/Binektorausgang	Connector/Binector Output
COM	Mittelkontakt eines Wechselkontaktes	Medium contact of a change-over contact
CP	Kommunikationsprozessor	Communications Processor
CPU	Zentralbaugruppe	Central Processing Unit
CRC	Checksummenprüfung	Cyclic Redundancy Check
CT	Konstantes Drehmoment	Constant Torque
CU	Control Unit	Control Unit
D		
DAC	Digital-Analog-Konverter	Digital Analog Converter
DC	Gleichstrom	Direct Current

Abbreviation	Meaning, German	Meaning, English
DCN	Gleichstrom negativ	Direct current negative
DCNA	Gleichstrom negativ Zusatzanschluss	Direct current negative auxiliary
DCP	Gleichstrom positiv	Direct current positive
DCPA	Gleichstrom negativ Zusatzanschluss	Direct current positive auxiliary
DDS	Antriebsdatensatz	Drive Data Set
DI	Digitaleingang	Digital Input
DI / DO	Digitaleingang/-ausgang bidirektional	Bidirectional Digital Input/Output
DMC	DRIVE-CLiQ Module Cabinet (Hub)	DRIVE-CLiQ Module Cabinet (Hub)
DO	Digitalausgang	Digital Output
DO	Antriebsobjekt	Drive Object
DPRAM	Speicher mit beidseitigem Zugriff	Dual-Port Random Access Memory
DRAM	Dynamischer Speicher	Dynamic Random Access Memory
DRIVE-CLiQ	Drive Component Link with IQ	Drive Component Link with IQ
DSC	Dynamic Servo Control	Dynamic Servo Control
E		
EDS	Geberdatensatz	Encoder Data Set
ESD	Elektrostatisch gefährdete Baugruppen	Electrostatic Sensitive Devices (ESD)
EMV	Elektromagnetische Verträglichkeit	Electromagnetic Compatibility (EMC)
EN	Europäische Norm	European Standard
EnDat	Geber-Schnittstelle	Encoder-Data-Interface
EP	Impulsfreigabe	Enable Pulses
ES	Engineering System	Engineering System
F		
F ...	Störung	Fault
FAQ	Häufig gestellte Fragen	Frequently Asked Questions
FCC	Function Control Chart	Function Control Chart
FCC	Flussstromregelung	Flux Current Control
FEPROM	Schreib- und Lesespeicher nichtflüchtig	Flash-EPROM
FG	Funktionsgenerator	Function Generator
FI	Fehlerstrom-Schutzschalter	Earth Leakage Circuit-Breaker (ELCB)
Float	Gleitkommazahl	Floating point
FP	Funktionsplan	Function diagram
FW	Firmware	Firmware
G		
GCP	Global-Control-Telegramm (Broadcast-Telegramm)	Global Control Telegram (broadcast telegram)
GSD	Gerätestammdatei: beschreibt die Merkmale eines PROFIBUS-Slaves	Device master file: describes the features of a PROFIBUS slave
H		
HLG	Hochlaufgeber	Ramp-function generator
HMI	Mensch-Maschine-Schnittstelle	Human Machine Interface
HTL	Hochpegellogik	High Threshold Logic

Abbreviation	Meaning, German	Meaning, English
HW	Hardware	Hardware
I		
i. V.	in Vorbereitung: diese Eigenschaft steht zur Zeit nicht zur Verfügung	in preparation: this feature is currently not available
IBN	Inbetriebnahme	Commissioning
I/O	Eingang/Ausgang	Input/Output
ID	Identifizierung	Identifier
IEC	Internationale Norm in der Elektrotechnik	International Electrotechnical Commission
IGBT	Bipolartransistor mit isolierter Steuerelektrode	Insulated Gate Bipolar Transistor
IT	Drehstromversorgungsnetz ungeerdet	three-phase supply network, ungrounded
J		
JOG	Tippen	Jogging
K		
KDV	Kreuzweiser Datenvergleich	Data cross-checking
KIP	Kinetische Pufferung	Kinetic buffering
KTY	Spezieller Temperatursensor	Special temperature sensor
L		
L	Inductance	Inductance
LED	Leuchtdiode	Light Emitting Diode
LSB	Niederwertigstes Bit	Least Significant Bit
M		
M	Masse	reference potential, zero potential
MB	Megabyte	Megabyte
MCC	Motion Control Chart	Motion Control Chart
MDS	Motordatensatz	Motor Data Set
MLFB	Machine-readable product designation	machine-readable product designation
MMC	Mensch Maschine Kommunikation	Man-Machine Communication
MSB	Höchstwertigstes Bit	Most Significant Bit
MSCY_C1	Zyklische Kommunikation zwischen Master (Klasse 1) und Slave	Master Slave Cycle Class 1
N		
NC	Öffner	Normally Closed (contact)
NC	Numerische Steuerung	Numerical Control
NEMA	Normengremium in USA (United States of America)	National Electrical Manufacturers Association
NM	Nullmarke	Zero Mark
NO	Schließer	Normally Open (contact)
O		
OEM	Original Equipment Manufacturer	Original Equipment Manufacturer
OLP	Busstecker für Lichtleiter	Optical Link Plug
OMI	Option Module Interface	Option Module Interface
P		
p ...	Einstellparameter	Adjustable parameter

