Equipment Manual 12/2004 Edition

sinamics

SINAMICS S120
Booksize Power Sections

SIEMENS

SIEMENS

SINAMICS

SINAMICS S120 Equipment Manual Booksize Power Sections

Equipment Manual

(GH2), 12/2004 Edition
6SL3097-2AC00-0BP1

SINAMICS® Documentation

Printing history

Brief details of this edition and previous editions are listed below.

The status of each edition is shown by the code in the "Remarks" column.

Status code in the "Remarks" column:

A New documentation
B Unrevised reprint with new order no.
C Revised edition with new status

If factual changes have been made on the page in relation to the same software version, this is indicated by a new edition coding in the header on that page.

Edition	Order No.	Remarks
12.04	6SL3097-2AC00-0BP1	C

Trademarks

SIMOVERT®, SIMATIC®, SIMATIC HMI®, SIMATIC NET®, SIMOTION®, SINUMERIK® and SINAMICS® are trademarks of Siemens. Other product names used in this documentation may be trademarks which, if used by third parties, could infringe the rights of their owners.

Further information is available on the Internet under:
http://www.siemens.com/motioncontrol

This publication was produced with SIPS+

Order No. 6SL3097-2AC00-0BP1
Printed in Germany

Siemens Aktiengesellschaft

Preface

Information on the SINAMICS S documentation:

The SINAMICS S documentation is divided into the following areas:

- General documentation/catalogs
- Manufacturer/service documentation
- Electronic documentation

This documentation is an integral part of the manufacturer/service documentation developed for SINAMICS. All documents can be obtained separately.

You can obtain detailed information about the documents named in the documentation overview and other documents available for SINAMICS from your local Siemens office.

For the sake of simplicity, this documentation does not contain all detailed information about all types of the product and cannot cover every conceivable case of installation, operation, or maintenance.

The contents of this documentation are not part of an earlier or existing agreement, a promise, or a legal agreement, nor do they change this. All obligations entered into by Siemens result from the respective contract of sale that contains the complete and sole valid warranty arrangements. These contractual warranty provisions are neither extended nor curbed as a result of the statements made in this documentation.

Audience

This documentation is aimed at machine and plant builders, commissioning engineers, and service personnel who use SINAMICS.

Objective

This manual describes the hardware components of the SINAMICS S system. It provides information about installation, electrical connection, and cabinet design.

Danger and warning notices – symbol explanations

The following danger and warning notices are used in this document:

Danger

Indicates an imminently hazardous situation which, if not avoided, will result in death, serious injury, or substantial damage to property.

Warning

Indicates an potentially hazardous situation which, if not avoided, could result in death, or serious injury, or substantial property damage.

Caution

Used with the safety alert symbol indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury or property damage.

Caution

Used without safety alert symbol indicates a potentially hazardous situation which, if not avoided, may result in property damage.

Notice

Used without the safety alert symbol indicates a potential situation which, if not avoided, may result in an undesirable result or state.

Note

This notice indicates that there are further issues to be taken into consideration.

Definition: Qualified personnel

With reference to this manual and the warning labels on the product, a "qualified person" is someone who is familiar with the installation, mounting, startup, and operation of the equipment and who has certified qualifications for the type of responsibility involved, such as:

- Training and instruction, i.e. authority to switch on and off, to earth and to label circuits and equipment according to safety regulations.
- Training and instruction in maintenance and use of adequate safety equipment according to safety regulations.
- First aid training.

Finding information

To help you find information more easily, the following sections have been included in the appendix in addition to the table of contents:

1. References
2. Index

Technical information

Hotline

If you have any further questions, please call our hotline:

A&D Technical Support

Tel.: +49 (0) 180 5050 - 222

Fax: +49 (0) 180 5050 - 223

http://www.siemens.com/automation/support-request

Please send any questions about the documentation (suggestions for improvement, corrections, and so on) to the following fax number or e-mail address:

Fax: +49 (0) 9131 98 - 2176

Fax form: See feedback page at the end of this publication

Email: motioncontrol.docu@erlf.siemens.de

Internet address

Up-to-date information about our products can be found on the Internet at the following address:

http://www.siemens.com/motioncontrol

ESD notices

Caution

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

Regulations for handling ESD components:

When handling components, make sure that personnel, workplaces, and packaging are well earthed!

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 boards should only be touched if absolutely necessary. They must only be handled on the front panel or, in the case of printed circuit boards, at the edge.

Electronic boards must not come into contact with plastics or items of clothing containing synthetic fibers.

Boards must only be placed on conductive surfaces (work surfaces with ESD surface, conductive ESD foam, ESD packing bag, ESD transport container).

Do not place boards near display units, monitors, or television sets (minimum distance from screen: 10 cm).

Measurements must only be taken on boards when

the measuring instrument is grounded (via protective conductors, for example)

the measuring probe is briefly discharged before measurements are taken with an isolated measuring device (for example, touching a bare metal housing).

Safety guidelines

Danger

Commissioning shall not start until you have ensured that the machine in which the components described here are to be installed complies with Directive 98/37/EC.

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 observe the specified danger and warning notices.

When electrical equipment and motors are operated, the electrical circuits automatically conduct a dangerous voltage.

Dangerous mechanical movements may occur in the system during operation.

All work on the electrical system must be performed after the system has been switched off and disconnected from the power supply.

SINAMICS S equipment with three-phase motors may only be connected to the line system via residual current devices (RCDs) if compatibility of the SINAMICS equipment with the RCD has been ensured as specified in EN 50178, Subsection 5.2.11.2.

Warning

Correct and safe operation of SINAMICS S equipment assumes correct transportation, storage, 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 system-specific regulations and requirements must be taken into account.

Only protective extra-low voltages (PELVs) that comply with EN60204-1 must be connected to all connections and terminals between 0 and 48 V.

Caution

As part of routine tests, SINAMICS equipment with three-phase motors will undergo a voltage test in accordance with EN 50178. Before the voltage test is performed on the electrical equipment of industrial machines to EN 60204-1, Section 19.4, all connectors of SINAMICS equipment must be disconnected/unplugged to prevent the equipment from being damaged.

Motors must be connected in accordance with the circuit diagram provided. They must not be connected directly to the three-phase supply because this will damage them.

Note

When operated in dry operating areas, SINAMICS equipment with three-phase motors conforms to low-voltage Directive 73/23/EEC.

SINAMICS equipment with three-phase motors conforms to EMC Directive 89/336/EEC in the configurations specified in the associated EC Certificate of Conformity.

Caution

Operating the equipment in the immediate vicinity (< 1.5 m) of mobile telephones with a transmitter power of > 1 W may lead to incorrect operation.

Notes

Contents

Tables

System Overview

1

1.1 Field of application

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

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

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

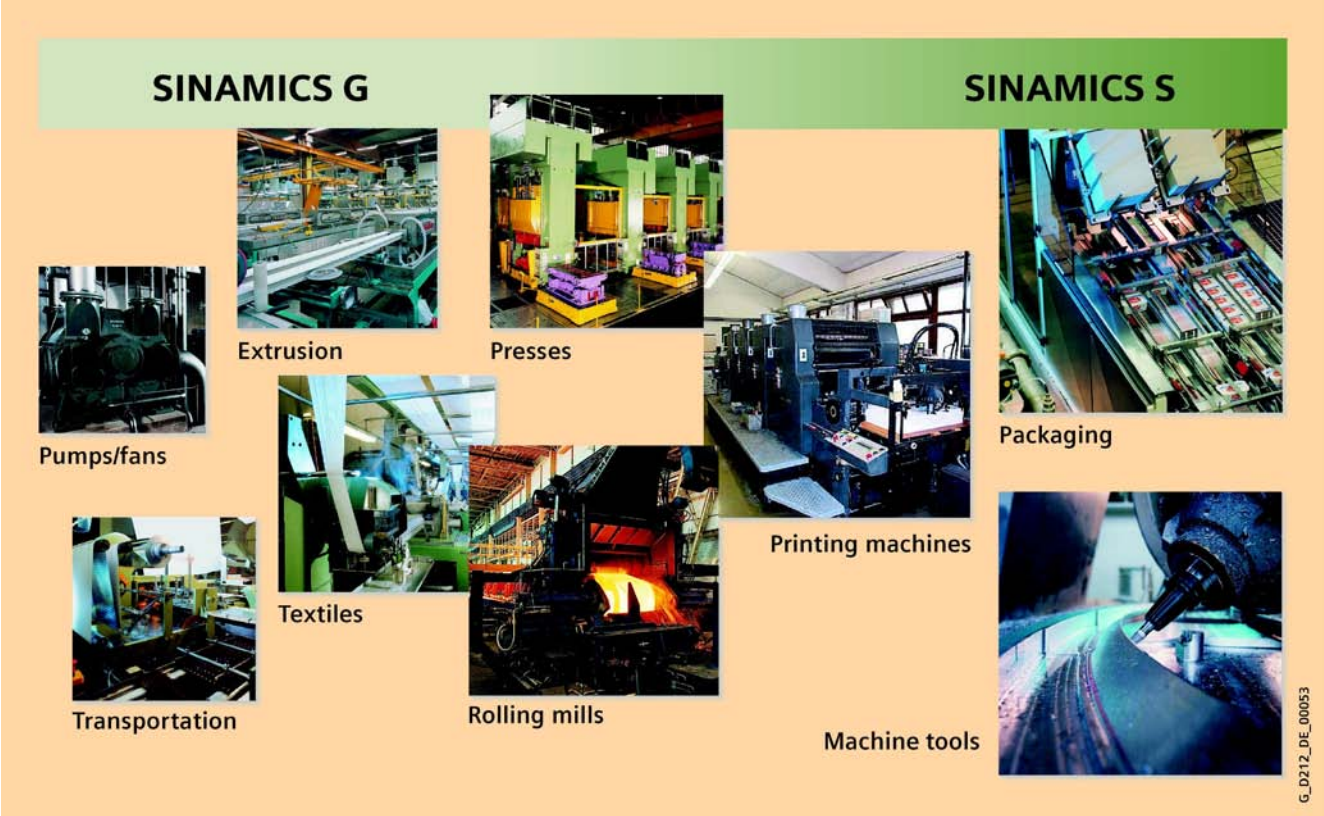


Figure 1-1 SINAMICS applications

1.2 Product variants

SINAMICS offers different versions designed to meet a range of requirements:

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

1.3 Platform Concept and Totally Integrated Automation

All SINAMICS versions are based on a platform concept. Joint 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 with no system gaps. The different SINAMICS versions can be easily combined with each other.

SINAMICS is a part of the Siemens "Totally Integrated Automation" concept. Integrated SINAMICS systems covering configuration, data storage, and communication at automation level, ensure low-maintenance solutions with SIMATIC, SIMOTION, and SINUMERIK.

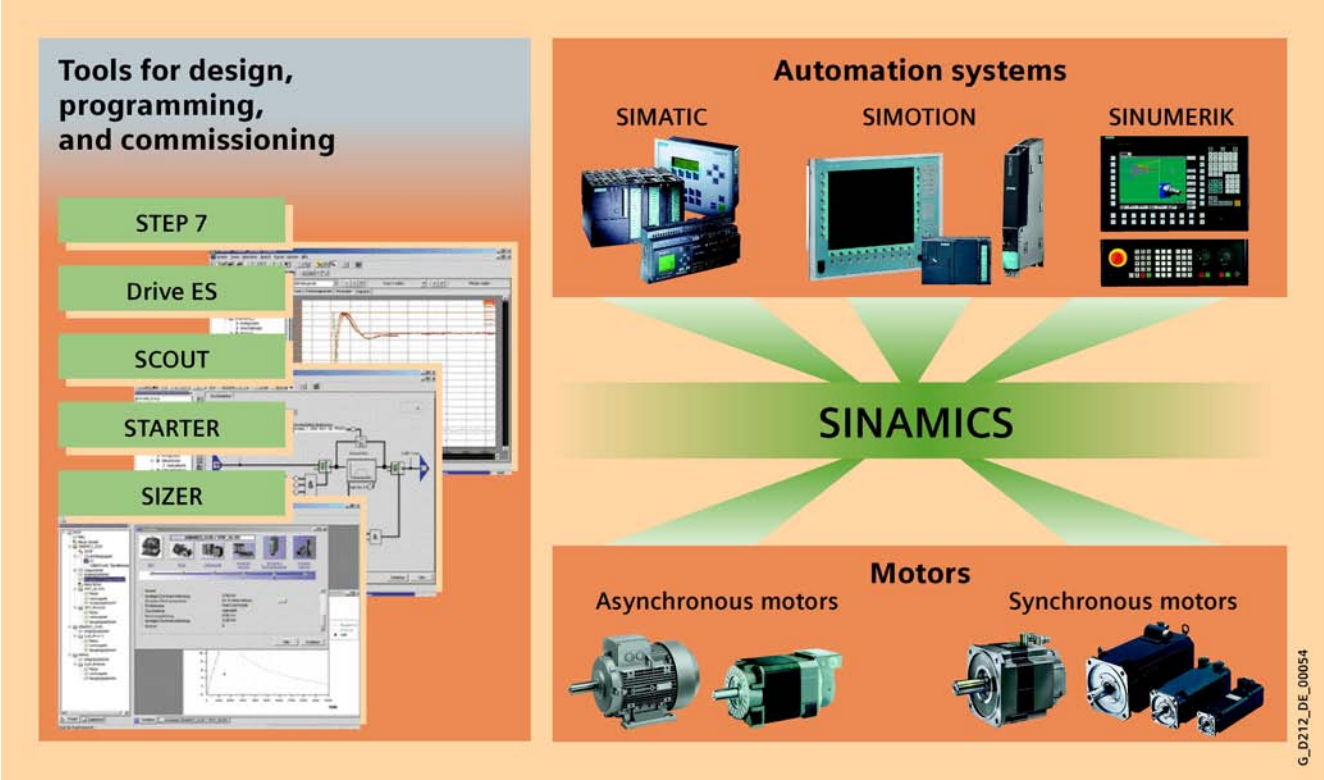


Figure 1-2 SINAMICS as part of the Siemens modular automation system

1.4 Introduction

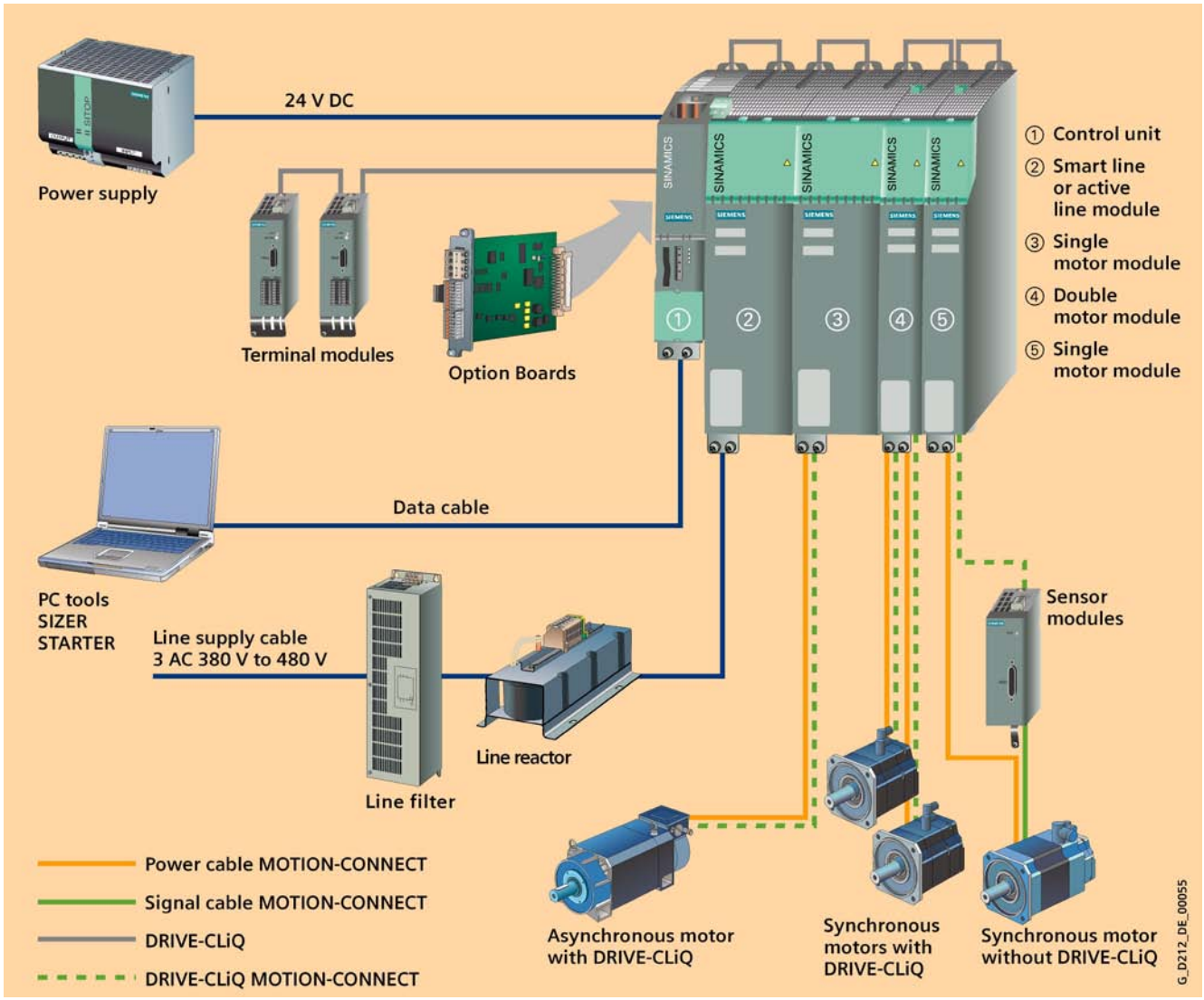


Figure 1-3 SINAMICS S120 System Overview

Modular system for complex drive tasks

SINAMICS S120 solves complex 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 configuration 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 asynchronous, all motor types are supported by SINAMICS S120.

Drive for multi-axis applications

The trend towards separate axes in mechanical engineering is growing all the time. Where possible, central drives are being replaced by electronically coordinated servo drives. These require drives with a connected DC link, which allows cost-saving energy balancing between braking and driving axes.

SINAMICS S120 features infeeds and inverters that cover a large power range, are designed for seamless integration, and enable space-saving, multi-axis drive configurations.

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 always had to take 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 axes. Since all the required data is stored in the central control unit, it does not need to be transferred. Cross-axis connections can be established within a control unit and easily configured in the STARTER commissioning tool using a mouse.

Simple technological tasks can be carried out automatically by the SINAMICS S120 control unit. For complex numerical or motion-control tasks, high-performance SINUMERIK or SIMOTION D modules are used instead.

DRIVE-CLiQ – a digital interface between all components

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

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

Electronic type plates in all components

All SINAMICS S120 components have an electronic type plate that contains all the relevant data about that particular component. In the motors, for example, this data includes the parameters of the electric equivalent circuit diagram and characteristic values for the in-built motor encoder. The control unit records this data automatically via DRIVE-CLiQ so that it does not need to be entered during commissioning or if the equipment is replaced.

In addition to the technical data, the type 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.

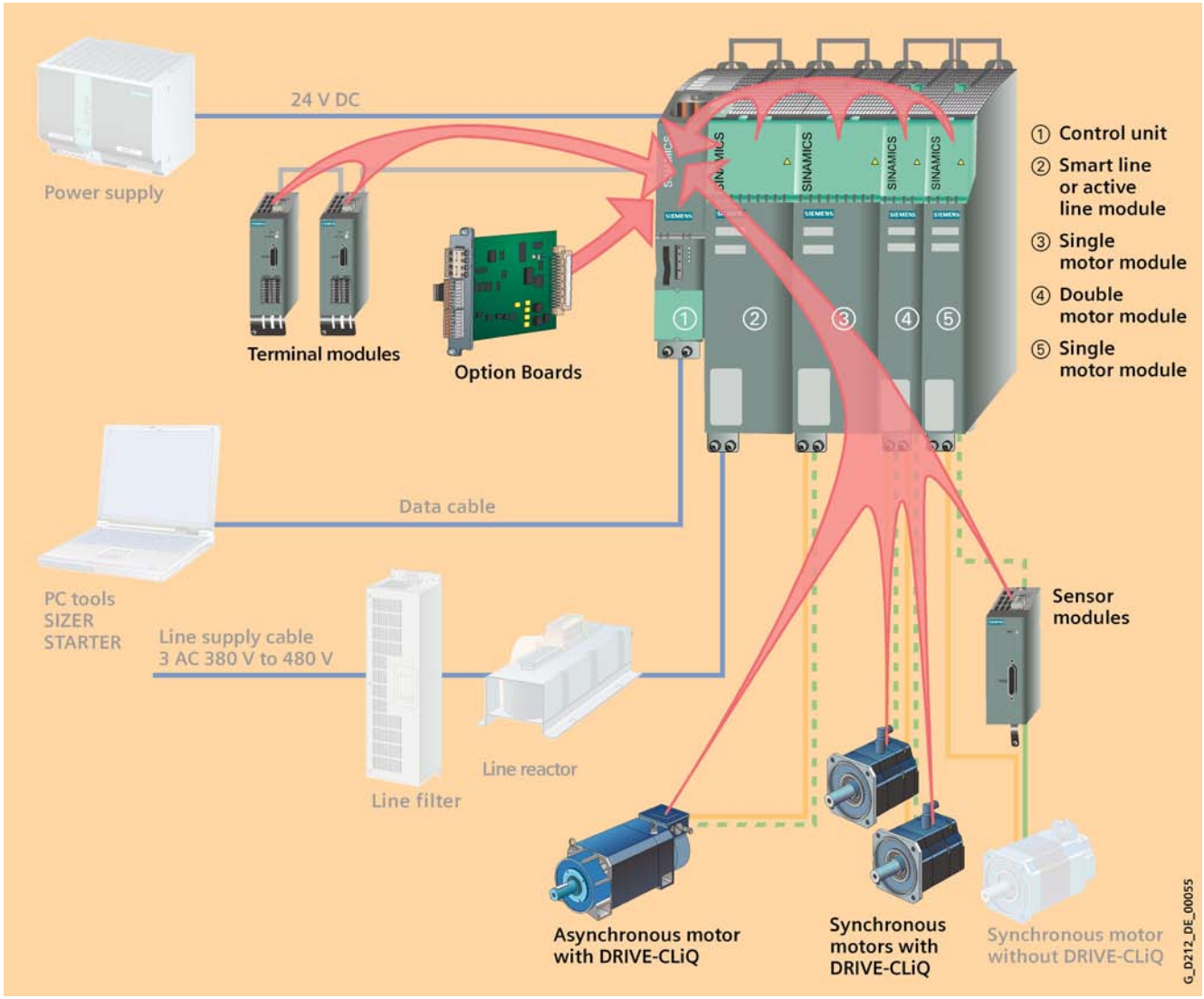


Figure 1-4 The electronic type plate for SINAMICS S120

1.5 SINAMICS S120 Components

This overview features the SINAMICS S120 components that are primarily used for multi-axis drive tasks.

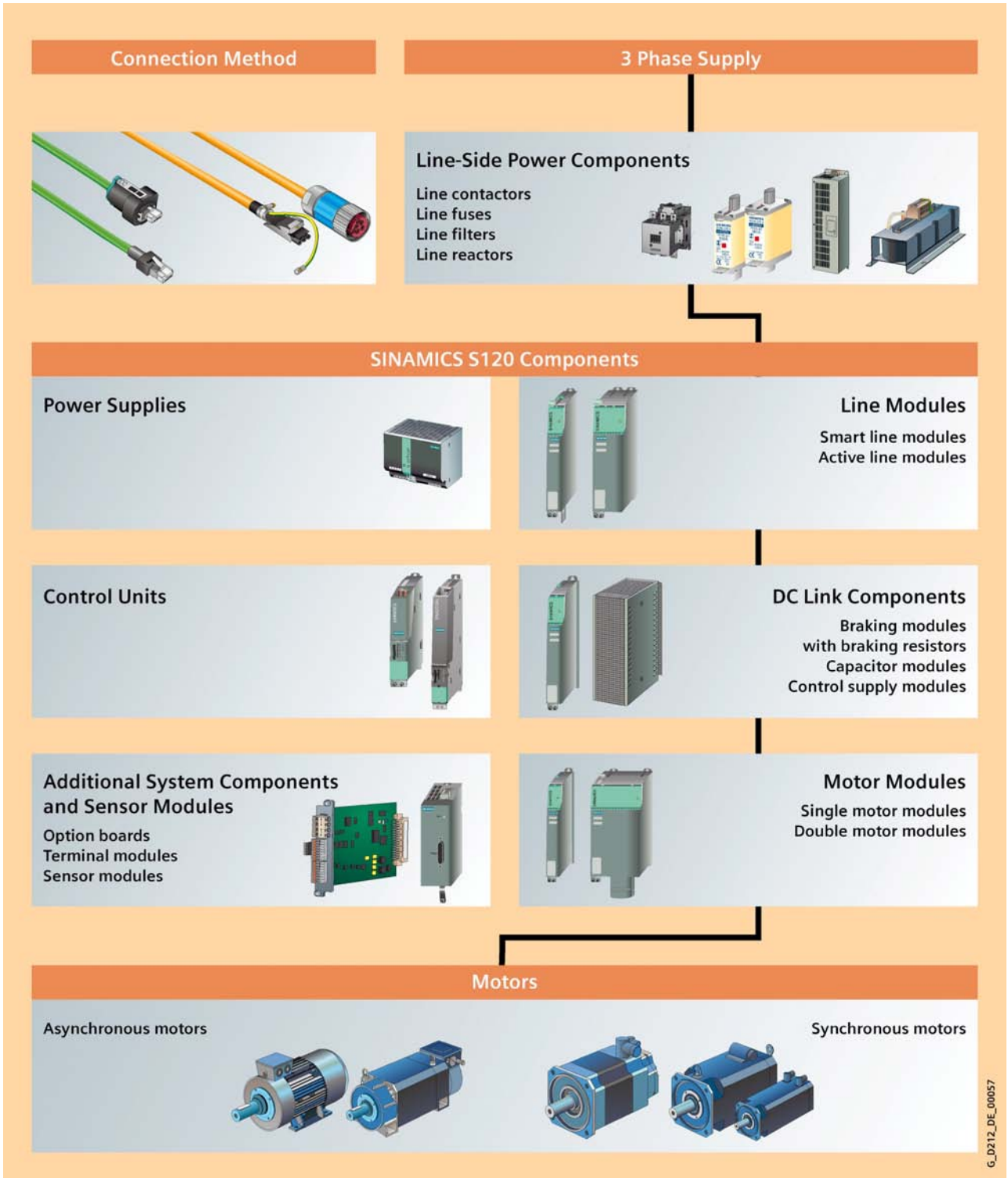


Figure 1-5 SINAMICS S120 component overview

The following power components are available:

- Line-side power components, such as fuses, contactors, reactors, and filters for switching the power supply and meeting EMC requirements.
- Line Modules, which supply power centrally to the DC link.
- DC link components (optional), which stabilize the DC link voltage.
- Motor Modules, which act as inverters, receive power from the DC link, and supply the connected motors.

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.

The 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 in accordance with EMC requirements
- Standardized design, seamless integration
- Internal ventilators (other cooling methods available on request).

1.6 Power Sections

Line Modules

Convert the three-phase supply into a DC voltage for the DC link.

- Smart Line Modules

  The Smart Line Modules generate a non-stabilized DC link voltage and are capable of regenerative feedback.

- Active Line Modules

  The Active Line Modules generate a stabilized DC link voltage and are capable of regenerative feedback.

Motor Modules

- Convert energy from the DC link for the connected motors with variable voltage and variable frequency.

1.7 System Data

Technical Specifications

Unless explicitly specified otherwise, the following technical specifications are valid for all components of the SINAMICS S120 booksize drive system.

Electrical specifications	
Line connection voltage	3 AC 380 V to 480 V ±10 % (-15 % < 1 min)
Line frequency	47 – 63 Hz
Electronics power supply	24 V DC, -15/+20 %*
Conducted radio interference • Standard • With line filter	 No conducted radio interference Class A1 to EN 55011
Overvoltage category	Class III to EN 60 664-1

*If a motor holding brake is used, restricted tolerances may have to be taken into account.

Mechanical data	
Vibratory load • Transportation • Operation	 EN 60 721-3-2, class 2M3 EN 60 721-3-3, class 3M4
Shock load • Transportation • Operation	 EN 60 721-3-2, class 2M3 EN 60 721-3-3, class 3M4

Ambient conditions	
Degree of protection	IP20 to EN 60 529
The Safety-Integrated safety function: The components must be protected against conducted contamination (e.g. by installing them in a cabinet with degree of protection IP54). Provided that conducted interference can be prevented at the installation site, the degree of protection for the cabinet can be decreased accordingly.	
Protection class	Class I (with protective conductor system) and Class III (PELV) to EN 61 800-5-1
Permissible ambient and coolant temperature (air) during operation for line-side components, Line Modules and Motor Modules	0°C to 40 °C without derating, >40°C to +55 °C (see derating characteristics)
Permissible ambient and coolant temperature (air) during operation for Control Units, additional system components, DC link components and Sensor Modules	0 °C to +55 °C

Ambient conditions	
Climatic ambient conditions • Storage • Transportation • Operation	 Class 1K3 to EN 60 721-3-1 Temperature: -40 °C to +70 °C Class 2K4 to EN 60 721-3-2 Temperature: -40 °C to +70 °C Max. humidity: 95 % at 40 °C Class 3K3 to EN 60 721-3-3 Relative air humidity 5 to 65 % (annual average, ≦ 80 % above the maximum for 2 months a year. Avoid splashing water and do not allow condensation or ice to form (EN 60 204, Part 1)
Storage and transportation: The above-mentioned conditions only apply to components in their original packaging.	
Environmental class • Storage • Transportation • Operation	 Class 1C2 to EN 60 721-3-1 Class 2C2 to EN 60 721-3-2 Class 3C2 to EN 60 721-3-3
Organic/biological influences • Storage • Transportation • Operation	 Class 1B1 to EN 60 721-3-1 Class 2B1 to EN 60 721-3-2 Class 3B1 to EN 60 721-3-3
Degree of contamination	2 to EN 60 664-1
Installation altitude	Up to 1,000 m above sea level without derating, >1,000 m to 5,000 m above sea level (see derating characteristics)

Approbation	
Certification	CE (low-voltage and EMC Directives), cULus (file pos.: E192450, E164110, E70122, and E214113)

Modules	
Line Modules in booksize format • Rated supply voltage	 3AC 380 V
Active Line Modules in booksize format • Rated pulse frequency	 8 kHz
Motor Modules in booksize format • DC link connection voltage • Rated pulse frequency	 510 V DC to 750 V DC 4 kHz

Line Connection Booksize

2

2.1 Introduction

The line connection for a SINAMICS booksize drive line-up comprises the following components:

- A line filter (optional)
- A line reactor

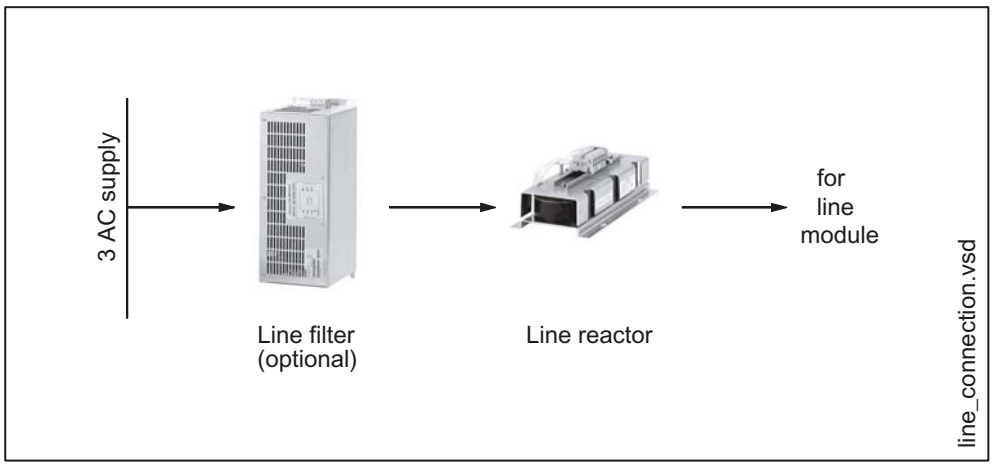


Figure 2-1 Overview diagram: line connection

Note

The limit values for the radio interference voltage are only observed when the filter is used.

2.2 Line connection variations

2.2.1 Methods of line connection

A distinction is made between:

- Direct operation of the line connection components on the supply
- Operation of the Line Connection Components via an Autotransformer
- Operation of the Line Connection Components via an Isolating Transformer

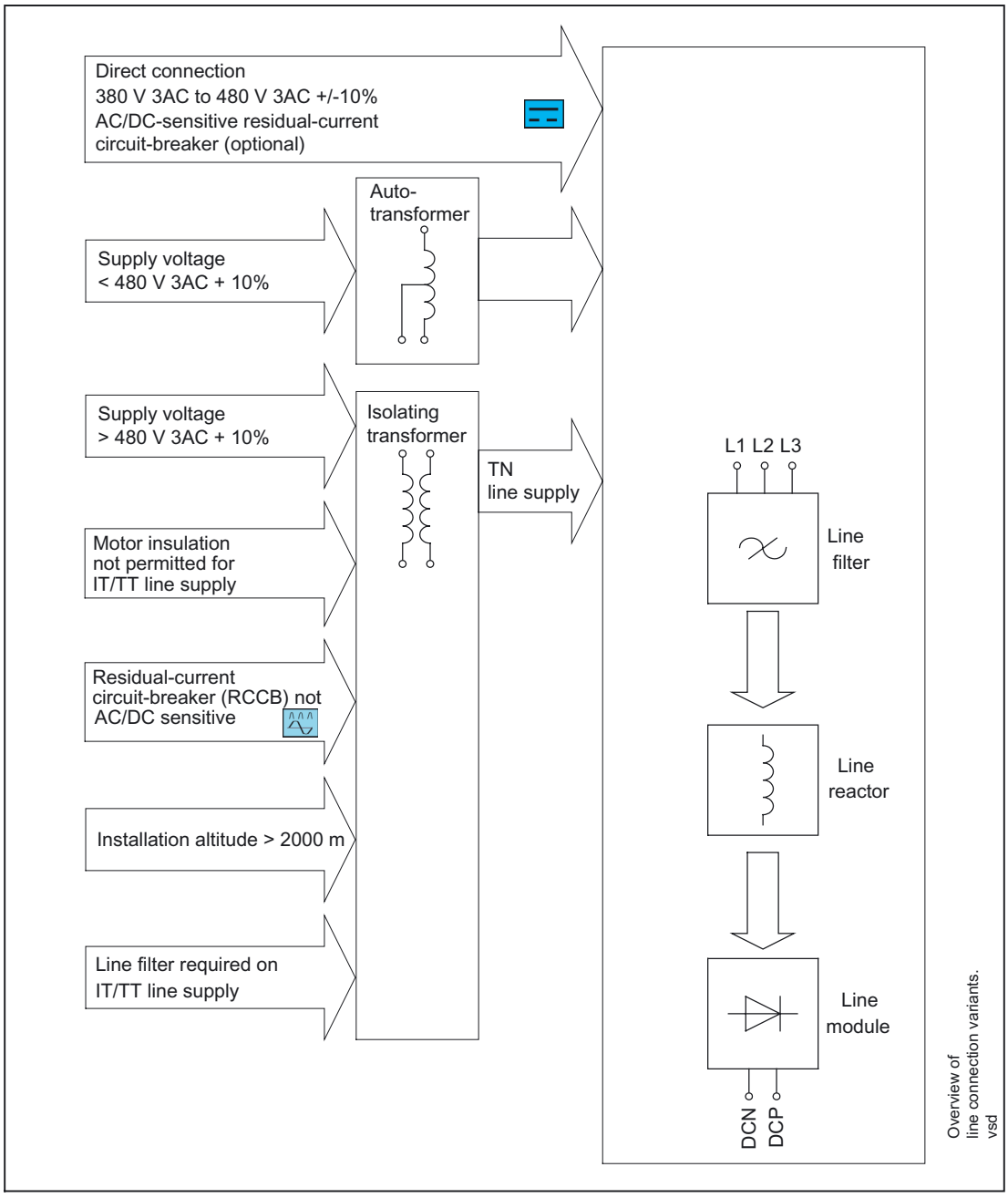


Figure 2-2 Overview of line connection variants

2.2.2 Operation of the line connection components on the supply network

The SINAMICS S booksize drive system is rated for direct operation on TN, TT, and IT supply systems with a nominal voltage of 3AC 380 V to 3AC 480 V. Operation with a line filter is only permitted for a TN supply system.

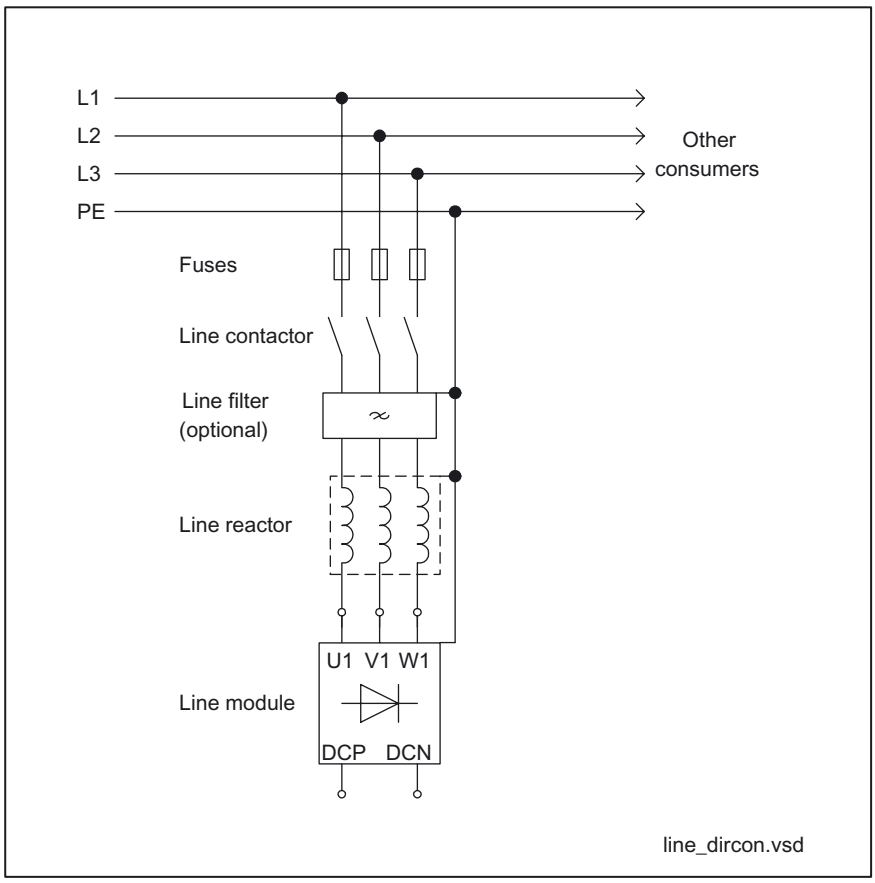


Figure 2-3 Direct operation on the supply network

2.2.3 Operation of the line connection components via an autotransformer

An autotransformer can be used for voltage adaptation in the range up to 3AC 480 V +10%.