Abbreviation	Meaning, German	Meaning, English
PDS	Leistungsteildatensatz	Power Module Data Set
PE	Schutzerde	Protective Earth
PELV	Schutzkleinspannung	Protective Extra Low Voltage
PG	Programmiergerät	Programming terminal
PI	Proportional Integral	Proportional Integral
PLC	Speicherprogrammierbare Steuerung (SPS)	Programmable Logic Controller (PLC)
PLL	Baustein zur Synchronisierung	Phase Locked Loop
PNO	PROFIBUS Nutzerorganisation	PROFIBUS user organization
PRBS	Weißes Rauschen	Pseudo Random Binary Signal
PROFIBUS	Serieller Datenbus	Process Field Bus
PS	Stromversorgung	Power Supply
PTC	Positiver Temperaturkoeffizient	Positive Temperature Coefficient
PTP	Punkt zu Punkt	Point To Point
PWM	Pulsweitenmodulation	Pulse Width Modulation
PZD	PROFIBUS Prozessdaten	PROFIBUS Process data
Q		
R		
r...	Beobachtungsparameter (nur lesbar)	Display Parameter (read only)
RAM	Speicher zum lesen und schreiben	Random Access Memory
RCD	Fehlerstrom-Schutzschalter	Residual Current Device
RJ45	Norm. Beschreibt eine 8-polige Steckverbindung mit Twisted-Pair Ethernet.	Standard. Describes an 8-pole plug connector with twisted pair Ethernet.
RO	Nur lesbar	Read Only
RS232	Serielle Schnittstelle	Serial Interface
RS485	Norm. Beschreibt die Physik einer digitalen seriellen Schnittstelle.	Standard. Describes the physical characteristics of a digital serial interface.
S		
S1	Dauerbetrieb	Continuous operation
S3	Aussetzbetrieb	periodic duty
SBC	Sichere Bremsenansteuerung	Safe Brake Control
SGE	Sicherheitsgerichtetes Eingangssignal	Safe input signal
SH	Sicherer Halt	Safe Standstill
SI	Safety Integrated	Safety Integrated
SIL	Sicherheitsintegritätsgrad	Safety Integrity Level
SLVC	Geberlose Vektorregelung	Sensorless Vector Control
SM	Sensor Module	Sensor Module
SMC	Sensor Module Cabinet	Sensor Module Cabinet
SME	Sensor Module External	Sensor Module External
SPS	Speicherprogrammierbare Steuerung	Programmable Logic Controller (PLC)
STW	PROFIBUS Steuerwort	PROFIBUS control word
T		
TB	Terminal Board	Terminal Board

Abbreviation	Meaning, German	Meaning, English
TIA	Totally Integrated Automation	Totally Integrated Automation
TM	Terminal Module	Terminal Module
TN	Drehstromversorgungsnetz geerdet	Three-phase supply network, grounded
TT	Drehstromversorgungsnetz geerdet	Three-phase supply network, grounded
TTL	Transistor-Transistor-Logik	Transistor-transistor logic
U		
UL	Underwriters Laboratories Inc.	Underwriters Laboratories Inc.
V		
VC	Vektorregelung	Vector Control
Vdc	Zwischenkreisspannung	DC link voltage
VDE	Verband Deutscher Elektrotechniker	Association of German Electrical Engineers
VDI	Verein Deutscher Ingenieure	Association of German Engineers
VSM	Voltage Sensing Module	Voltage Sensing Module
VT	Variables Drehmoment	Variable Torque
W		
WZM	Werkzeugmaschine	Machine tool
X		
XML	Erweiterbare Auszeichnungssprache (Standardsprache für Web-Publishing und Dokumentenmanagement)	Extensible Markup Language
Y		
Z		
ZK	Zwischenkreis	DC Link
ZSW	PROFIBUS Zustandswort	PROFIBUS status word

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