Caution

To ensure safe electrical separation, an isolating transformer must be installed with voltages greater than 3AC 480 V +10%.

Applications:

- The motor insulation must be protected from excessive voltages.
- The Active Line Module must provide a stabilized DC link voltage. It can be in the range 380 V to 415 V.

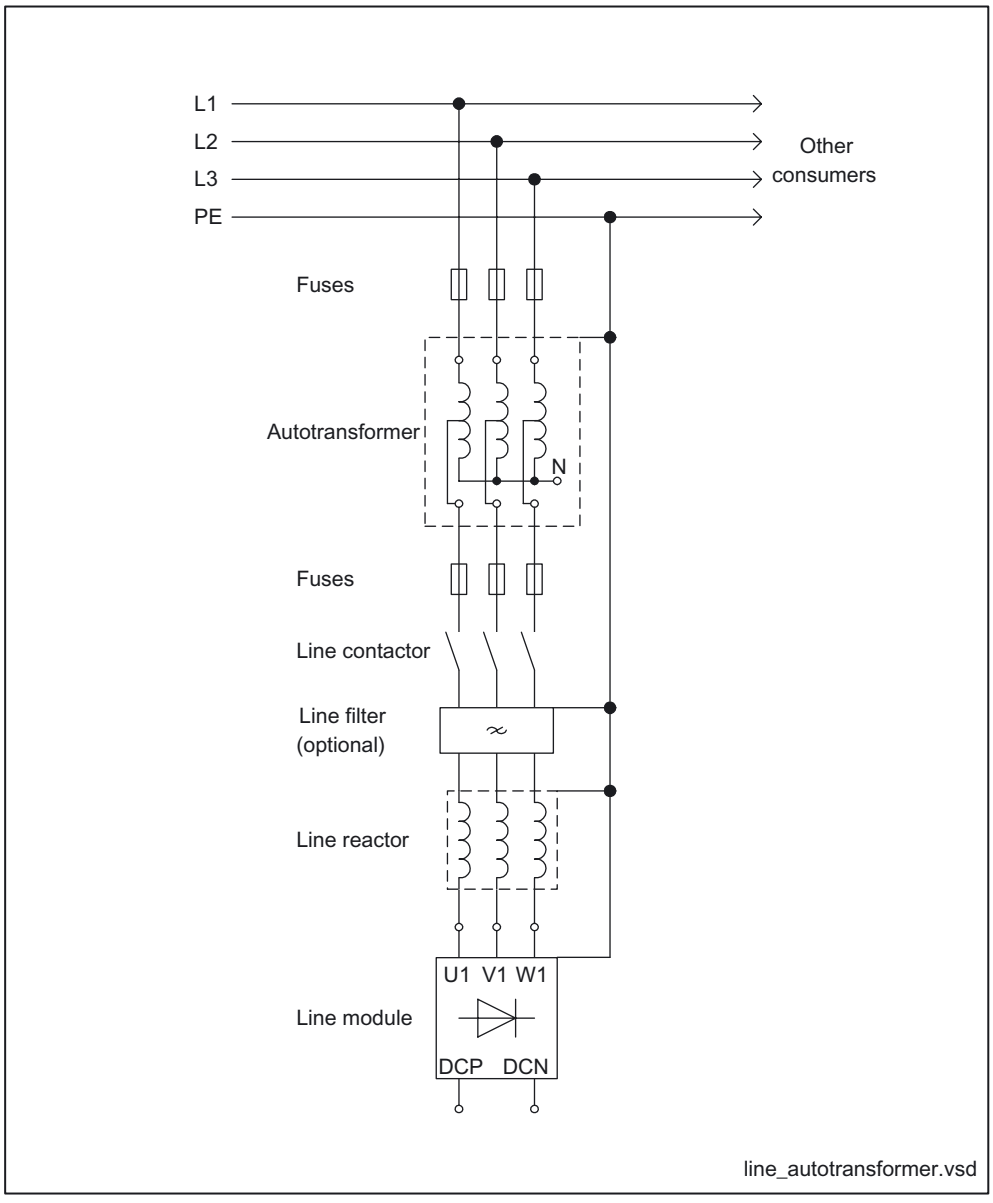


Figure 2-4 Autotransformer

2.2.4 Operation of the line connection components via an isolating transformer

The isolating transformer converts the network configuration of the system (e.g. IT/TT system) to a TN system. Additional voltage adaptation to the permissible voltage tolerance range is possible.

An isolating transformer must be used in the following cases:

- The motors are not approved for use in IT/TT systems.
- A residual-current circuit-breaker is required.
- The installation altitude is higher than 2000 m.
- A line filter is envisaged in an IT/TT system.

Caution

If the supply voltage is greater than 480 V +10%, an autotransformer must not be used. An isolating transformer must be used to ensure safe electrical separation.

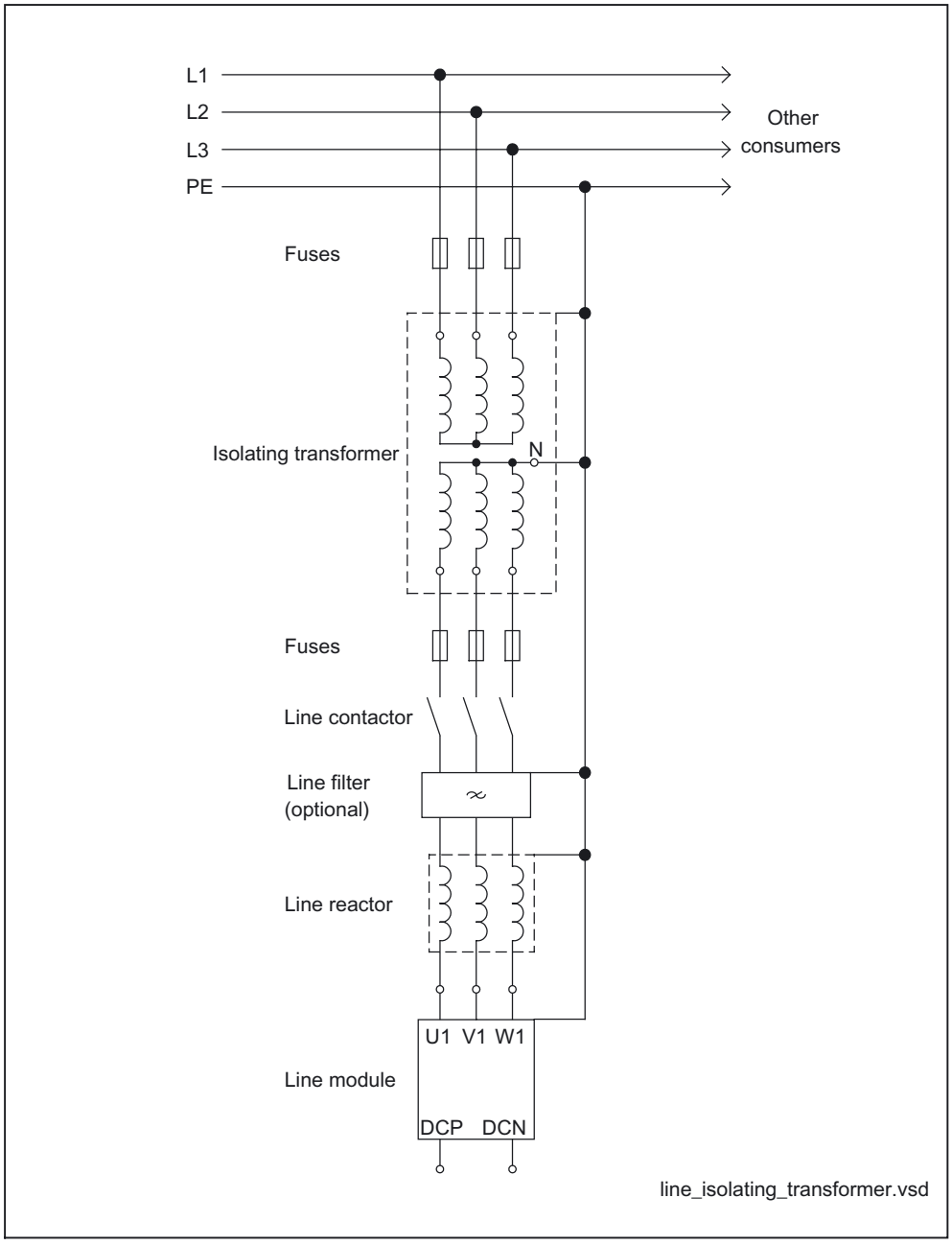


Figure 2-5 Isolating transformer

2.2.5 Line connection via a ground-fault circuit interrupter

In addition to protection measures against hazardous shock current (e.g. overcurrent trip), selectively tripping AC/DC-sensitive residual-current circuit-breakers can be used.

Note

A direct connection to a power system with selectively tripping AC/DC-sensitive residual-current circuit-breakers is only possible with the 5 kW, 10 kW, 16 kW and 36 kW Line Modules.

Selectively tripping AC/DC-sensitive residual-current circuit-breakers can be used without restriction in the event of a fault as a protective measure against hazardous shock currents.

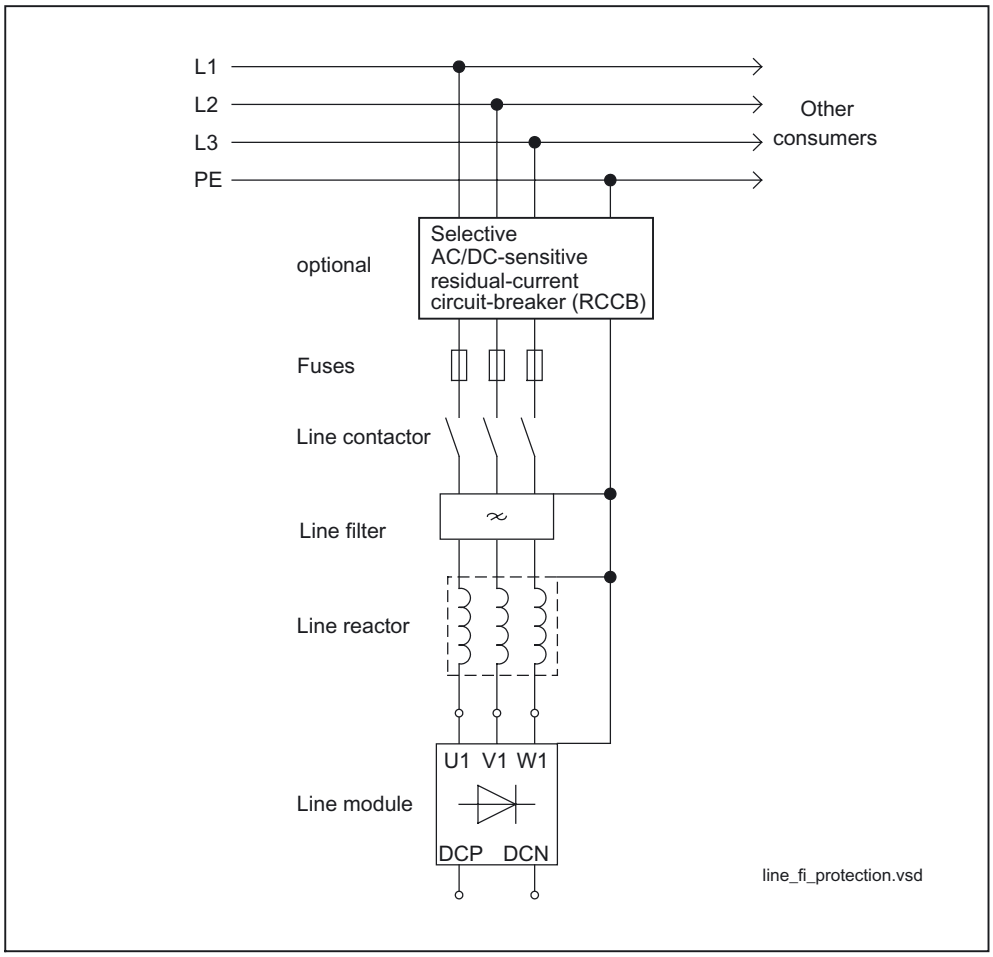


Figure 2-6 Residual-current circuit-breaker (RCCB)

Please note the following:

- Only the use of a delayed-tripping (selective) AC/DC-sensitive RCCB is permitted.
- The maximum permissible ground resistance of the "selective protection device" must be observed (max. 83 Ω for residual-current circuit-breakers with a rated differential current of 0.3 A).
- Parts of the electrical equipment and machine that can be touched are integrated in a protective grounding system.
- The total length of the shielded power cables used in the drive line-up (motor cable incl. line supply cables from line filters to line feed terminals) must be less than 350 m.
- Only recommended line filters must be used during operation.
- Only one residual-current circuit-breaker may be connected in series (cascading is not possible).
- Switching elements (main circuit-breakers, contactors) for connecting and disconnecting the drive line-up must feature a max. 35ms delay time between closing and opening individual main contacts.

Recommendation

SIEMENS selectively switching AC/DC-sensitive residual-current circuit-breakers to EN 50178, type 5SZ (e.g. 5SZ6 468–0KG00 or 5SZ6468–0KG30 with auxiliary disconnector (1NC/1NO) for rated current 63 A, rated fault current 0.3 A) (see also catalog CA01).

Notice

AC or pulse-sensitive RCCBs are not suitable.

2.3 Line Filters

2.3.1 Description

Line filters limit the conducted interference emitted by the converter units to permissible values for industry.

2.3.2 Safety information

Caution

Line filters are only suitable for direct connection to TN systems.

Danger

The 100 mm clearances above and below the components must be observed. The mounting position must ensure that cool air flows vertically through the filter. This measure prevents thermal overloading of the filter.

Caution

The terminals must be correctly connected:

Incoming line cable to LINE/NETZ L1, L2, L3

Outgoing cable to the line reactor to LOAD/LAST U, V, W

Non-observance may damage the line filter

Caution

The line filters listed conduct a high leakage current via the PE conductor. Because of the high leakage current of the line filters, a permanent PE connection of the line filter or switching cabinet is required.

Measures according to EN 50178/94 Part 5.3.2.1 must be taken, e.g. PE conductor ($\geq$10 mm ^{2} Cu) or laying of a second conductor, electrically parallel to the PE conductor, via separate terminals. This conductor must also fully meet the requirements for PE conductors according to IEC 364-5-543.

Note

If a high-potential test is conducted with alternating voltage in the system, the line filters must be disconnected to obtain correct measurement results.

Caution

Only the line filters listed in Catalog NC Z must be used. Other line filters can lead to line harmonics that can interfere with or damage other loads powered from the network.

2.3.3 Interface description

2.3.3.1 Overview

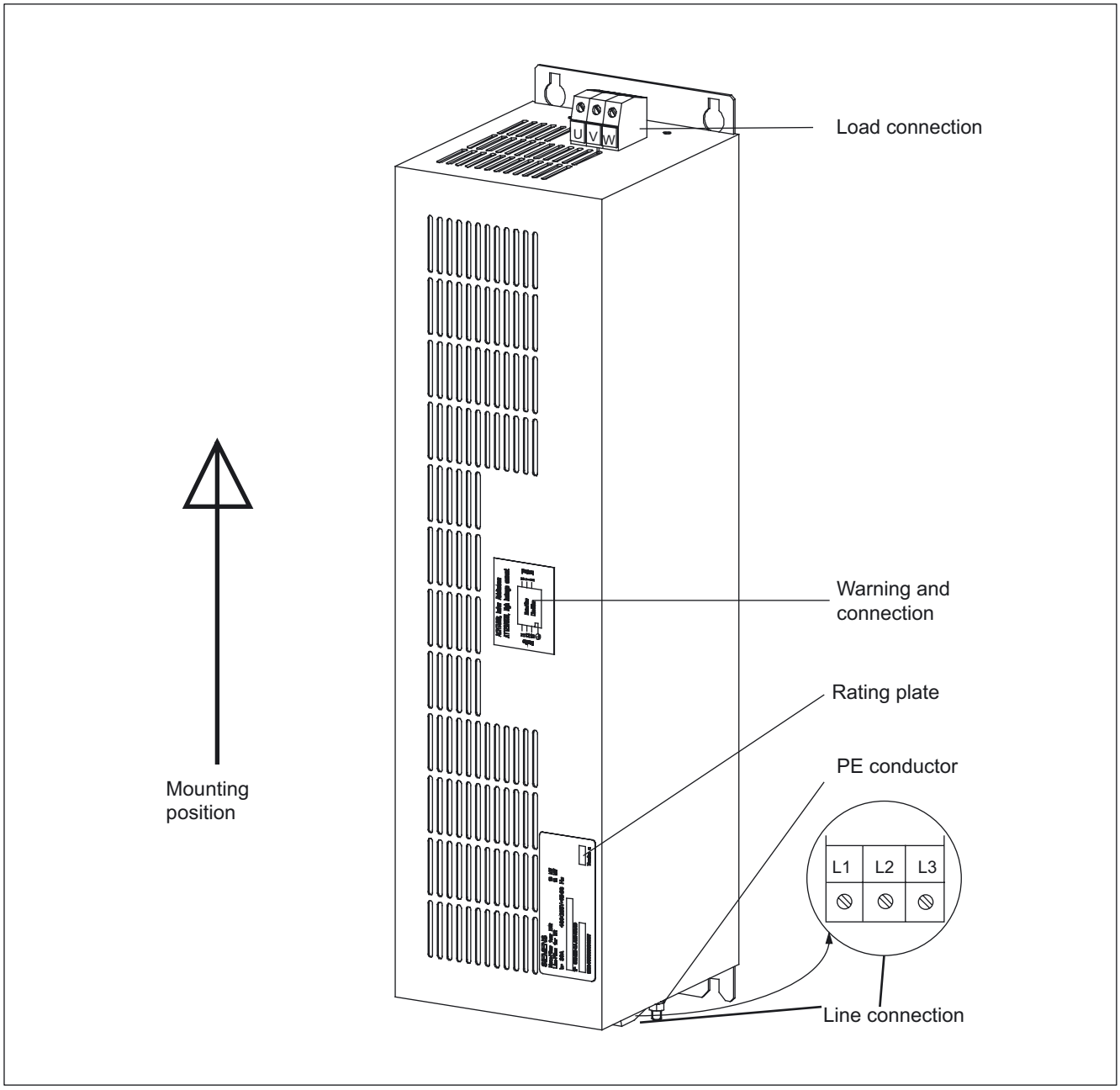


Figure 2-7 Line filter (example: 16kW)

2.3.3.2 Line/load connection

The line filter is rated for a voltage range from 380 V 3AC -10% to 480 V 3AC +10% (-15% <1 min) at 47 Hz to 63 Hz.

Table 2-1 Type of connection

Terminals	Designations
Line connection (line)	L1, L2, L3, PE
Load connection (load)	U, V, W
Line filters for Active Line Modules	
16 kW	Screw terminal: 10 mm^2 3–pin/1.5 Nm (see Screw Terminals) Ground stud: M5/3 Nm 1) Rated current: 30 A
36 and 55 kW	Screw terminal: 50 mm^2 3–pin/6 Nm (see Screw Terminals) Ground stud: M8/13 Nm 1) Rated current (36 kW): 67 A Rated current (55 kW): 103 A
80 kW	Screw terminal: 95 mm^2 3–pin/15 Nm (see Screw Terminals) Ground stud: M8/13 Nm 1) Rated current: 150 A
120 kW	Connection strap: d = 11 mm (M10/25 Nm) Ground stud: M8/13 Nm 1) Rated current: 225 A
Line filters for Smart Line Modules	
5 kW	Screw terminal: 10 mm^2 3-pin/1.5 Nm (see Screw Terminals) Ground stud: M6/4.8 Nm1) Rated current: 12 A
10 kW	Screw terminal: 10 mm^2 3-pin/1.5 Nm (see Screw Terminals) Ground stud: M6/4.8 Nm1) Rated current: 24 A
1) for ring cable lugs to DIN 46234	

2.3.4 Dimension drawing

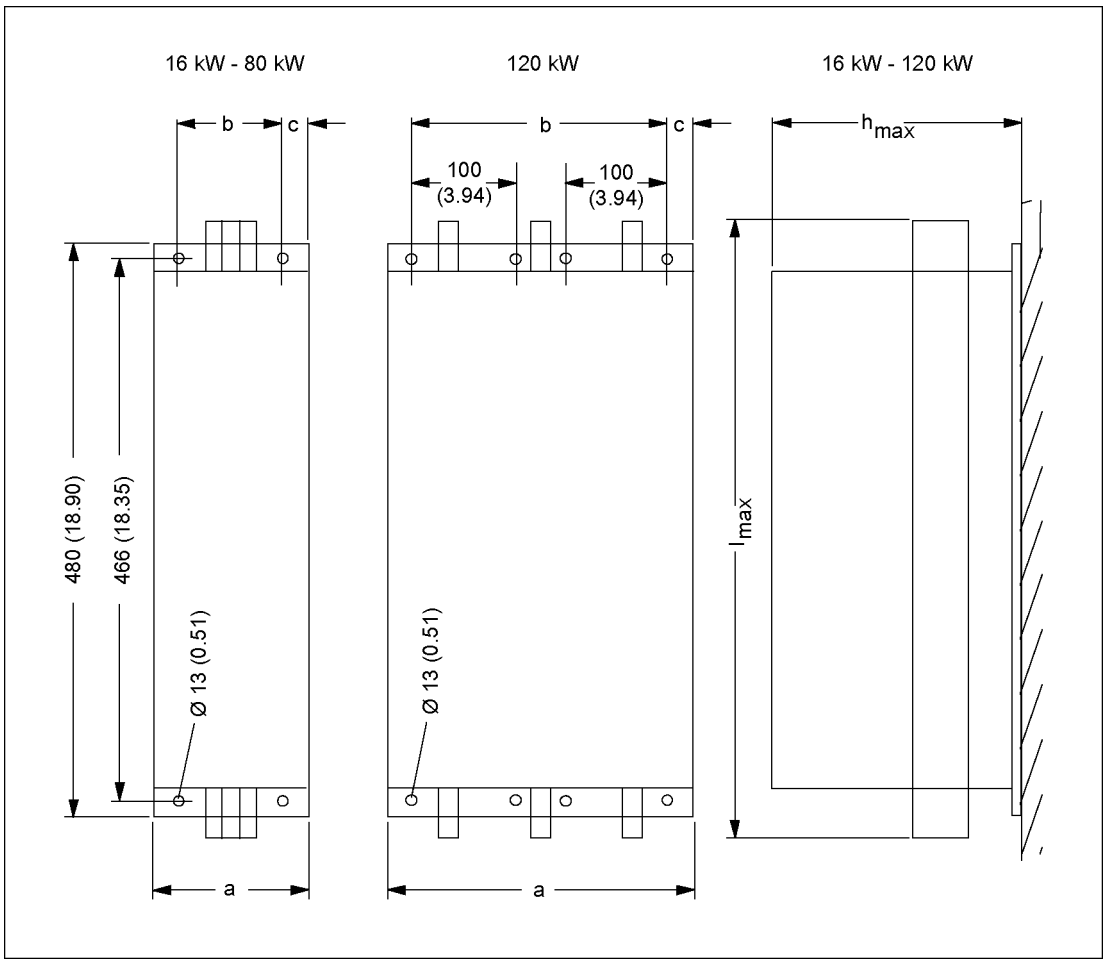


Figure 2-8 Dimension drawings of the line filter for the Active Line Module

Table 2-2 Dimensions of line filter

For Active Line Module	Order number 6SL3000-	a [mm] (inches)	b [mm] (inches)	c [mm] (inches)	h_{max} [mm] (inches)	l_{max} [mm] (inches)
16 kW	0BE-21-6AAx	130 (5.12)	100 (3.94)	15 (0.59)	150 (5.91)	489 (19.25)
36 kW	0BE-23-6AAx	130 (5.12)	100 (3.94)	15 (0.59)	245 (9.65)	526 (20.71)
55 kW	0BE-25-5AAx	130 (5.12)	100 (3.94)	15 (0.59)	260 (10.24)	526 (20.71)
80 kW	0BE-28-0AAx	200 (7.87)	150 (5.91)	25 (0.98)	260 (10.24)	539 (21.22)
120 kW	0BE-31-2AAx	300 (11.81)	250 (9.84)	25 (0.98)	260 (10.24)	530 (20.87)

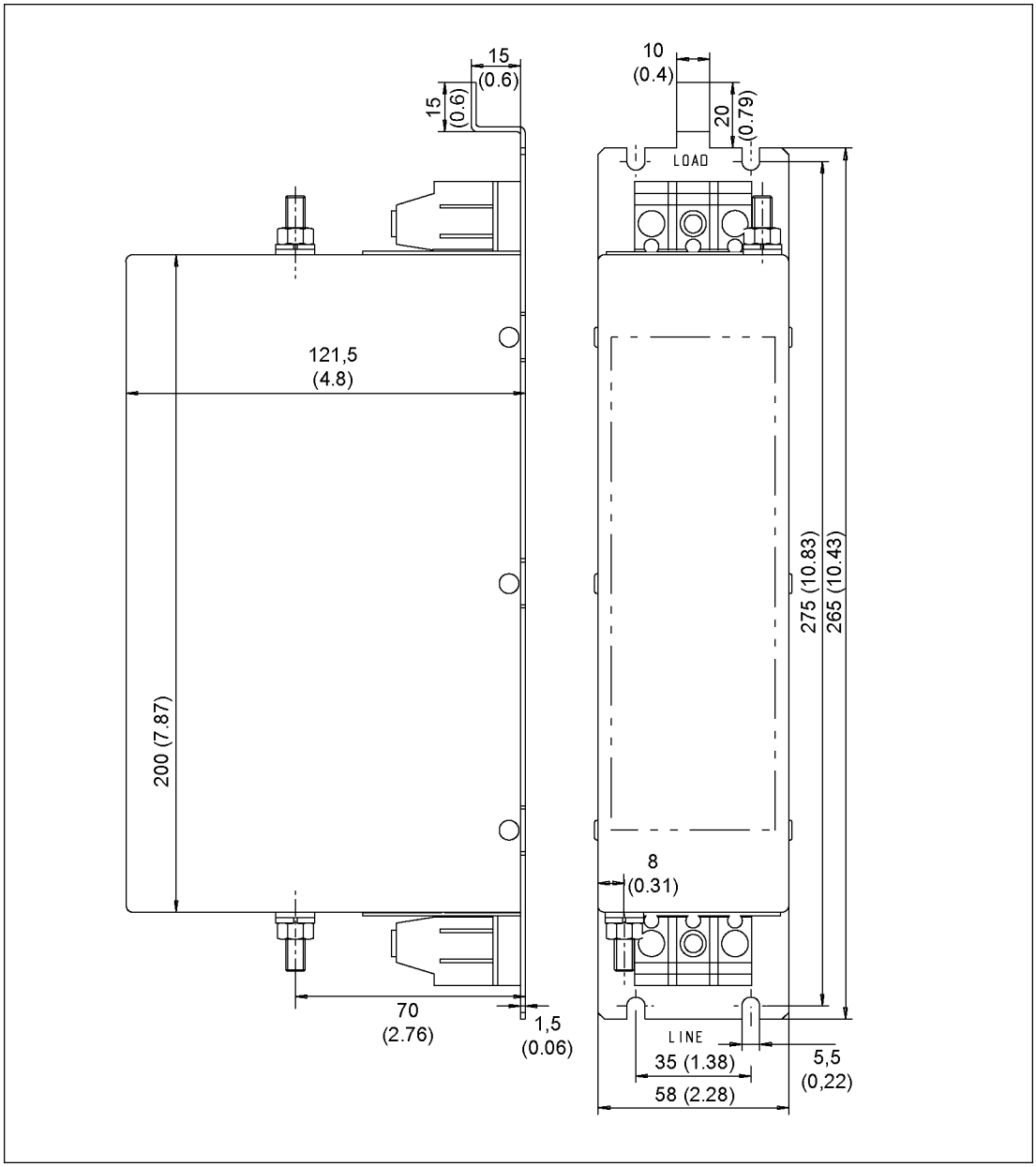


Figure 2-9 Dimension drawing of the line filter for the Smart Line Module (5 and 10 kW)

2.3.5 Technical Specifications

Table 2-3 Technical specifications of line filters for the Active Line Module

	6SL3000- unit	0BE21- 6AA0	0BE23- 6AA0	0BE25- 5AA0	0BE28- 0AA0	0BE31- 2AA0
Connection voltages: Supply voltage Line frequency	 V_{AC} Hz	3AC 380 -10% to 3AC 480 +10% (-15% < 1 min) 47 to 63 Hz				
Rated current	A_{AC}	30	67	103	150	225
Power loss[1]	W	70	90	110	150	200
Weight	kg	9	16	19	22	32

Table 2-4 Technical specifications of line filters for the Smart Line Module

	6SL3000- unit	0BE15-0AA0	0BE21-0AA0
Connection voltage: Supply voltage Line frequency	 V_{AC} Hz	3AC 380 -10% to 3AC 480 +10% (-15% < 1 min) 47 to 63 Hz	
Rated current	A_{AC}	16	25
Power loss[1]	W	20	20
Weight	kg	3.8	5.7

[1] For an overview, see the power loss tables in Cabinet Design.

2.4 Line reactors

2.4.1 Description

Line reactors limit low-frequency line harmonics to permissible values. In conjunction with Active Line Modules, they are also used to store energy.

2.4.2 Safety information

Caution

With the exception of the mounting wall, the 100 mm clearances above and below the components must be observed.

Note

The connection cables to the Line Module must be as short as possible (max. 10 m).
If possible, they should be shielded.

Caution

Only the line filters listed in Catalog NC Z must be used.

Using line reactors not approved by SIEMENS for SINAMICS 6SL31:

- can damage/destroy Line Modules.

- cause line reactions that can damage or destroy other loads powered from the same network.

Caution

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

2.4.3 Interface description

2.4.3.1 Overview

The line reactor is rated for a voltage range from 380 V 3AC -10% to 480 V 3AC +10% at 47 Hz to 63 Hz.

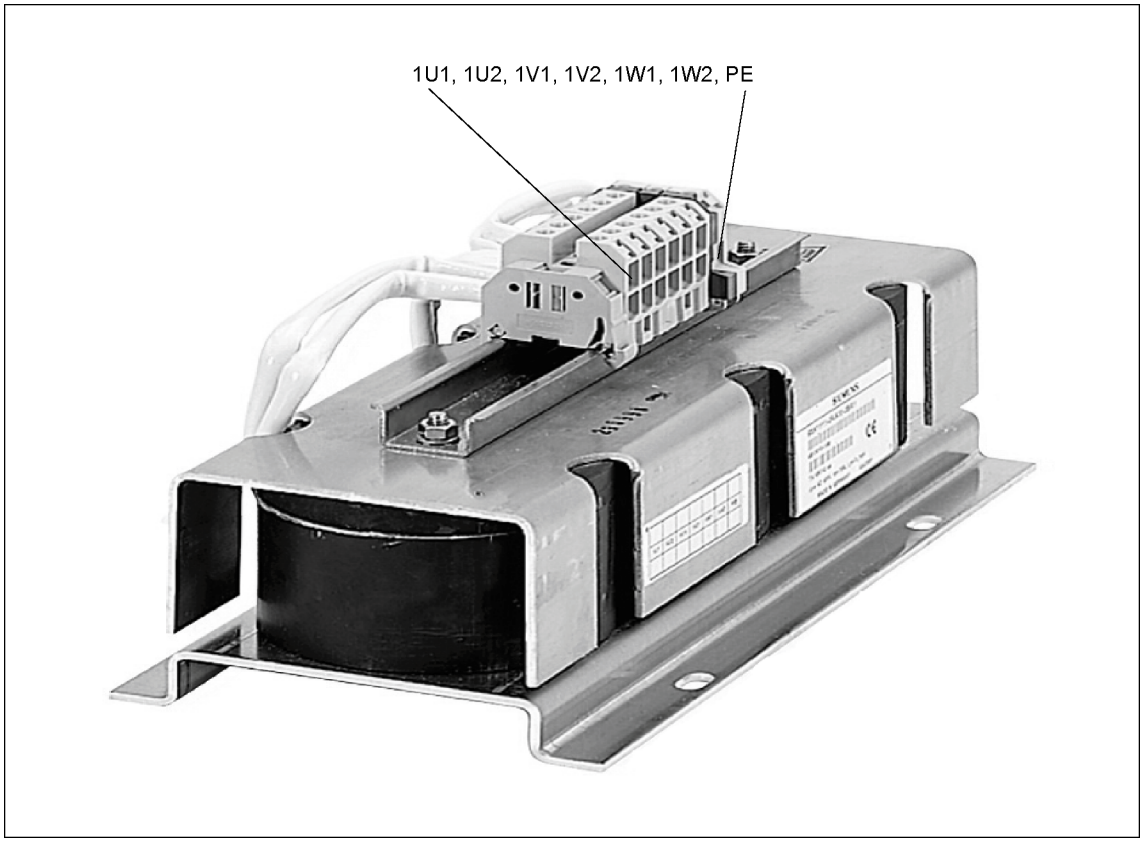


Figure 2-10 Line reactor (example: 16 kW)

2.4.3.2 Line/load connection

Table 2-5 Connection methods for line reactor

Terminals	Designations
Line connection	1U1, 1V1, 1W1, PE
Load connection	1U2, 1V2, 1W2
Line reactors for Active Line Modules	
16 kW	Screw terminal 16 mm^2 3–pin / 6 Nm*
36 kW	Screw terminal 35 mm^2 3–pin / 6 Nm*
55 kW	Screw terminal 70 mm^2 3–pin / 6 Nm*
80 kW	Connection strap d = 9 mm^2 (M10/25 Nm) for ring cable lugs to DIN 46234
120 kW	Connection strap d = 10 mm^2 (M10/25 Nm) for ring cable lugs to DIN 46234
Line reactors for Smart Line Modules	
5 kW	Screw terminal 4 mm^2 3-pin*
10 kW	Screw terminal 10 mm^2 3-pin*

* See Screw Terminals

2.4.4 Dimension drawing

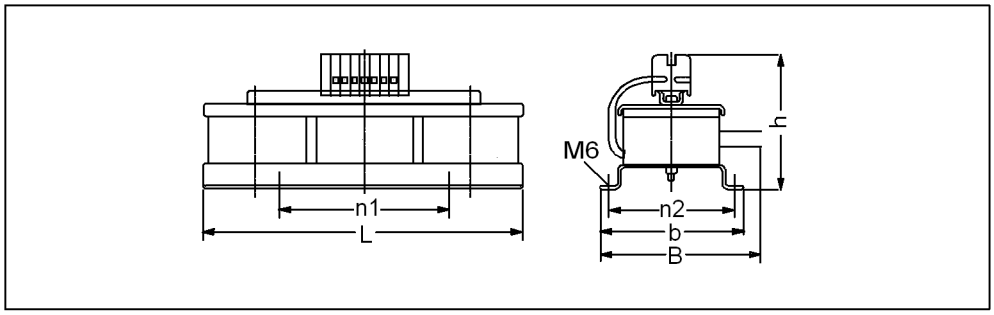


Figure 2-11 Dimension drawing of line reactor

Table 2-6 Dimensions of line reactor

For Active Line Module	Order number 6SN1111-	L [mm] (inches)	B [mm] (inches)	h [mm] (inches)	b [mm] (inches)	n_1 [mm] 1) (inches)	n_2 [mm] 1) (inches)
16 kW	0AA00-0BA1	330 (12.99)	150 (5.91)	145 (5.71)	150 (5.91)	175 (6.89)	136 (5.35)
36 kW	0AA00-0CA1	330 (12.99)	150 (5.91)	230 (9.06)	150 (5.91)	175 (6.89)	136 (5.35)
55 kW	0AA00-0DA1	330 (12.99)	150 (5.91)	280 (11.02)	150 (5.91)	175 (6.89)	136 (5.35)
1) Dimensions n1 and n2 correspond to the drill hole spacing							

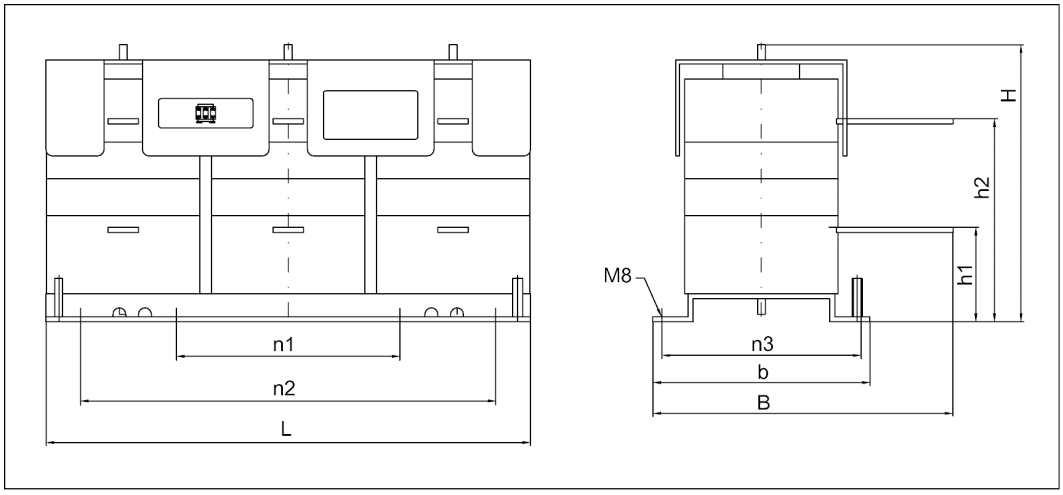


Table 2-7 Dimensions of line reactor

For Active Line Module	Order number	L [mm] (inches)	B [mm] (inches)	h1 [mm] (inches)	h2 [mm] (inches)	H [mm] (inches)	b [mm] (inches)	n_1 [mm] 1) (inches)	n_2 [mm] 1) (inches)	n_2 [mm] 1) (inches)
80 kW	6SN1111-0AA00-1EA0	380 (14.96)	225 (8.86)	50 (1.70)	170 (6.69)	220 (8.66)	170 (6.69)	175 (6.89)	325 (12.80)	156 (6.14)
120 kW	6SN3000-0DE31-2BA00	490 (19.29)	225 (8.86)	60 (2.36)	220 (8.66)	250 (9.84)	170 (6.69)	175 (6.89)	325 (12.80)	156 (6.14)
1) Dimensions n1, n2 and n3 correspond to the drill hole spacing										

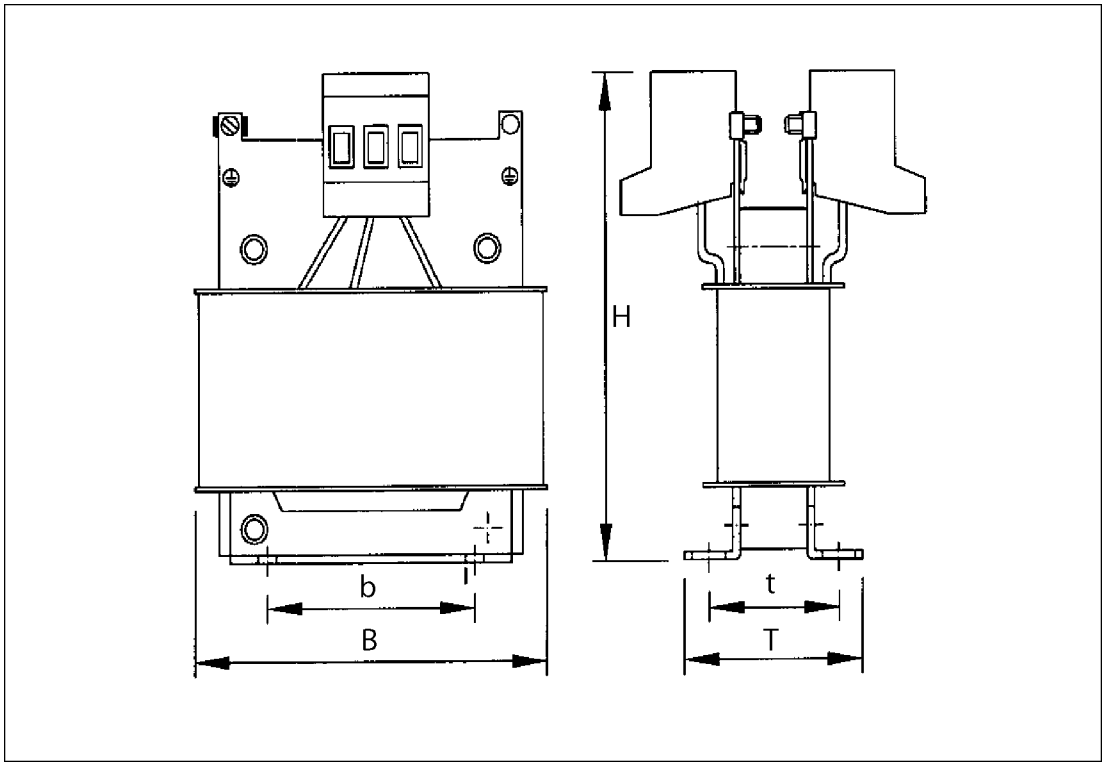


Figure 2-12 Dimension drawing of line reactor for Smart Line Module

Table 2-8 Dimensions of line reactor

For Smart Line Module	Order number 6SL3000-	B [mm] (inches)	b [mm] 1) (inches)	H [mm] (inches)	T [mm] (inches)	t [mm] 1) (inches)
5 kW	0CE-15-0AA0	150 (5.91)	113 (4.53)	175 (6.89)	66.5 (2.62)	49.5 (1.95)
10 kW	0CE-21-0AA0	177 (6.97)	136 (5.35)	196 (7.72)	86 (3.39)	67 (2.64)
1) Dimensions w and t correspond to the drill hole spacing						

2.4.5 Technical specifications

Table 2-9 Technical specifications of line reactors for the Active Line Module

	6SN1111– Unit	**0BA1**	**0CA1**	**0DA1**	**1EA0**	**1FA0**
Output	kW	16	36	55	80	120
Rated current	A_{rms}	30	67	103	150	225
Power loss[1]	W	170	250	350	450	590
Weight	[kg]	8.5	13	18	40	50

[1] For an overview, see the power loss tables in Cabinet Design.

Table 2-10 Technical specifications of line reactors for the Smart Line Module

	6SL3000- unit	**0CE15-0AA0**	**0CE21-0AA0**
Output	kW	5	10
Rated current	A_{rms}	14	28
Power loss[1]	W	62	116
Weight	kg	3.7	7.5

[1] For an overview, see the power loss tables in Cabinet Design.

Line Modules Booksize

3

3.1 Introduction

Line Modules generate a DC voltage that is used to power the Motor Modules from the connected supply voltage.

The Active Line Modules are equipped with DRIVE-CLiQ interfaces so that they can be connected to the control unit. The Smart Line Modules must be connected to the control unit via terminals.

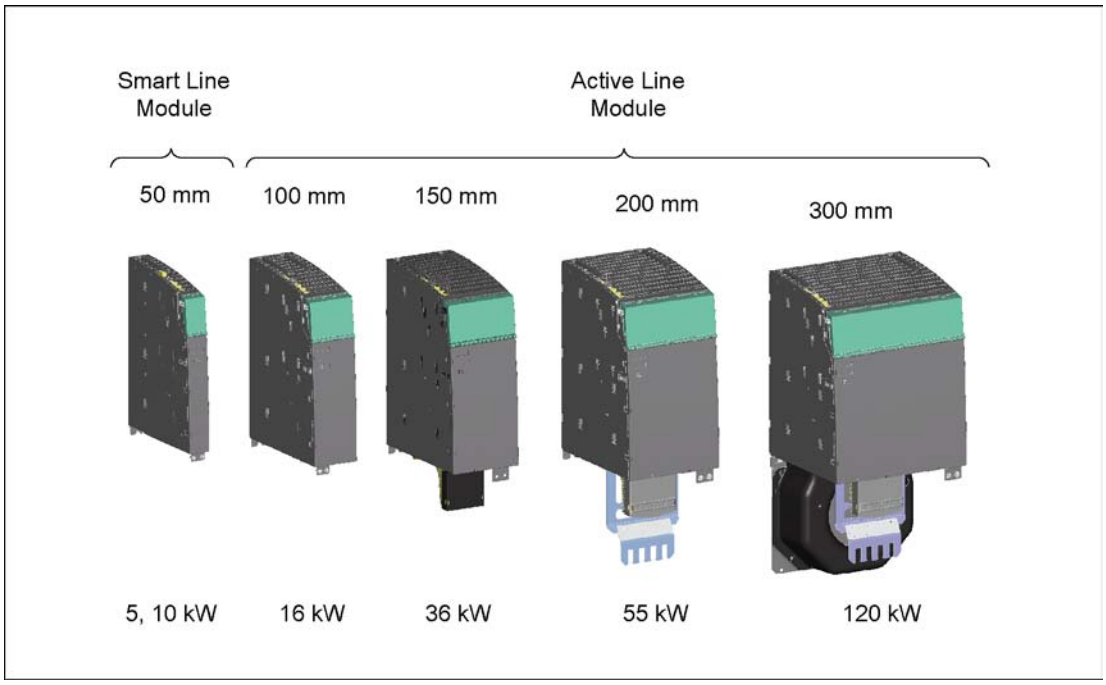


Figure 3-1 Overview of Line Modules

General characteristics of the Line Modules

- Connection voltage: 3AC 380 V – 10% to 3AC 480 V + 10% (-15% <1 min) (47 to 63 Hz)
- Suitable for TN, TT, and IT supply systems
- 100% regenerative feedback capability
- Internal/external air cooling
- Short-circuit/ground-fault-proof
- Integrated DC link and electronics current busbar connection
- Operating status and error status via LEDs

Characteristics of the Active Line Modules

- Regulated DC link voltage
- Regenerative feedback capability
- Sinusoidal line currents
- Electronic type plate
- DRIVE-CLiQ interface for communication with the control unit and/or other components in the drive line-up.
  - Integration in system diagnostics

Characteristics of the Smart Line Modules

- Unregulated DC link voltage
- Regenerative feedback capability
- Square-wave line currents

3.2 Active Line Modules with Internal Air Cooling

3.2.1 Description

The Motor Modules are connected to the power supply network via the Active Line Modules which provide the Motor Modules with a constant DC link voltage. This ensures that they are not influenced by network fluctuations. The regenerative feedback capability of the modules can be deactivated by parameterization.

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

When the motors are in feedback mode, Active Line Modules supply power back to the network.

3.2.2 Safety information

Warning

After disconnecting all the supply voltages, a hazardous voltage will be present in all components for another 5 minutes. The protective cover must not be opened until this time has elapsed.

When opening the protective cover for the DC link, you must activate the release. A suitable tool (e.g. screwdriver) must be used for this purpose.

The components must only be operated when the protective cover of the DC link is closed. Damaged components must not be used, otherwise this could result in secondary damage or accidents.

Warning

A sufficiently high short-circuit power is required for tripping the fuses within the predefined time in the event of a ground fault. Insufficient short-circuit power increases the time to trip beyond permissible levels (e.g. fire possible).

Caution

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

A set of labels in 12 languages is available using order number: 6SL3166-3AB00-0AAx.

Notice

The 80 mm clearances above and below the components must be observed.

For the 80 kW and 120 kW Active Line Modules, a ventilation clearance of 50 mm must be observed in front of the fan.

Caution

The tightening torque of the DC link busbar screws (1.8 Nm) must be checked before startup.

In a supply system without regenerative feedback capability (e.g. diesel generator), the regenerative feedback capability of the Active Line Module must be deactivated via a 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.

Caution

The total length of all the power cables (motor supply cables and DC link cables) must not exceed 350 m in active mode.

Caution

For DRIVE-CliQ connections self-prefabricated cables or couplings must not be used.

Caution

The ratio of the short-circuit power to the rated power of the Line Module must be ≥ 70.

Caution

The DC link busbar in a drive line-up must be sealed at both ends using DC link side covers (order no.: 6SL3162-5AA00-0AA0).

3.2.3 Interface description

3.2.3.1 Overview

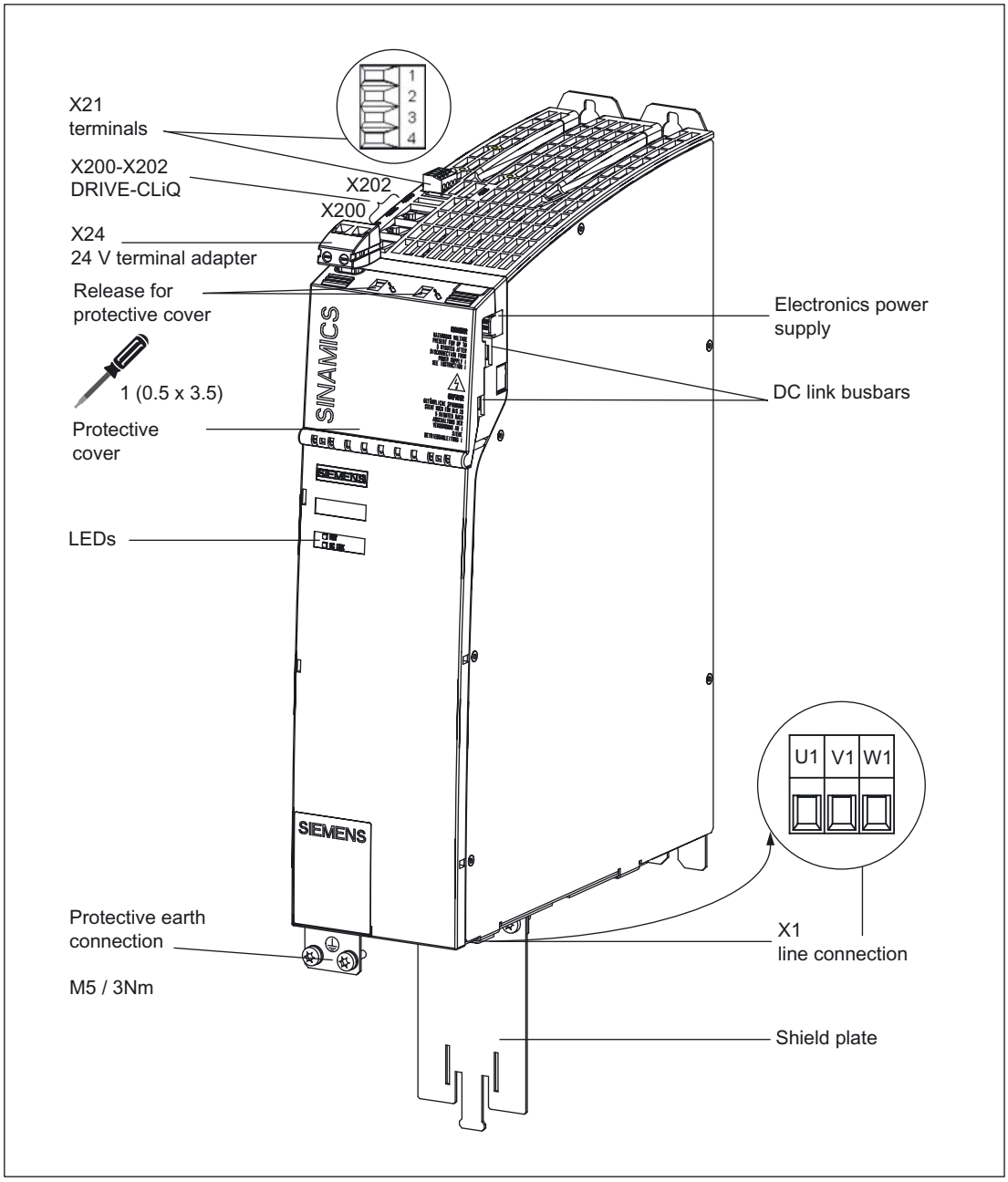
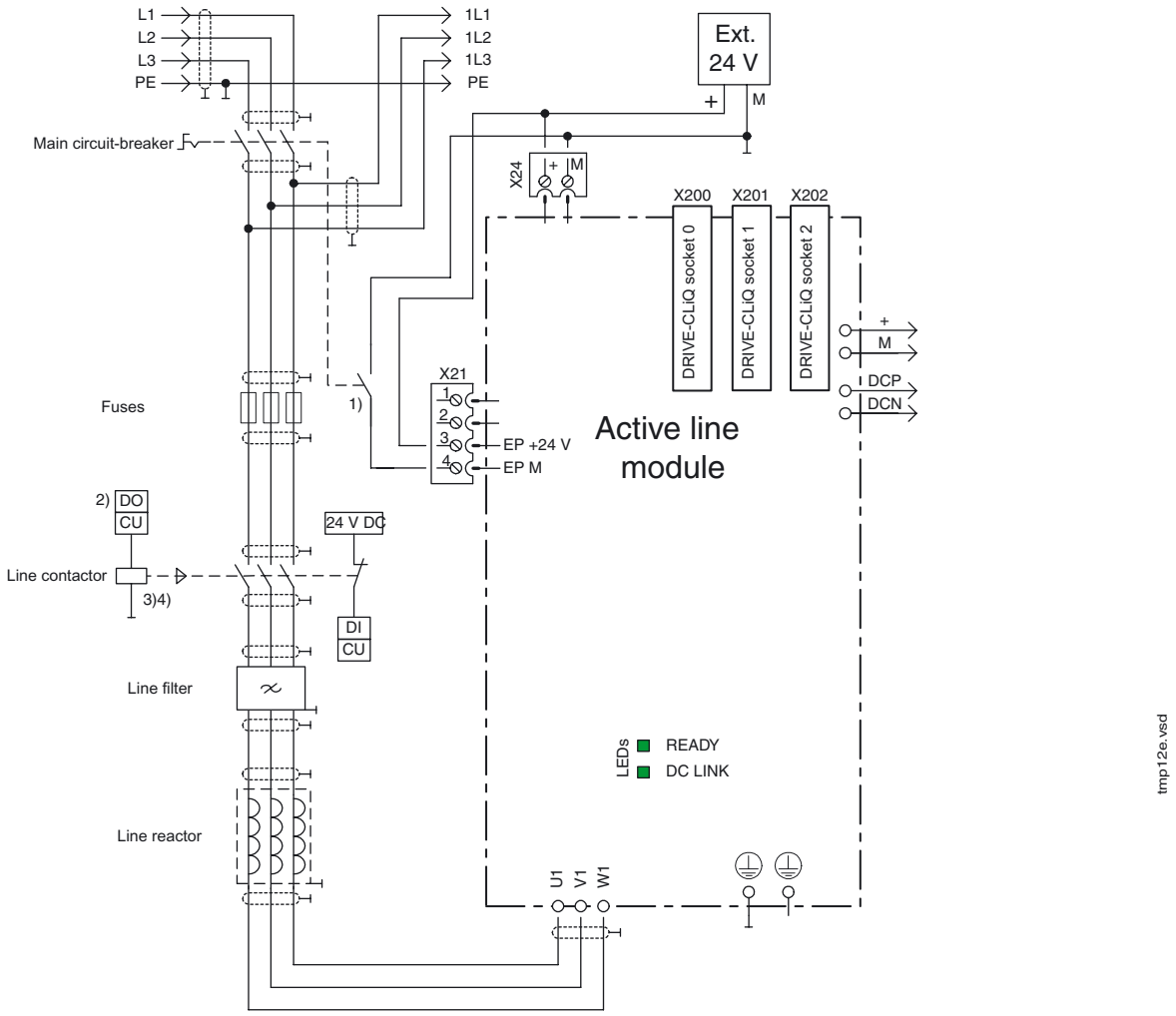


Figure 3-2 Active Line Module with internal air cooling (example: 16 kW)

3.2.3.2 Connection example

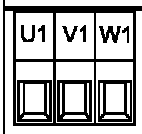
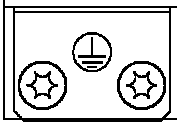


1) Leading break contact t >10 ms for operation, 24 V DC and ground must be applied.
2) DI/DO (controlled by the control unit)
3) No additional consumer permitted downstream of line contactor
4) The current carrying capacity of the DO must be taken into account
An output interface element may have to be used

Figure 3-3 Example connection of Active Line Module

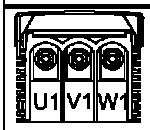
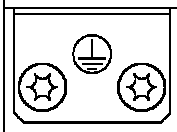
3.2.3.3 Line connection

Table 3-1 Terminal block X1 Active Line Module 16 kW

	Terminal	Technical specifications
	U1	Supply voltage:
	V1	3AC 480 V +10% (-15% < 1 min) at 47 Hz to 63 Hz
	W1	Max. connectable cross-section: 10 mm²
		Type: Screw terminal 6 (see Connection Methods)
	PE connection	Threaded hole M5/3 Nm [1]

[1] for ring cable lugs to DIN 46234

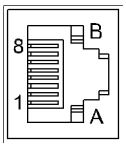
Table 3-2 Terminal block for the Active Line Module (36 kW to 120 kW)

	Terminals	Technical specifications
	U1	Supply voltage:
	V1	3AC 480 V +10% (-15% < 1 min) at 47 Hz to 63 Hz
	W1	**36kW:**
		Threaded bolt M6/6 Nm [1)]
		55 kW:
		Threaded bolt M8/13 Nm [1)]
		80 kW to 120 kW:
		Threaded bolt M8/13 Nm [1)]
	PE connection	**36kW:**
		Threaded hole M6/6 Nm [1)]
		55 kW:
		Threaded hole M6/6 Nm [1)]
		80 kW to 120 kW:
		Threaded hole M8/13 Nm [1]

[1] for ring cable lugs to DIN 46234

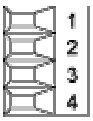
3.2.3.4 X200-X202 DRIVE-CLiQ interfaces

Table 3-3 DRIVE-CLiQ interface X200-X202

	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	GND (0 V)	Electronic ground
Blanking plate for DRIVE-CLiQ interface: Molex, order number: 85999-3255			

3.2.3.5 EP terminals X21

Table 3-4 Terminal block X21

	Terminal	Name	Technical specifications
	1	Reserved, do not use	
	2	Reserved, do not use	
	3	EP +24 V (Enable Pulses)	Voltage 24 V DC Current consumption: 10 mA Isolated input Signal propagation times: L → H 100 µs H → L: 1000 µs
	4	EP M (Enable Pulses)	
Max. connectable cross-section: 1.5 mm^2 Type: Screw terminal 1 (see Connection Methods)			

Note

For operation, 24 V DC must be connected to terminal 3 and ground to terminal 4. Upon removal, pulse inhibit is activated. Regenerative feedback is deactivated.

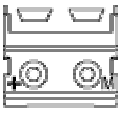
If the Line Module is not disconnected from the network, the DC link remains charged (e.g. a main contactor is not installed).

Notice

Before the drive line-up is switched off by means of the line disconnecting device, the voltage at terminals 3 (EP +24 V) and 4 (EP M) must be interrupted. This can be carried out using a leading breaking auxiliary contact (≥ 10 ms), for example.

3.2.3.6 X24 24 V terminal adapter

Table 3-5 Terminal block X24

	Terminal	Name	Technical specifications
	+	24 V power supply	24 V DC supply voltage
	M	Ground	Electronic ground
The 24 V terminal adapter is supplied as standard Max. connectable cross-section: 6 mm^2 Type: Screw terminal 5 (see Connection Methods)			

3.2.3.7 Meaning of the LEDs on the Active Line Module

Table 3-6 Meaning of the LEDs on the Active Line Module

LED	Color	State	Description
READY	-	OFF	Electronics power supply outside permissible tolerance range.
	Green	Continuous	The component is ready for operation and cyclic DRIVE-CLiQ communication is taking place.
	Orange	Continuous	DRIVE-CLiQ communication is being established.
	Red	Continuous	At least one fault is present in this component.
	Green Red	Flashing 2 Hz	Firmware is being downloaded.
	Green/ Orange or Red/ Orange	Flashing 2 Hz	Component recognition via LED is activated (p0124). Note: Both options depend on the LED status when module recognition is activated via p0124 = 1.
DC LINK	-	OFF	Electronics power supply outside permissible tolerance range.
	Orange	Continuous	DC link voltage within permissible tolerance range (only when ready for operation)
	Red	Continuous	DC link voltage outside the permissible tolerance range (only when Active Line Module is ready for operation).

Cause and rectification of faults

The following reference contains information about the cause and rectification of faults:

Reference: /IH1/ SINAMICS S120 Commissioning Manual

3.2.4 Dimension drawing

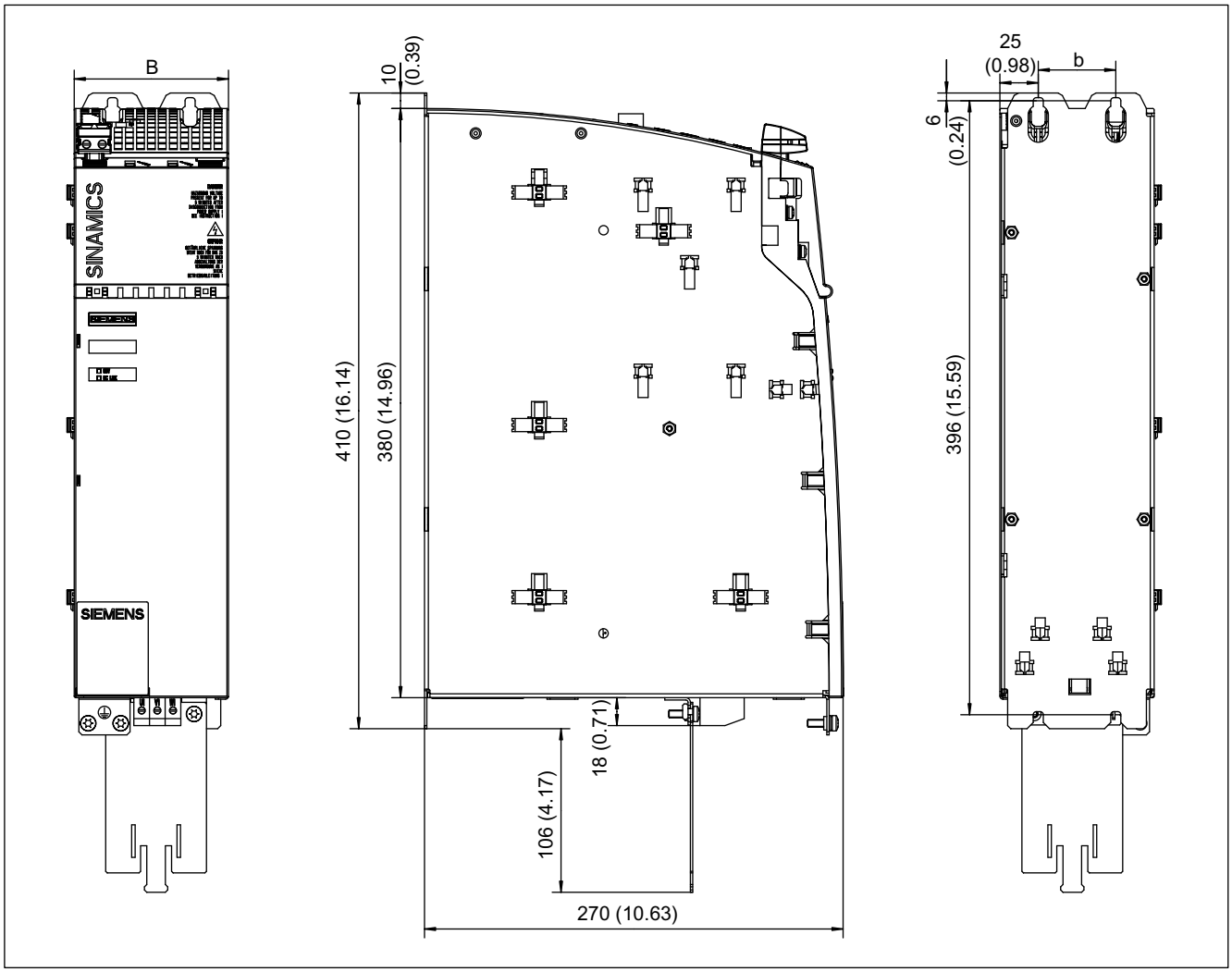


Figure 3-4 Dimension drawing of Active Line Module with internal air cooling (16 kW)

Table 3-7 Dimensions of Active Line Module with internal air cooling (16 kW)

Active Line Module type	Order number	B [mm] (inches)	b [mm] (inches)	h [mm] (inches)
16 kW	6SL3130-7TE21-6AAx	100 (3.94)	50 (1.97)	18 (0.71)

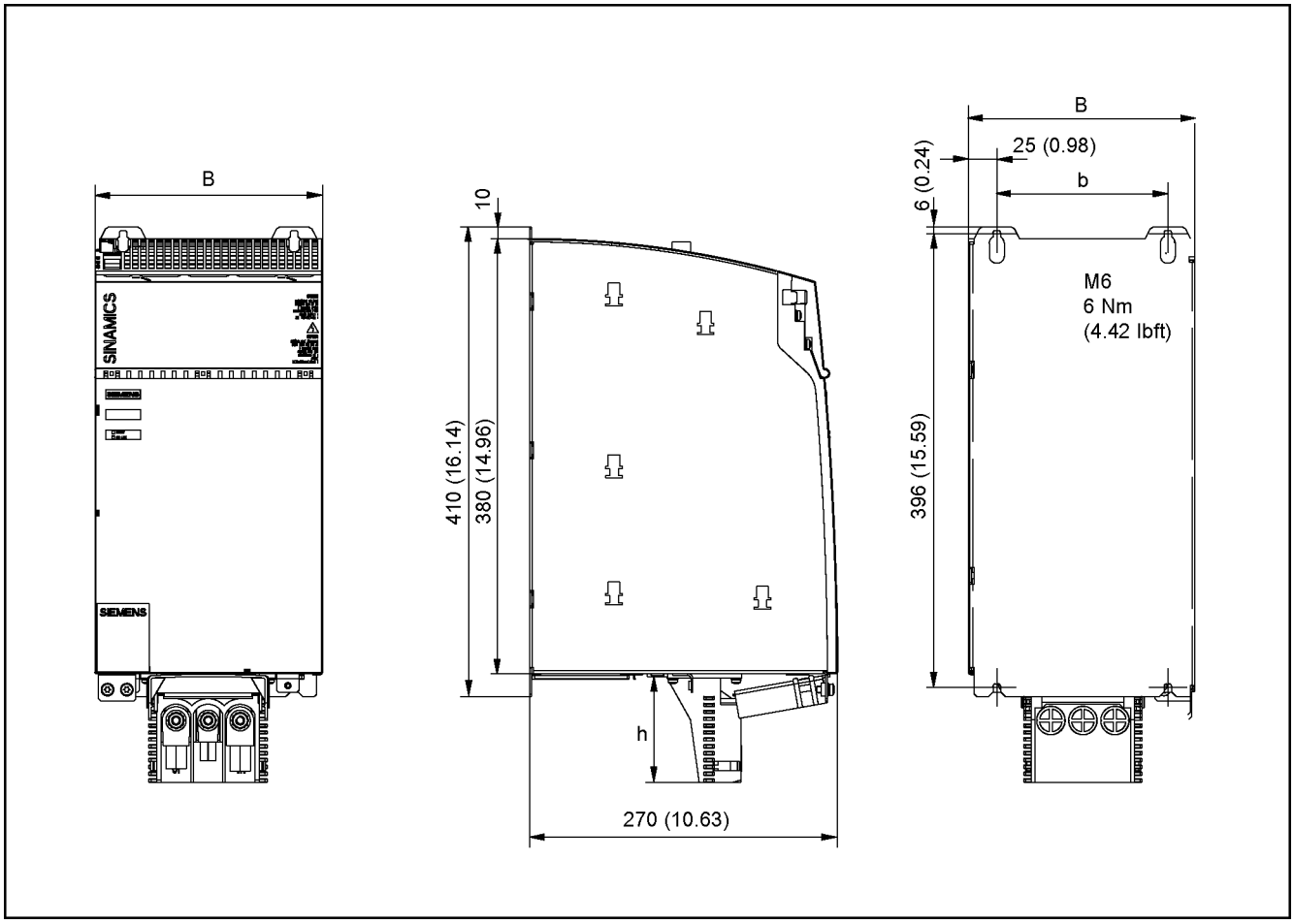


Figure 3-5 Dimension drawing of Active Line Module with internal air cooling (36 kW and 55 kW)

Table 3-8 Dimensions of Active Line Module with internal air cooling (36 kW and 55 kW)

Active Line Module type	Order number	B [mm] (inches)	b [mm] (inches)	h [mm] (inches)
36 kW	6SL3130-7TE23-6AAx	150 (5.91)	100 (3.94)	105 (4.13)
55 kW	6SL3130-7TE25-5AAx	200 (7.87)	150 (5.91)	105 (4.13)

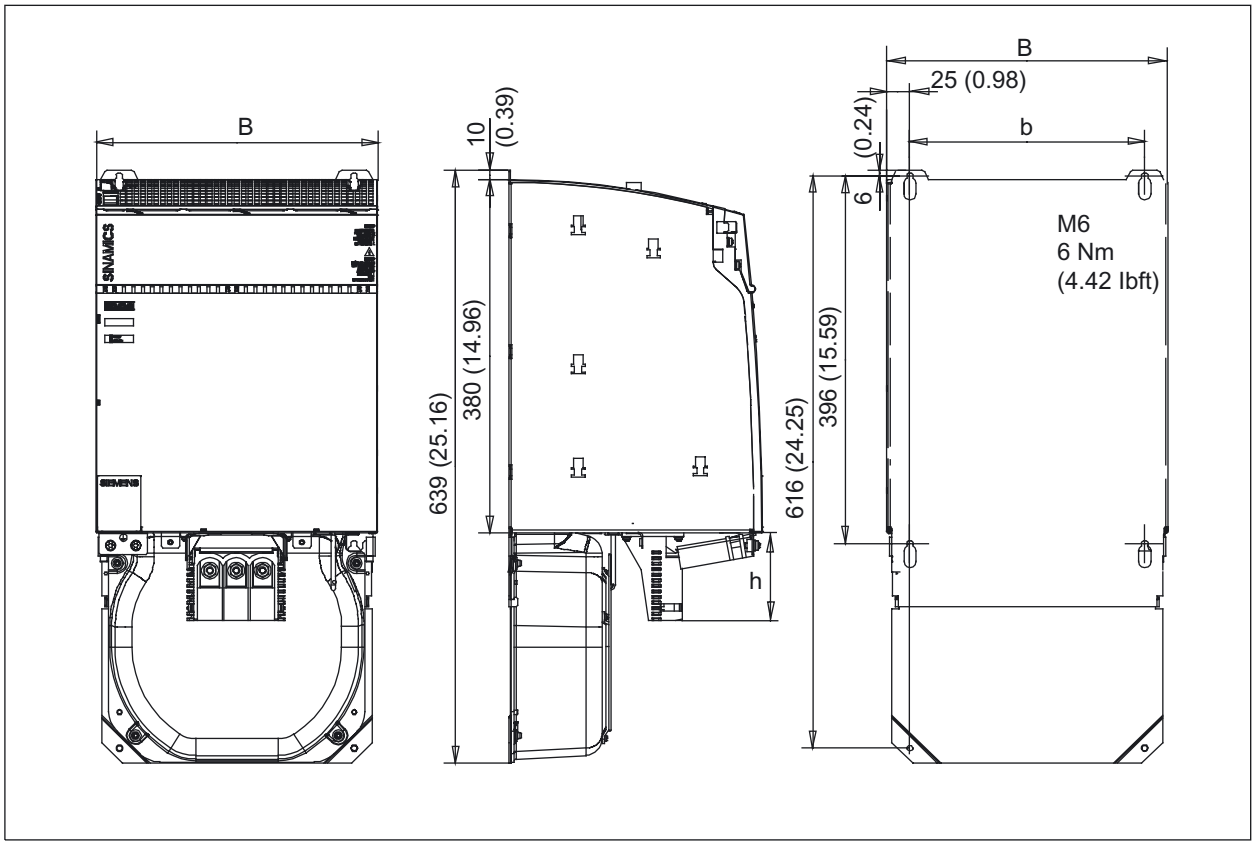


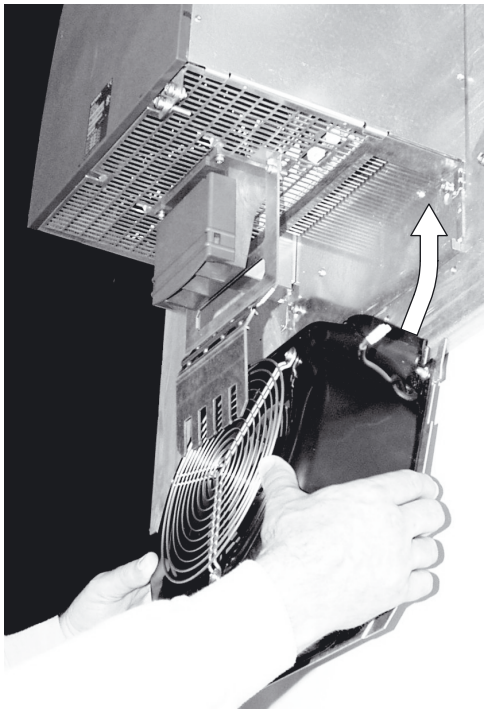
Figure 3-6 Dimension drawing of Active Line Modules with internal air cooling (80 kW and 120 kW)

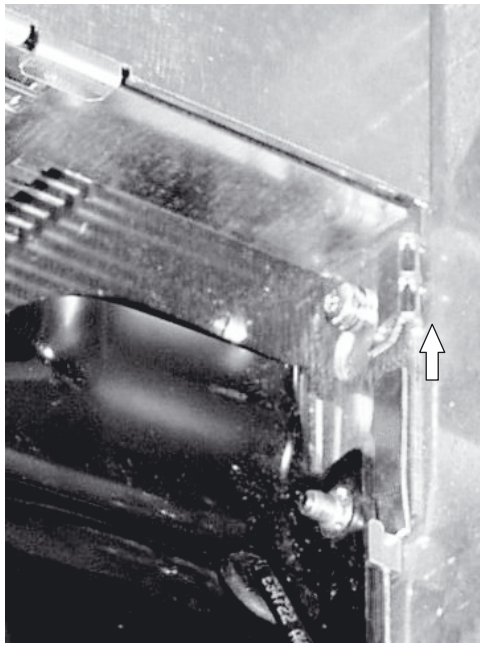
Table 3-9 Dimensions of Active Line Module with internal air cooling (80 kW and 120 kW)

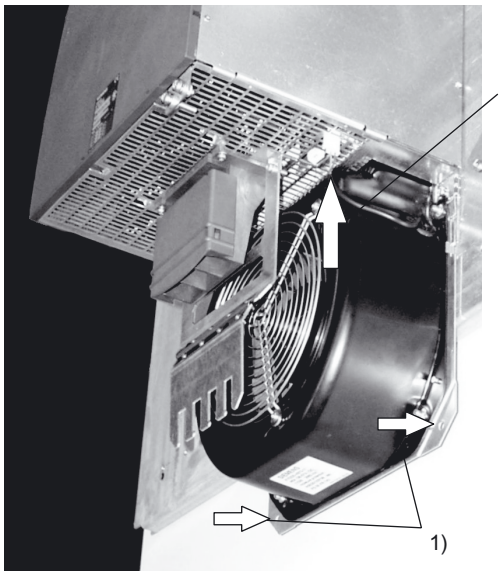
Active Line Module type	Order number	B [mm] (inches)	b [mm] (inches)	h [mm] (inches)
80 kW	6SL3130-7TE28-0AAx	300 (11.81)	250 (9.84)	105 (4.13)
120 kW	6SL3130-7TE31-2AAx	300 (11.81)	250 (9.84)	105 (4.13)

3.2.5 Installation

Installing the fan on Active Line Modules 80 kW and 120 kW







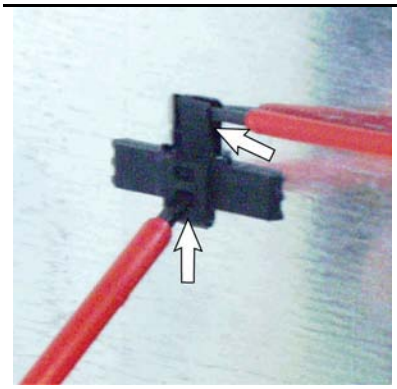
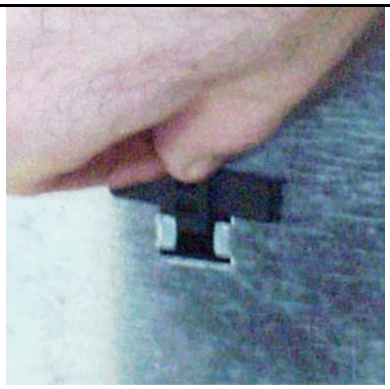
1) Secure with M6 / 6 Nm screws.

2) Connect power supply for fan.

Figure 3-7 Installing the fan for 300 mm modules

Removing the holders for securing the control unit

If an additional component is to be flush-mounted to the left of the component, the holders for securing the control unit must be removed.

		
Use suitable tools to lift the latching device and push up the holder.	Remove the holder.	The holder removed

3.2.6 Electrical connection

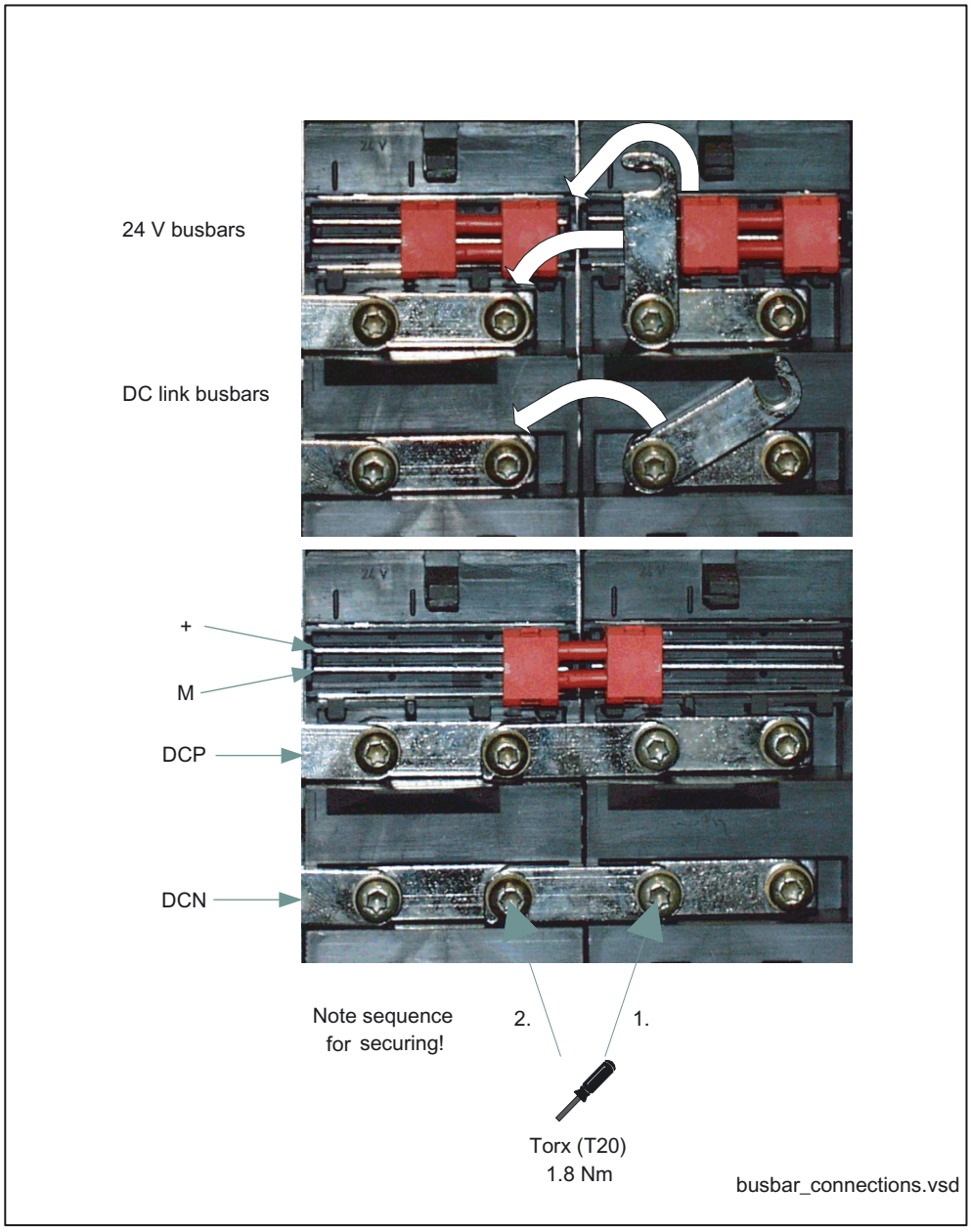


Figure 3-8 Busbar connections for booksize components

3.2.7 Technical specifications

Table 3-10 Technical specifications of Active Line Modules

Internal air cooling	**6SL3130–**	**7TE21–6AAx**	**7TE23–6AAx**	**7TE25–5AAx**	**7TE28–0AAx**	**7TE31–2AAx**
Rated power	**kW**	**16**	**36**	**55**	**80**	**120**
Supply:						
Rated power (S1)[1]	kW (Pn)	16	36	55	80	120
Power rating (S6-40%)[1]	kW (Ps6)	21	47	71	106	145
Peak infeed power rating[1]	kW (Pmax)	35	70	91	131	175
Regenerative feedback:						
Continuous feedback power rating	kW	16	36	55	80	120
Peak feedback power rating	kW	35	70	91	131	175
Connection voltages:						
Line voltage	V_{ACrms}	3AC 380 -10% to 3AC 480 +10% (-15% < 1 min)				
Line frequency	Hz	47 to 63 Hz				
Electronics power supply	V_{DC}	24 (20.4 - 28.8)				
DC link voltage	V_{DC}	510 - 750				
Overvoltage trip threshold	V_{DC}	820 ± 2%				
Undervoltage trip threshold	V_{DC}	360 ± 2%				
Supply currents:						
at 380 V_{AC}	A_{AC}	26	58	88	128	192
at 480 V_{AC}/528 V_{AC}	A_{AC}	21 / 19	46 / 42	70 / 64	102 / 93	152 / 139
at 480 V; S6-40%	A_{AC}	27	60	92	134	201
Peak current (at 400 V_{AC}/480 V_{AC})	A_{AC}	54 / 45	107 / 89	139 / 116	200 / 166	267 / 222
Output currents at 600 V_{DC}:						
Rated current	A_{DC}	27	60	92	134	200
at S6-40%	A_{DC}	35	79	121	176	244
Peak current	A_{DC}	59	117	152	218	292
DC link busbar current carrying capacity	A_{DC}	100	100	200	200	200
24 V busbar current carrying capacity	A_{DC}	20	20	20	20	20
Electronics current consumption	A_{DC}	1.1	1.5	1.9	2	2.5
Power loss[2]	W	260	630	900	1350	2200
Max. ambient temperature without derating	°C	40	40	40	40	40

Internal air cooling	6SL3130–	7TE21–6AAx	7TE23–6AAx	7TE25–5AAx	7TE28–0AAx	7TE31–2AAx
Rated power	**kW**	**16**	**36**	**55**	**80**	**120**
Max. ambient temperature with derating	°C	55	55	55	55	55
DC link capacitance	µF	705	1 410	1 880	2 820	3 995
Charging limit	µF	20 000	20 000	20 000	20 000	20 000
Power factor	cosφ	1	1	1	1	1
Efficiency	η	0.95	0.95	0.95	0.95	0.95
Cooling method		Internal fan	Internal fan	Internal fan	Separate mounted fan	Separate mounted fan
Sound pressure level	dB(A)	<60	<65	<60	<73	<73
Cooling air requirement	m^3/h	56	112	160	520	520
Rated voltage for rated data 3 AC 380 V						
Weight	kg	7	10	17	23	23

[1] The specified values apply to 380 V

[2] For an overview, see the power loss tables in Cabinet Design.

Rated duty cycles of Active Line Modules

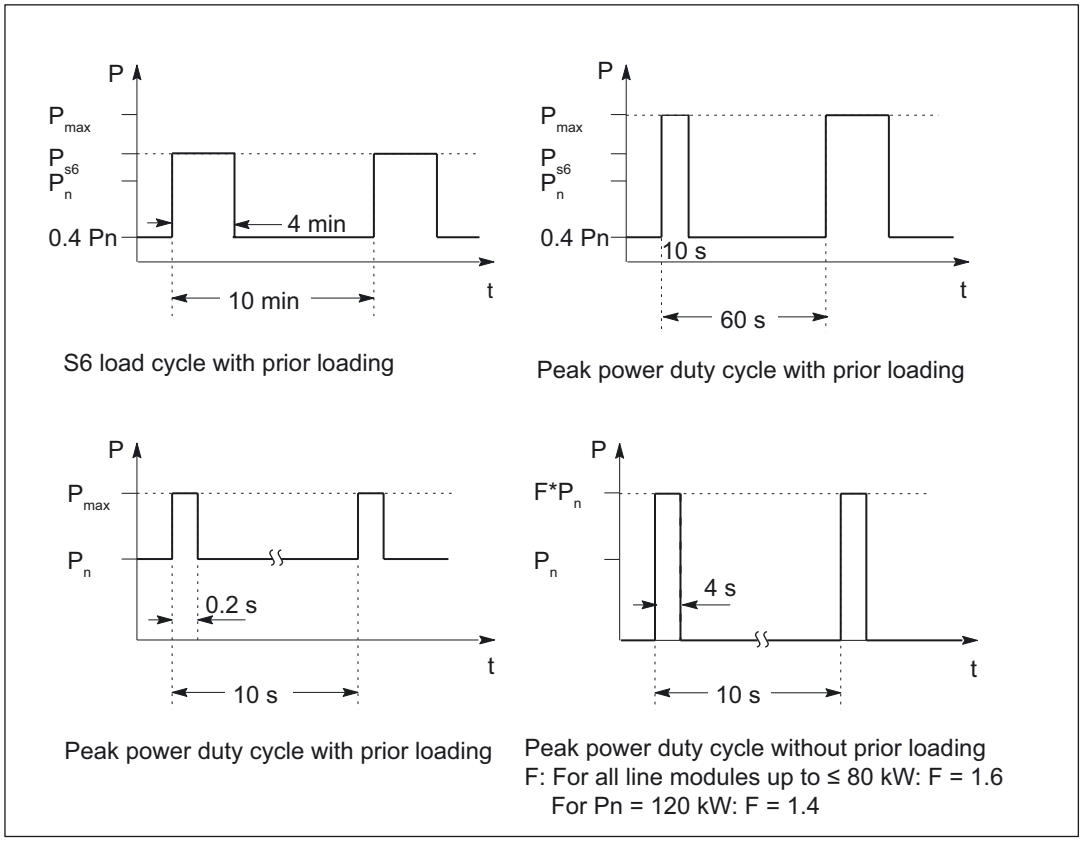


Figure 3-9 Rated duty cycles of Active Line Modules

Derating as a function of the ambient temperature

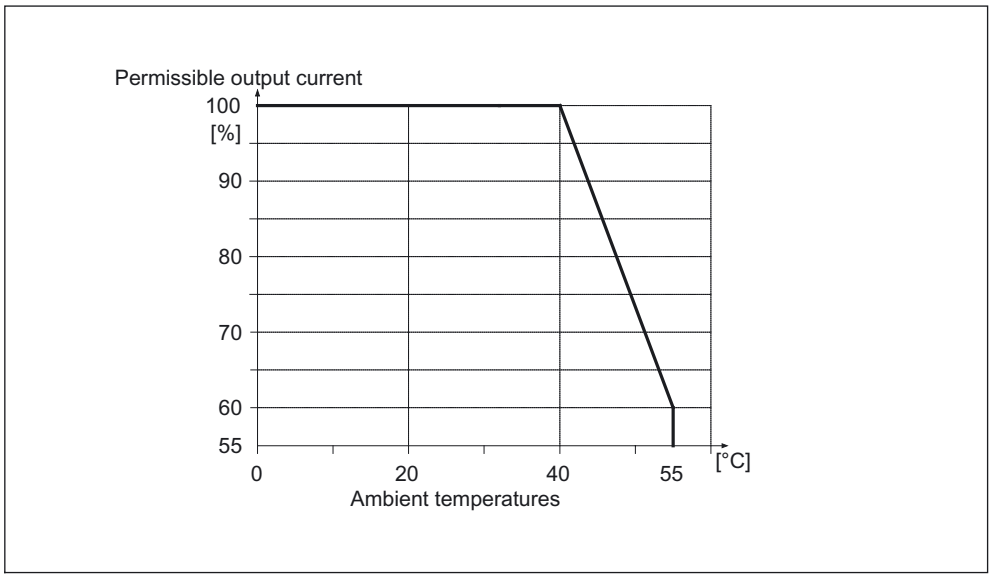


Figure 3-10 Derating as a function of the ambient temperature

Derating as a function of the installation altitude

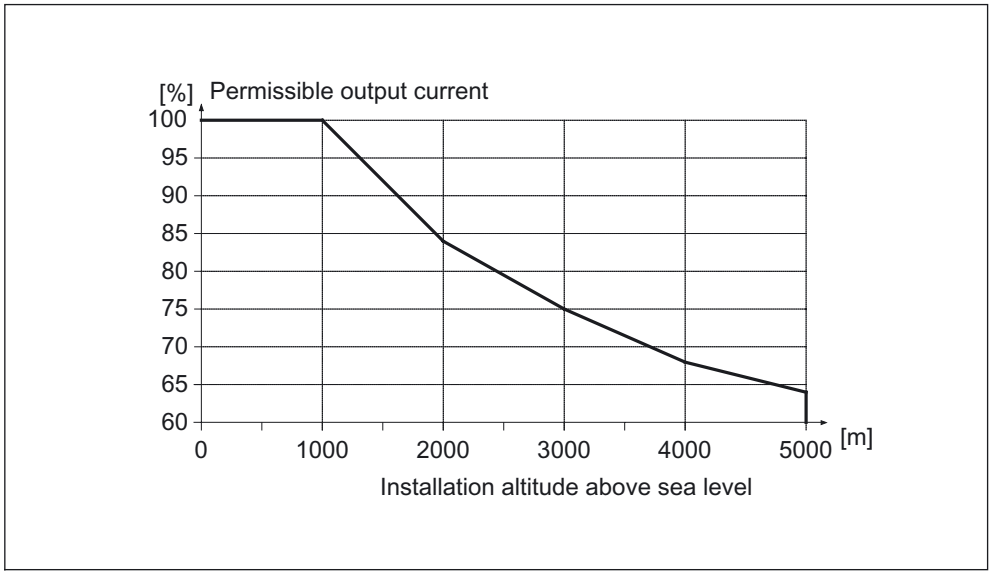


Figure 3-11 Derating as a function of the installation altitude

3.3 Active Line Modules with External Air Cooling

3.3.1 Description

The Motor Modules are connected to the power supply network via the Active Line Modules with external air cooling, which provide the Motor Modules with a constant DC link voltage. This ensures that they are not influenced by network fluctuations. The regenerative feedback capability of the modules can be deactivated by parameterization.

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

When the motors are in feedback mode, Active Line Modules supply power back to the network.

External air cooling uses the "through-hole" method. This is a cooling method for SINAMICS power units that is only available for booksize devices. The power unit and its heat sink can be inserted in a rectangular knockout at the rear of the switching cabinet and mounted with a seal. The heat sink fins and the fan (included in the scope of supply) project beyond the rear of the switching cabinet and the heat is dissipated outside the switching cabinet or in a separate air duct.

3.3.2 Safety Information

Warning

After disconnecting all the supply voltages, a hazardous voltage will be present in all components for another 5 minutes. The protective cover must not be opened until this time has elapsed.

When opening the protective cover for the DC link, you must activate the release. A suitable tool (e.g. screwdriver) must be used for this purpose.

The components must only be operated when the protective cover of the DC link is closed. Damaged components must not be used, otherwise this could result in secondary damage or accidents.

Warning

A sufficiently high short-circuit power is required for tripping the fuses within the predefined time in the event of a ground fault. Insufficient short-circuit power increases the time to trip beyond permissible levels (e.g. fire possible).

Caution

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

A set of labels in 12 languages is available using order number: 6SL3166-3AB00-0AAx.

Notice

The 80 mm clearances above and below the components must be observed.

Caution

The tightening torque of the DC link busbar screws (1.8 Nm) must be checked before startup.

In a supply system without regenerative feedback capability (e.g. diesel generator), the regenerative feedback capability of the Active Line Module must be deactivated via a 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.

Caution

The total length of all the power cables (motor supply cables and DC link cables) must not exceed 350 m in active mode.

Caution

For DRIVE-CliQ connections self-prefabricated cables or couplings must not be used.

Notice

The external air cooling can cause the fans and the heat sink to become heavily contaminated, which may trigger the temperature monitor in the power section. The fans and heat sink must be checked for contamination at regular intervals and, if necessary, cleaned.

Note

After installation, the seal on the rear of the device must be checked to ensure that it is tight. Additional sealing can be used, if necessary.

Caution

The ratio of the short-circuit power to the rated power of the Line Module must be ≥ 70.

Caution

The DC link busbar in a drive line-up must be sealed at both ends using DC link side covers (order no.: 6SL3162-5AA00-0AA0).

3.3.3 Interface description

3.3.3.1 Overview

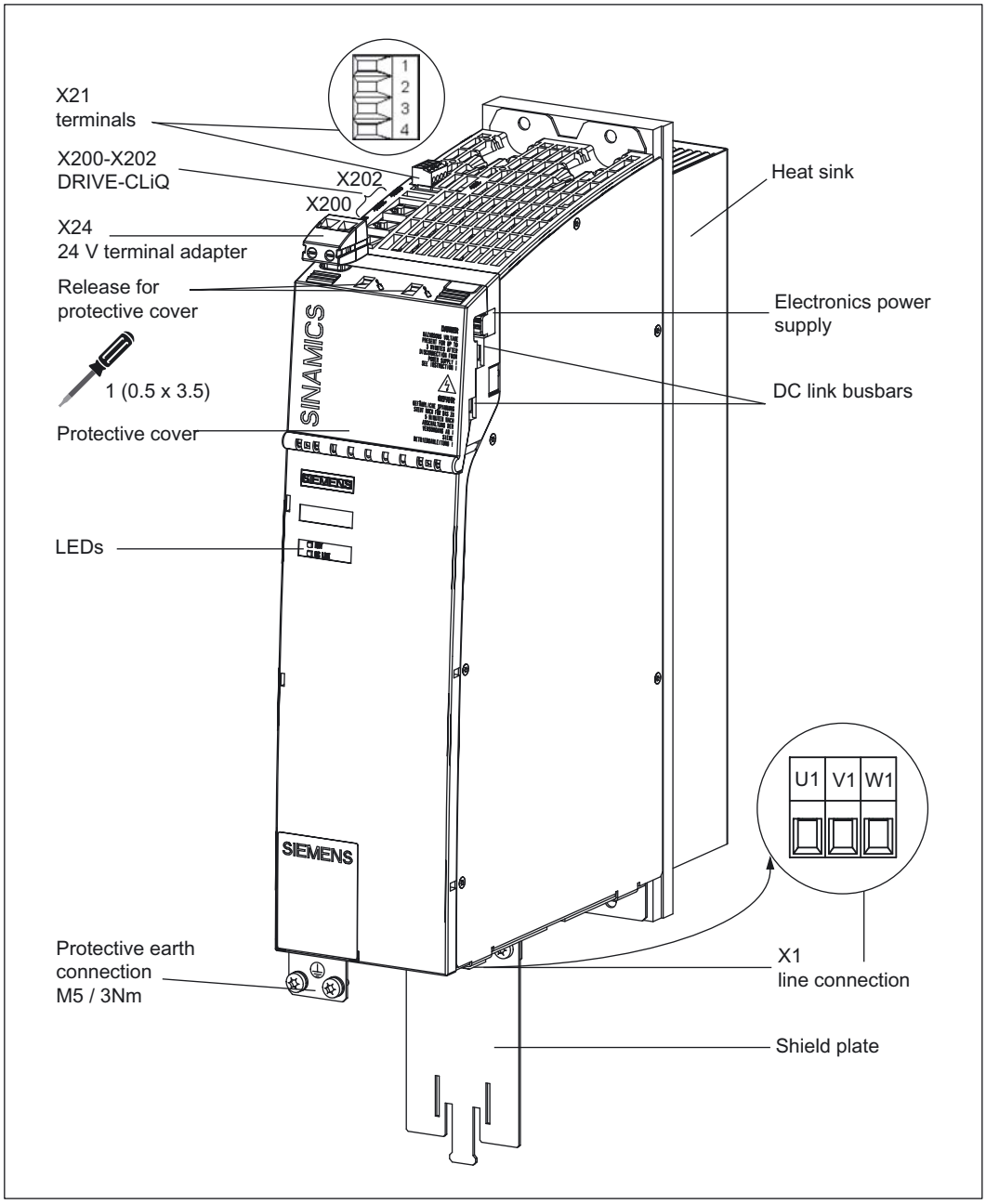
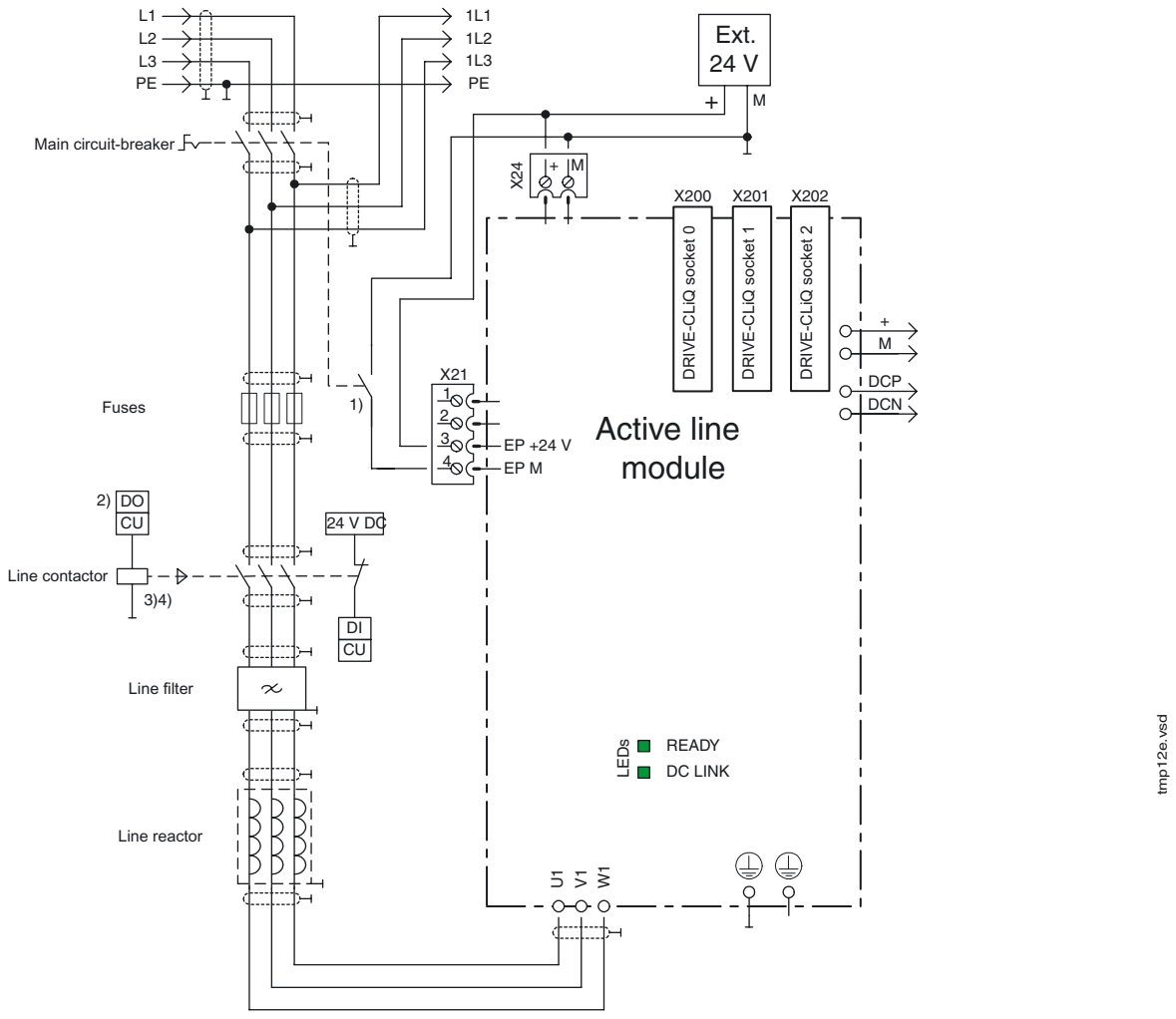


Figure 3-12 Active Line Module with external air cooling (example: 16 kW)

3.3.3.2 Connection example

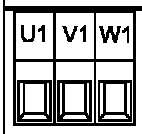
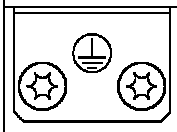


1) Leading break contact t >10 ms for operation, 24 V DC and ground must be applied.
2) DI/DO (controlled by the control unit)
3) No additional consumer permitted downstream of line contactor
4) The current carrying capacity of the DO must be taken into account
An output interface element may have to be used

Figure 3-13 Example connection of Active Line Module

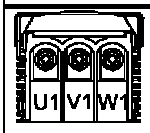
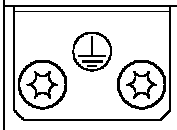
3.3.3.3 Line connection

Table 3-11 Terminal block X1 Active Line Module 16 kW

	Terminal	Technical specifications
	U1	Supply voltage:
	V1	3AC 480 V +10% (-15% < 1 min) at 47 Hz to 63 Hz
	W1	Max. connectable cross-section: 10 mm²
		Type: Screw terminal 6 (see Connection Methods)
	PE connection	Threaded hole M5/3 Nm [1]

[1] for ring cable lugs to DIN 46234

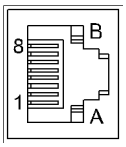
Table 3-12 Terminal block for the Active Line Module (36 kW to 120 kW)

	Terminals	Technical specifications
	U1	Supply voltage:
	V1	3AC 480 V +10% (-15% < 1 min) at 47 Hz to 63 Hz
	W1	**36kW:**
		Threaded bolt M6/6 Nm [1)]
		55 kW:
		Threaded bolt M8/13 Nm [1)]
		80 kW to 120 kW:
		Threaded bolt M8/13 Nm [1)]
	PE connection	**36kW:**
		Threaded hole M6/6 Nm [1)]
		55 kW:
		Threaded hole M6/6 Nm [1)]
		80 kW to 120 kW:
		Threaded hole M8/13 Nm [1]

[1] for ring cable lugs to DIN 46234

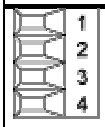
3.3.3.4 X200-X202 DRIVE-CLiQ interfaces

Table 3-13 DRIVE-CLiQ interface X200-X202

	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	GND (0 V)	Electronic ground
Blanking plate for DRIVE-CLiQ interface: Molex, order number: 85999-3255			

3.3.3.5 EP terminals X21

Table 3-14 Terminal block X21

	Terminal	Name	Technical specifications
	1	Reserved, do not use	
	2	Reserved, do not use	
	3	EP +24 V (Enable Pulses)	Voltage 24 V DC Current consumption: 10 mA Isolated input Signal propagation times: L → H 100 µs H → L: 1000 µs
	4	EP M (Enable Pulses)	
Max. connectable cross-section: 1.5 mm^2 Type: Screw terminal 1 (see Connection Methods)			

Note

For operation, 24 V DC must be connected to terminal 3 and ground to terminal 4. Upon removal, pulse inhibit is activated. Regenerative feedback is deactivated.

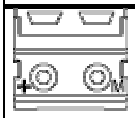
If the Line Module is not disconnected from the network, the DC link remains charged (e.g. a main contactor is not installed).

Notice

Before the drive line-up is switched off by means of the line disconnecting device, the voltage at terminals 3 (EP +24 V) and 4 (EP M) must be interrupted. This can be carried out using a leading breaking auxiliary contact (≥ 10 ms), for example.

3.3.3.6 X24 24 V terminal adapter

Table 3-15 Terminal block X24

	Terminal	Name	Technical specifications
	+	24 V power supply	24 V DC supply voltage
	M	Ground	Electronic ground
The 24 V terminal adapter is supplied as standard Max. connectable cross-section: 6 mm^2 Type: Screw terminal 5 (see Connection Methods)			

3.3.3.7 Meaning of the LEDs on the Active Line Module

Table 3-16 Meaning of the LEDs on the Active Line Module

LED	Color	State	Description
READY	-	OFF	Electronics power supply outside permissible tolerance range.
	Green	Continuous	The component is ready for operation and cyclic DRIVE-CLiQ communication is taking place.
	Orange	Continuous	DRIVE-CLiQ communication is being established.
	Red	Continuous	At least one fault is present in this component.
	Green Red	Flashing 2 Hz	Firmware is being downloaded.
	Green/ Orange or Red/ Orange	Flashing 2 Hz	Component recognition via LED is activated (p0124). Note: Both options depend on the LED status when module recognition is activated via p0124 = 1.
DC LINK	-	OFF	Electronics power supply outside permissible tolerance range.
	Orange	Continuous	DC link voltage within permissible tolerance range (only when ready for operation)
	Red	Continuous	DC link voltage outside the permissible tolerance range (only when Active Line Module is ready for operation).

Cause and rectification of faults

The following reference contains information about the cause and rectification of faults:

Reference: /IH1/ SINAMICS S120 Commissioning Manual

3.3.4 Dimension Drawings

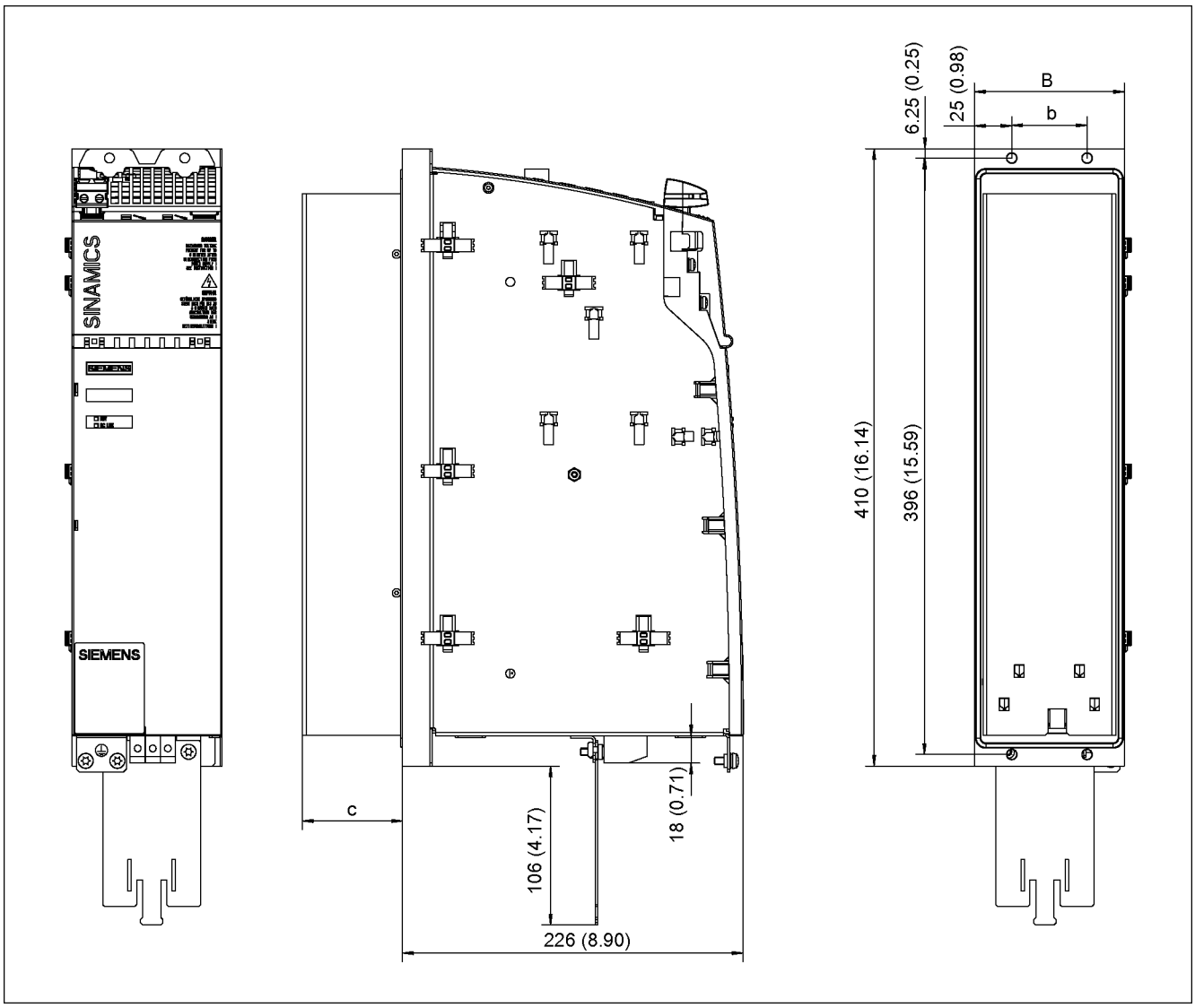


Figure 3-14 Dimension drawing of Active Line Module with external air cooling (16 kW)

Table 3-17 Dimensions of Active Line Module with external air cooling (16 kW)

Line Module type	Order number	B [mm] (inches)	b [mm] (inches)	c [mm] (inches)	h [mm] (inches)
16 kW	6SL3130-7TE21-6AAx	100 (3.94)	50 (1.97)	66.5 (2.62)	18 (0.71)

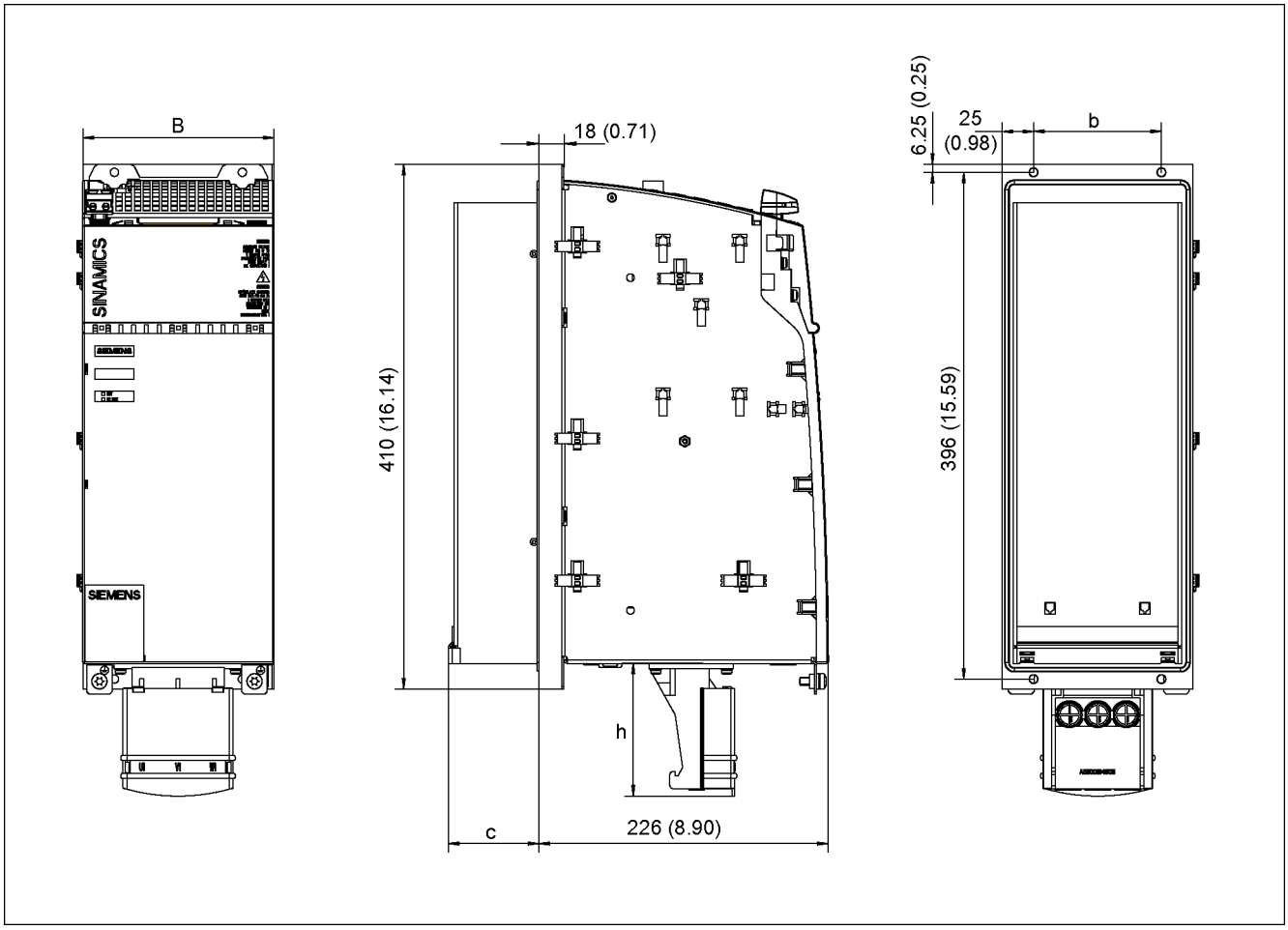


Figure 3-15 Dimension drawing of active line with external air cooling (36 kW, 55 kW, 80 kW, and 120 kW)

Table 3-18 Dimensions of active line with external air cooling (36 kW, 55 kW, 80 kW, and 120 kW)

Line Module type	Order number	B [mm] (inches)	b [mm] (inches)	h [mm] (inches)	c [mm] (inches)
36 kW	6SL3136-7TE23-6AAx	150 (5.91)	100 (3.94)	105 (4.13)	71 (2.80)
55 kW	6SL3136-7TE25-5AAx	200 (7.87)	150 (5.91)	105 (4.13)	92 (3.62)

3.3.5 Installation

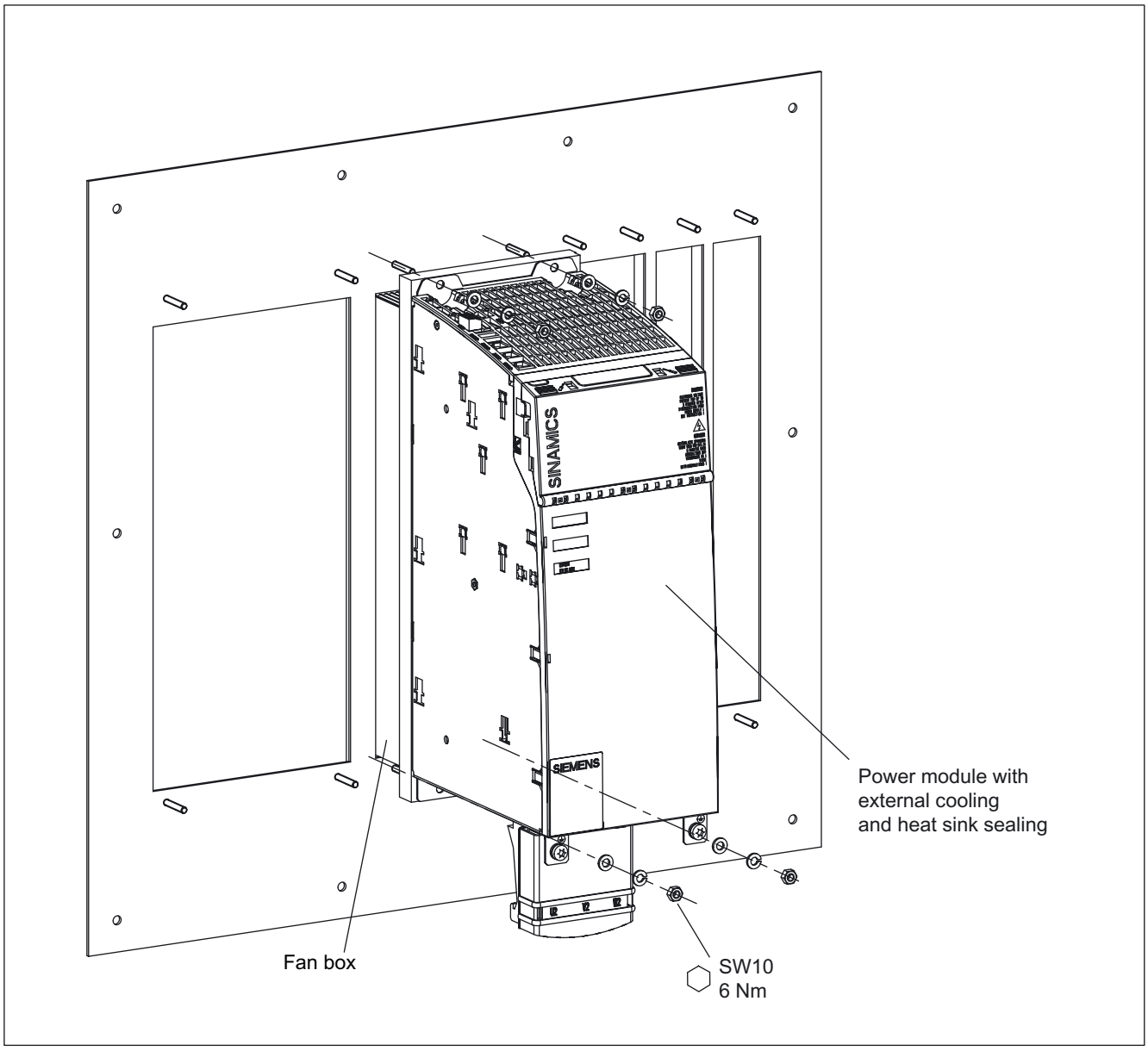


Figure 3-16 Example: installing the power module with external air cooling

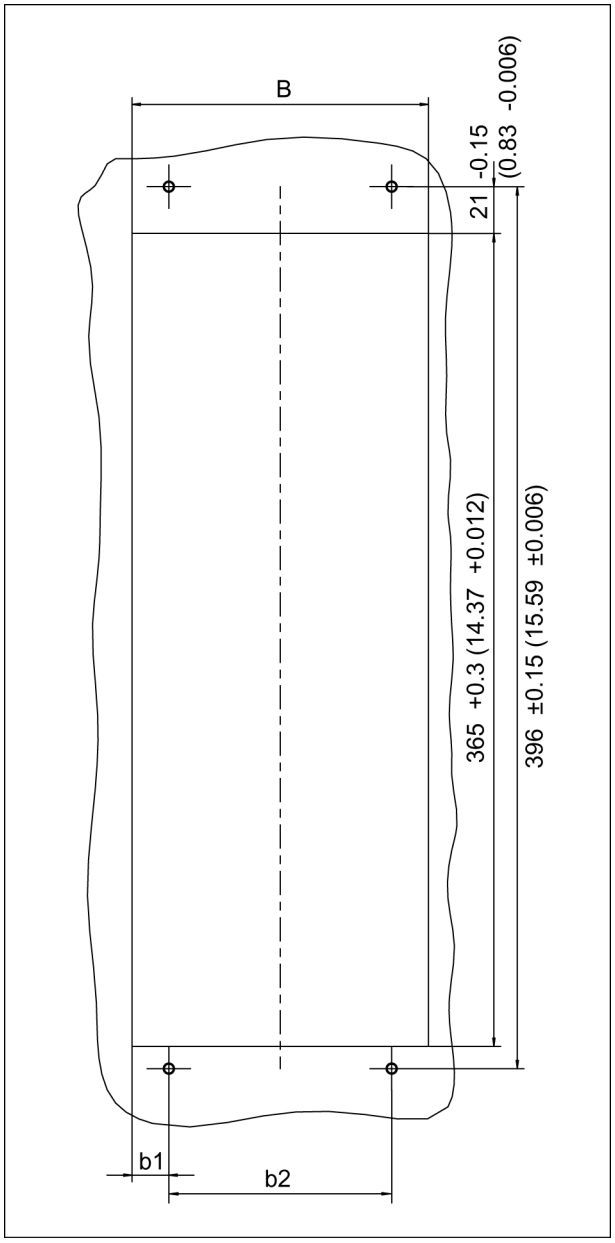


Figure 3-17 Installation openings for the power module with external air cooling

Table 3-19 Dimensions of the installation openings for the power module with external air cooling

Module width	B [mm] (inches)	b1 [mm] (inches)	b2 [mm] (inches)
50 mm	41.5 + 0.3 (1.63 + 0.012)	20.75 +0.15 (0.82 +0.006)	0
100 mm	89.5 + 0.3 (3.52 + 0.012)	19.75 +0.15 (0.78 +0.006)	50 ± 0.15 (1.97 ± 0.006)
150 mm	133 + 0.3 (5.24 + 0.012)	16.5 +0.15 (0.65 +0.006)	100 ± 0.15 (3.94 ± 0.006)
200 mm	173 + 0.3 (6.81 + 0.012)	11.5 +0.15 (0.45 +0.006)	150 ± 0.15 (5.91 ± 0.006)

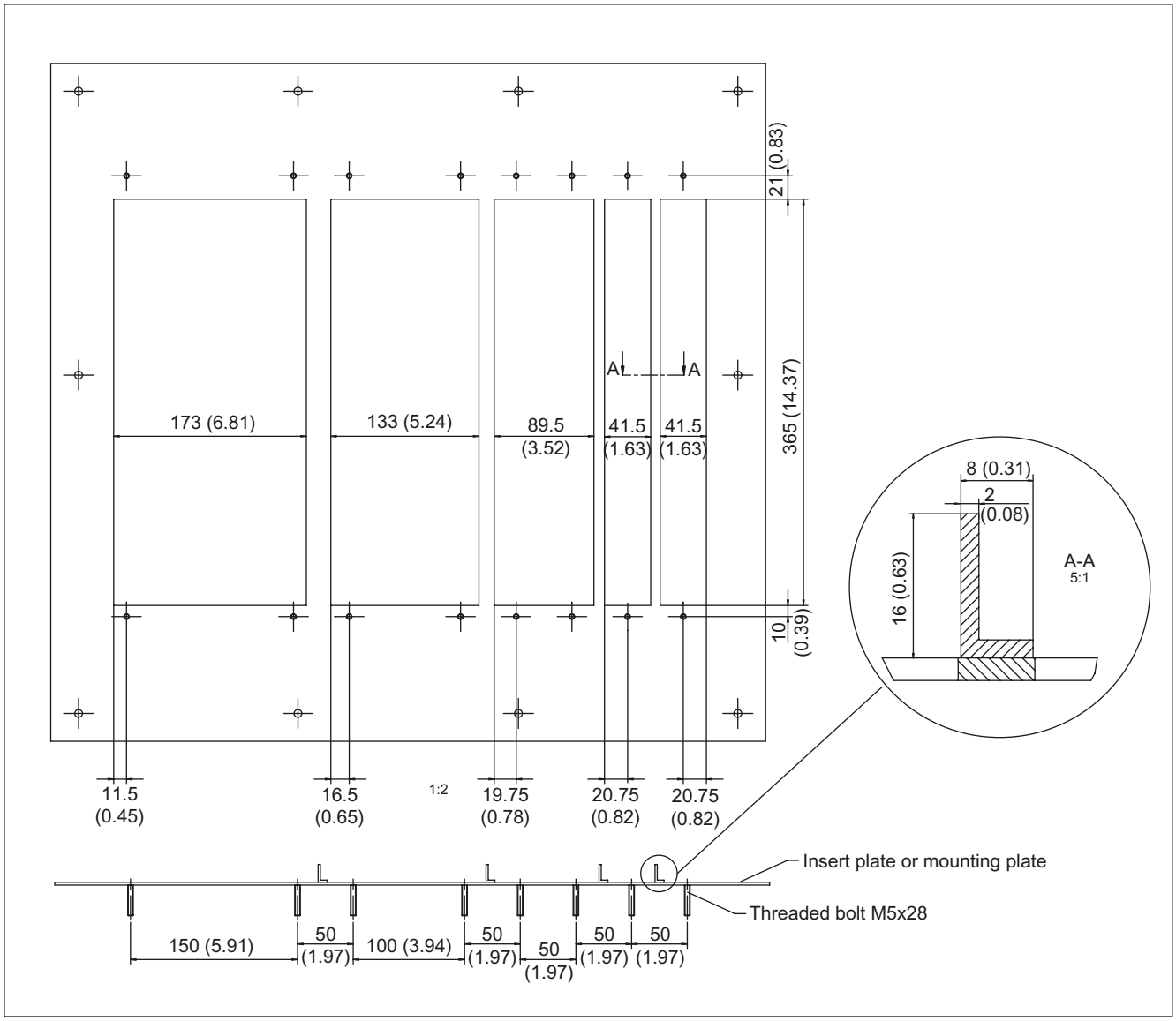


Figure 3-18 Example: mounting plate with a drive line-up

When installing the module, you must ensure that the module seal is tight all round. The cross-pieces must be sufficiently stable.

If required, we recommend that you reinforce the cross-pieces for the recesses.

In our example, the cross-pieces have been reinforced using brackets to EN 755-9.

Any means necessary can be used to secure the bracket to the insert plate.

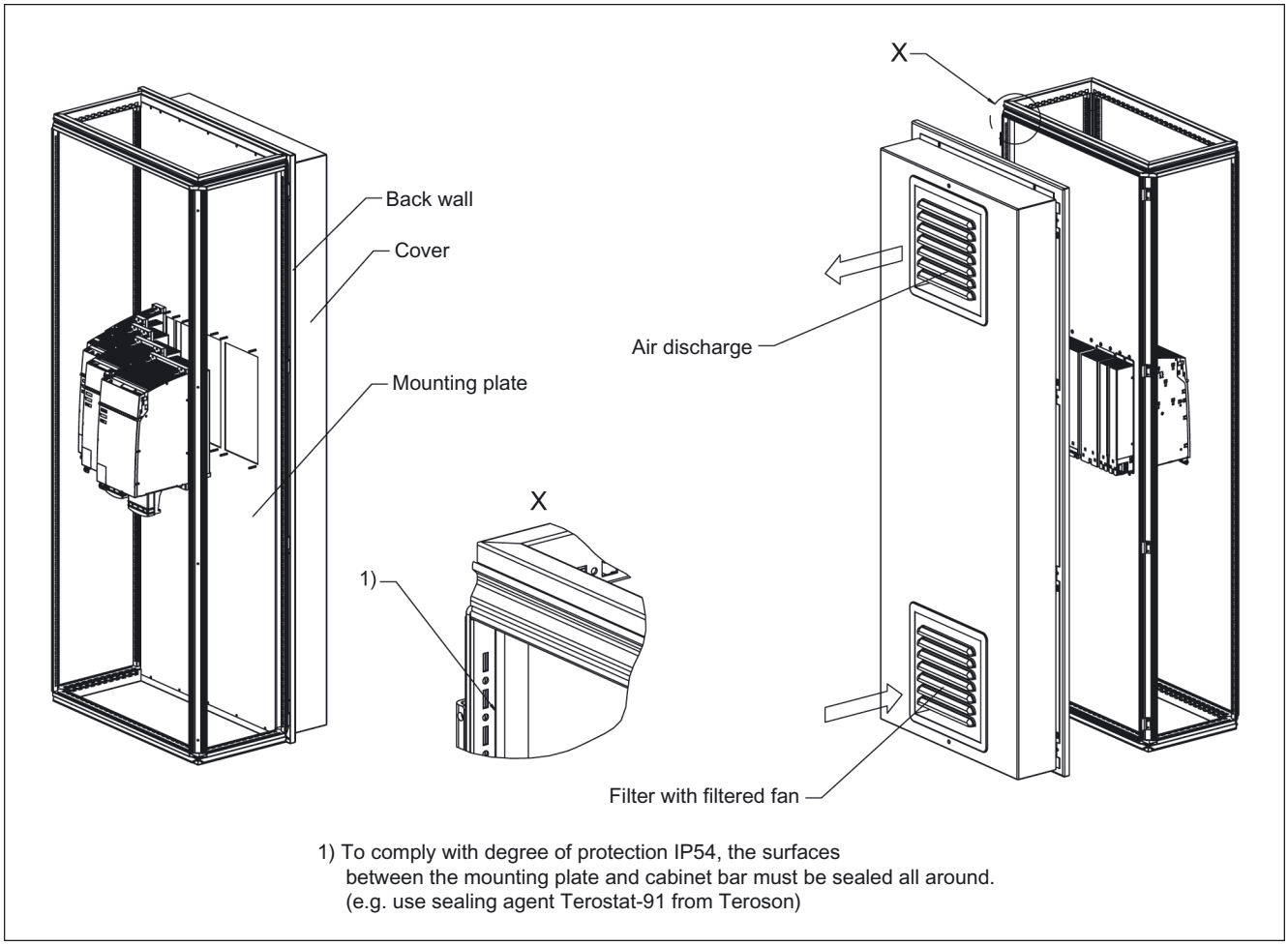


Figure 3-19 Example 1: installation in cabinet with mounting plate

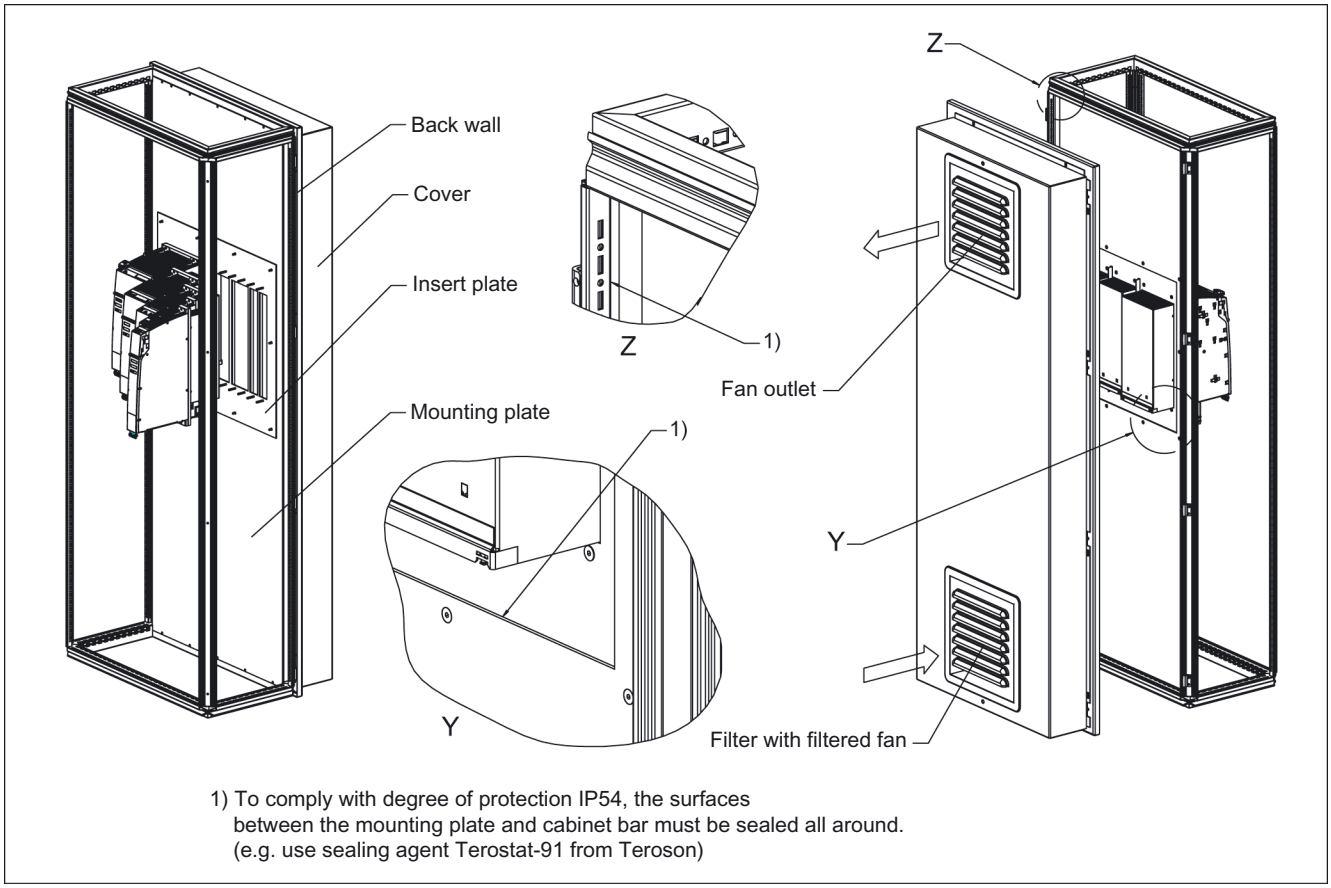


Figure 3-20 Example 2: installation in cabinet with mounting plate

We recommend that you attach a cover and filtered fan to the cabinet.

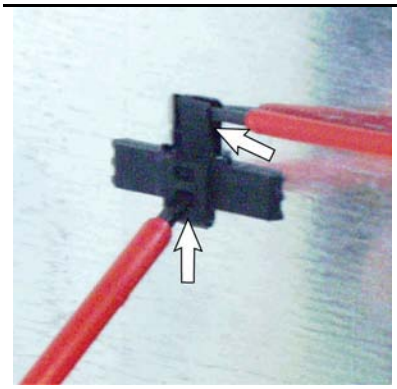
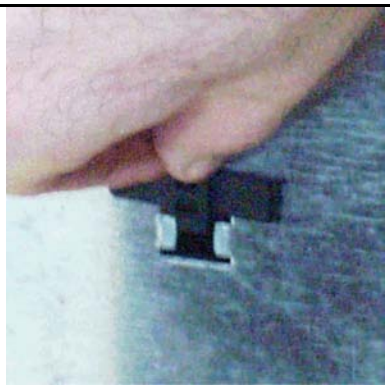
The filtered fan must be fitted in such a way that the cooling air required by the drive line-up is not restricted. This can be determined by establishing the total cooling air required by the individual components. This information is available in the technical specifications.

Note

If the cooling air requirement is not covered by the filtered fan, the components cannot output their specified power.
The filter must be serviced at regular intervals.

Removing the holders for securing the control unit

If an additional component is to be flush-mounted to the left of the component, the holders for securing the control unit must be removed.

		
Use suitable tools to lift the latching device and push up the holder.	Remove the holder.	The holder removed

3.3.6 Electrical connection

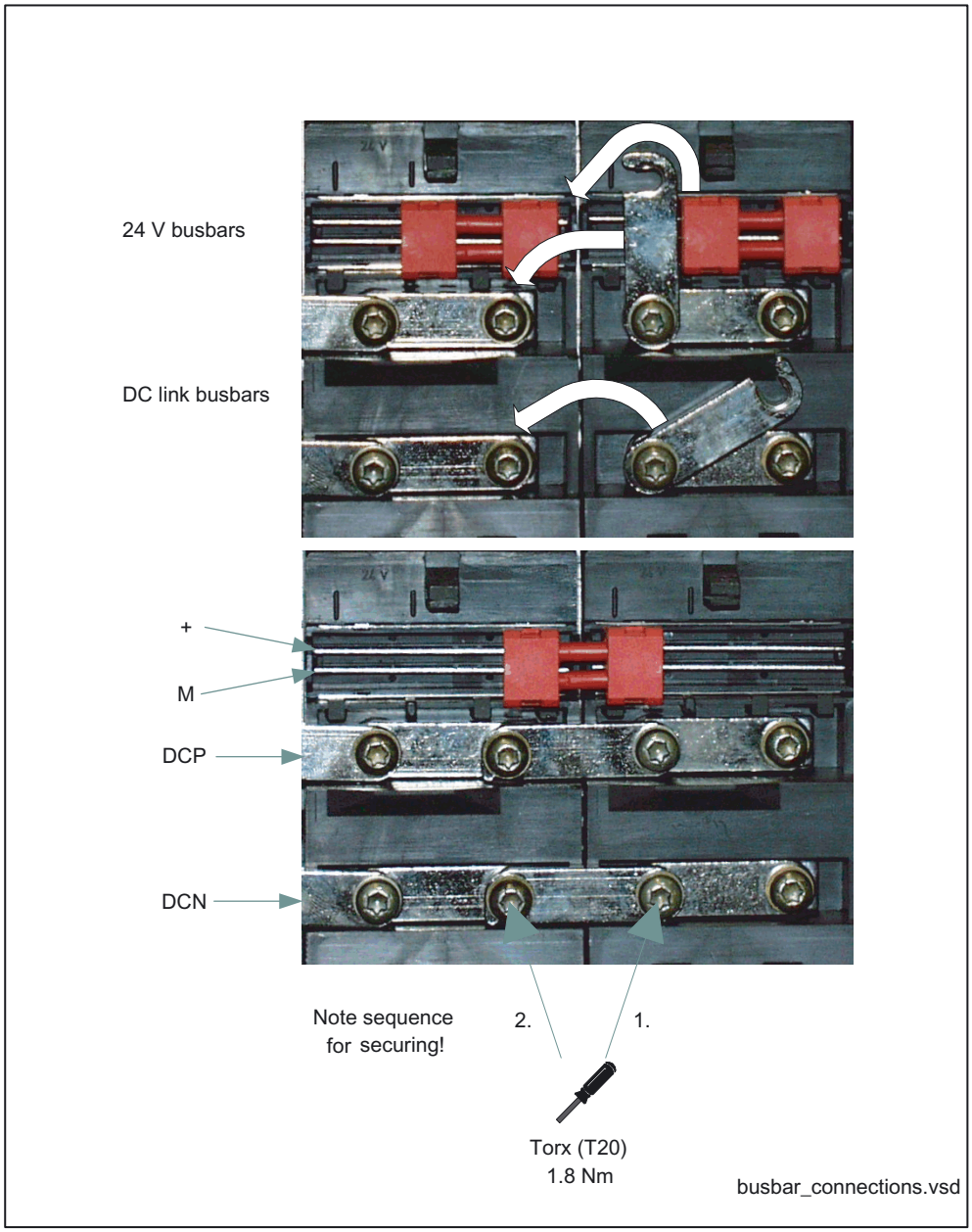


Figure 3-21 Busbar connections for booksize components

3.3.7 Technical specifications

Table 3-20 Technical specifications of Active Line Modules

Internal air cooling	**6SL3130–**	**7TE21–6AAx**	**7TE23–6AAx**	**7TE25–5AAx**
Rated power	**kW**	**16**	**36**	**55**
Supply:				
Rated power (S1)[1]	kW (Pn)	16	36	55
Power rating (S6-40%)[1]	kW (Ps6)	21	47	71
Peak infeed power rating[1]	kW (Pmax)	35	70	91
Regenerative feedback:				
Continuous feedback power rating	kW	16	36	55
Peak feedback power rating	kW	35	70	91
Connection voltages:				
Line voltage	V_{ACrms}	3AC 380 -10% to 3AC 480 +10% (-15% < 1 min)		
Line frequency	Hz	47 to 63 Hz		
Electronics power supply	V_{DC}	24 (20.4 - 28.8)		
DC link voltage	V_{DC}	510 - 750		
Overvoltage trip threshold	V_{DC}	820 ± 2%		
Undervoltage trip threshold	V_{DC}	360 ± 2%		
Supply currents:				
at 380 V_{AC}	A_{AC}	26	58	88
at 480 V_{AC}/528 V_{AC}	A_{AC}	21 / 19	46 / 42	70 / 64
at 480 V; S6-40%	A_{AC}	27	60	92
Peak current (at 400 V_{AC}/480 V_{AC})	A_{AC}	54 / 45	107 / 89	139 / 116
Output currents at 600 V_{DC}:				
Rated current	A_{DC}	27	60	92
at S6-40%	A_{DC}	35	79	121
Peak current	A_{DC}	59	117	152
DC link busbar current carrying capacity	A_{DC}	100	100	200
24 V busbar current carrying capacity	A_{DC}	20	20	20
Electronics current consumption	A_{DC}	1.1	1.5	1.9
Power loss[2]	W (int./ext.)	60/200	135/495	200/700
Max. ambient temperature without derating	°C	40	40	40
Max. ambient temperature with derating	°C	55	55	55
DC link capacitance	µF	705	1 410	1 880
Charging limit	µF	20 000	20 000	20 000
Power factor	cosφ	1	1	1
Efficiency	η	0.95	0.95	0.95
Cooling air requirement	m^3/h	56	112	160
Sound pressure level	dB(A)	<60	<65	<60
Rated voltage for rated data 3 AC 380 V				
Weight	kg	8.78	13.77	To be added.

[1] The specified values apply to 380 V

[2] For an overview, see the power loss tables in Cabinet Design.

Rated duty cycles of Active Line Modules

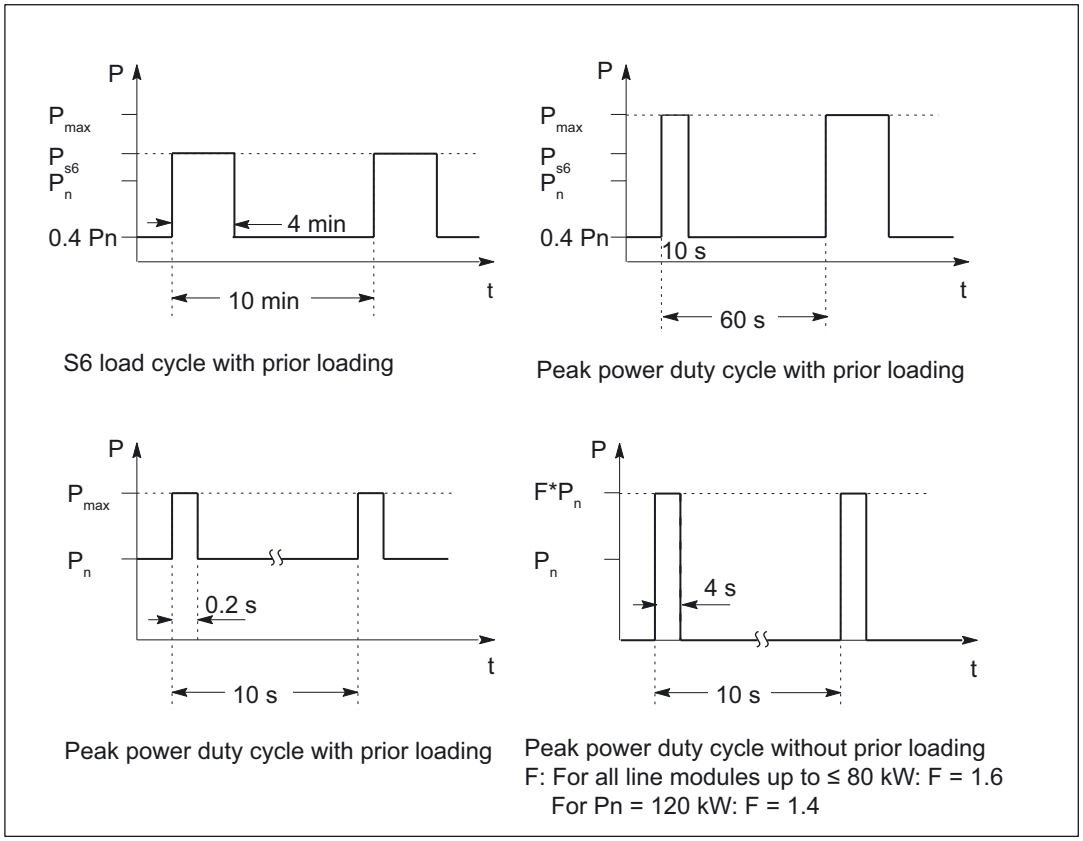


Figure 3-22 Rated duty cycles of Active Line Modules

Derating as a function of the ambient temperature

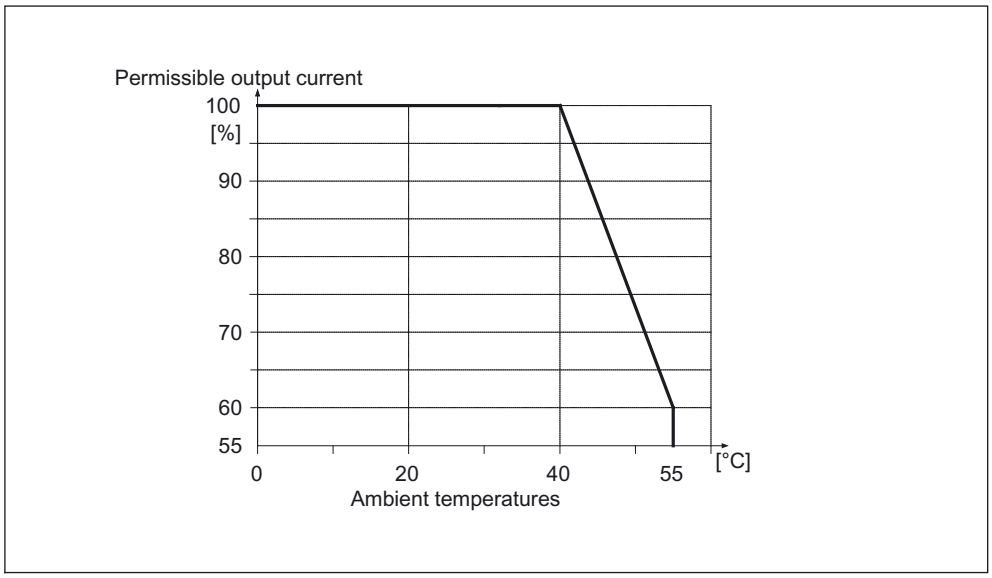


Figure 3-23 Derating as a function of the ambient temperature

Derating as a function of the installation altitude

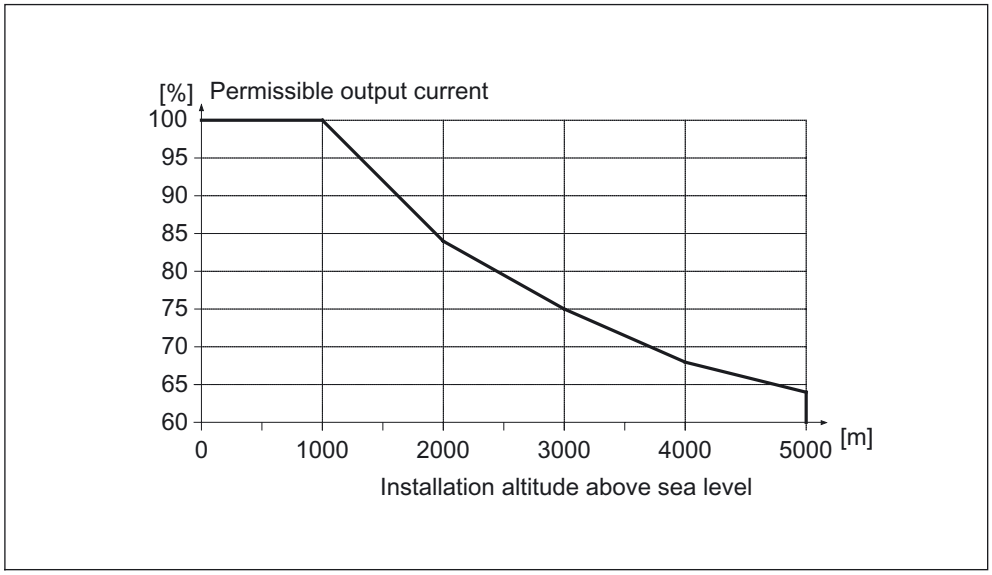


Figure 3-24 Derating as a function of the installation altitude

3.4 Smart Line Modules with Internal Air Cooling

3.4.1 Description

The Smart Line Module (SLM) is an unregulated feed/feedback unit whose AC input is connected to the supply system via a line reactor. The SLM supplies the Motor Module(s) with an unregulated DC voltage at the DC output. With the SLM, the DC link starts pre-charging as soon as the supply voltage is applied and is independent of its phase sequence direction. An optional main contactor is required for disconnecting the voltage. As regards the current waveform, the SLM in infeed mode exhibits the typical characteristic of a 6-pulse diode rectifier jumper. In feedback mode, the current waveform is square waved. Smart Line Modules are suitable for direct operation in TN, IT, and TT systems.

3.4.2 Safety Information

Warning

After disconnecting all the supply voltages, a hazardous voltage will be present in all components for another 5 minutes. The protective cover must not be opened until this time has elapsed.

When opening the protective cover for the DC link, you must activate the release. A suitable tool (e.g. screwdriver) must be used for this purpose.

The components must only be operated when the protective cover of the DC link is closed. Damaged components must not be used, otherwise this could result in secondary damage or accidents.

Warning

A sufficiently high short-circuit power is required for tripping the fuses within the predefined time in the event of a ground fault. Insufficient short-circuit power increases the time to trip beyond permissible levels (e.g. fire possible).

Caution

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

A set of labels in 12 languages is available using order number: 6SL3166-3AB00-0AAx.

Notice

The 80 mm clearances above and below the components must be observed.

Caution

The tightening torque of the DC link busbar screws (1.8 Nm) must be checked before startup.

Danger

In a supply system without regenerative feedback capability (e.g. diesel generator), the regenerative feedback capability of the Smart Line Module must be deactivated by means of a jumper between terminals X22.1 and X22.2. The braking energy must then be dissipated via an additional Braking Module with a braking resistor in the drive line-up.

Caution

The total length of the power cables (motor supply cables and DC link cables) must not exceed 350 m.

Notice

Operation without the line reactor is not permissible.

Caution

The ratio of line short-circuit power to rated power must be ≧ 70.

Caution

The DC link busbar in a drive line-up must be sealed at both ends using DC link side covers (order no.: 6SL3162-5AA00-0AA0).

3.4.3 Interface Description

3.4.3.1 Overview

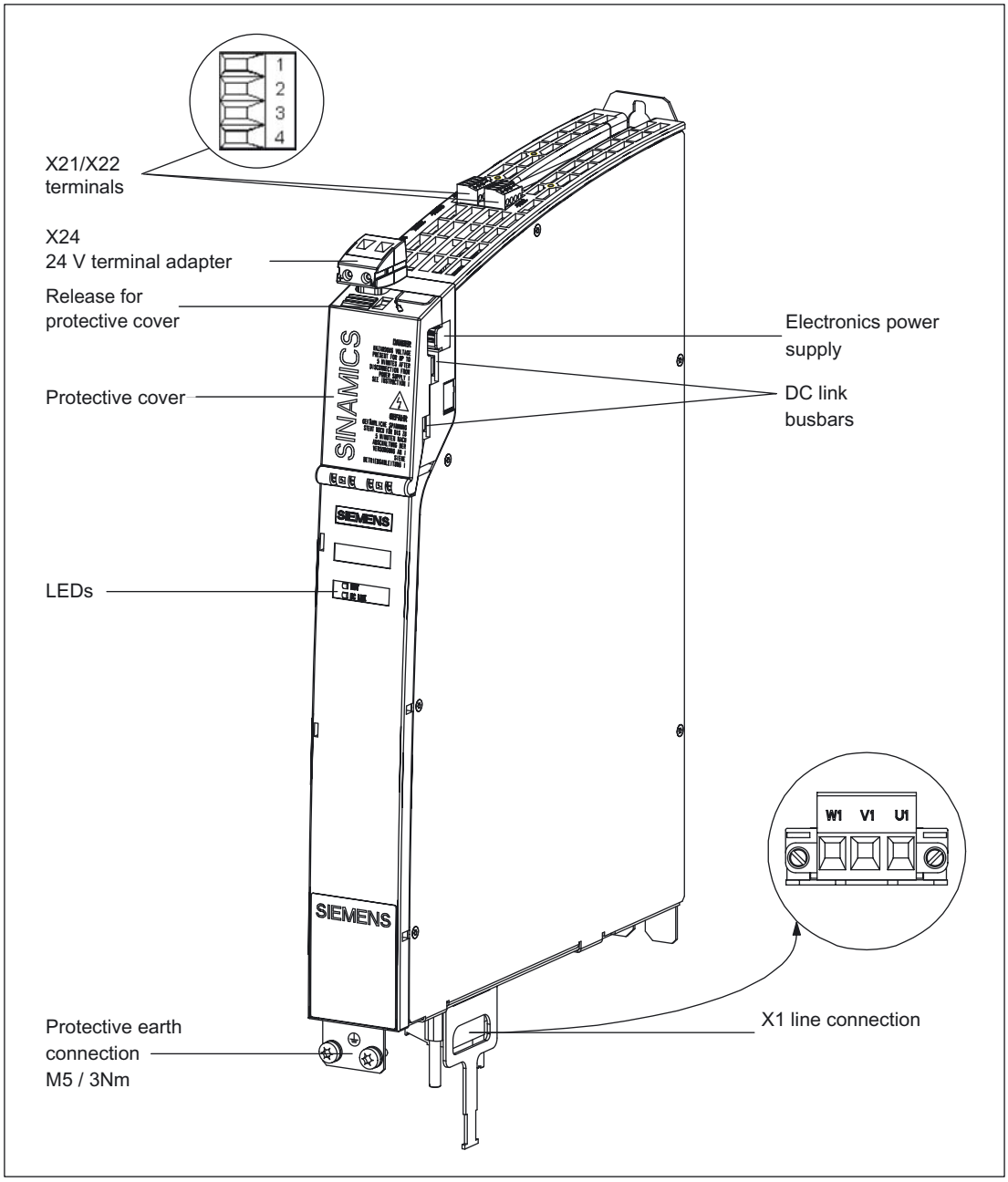
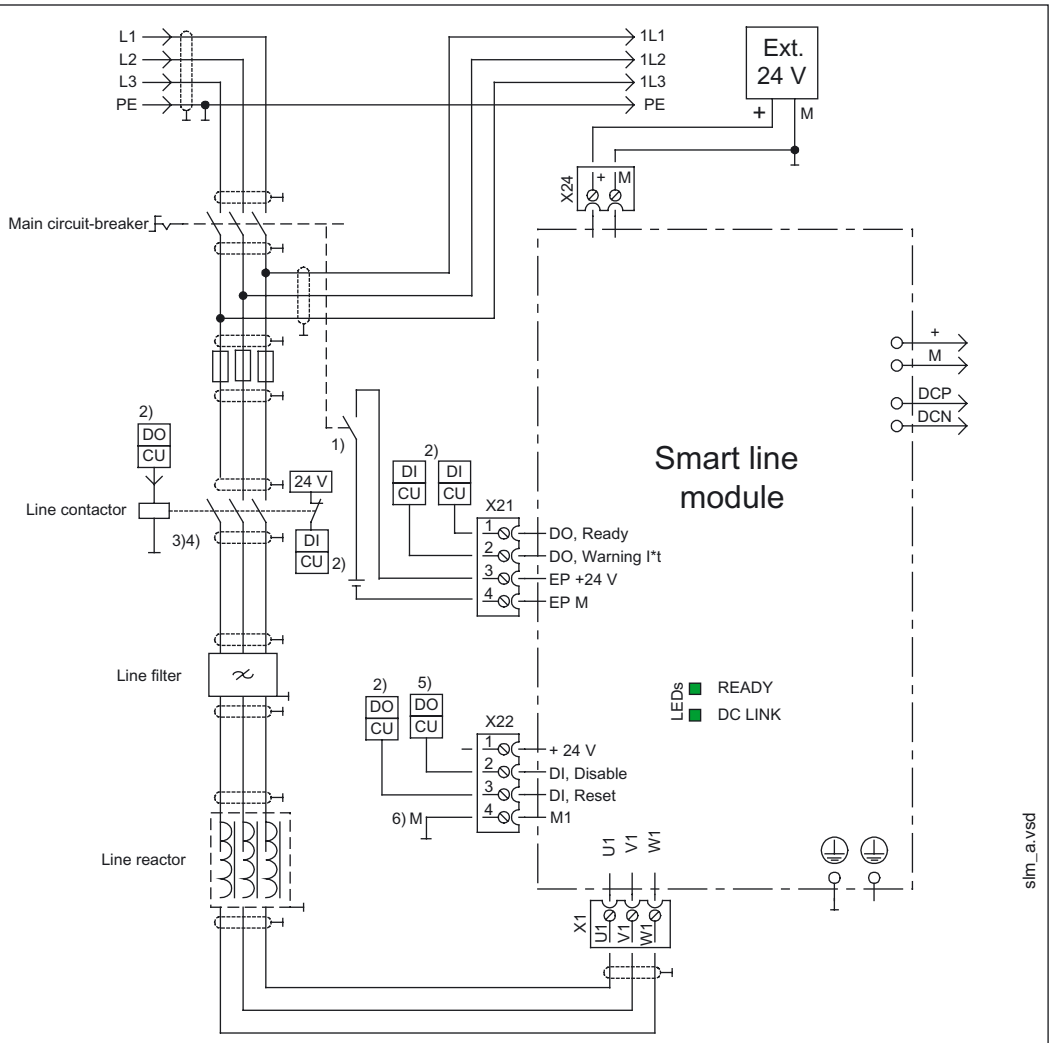


Figure 3-25 Smart Line Module with internal air cooling (example 5 kW)

3.4.3.2 Connection example

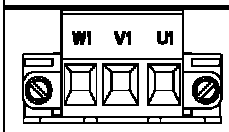
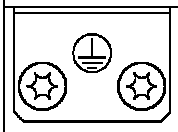


1) Leading break contact t>10ms for operation, 24 V DC and ground must be applied.
2) DI/DO (controlled by the control unit)
3) No additional consumer permitted downstream of line contactor
4) The current carrying capacity of the DO must be taken into account
An output interface element may have to be used
5) DO high, feedback deactivated (for permanent deactivation, a jumper can be installed between X22 pins 1 and 2)
6) X22 pin 4 must be connected to ground (ext. 24 V).

Figure 3-26 Example connection of Smart Line Module

3.4.3.3 X1 line connection

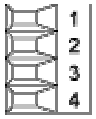
Table 3-21 Terminal block X1 of Smart Line Module (5 kW and 10 kW)

	Terminal	Technical specifications
	U1	Supply voltage:
	V1	480 V 3AC -10% to 480 V 3AC +10% (-15% < 1 min) at 47 Hz to 63 Hz
	W1	Max. connectable cross-section: 6 mm^2
		Type: Screw terminal 5 (see Connection Methods)
	PE connection	Threaded hole M5/3 Nm [1]

[1] for ring cable lugs to DIN 46234

3.4.3.4 X21 terminals: Smart Line Module

Table 3-22 Terminal block X21

	Terminal	Name	Technical specifications
	1	DO: Ready	Checkback: smart line module ready The signal switches to high level when the following conditions have been met: • Electronics power supply (X24) OK • DC link is pre-charged • Pulses enabled (X21.3/.4) • No overtemperature • No overcurrent switch-off
	2	DO: Pre Warning	Prewarning threshold overtemperature / I x t When 80% of the maximum temperature of the Smart Line Module is exceeded, a high signal is output.
	3	DI: Enable pulses	Voltage 24 V DC Current consumption: 10 mA Isolated input
	4	DI: Enable pulses ground	
Max. connectable cross-section: 1.5 mm^2 Type: Screw terminal 1 (see Spring-Loaded Terminals/Screw Terminals)			

Note

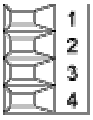
For operation, 24 V DC must be connected to terminal 3 and ground to terminal 4. When removed, pulse inhibit is activated and the feedback is deactivated.

Notice

The DC link is also live when the pulses are inhibited by means of EP. No electrical isolation exists. If electrical isolation is required, a line contactor must be installed.

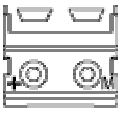
3.4.3.5 X22 terminals: Smart Line Module

Table 3-23 Terminal block X22

	Terminal	Name	Technical specifications
	1	24 V power supply	Electronics power supply for controlling digital inputs X22.2 and 3.
	2	DI: Disable Regeneration	Deactivate feedback No power is supplied back to the network from the DC link. The regenerative energy of the motors may have to be reduced using a combination of the Braking Module and braking resistor.
	3	DI: Reset	Reset faults (positive edge)
	4	Ground	Electronic ground
Max. connectable cross-section: 1.5 mm^2 Type: Screw terminal 1 (see Connection Methods)			

3.4.3.6 X24 24 V terminal adapter

Table 3-24 Terminal block X24

	Terminal	Name	Technical specifications
	+	24 V power supply	24 V DC supply voltage
	M	Ground	Electronic ground
The 24 V terminal adapter is supplied as standard Max. connectable cross-section: 6 mm^2 Type: Screw terminal 5 (see Connection Methods)			

3.4.3.7 Meaning of the LEDs on the Smart Line Module

Table 3-25 Meaning of the LEDs on the Smart Line Module

LED	Color	State	Description
READY	Green	Continuous	Operation
	Yellow	Continuous	Pre-charging not yet complete; bypass relay dropped out
	Red	Continuous	Overtemperature/overcurrent switch-off, or Electronics power supply outside permissible tolerance range
DC LINK		OFF	Electronics power supply outside permissible tolerance range
	Yellow	Continuous	DC link voltage within permissible tolerance range
	Red	Continuous	DC link voltage outside permissible tolerance range

Cause and rectification of faults

The following reference contains information about the cause and rectification of faults:

Reference: /IH1/ SINAMICS S120 Commissioning Manual

3.4.4 Dimension Drawing

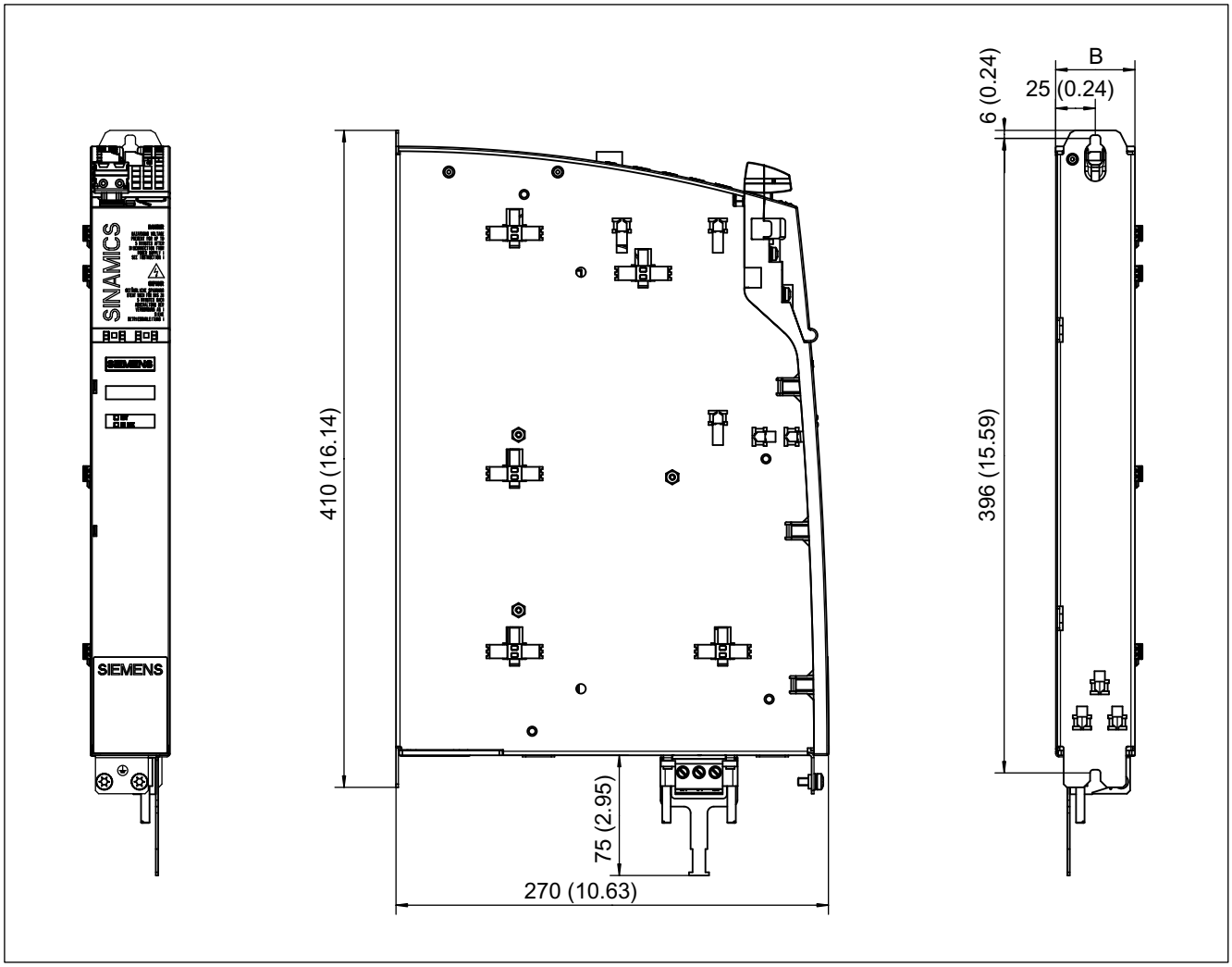


Figure 3-27 Dimension drawing of Smart Line Module with internal air cooling (5 kW and 10 kW)

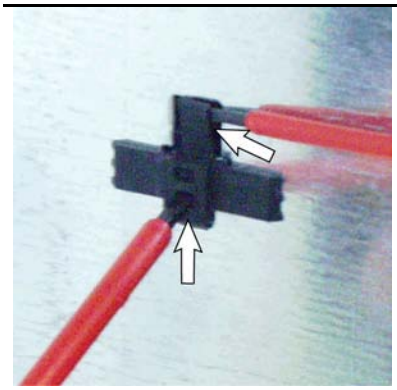
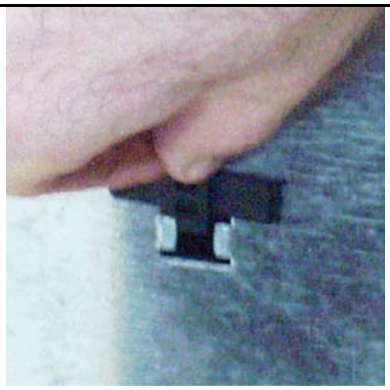
Table 3-26 Dimensions of Smart Line Module with internal air cooling (5 kW and 10 kW)

Line Module type	Order number	B [mm] (inches)
5 kW	6SL3130-6AE15-0AAx	50 (1.97)
10 kW	6SL3130-6AE21-0AAx	50 (1.97)

3.4.5 Installation

Removing the holders for securing the control unit

If an additional component is to be flush-mounted to the left of the component, the holders for securing the control unit must be removed.

		
Use suitable tools to lift the latching device and push up the holder.	Remove the holder.	The holder removed

3.4.6 Electrical Connection

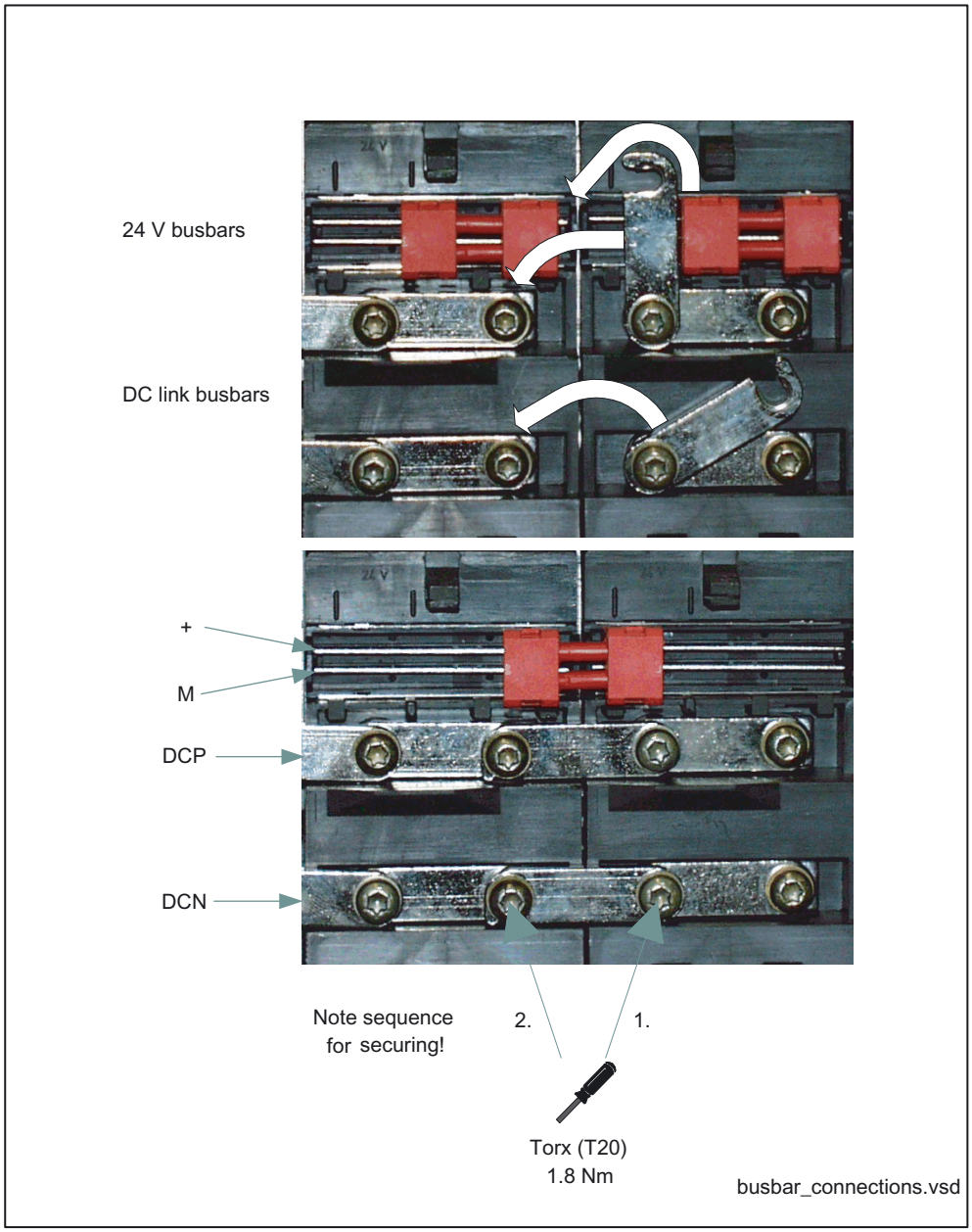


Figure 3-28 Busbar connections for booksize components

3.4.7 Technical Specifications

Table 3-27 Technical specifications for Smart Line Modules in booksize format with internal air cooling

Internal air cooling	**6SL3130–**	**6AE15–0AAx**	**6AE21–0AAx**
Rated power	**kW**	**5**	**10**
Supply:			
Rated power (S1)[1]	kW (Pn)	5	10
S6 infeed			
Power rating (S6-40%)[1]	kW (Ps6)	6.5	13
Peak infeed power rating[1]	kW (Pmax)	10	20
Regenerative feedback:			
Continuous feedback power rating	kW	5	10
Peak feedback power rating	kW	10	20
Connection voltages:			
Line voltage	V_{AC}	3AC 380 -10% to 3AC 480 +10% (-15% < 1 min)	
Line frequency	Hz	47 to 63	
Electronics power supply	V_{DC}	24 (20.4 - 28.8)	
DC link voltage	V_{DC}	510 – 750	
Overvoltage trip threshold	V_{DC}	820 ± 2%	
Undervoltage trip threshold	V_{DC}	360 ± 2%	
Supply currents:			
at 380 V_{AC}	A_{AC}	12	24
at 480 V_{AC}/528 V_{AC}	A_{AC}	9.3/8.5	18/16.5
at 480 V; S6-40%	A_{AC}	12	24
Peak current (at 400 V_{AC}/480 V_{AC})	A_{AC}	22/18.5	44/37
Output currents at 600 V_{DC}:			
Rated current	A_{DC}	8.3	16.6
at S6-40%	A_{DC}	11	22
Peak current	A_{DC}	16.6	33.2
26 V DC busbar DC link busbar	A_{DC}	100	100
26 V DC busbar current carrying capacity	A_{DC}	20	20
Electronics current consumption	A_{DC}	1.0	1.3
Power loss[2]	W	89	170
Max. ambient temperature without derating	°C	40	40
Max. ambient temperature with derating	°C	55	55
DC link capacitance	µF	220	330
Charging limit	µF	6000	6000
Power factor	cos φ	1	1
Efficiency	η	0.98	0.98
Cooling method		Internal fan	Internal fan
Sound pressure level	dB(A)	<60	<60
Cooling air requirement	m^3/h	29.6	29.6
Rated voltage for rated data 3 AC 380 V			
Weight	kg	4.68	4.78

[1] The specified values apply to 380 V

[2] For an overview, see the power loss tables in Cabinet Design.

Rated duty cycles of Smart Line Modules

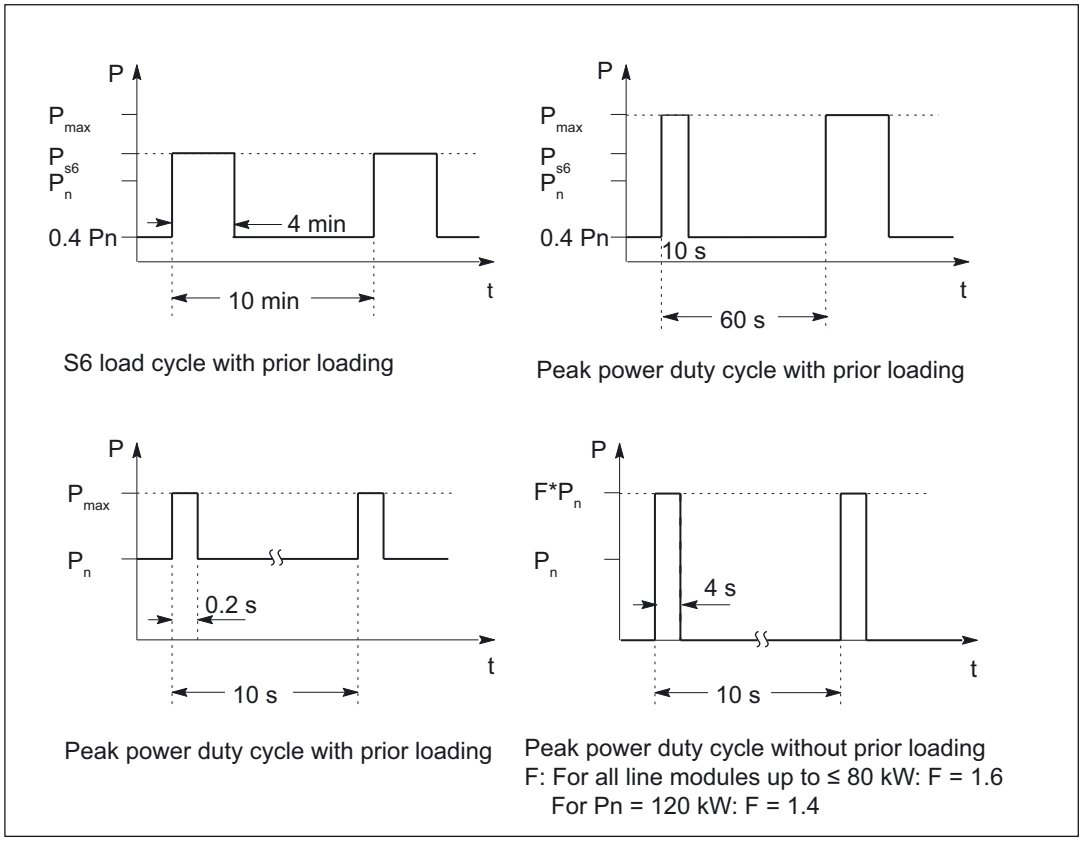


Figure 3-29 Rated duty cycles of Smart Line Modules

Derating as a function of the ambient temperature

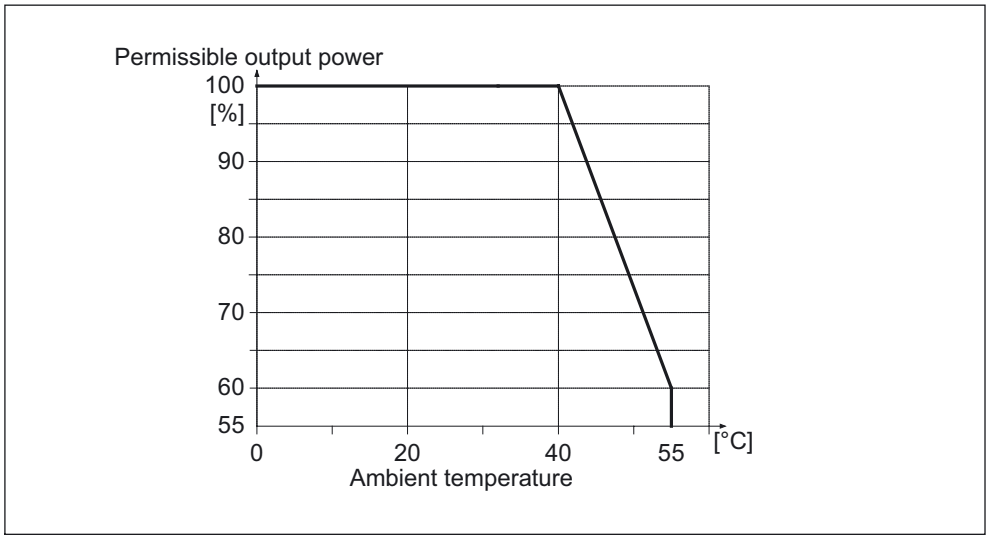


Figure 3-30 Derating as a function of the ambient temperature

Derating as a function of the installation altitude

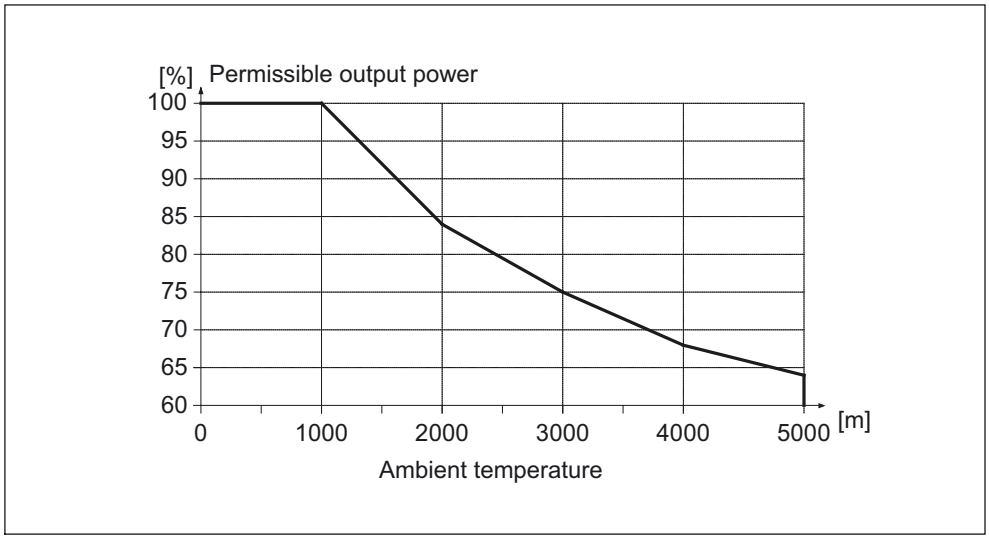


Figure 3-31 Derating as a function of the installation altitude

3.5 Smart Line Modules with External Air Cooling

3.5.1 Description

The Smart Line Module (SLM) is an unregulated feed/feedback unit whose AC input is connected to the supply system via a line reactor. The SLM supplies the Motor Module(s) with an unregulated DC voltage at the DC output. With the SLM, the DC link starts pre-charging as soon as the supply voltage is applied and is independent of its phase sequence direction. An optional main contactor is required for disconnecting the voltage. The SLM in infeed mode exhibits the typical waveform of a 6-pulse diode rectifier jumper. In feedback mode, the current waveform is square waved. Smart Line Modules are suitable for direct operation in TN, IT, and TT systems.

External air cooling uses the "through-hole" method. This is a cooling method for SINAMICS power units that is only available for booksize devices. The power unit and its heat sink can be inserted in a rectangular knockout at the rear of the switching cabinet and mounted with a seal. The heat sink fins and the fan (included in the scope of supply) project beyond the rear of the switching cabinet and the heat is dissipated outside the switching cabinet or in a separate air duct.

3.5.2 Safety Information

Warning

After disconnecting all the supply voltages, a hazardous voltage will be present in all components for another 5 minutes. The protective cover must not be opened until this time has elapsed.

When opening the protective cover for the DC link, you must activate the release. A suitable tool (e.g. screwdriver) must be used for this purpose.

The components must only be operated when the protective cover of the DC link is closed. Damaged components must not be used, otherwise this could result in secondary damage or accidents.

Warning

A sufficiently high short-circuit power is required for tripping the fuses within the predefined time in the event of a ground fault. Insufficient short-circuit power increases the time to trip beyond permissible levels (e.g. fire possible).

Caution

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

A set of labels in 12 languages is available using order number: 6SL3166-3AB00-0AAx.

Notice

The 80 mm clearances above and below the components must be observed.

Caution

The tightening torque of the DC link busbar screws (1.8 Nm) must be checked before startup.

Danger

In a supply system without regenerative feedback capability (e.g. diesel generator), the regenerative feedback capability of the Smart Line Module must be deactivated by means of a jumper between terminals X22.1 and X22.2. The braking energy must then be dissipated via an additional Braking Module with a braking resistor in the drive line-up.

Caution

The total length of the power cables (motor supply cables and DC link cables) must not exceed 350 m.

Notice

The external air cooling can cause the fans and the heat sink to become heavily contaminated, which may trigger the temperature monitor in the power section. The fans and heat sink must be checked for contamination at regular intervals and, if necessary, cleaned.

Note

After installation, the seal on the rear of the device must be checked to ensure that it is tight. Additional sealing can be used, if necessary.

Note

The mounting frames can only be used if the cabinet has an unpainted metal surface.

Notice

Operation without the line reactor is not permissible.

Caution

The ratio of line short-circuit power to rated power must be $\geqq 70$.

Caution

The DC link busbar in a drive line-up must be sealed at both ends using DC link side covers (order no.: 6SL3162-5AA00-0AA0).

3.5.3 Interface description

3.5.3.1 Overview

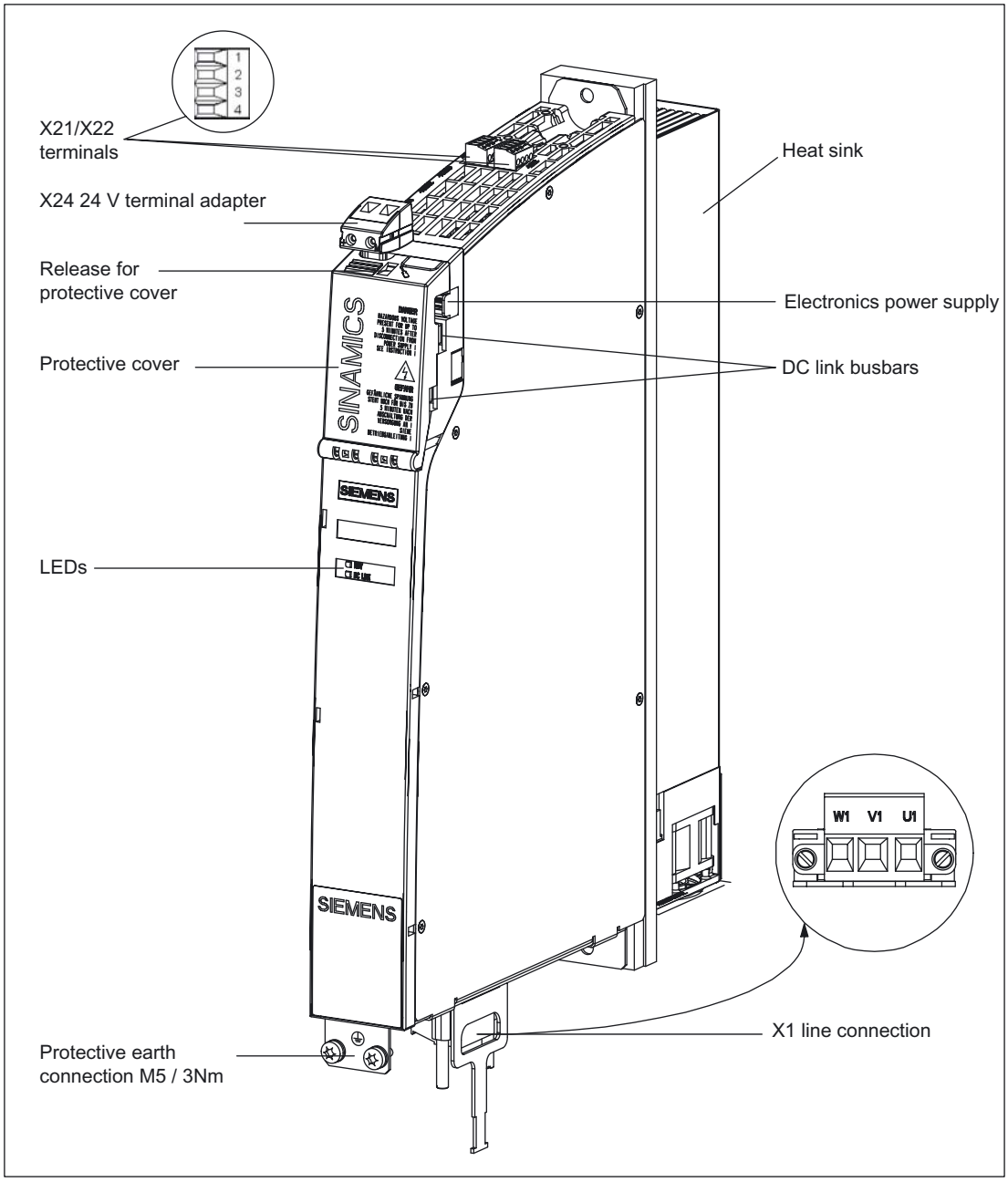
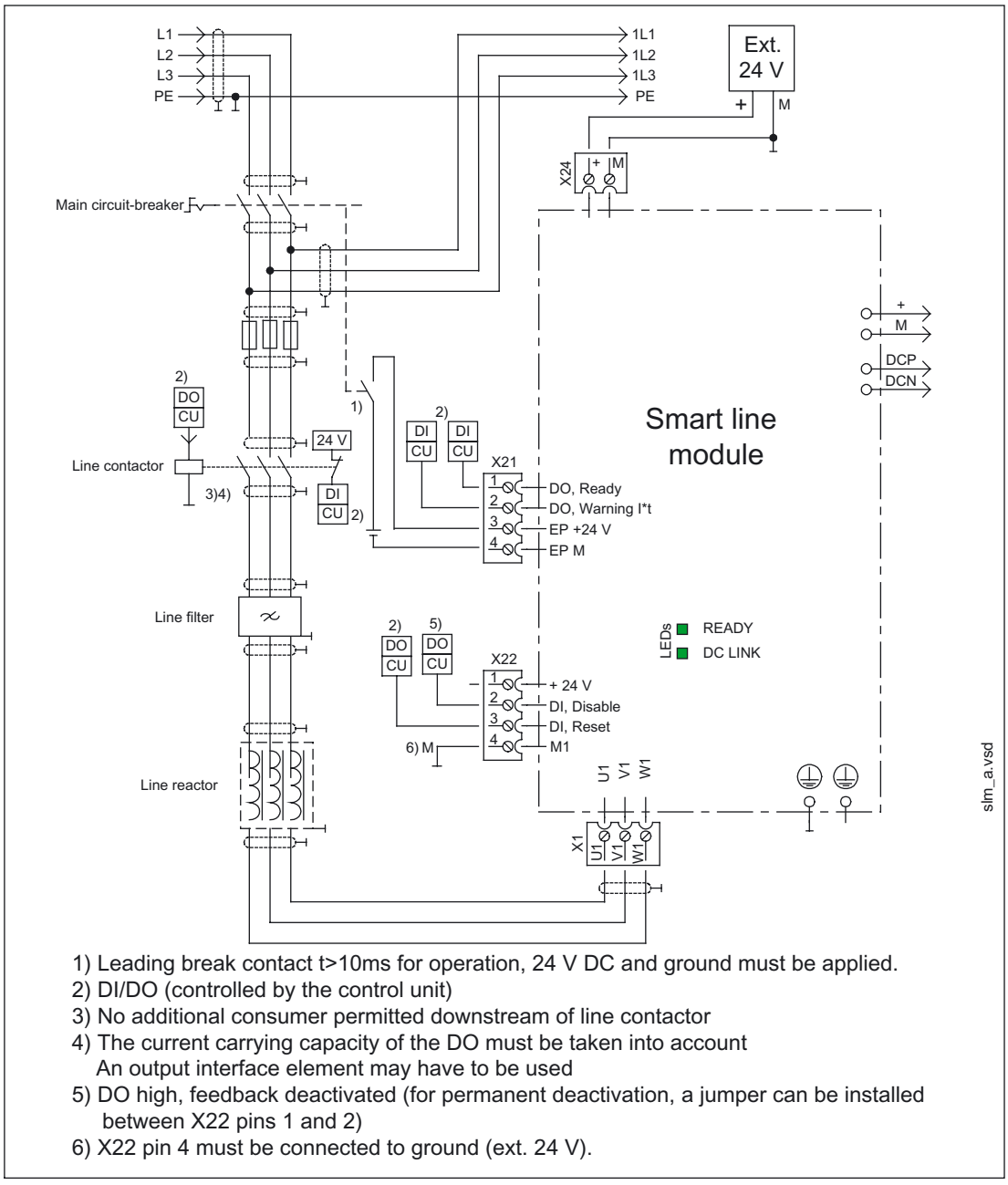


Figure 3-32 Smart Line Module with external air cooling (example 5 kW)

3.5.3.2 Connection example

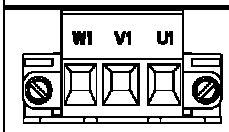
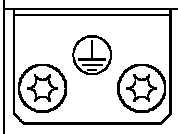


1) Leading break contact t>10ms for operation, 24 V DC and ground must be applied.
2) DI/DO (controlled by the control unit)
3) No additional consumer permitted downstream of line contactor
4) The current carrying capacity of the DO must be taken into account
   An output interface element may have to be used
5) DO high, feedback deactivated (for permanent deactivation, a jumper can be installed between X22 pins 1 and 2)
6) X22 pin 4 must be connected to ground (ext. 24 V).

Figure 3-33 Example connection of Smart Line Module

3.5.3.3 X1 line connection

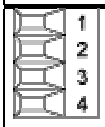
Table 3-28 Terminal block X1 of Smart Line Module (5 kW and 10 kW)

	Terminal	Technical specifications
	U1	Supply voltage:
	V1	480 V 3AC -10% to 480 V 3AC +10% (-15% < 1 min) at 47 Hz to 63 Hz
	W1	Max. connectable cross-section: 6 mm^2
		Type: Screw terminal 5 (see Connection Methods)
	PE connection	Threaded hole M5/3 Nm [1]

[1] for ring cable lugs to DIN 46234

3.5.3.4 X21 terminals: Smart Line Module

Table 3-29 Terminal block X21

	Terminal	Name	Technical specifications
	1	DO: Ready	Checkback: Smart Line Module ready The signal switches to high level when the following conditions have been met: • Electronics power supply (X24) OK • DC link is pre-charged • Pulses enabled (X21.3/.4) • No overtemperature • No overcurrent switch-off
	2	DO: Pre Warning	Prewarning threshold overtemperature / I x t When 80% of the maximum temperature of the Smart Line Module is exceeded, a high signal is output.
	3	DI: Enable pulses	Voltage 24 V DC Current consumption: 10 mA Isolated input
	4	DI: Enable pulses ground	
Max. connectable cross-section: 1.5 mm^2 Type: Screw terminal 1 (see Spring-Loaded Terminals/Screw Terminals)			

Note

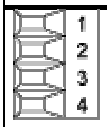
For operation, 24 V DC must be connected to terminal 3 and ground to terminal 4. When removed, pulse inhibit is activated and the feedback is deactivated.

Notice

The DC link is also live when the pulses are inhibited by means of EP. No electrical isolation exists. If electrical isolation is required, a line contactor must be installed.

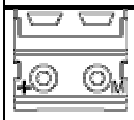
3.5.3.5 X22 terminals: Smart Line Module

Table 3-30 Terminal block X22

	Terminal	Name	Technical specifications
	1	24 V power supply	Electronics power supply for controlling digital inputs X22.2 and 3.
	2	DI: Disable Regeneration	Deactivate feedback No power is supplied back to the network from the DC link. The regenerative energy of the motors may have to be reduced using a combination of the Braking Module and braking resistor.
	3	DI: Reset	Reset faults (positive edge)
	4	Ground	Electronic ground
Max. connectable cross-section: 1.5 mm^2 Type: Screw terminal 1 (see Connection Methods)			

3.5.3.6 X24 24 V terminal adapter

Table 3-31 Terminal block X24

	Terminal	Name	Technical specifications
	+	24 V power supply	24 V DC supply voltage
	M	Ground	Electronic ground
The 24 V terminal adapter is supplied as standard Max. connectable cross-section: 6 mm^2 Type: Screw terminal 5 (see Connection Methods)			

3.5.3.7 Meaning of the LEDs on the Smart Line Module

Table 3-32 Meaning of the LEDs on the Smart Line Module

LED	Color	State	Description
READY	Green	Continuous	Operation
	Yellow	Continuous	Pre-charging not yet complete; bypass relay dropped out
	Red	Continuous	Overtemperature/overcurrent switch-off, or Electronics power supply outside permissible tolerance range
DC LINK		OFF	Electronics power supply outside permissible tolerance range
	Yellow	Continuous	DC link voltage within permissible tolerance range
	Red	Continuous	DC link voltage outside permissible tolerance range

Cause and rectification of faults

The following reference contains information about the cause and rectification of faults:

Reference: /IH1/ SINAMICS S120 Commissioning Manual

3.5.4 Dimension Drawing

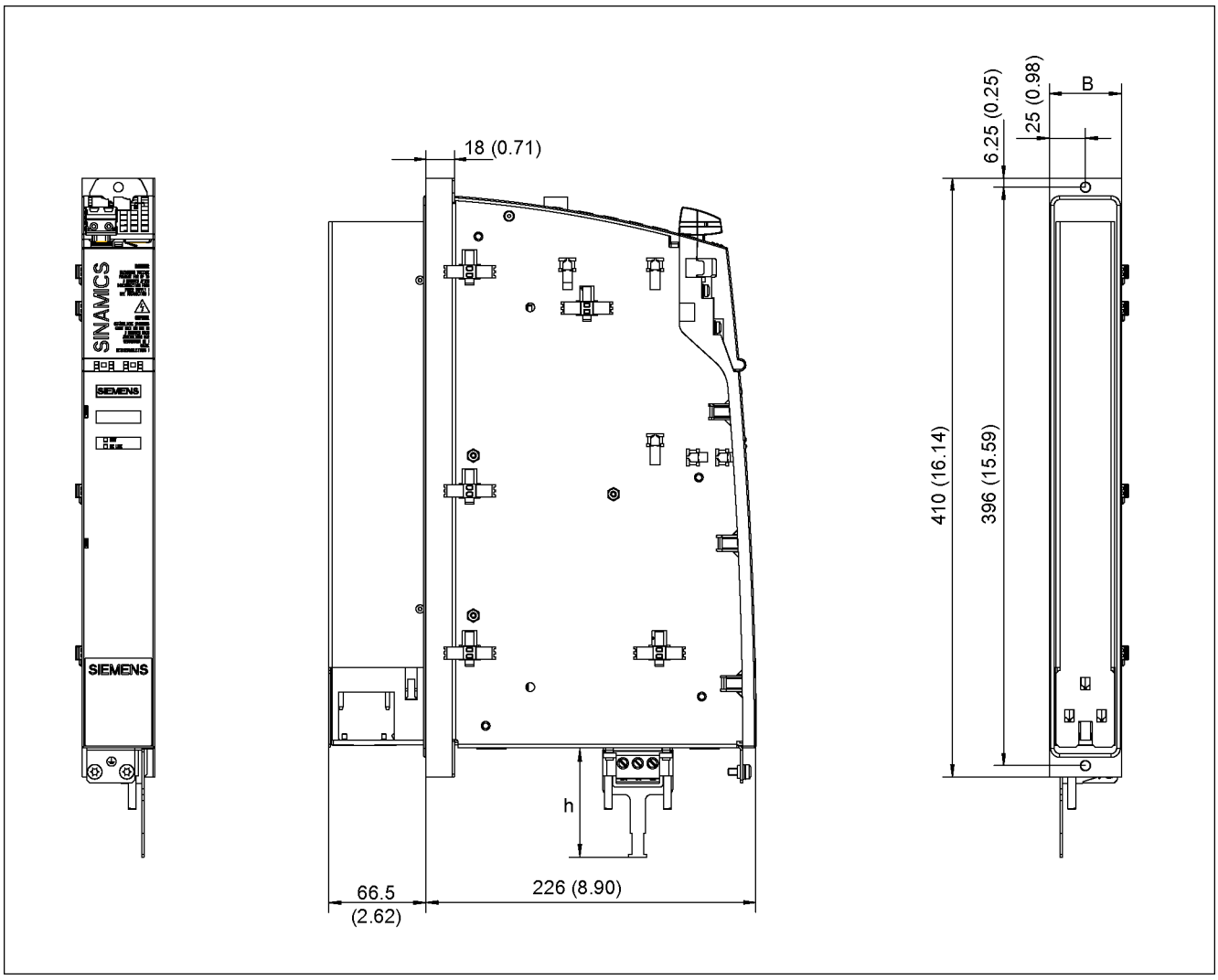


Figure 3-34 Dimension drawing of Smart Line Module with external air cooling (5 kW and 10 kW)

Table 3-33 Dimensions of Smart Line Module with external air cooling (5 kW and 10 kW)

Line Module type	Order number	B [mm] (inches)	h [mm] (inches)
5 kW	6SL3136-6AE15-0AAx	50 (1.97)	75 (2.95)
10 kW	6SL3136-6AE21-0AAx	50 (1.97)	75 (2.95)

3.5.5 Installation

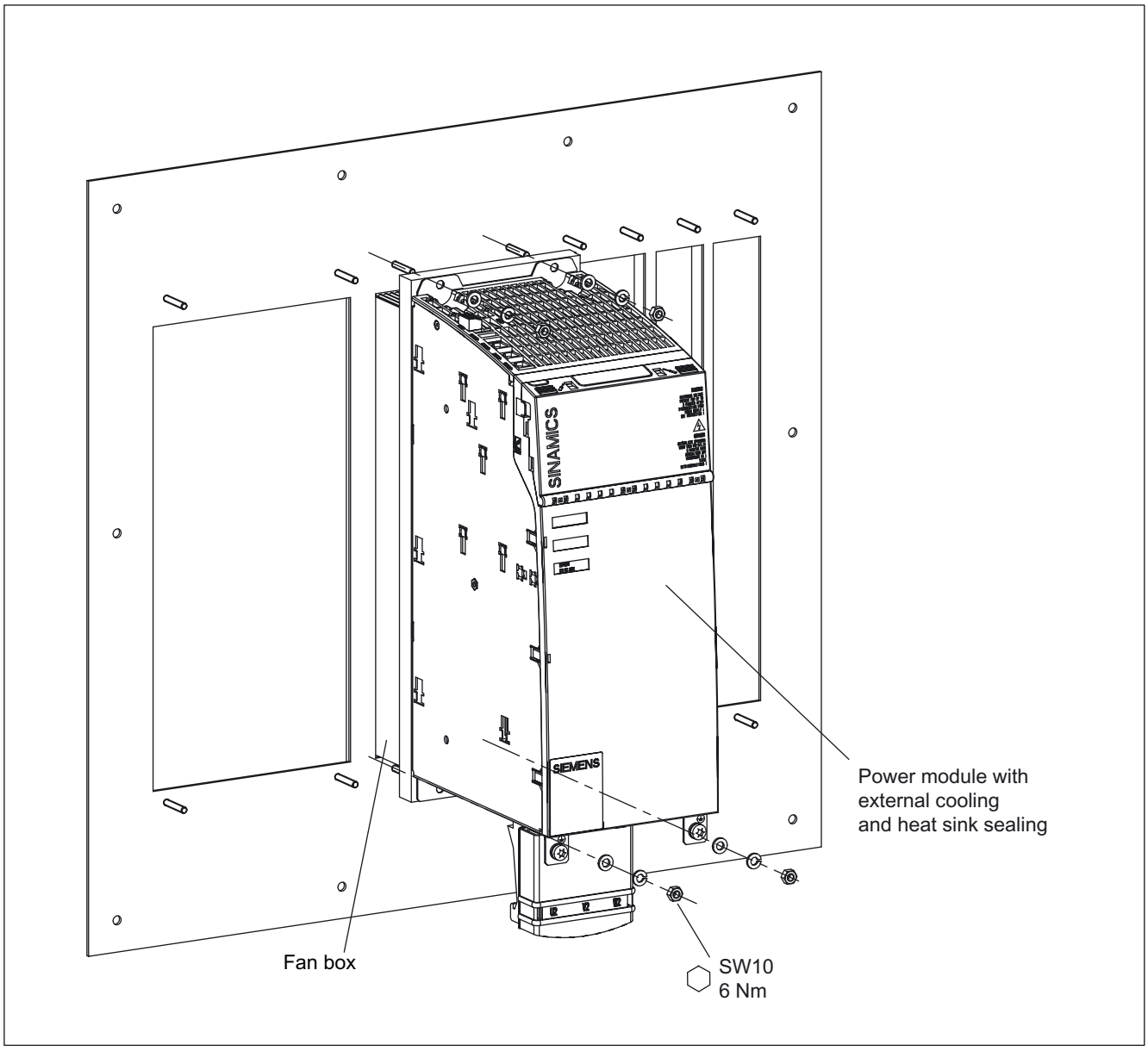


Figure 3-35 Example: installing the power module with external air cooling

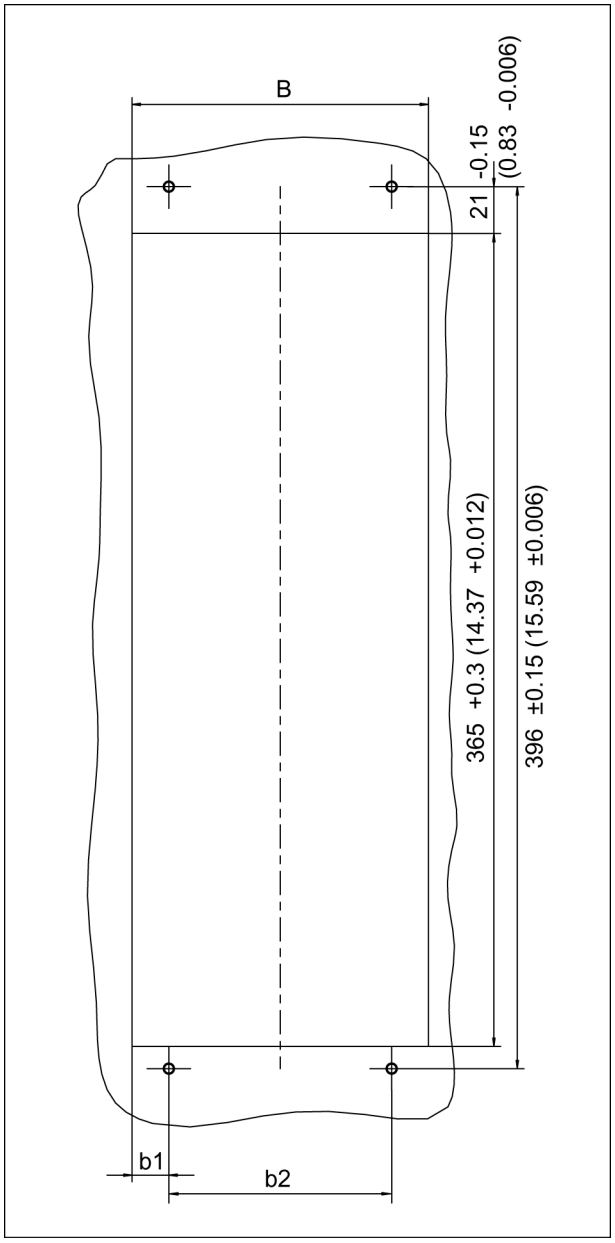


Figure 3-36 Installation openings for the power module with external air cooling

Table 3-34 Dimensions of the installation openings for the power module with external air cooling

Module width	B [mm] (inches)	b1 [mm] (inches)	b2 [mm] (inches)
50 mm	41.5 + 0.3 (1.63 + 0.012)	20.75 +0.15 (0.82 +0.006)	0
100 mm	89.5 + 0.3 (3.52 + 0.012)	19.75 +0.15 (0.78 +0.006)	50 ± 0.15 (1.97 ± 0.006)
150 mm	133 + 0.3 (5.24 + 0.012)	16.5 +0.15 (0.65 +0.006)	100 ± 0.15 (3.94 ± 0.006)
200 mm	173 + 0.3 (6.81 + 0.012)	11.5 +0.15 (0.45 +0.006)	150 ± 0.15 (5.91 ± 0.006)

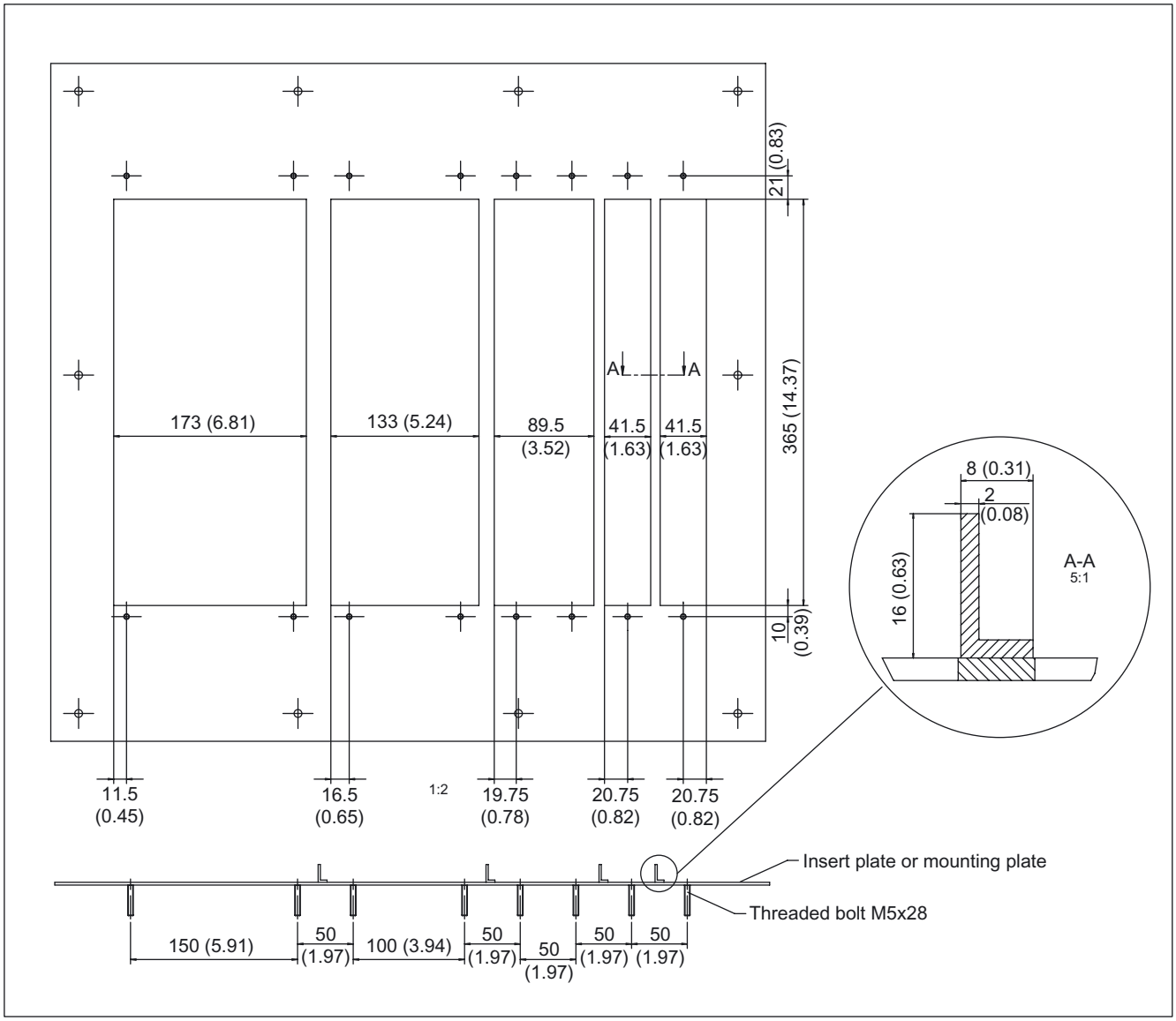


Figure 3-37 Example: mounting plate with a drive line-up

When installing the module, you must ensure that the module seal is tight all round. The cross-pieces must be sufficiently stable.

If required, we recommend that you reinforce the cross-pieces for the recesses.

In our example, the cross-pieces have been reinforced using brackets to EN 755-9.

Any means necessary can be used to secure the bracket to the insert plate.

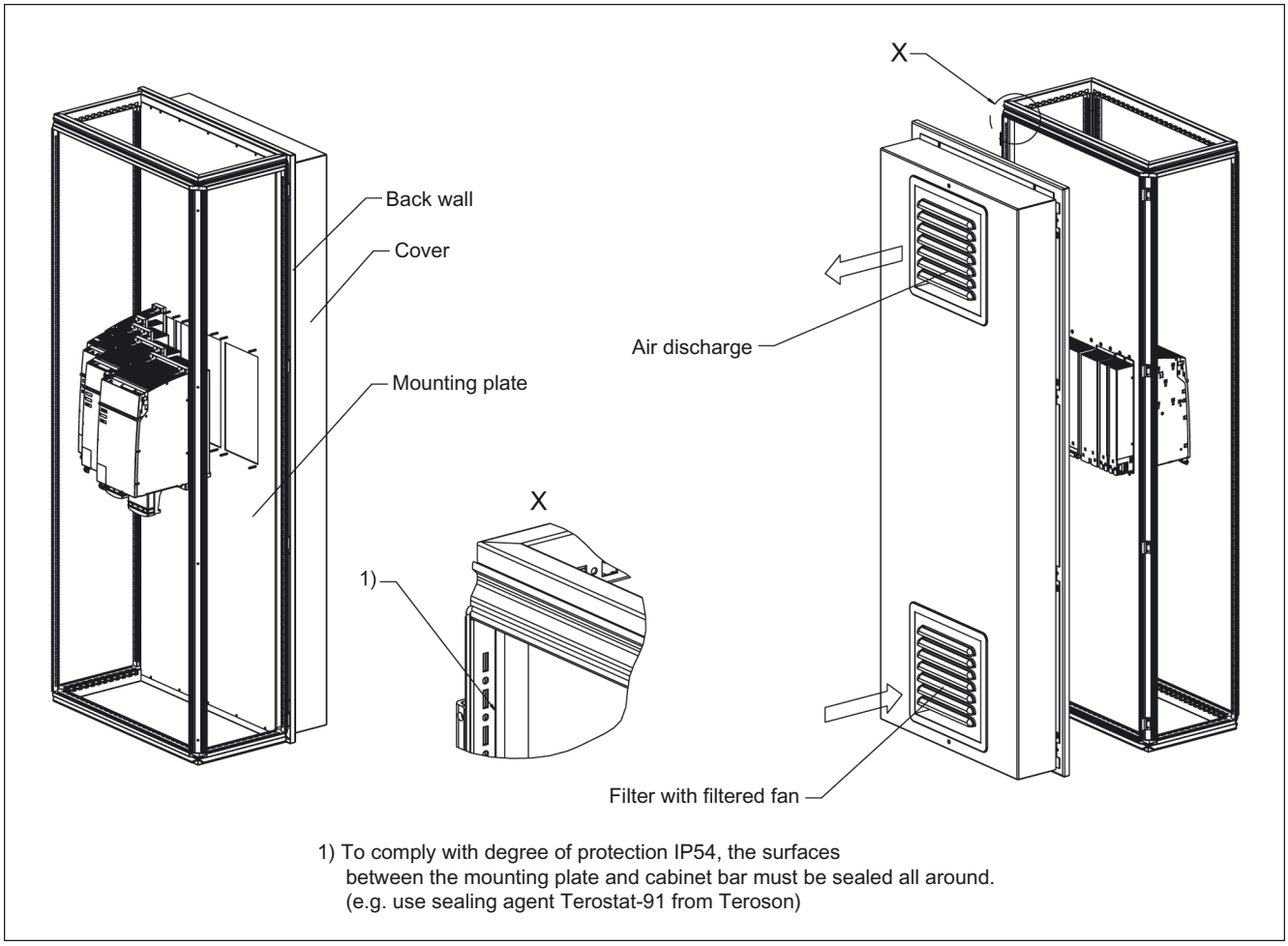


Figure 3-38 Example 1: installation in cabinet with mounting plate

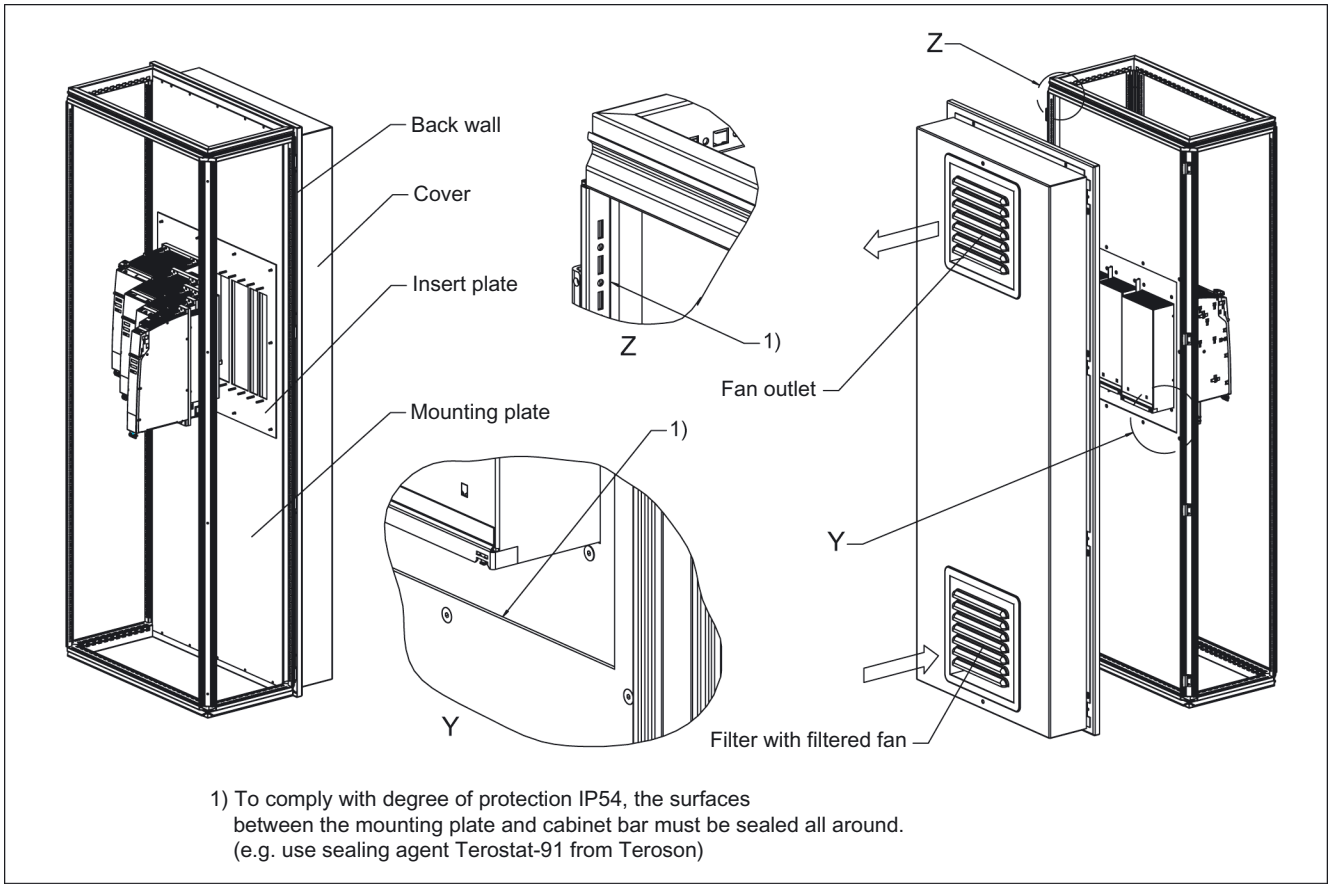


Figure 3-39 Example 2: installation in cabinet with mounting plate

We recommend that you attach a cover and filtered fan to the cabinet.

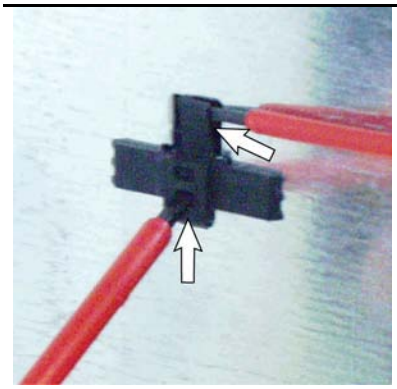
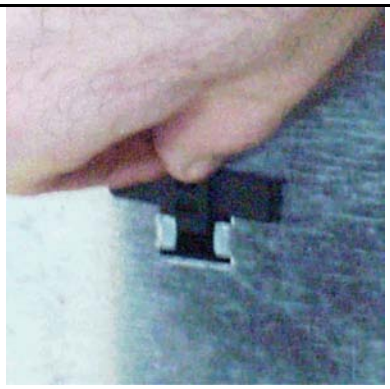
The filtered fan must be fitted in such a way that the cooling air required by the drive line-up is not restricted. This can be determined by establishing the total cooling air required by the individual components. This information is available in the technical specifications.

Note

If the cooling air requirement is not covered by the filtered fan, the components cannot output their specified power.
The filter must be serviced at regular intervals.

Removing the holders for securing the control unit

If an additional component is to be flush-mounted to the left of the component, the holders for securing the control unit must be removed.

		
Use suitable tools to lift the latching device and push up the holder.	Remove the holder.	The holder removed

3.5.6 Electrical Connection

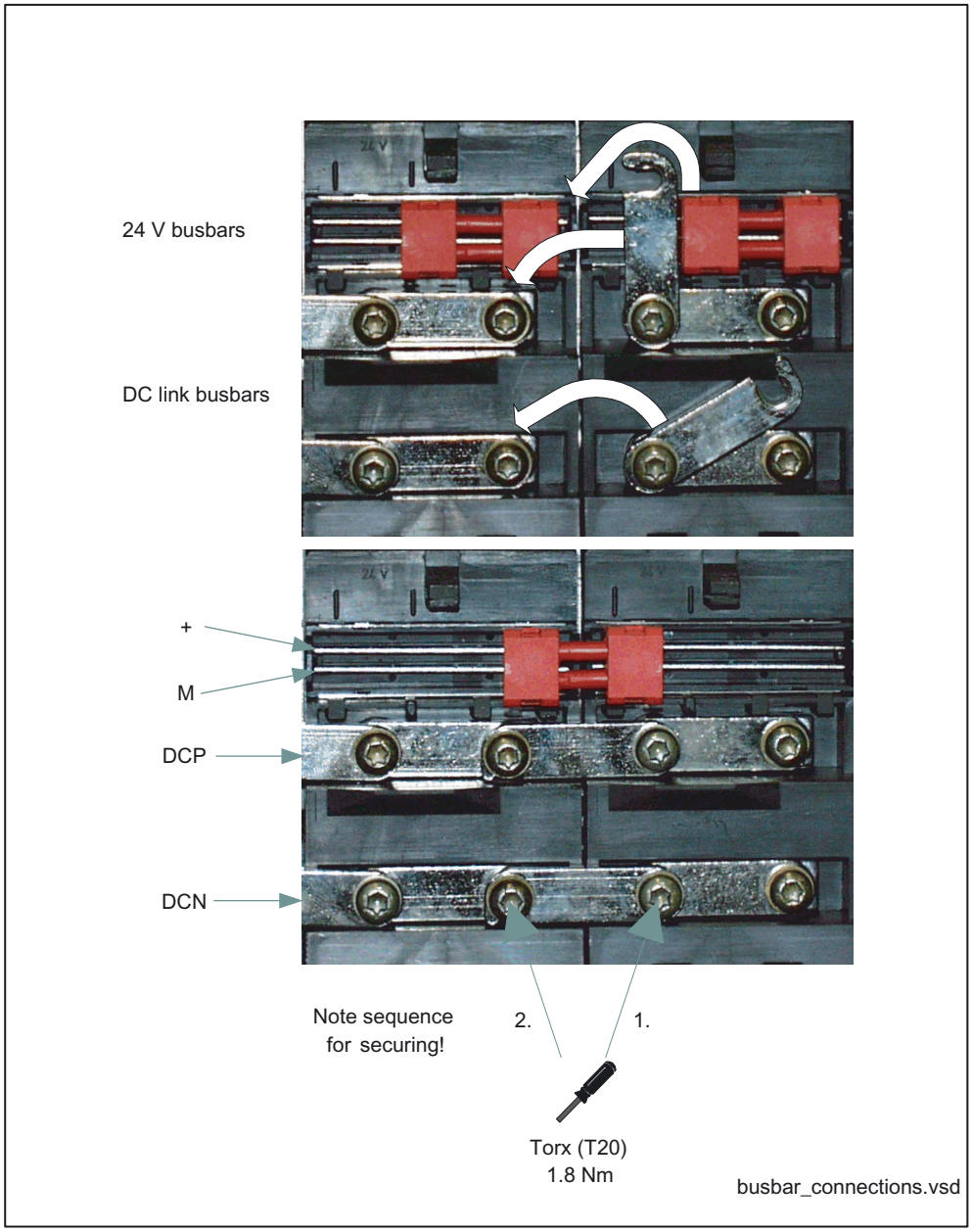


Figure 3-40 Busbar connections for booksize components

3.5.7 Technical Specifications

Table 3-35 Technical specifications for Smart Line Modules in booksize format with internal air cooling

Internal air cooling	6SL3130–	6AE15–0AAx	6AE21–0AAx
Rated power	kW	5	10
Supply:			
Rated power (S1)[1]	kW (Pn)	5	10
S6 infeed			
Power rating (S6-40%)[1]	kW (Ps6)	6.5	13
Peak infeed power rating[1]	kW (Pmax)	10	20
Regenerative feedback:			
Continuous feedback power rating	kW	5	10
Peak feedback power rating	kW	10	20
Connection voltages:			
Line voltage	V_{AC}	3AC 380 -10% to 3AC 480 +10% (-15% < 1 min)	
Line frequency	Hz	47 to 63	
Electronics power supply	V_{DC}	24 (20.4 - 28.8)	
DC link voltage	V_{DC}	510 – 750	
Overvoltage trip threshold	V_{DC}	820 ± 2%	
Undervoltage trip threshold	V_{DC}	360 ± 2%	
Supply currents:			
at 380 V_{AC}	A_{AC}	12	24
at 480 V_{AC}/528 V_{AC}	A_{AC}	9.3/8.5	18/16.5
at 480 V; S6-40%	A_{AC}	12	24
Peak current (at 400 V_{AC}/480 V_{AC})	A_{AC}	22/18.5	44/37
Output currents at 600 V_{DC}:			
Rated current	A_{DC}	8.3	16.6
at S6-40%	A_{DC}	11	22
Peak current	A_{DC}	16.6	33.2
26 V DC busbar DC link busbar	A_{DC}	100	100
26 V DC busbar current carrying capacity	A_{DC}	20	20
Electronics current consumption	A_{DC}	1.0	1.3
Power loss[2]	W (int./ext.)	39/50	65/105
Max. ambient temperature without derating	°C	40	40
Max. ambient temperature with derating	°C	55	55
DC link capacitance	µF	220	330
Charging limit	µF	6000	6000
Power factor	cos φ	1	1
Efficiency	η	0.98	0.98
Sound pressure level	dB(A)	<60	<60
Cooling air requirement	m^3/h	29.6	29.6
Rated voltage for rated data 3 AC 380 V			
Weight	kg	5.3	5.4

[1] The specified values apply to 380 V

[2] For an overview, see the power loss tables in Cabinet Design.

Rated duty cycles of Smart Line Modules

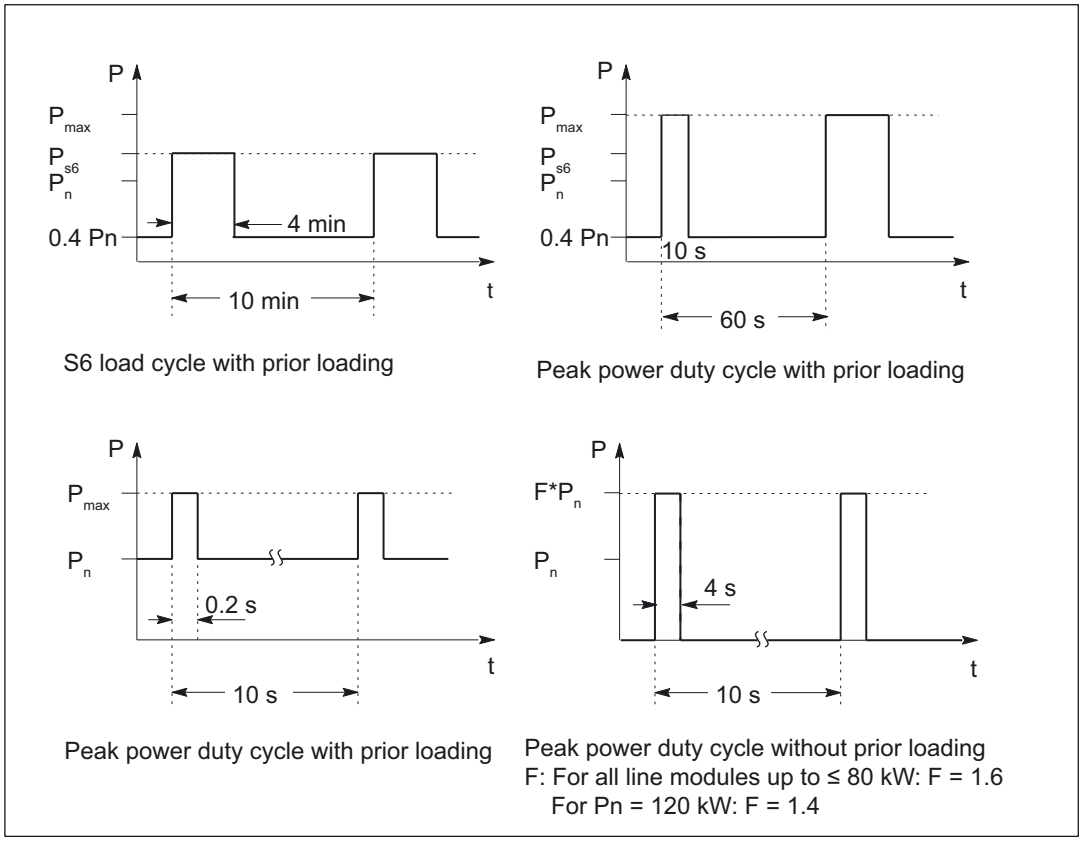


Figure 3-41 Rated duty cycles of Smart Line Modules

Derating as a function of the ambient temperature

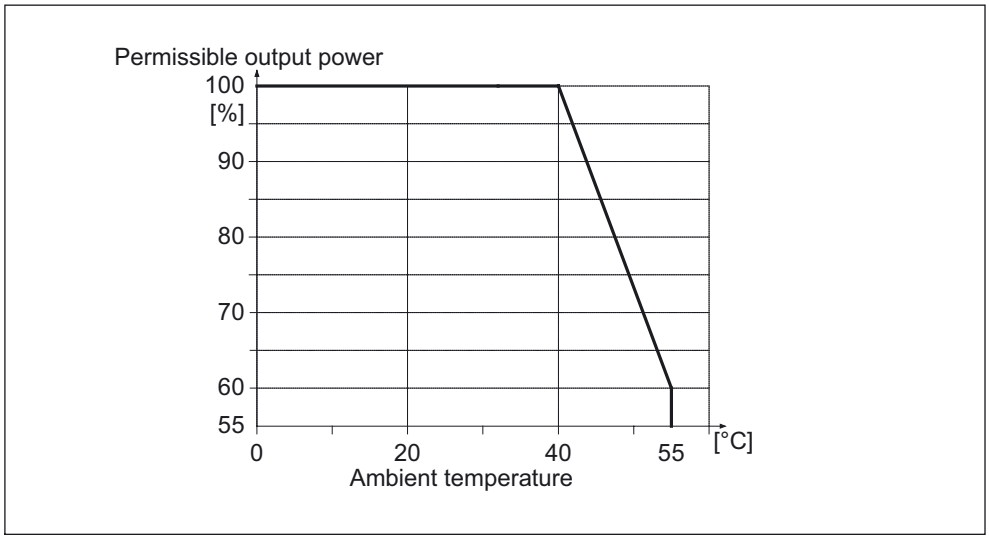


Figure 3-42 Derating as a function of the ambient temperature

Derating as a function of the installation altitude

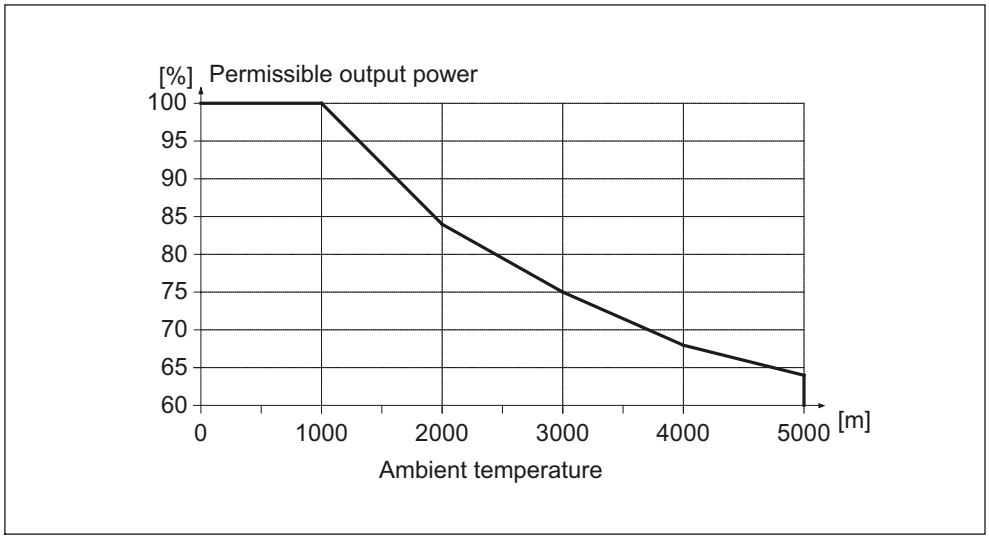


Figure 3-43 Derating as a function of the installation altitude

Motor Modules Booksize

4

4.1 Introduction

The Motor Modules in the SINAMICS S system in “booksize” format are inverters. The control information is generated in the control unit and distributed to the individual Motor Modules via DRIVE-CLiQ.

Depending on the type (single or double), each Motor Module has one or two DRIVE-CLiQ interfaces for connecting the motor encoder evaluation (Sensor Modules).

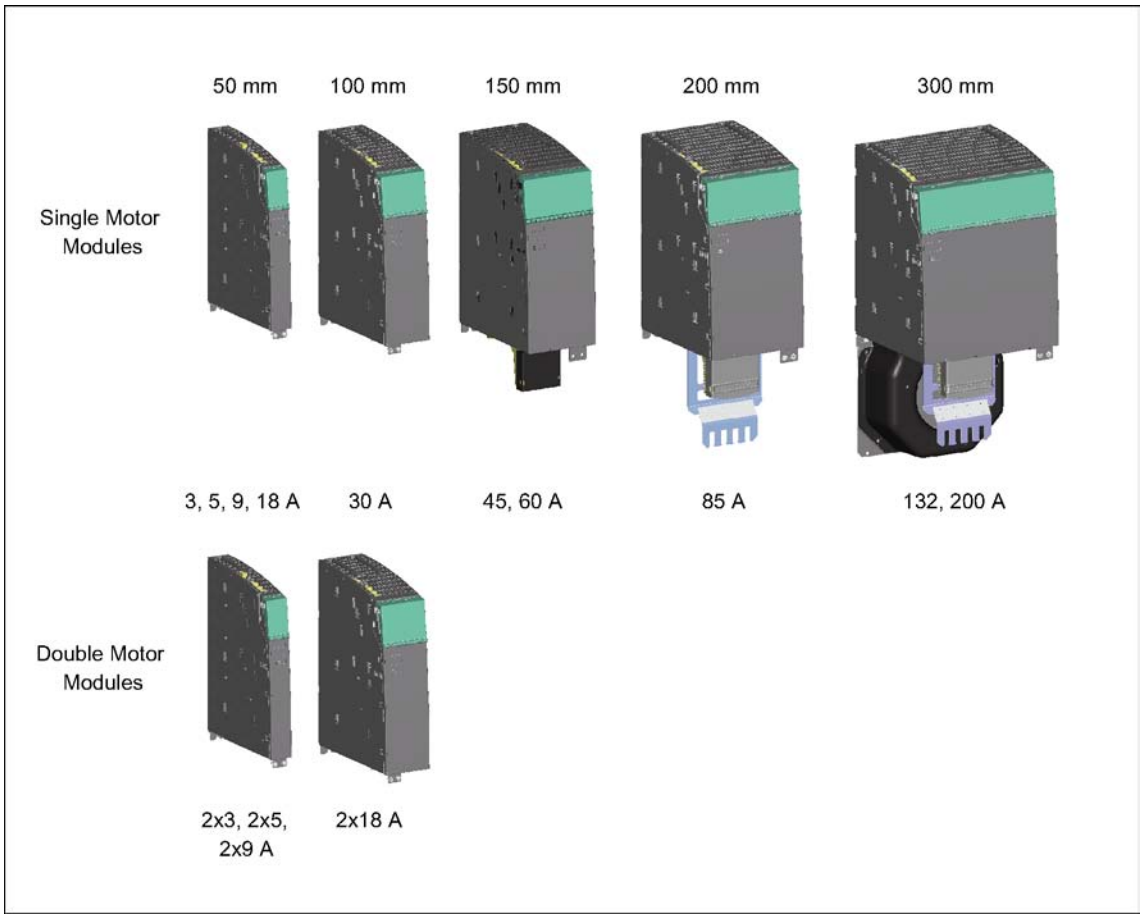


Figure 4-1 Overview of Motor Modules booksize (currents are continuous rms)

Characteristics of the Motor Modules:

- Single type from 3 A to 200 A
- Double type from 2x3 A to 2x18 A
- Internal/external air cooling
- Short-circuit/ground-fault-proof
- Integrated DC link and electronics current busbar connection
- Integrated "safe motor brake control"
- Electronic type 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 Motor Modules with Internal Air Cooling

4.2.1 Description

A Motor Module is a power unit (inverter) that provides the power supply for the connected motor(s). 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 for the Motor Module are stored in the control unit.

One motor can be connected to Single Motor Modules and two motors can be connected to Double Motor Modules.

4.2.2 Safety information

Warning

After disconnecting all the supply voltages, a hazardous voltage will be present in all components for another 5 minutes. The protective cover must not be opened until this time has elapsed.

When opening the protective cover for the DC link, you must activate the release. A suitable tool (e.g. screwdriver) must be used for this purpose.

The components must only be operated when the protective cover of the DC link is closed. Damaged components must not be used, otherwise this could result in secondary damage or accidents.

Caution

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

A set of labels in 12 languages is available using order number: 6SL3166-3AB00-0AAx.

Notice

The 80 mm clearances above and below the components must be observed.

For the 132 A and 200 A Motor Modules, a ventilation clearance of 50 mm must be observed in front of the fan.

Caution

The tightening torque of the DC link busbar screws (1.8 Nm) must be checked before startup.

Warning

Cable shields and unused power cable conductors (e.g. brake conductors) must be connected to PE potential to prevent capacitive cross-talk charges.

Non-observance can cause lethal shock voltages.

Caution

For DRIVE-CliQ connections self-prefabricated cables or couplings must not be used.

Note

A regulated DC power supply is required to operate motors with a built-in holding brake. The voltage is supplied via the internal 24 V busbars. The voltage tolerances of the motor holding brakes and the voltage drops of the connection cables must be taken into account.

The DC power supply should be set to 26 V. This ensures that the voltage supply for the brake remains within the permissible range when the following conditions are fulfilled:

- Using Siemens three-phase motors
- Using Siemens MOTION-CONNECT power cables
- Motor cable lengths: max. 100 m

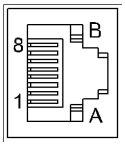
Caution

The DC link busbar in a drive line-up must be sealed at both ends using DC link side covers (order no.: 6SL3162-5AA00-0AA0).

4.2.3 Interface description

4.2.3.1 X200-X203 DRIVE-CLiQ interface

Table 4-1 DRIVE-CLiQ interface X200-X202: Single Motor Module
DRIVE-CLiQ interface X200-X203: Double Motor Module

	Pin	Name	Technical specifications
	1	TXP	Transmit data +
	2	TXN	Transmit data -
	3	RXP	Receive data +
	4	Reserved, do not use	
	5	Reserved, do not use	
	6	RXN	Receive data -
	7	Reserved, do not use	
	8	Reserved, do not use	
	A	+ (24 V)	Power supply
	B	GND (0 V)	Electronic ground
Blanking plate for DRIVE-CLiQ interface: Molex, order number: 85999-3255			

4.2.3.2 Overview

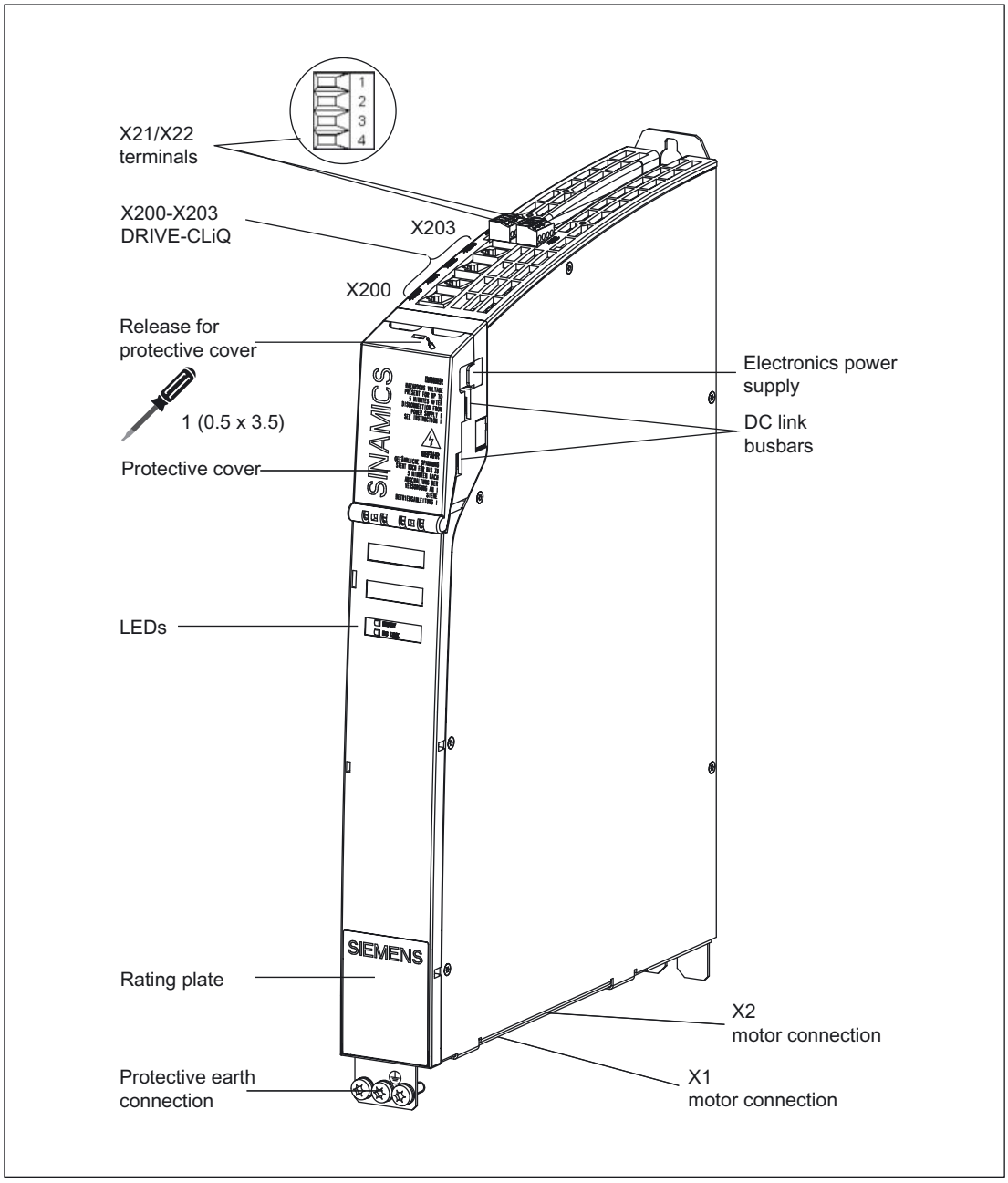


Figure 4-2 Example: Double Motor Module with internal air cooling (2 x 3 A)

4.2.3.3 Connection Examples

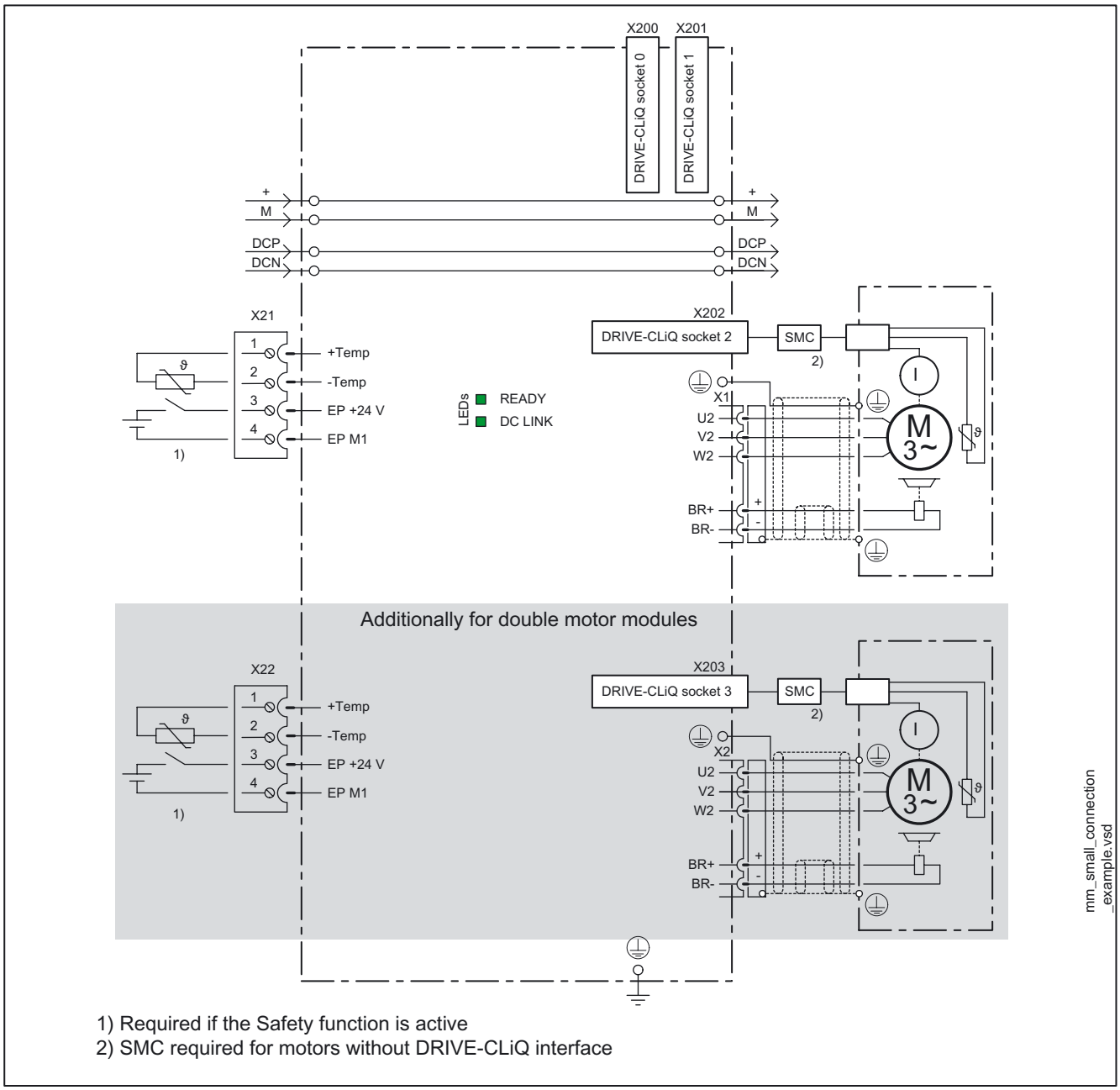


Figure 4-3 Example connection of Motor Modules 3 A to 30 A and 2x3 A to 2x18 A

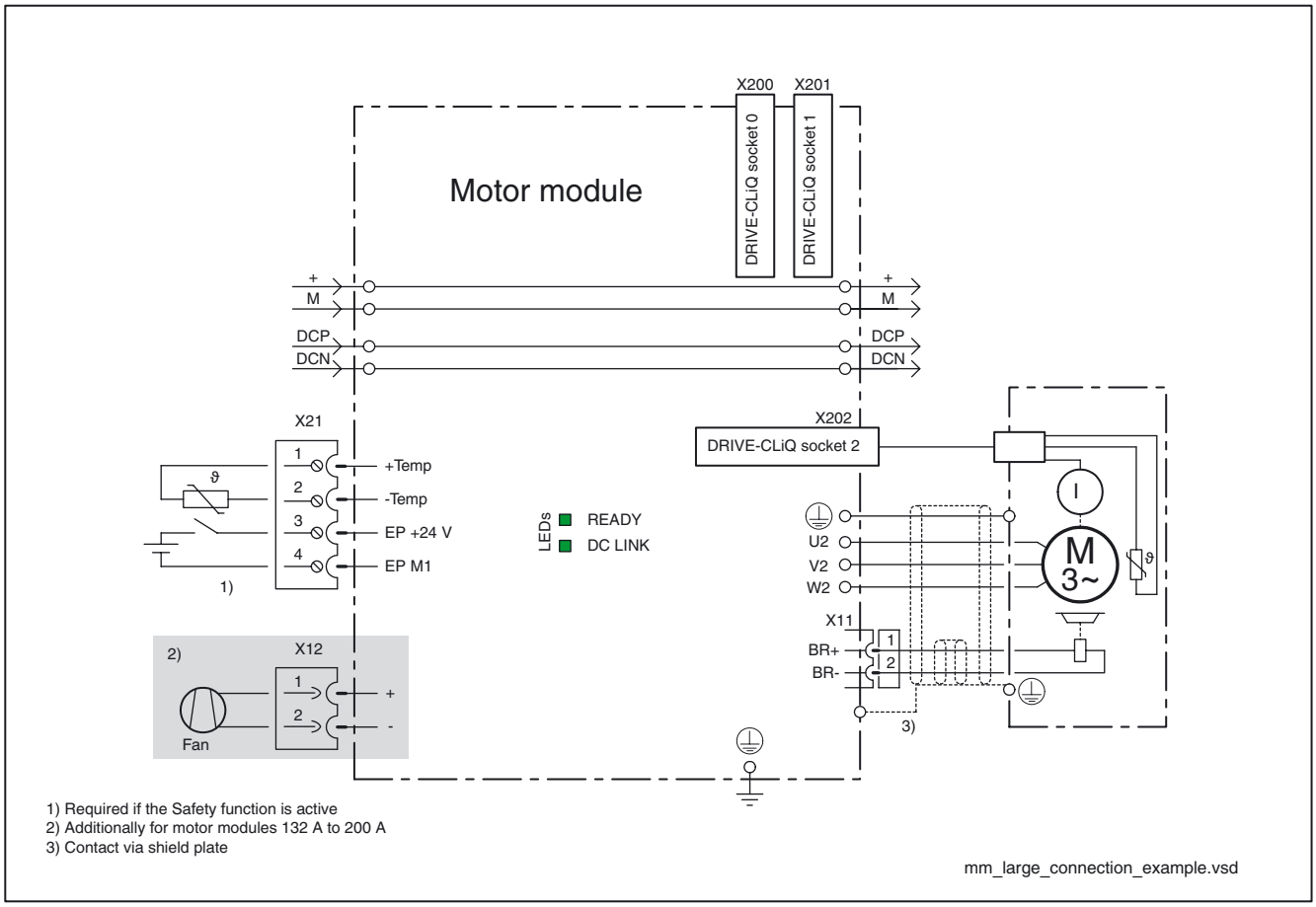
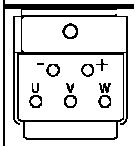
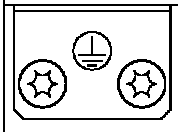


Figure 4-4 Example connection of Single Motor Modules 45 A to 200 A

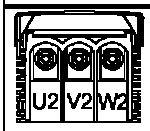
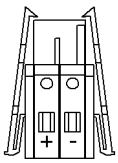
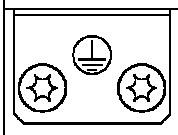
4.2.3.4 Motor/brake connection

Table 4-2 Terminal block X1/X2 Motor Modules 3 A to 30 A and 2x3 A to 2x18 A

	Terminal	Technical specifications
	U (U2)	Motor connection
	V (V2)	
	W (W2)	
	+ (BR+)	Brake connection
	- (BR-)	
	PE connection	Threaded hole M5/3 Nm [1]

[1] for ring cable lugs to DIN 46234

Table 4-3 Terminal block Single Motor Module 45 A to 200 A

	Terminals	Technical specifications
	U2 V2 W2	**45 A to 60 A:** Threaded bolt M6/6 Nm [1] **85 A:** Threaded bolt M8/13 Nm [1] **132 A to 200 A:** Threaded bolt M8/13 Nm [1]
	+ (BR+) - (BR-)	X11 brake connector [2]: Voltage: 24 V DC Max. load current: 2 A Min. load current: 0.1 A Max. connectable cross-section: 2.5 mm^2 Type: Spring-loaded terminal 2 (see Connection Methods) Manufacturer: Wago; order number: 231-102/037-000 The brake connector is part of the prefabricated cable.
	PE connection	**Single Motor Module with a rated output current of 45 A to 132:** Threaded bolt for motor cables: M6/6 Nm [1] Threaded hole for PE: M6/6 Nm[1] **Single Motor Module with a rated output current of 85 A** Threaded bolt for motor cables: M8/13 Nm [1] Threaded hole for PE: M6/6 Nm[1] **Single Motor Module with a rated output current of 132 A to 200 A** Threaded bolt for motor cables: M8/13 Nm [1] Threaded hole for PE: M8/6 Nm [1]

[1] For ring cable lugs to DIN 46234

[2] The circuit for protecting the brakes against overvoltage is in the Motor Module and does not need to be installed externally. The max. load current is 2 A, the min. load current 0.1 A.

Note

The total length of the shielded power cables (motor supply cables and DC link cables) must not exceed 350 m.

Note

The motor brake must be connected via connector X11. Cable BR - must not be connected directly to electronic ground (M).

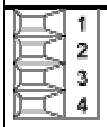
Warning

Only protective extra-low voltages (PELVs) that comply with EN60204-1 must be connected to all connections and terminals between 0 and 48 V DC.

The voltage tolerances of the motor holding brakes must be taken into account.

4.2.3.5 X21/X22 EP terminals / temperature sensor connection Motor Module

Table 4-4 Terminal block X21/X22

	Terminal	Function	Technical specifications
	1	+Temp	Temperature sensor connection KTY84–1C130/PTC
	2	-Temp	
	3	EP +24 V (Enable Pulses)	Supply voltage: 24 V DC (20.4 V - 28.8 V) Current consumption: 10 mA Isolated input Signal propagation times: L → H 100 µs H → L: 1000 µs
	4	EP M1 (Enable Pulses)	
Max. connectable cross-section 1.5 mm² Type: Screw terminal 1 (see Connection Methods)			

Notice

The KTY temperature sensor/the PTC must be connected with the correct polarity.

Note

The temperature sensor connection is required for motors whose temperature value is not transmitted by DRIVE-CLiQ.
To operate, 24 V DC must be applied to terminal 3 and terminal 4 must be grounded if the "Safe Standstill" function is selected. Upon removal, pulse inhibit is activated.

4.2.3.6 Meaning of the LEDs on the Motor Module

Table 4-5 Meaning of the LEDs on the Motor Module

LED	Color	State	Description
READY	-	OFF	Electronics power supply outside permissible tolerance range.
	Green	Continuous	The component is ready for operation and cyclic DRIVE-CLiQ communication is taking place.
	Orange	Continuous	DRIVE-CLiQ communication is being established.
	Red	Continuous	At least one fault is present in this component.
	Green Red	Flashing 2 Hz	Firmware is being downloaded.
	Green/ Orange or Red/ Orange	Flashing 2 Hz	Component recognition via LED is activated (p0124). Note: Both options depend on the LED status when module recognition is activated via p0124 = 1.
DC LINK	-	OFF	Electronics power supply outside permissible tolerance range.
	Orange	Continuous	DC link voltage within permissible tolerance range (only when ready for operation)
	Red	Continuous	DC link voltage outside permissible tolerance range (only when ready for operation)

Cause and rectification of faults

The following reference contains information about the cause and rectification of faults:

Reference: /IH1/ SINAMICS S120 Commissioning Manual

4.2.4 Dimension drawings

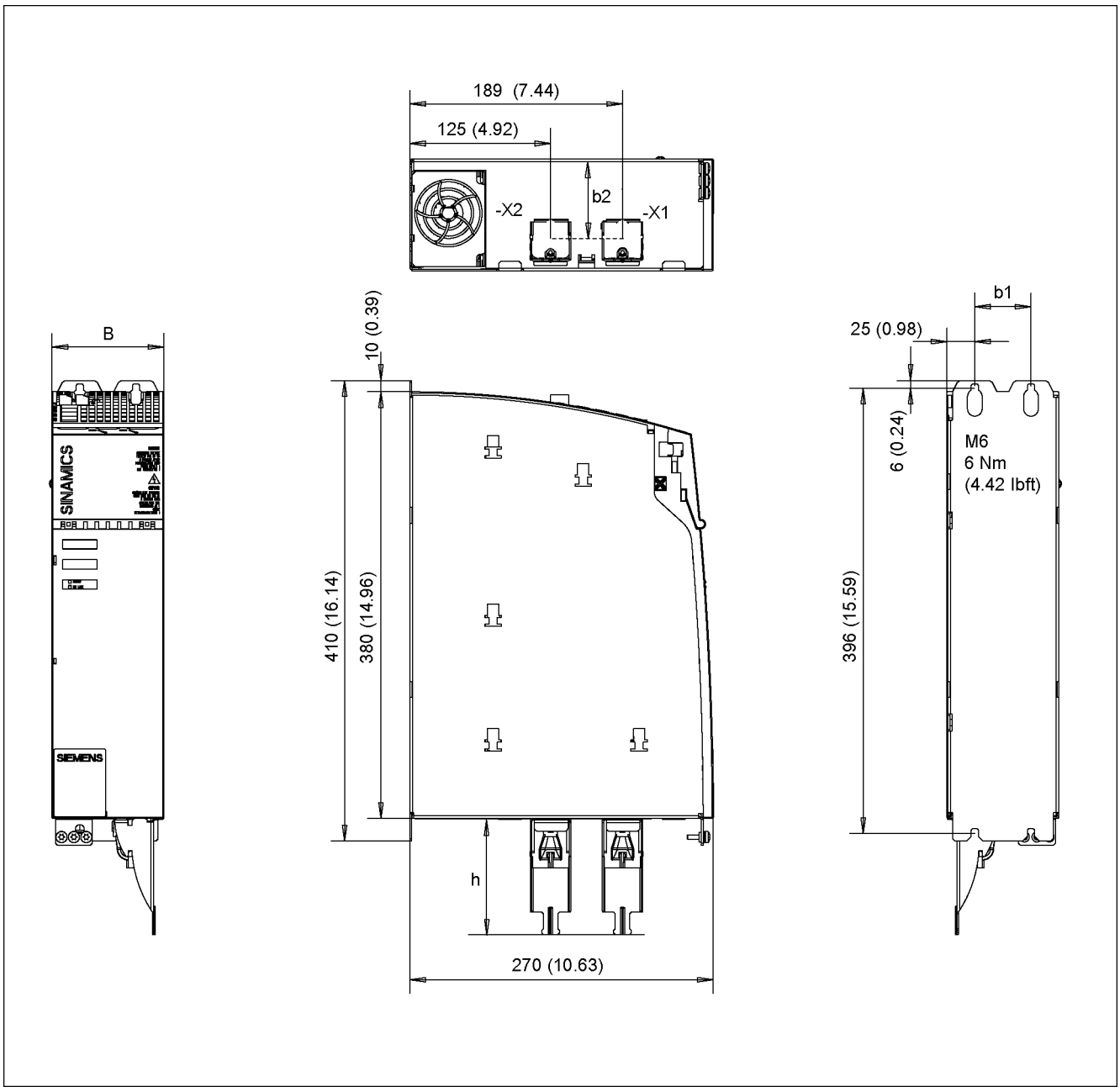


Figure 4-5 Dimension drawing of Motor Module with internal air cooling (3 A to 30 A and 2 x 3 A to 2 x 18 A)

Table 4-6 Dimensions of Motor Module with internal air cooling (3 A to 30 A and 2 x 3 A to 2 x 18 A)

Motor Module type	Order number	B [mm] (inches)	b_1 [mm] (inches)	b_2 [mm] (inches)	h [mm] (inches)
Single Motor Module 3 A	6SL3120-1TE13-0AAx	50 (1.97)	-	28 (1.10)	89 (3.50)
Single Motor Module 5 A	6SL3120-1TE15-0AAx	50 (1.97)	-	28 (1.10)	89 (3.50)
Single Motor Module 9 A	6SL3120-1TE21-0AAx	50 (1.97)	-	28 (1.10)	89 (3.50)
Single Motor Module 18 A	6SL3120-1TE21-8AAx	50 (1.97)	-	28 (1.10)	89 (3.50)
Single Motor Module 30 A	6SL3120-1TE23-0AAx	100 (3.94)	50 (1.97)	78 (3.07)	89 (3.50)
Double Motor Module 3 A	6SL3120-2TE13-0AAx	50 (1.97)	-	28 (1.10)	89 (3.50)
Double Motor Module 5 A	6SL3120-2TE15-0AAx	50 (1.97)	-	28 (1.10)	89 (3.50)
Double Motor Module 9 A	6SL3120-2TE21-0AAx	50 (1.97)	-	28 (1.10)	89 (3.50)
Double Motor Module 18 A	6SL3120-2TE21-8AAx	100 (3.94)	50 (1.97)	78 (3.07)	89 (3.50)

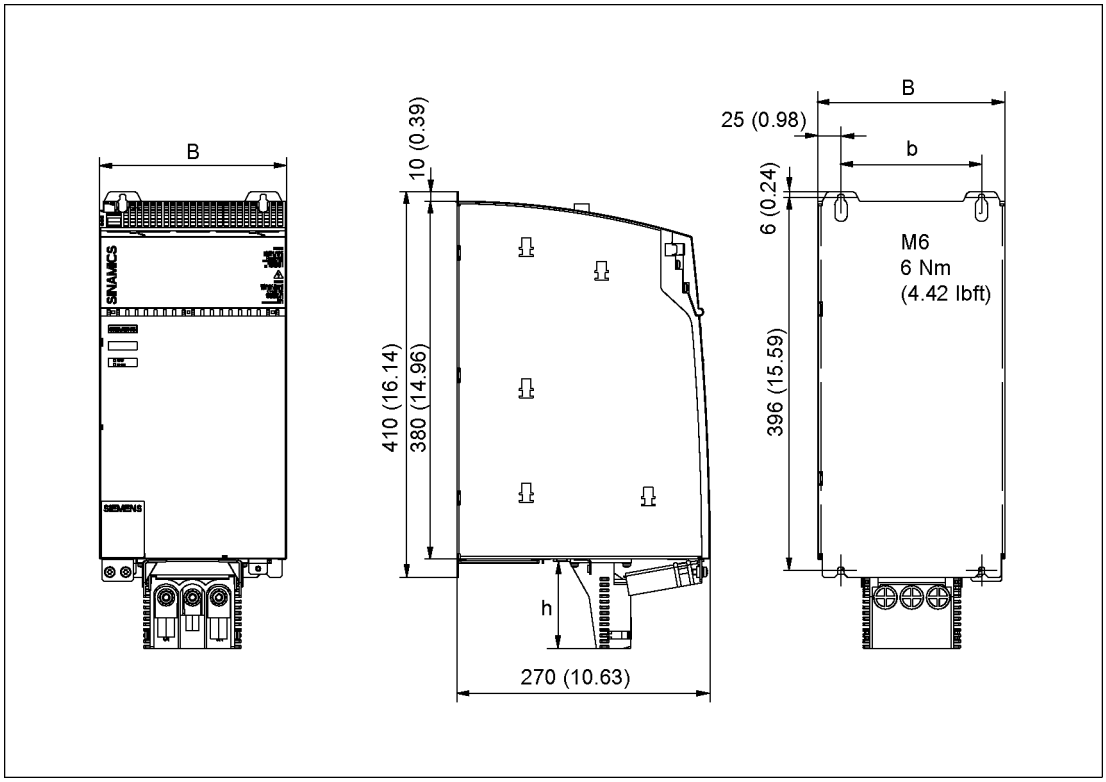


Figure 4-6 Dimension drawing of Motor Module with internal air cooling (45 A to 85 A)

Table 4-7 Dimensions of Motor Module with internal air cooling (45 A to 85 A)

Motor Module type	Order number	B [mm] (inches)	b [mm] (inches)	h [mm] (inches)
Single Motor Module 45 A	6SL3120-1TE24-5AAx	150 (5.91)	100 (3.94)	89 (3.50)
Single Motor Module 60 A	6SL3120-1TE26-0AAx	150 (5.91)	100 (3.94)	89 (3.50)
Single Motor Module 85 A	6SL3120-1TE28-5AAx	200 (7.87)	150 (5.91)	89 (3.50)

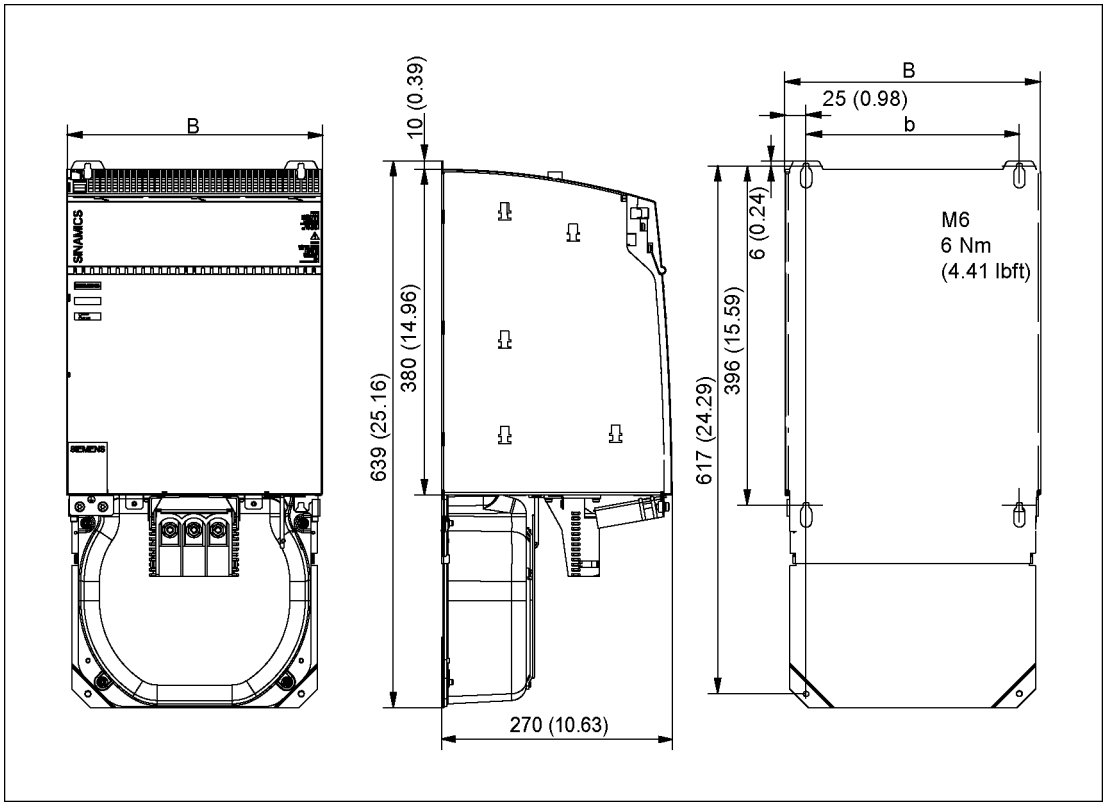


Figure 4-7 Dimension drawing of Motor Module with internal air cooling (132 A and 200 A)

Table 4-8 Dimensions of Motor Module with internal air cooling (132 A and 200 A)

Motor Module type	Order number	B [mm] (inches)	b [mm] (inches)	h [mm] (inches)
Single Motor Module 132 A	6SL3120-1TE31-3AAx	300 (11.81)	250 (9.84)	89 (3.50)
Single Motor Module 200 A	6SL3120-1TE32-0AAx	300 (11.81)	250 (9.84)	89 (3.50)

4.2.5 Installation

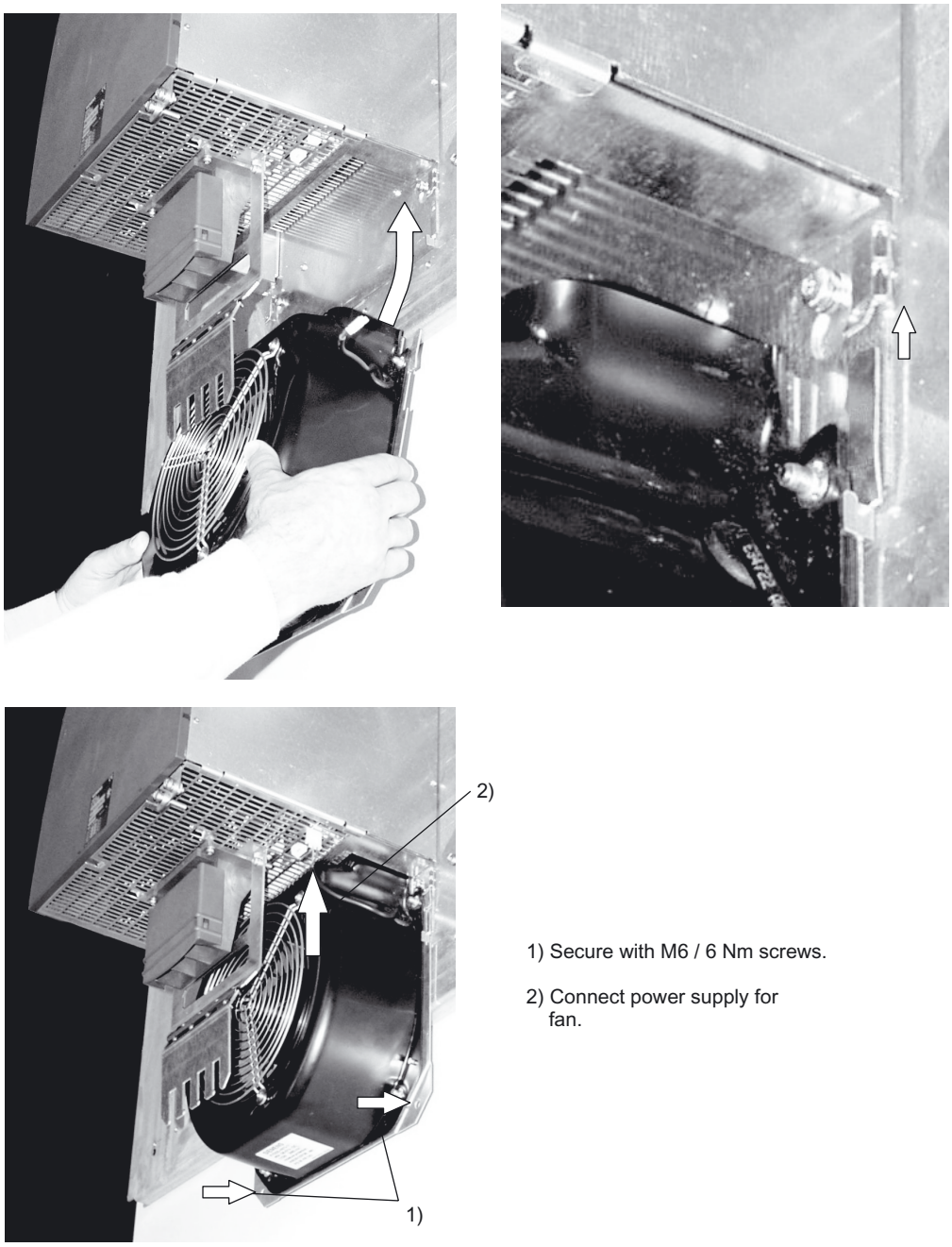


Figure 4-8 Installing the fan for 300 mm modules

4.2.6 Electrical connection

Shield contact for the terminals

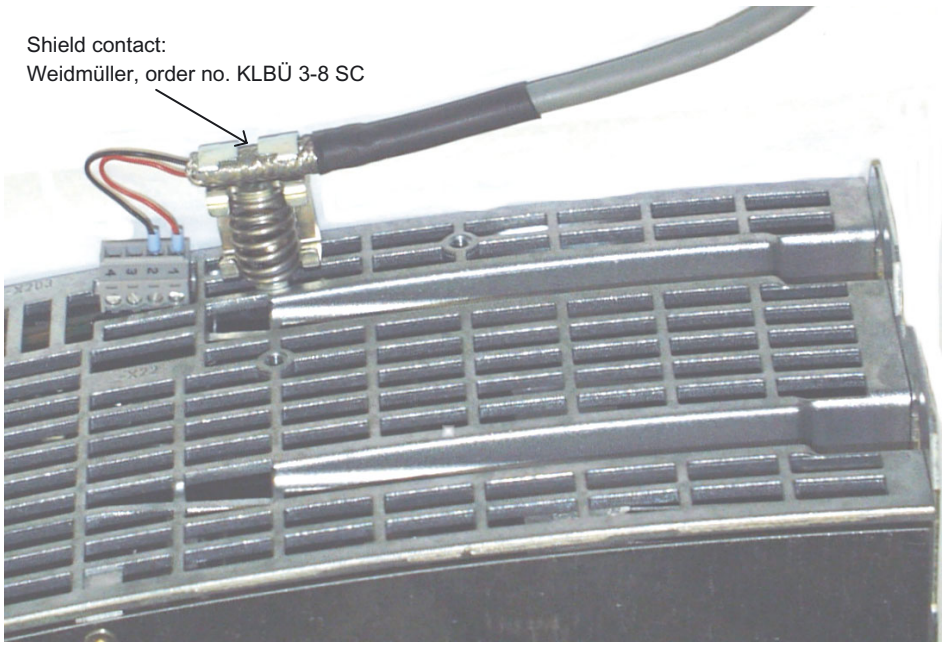


Figure 4-9 Shield contact for the terminals

Internet address:

Weidmüller: http://www.weidmueller.com

4.2.7 Technical specifications

Table 4-9 Technical specifications for Single Motor Modules booksize (3 to 30 A)

Internal air cooling	6SL3120–	1TE13-0AAx	1TE15-0AAx	1TE21–0AAx	1TE21–8AAx	1TE23-0AAx
Rated current	**A**	**3**	**5**	**9**	**18**	**30**
Supply: DC link voltage Electronics power supply	V_{DC} V_{DC}	510 – 750 24 (20.4 - 28.8)				
Output voltage	V_{ACrms}	0 – 480				
Overvoltage tripping Undervoltage tripping	V_{DC} V_{DC}	820 ± 2% 380 ± 2%				
Electronics current consumption at 24 V	A_{DC}	0.85	0.85	0.85	0.85	0.9
Power loss[1]	W	30	55	80	165	290
Rated outp, curr.(I_n)	A_{ACrms}	3	5	9	18	30
Base load curr. (I_{base})	A	2.6	4.3	7.7	15.3	25.5
Intermittent duty current (I_{s6}) 40%	A_{ACrms}	3.5	6	10	24	40
Peak current (I_{max})	A_{ACrms}	6	10	18	36	56
DC link busbar current carrying capacity	A_{DC}	100	100	100	100	100
24 V busbar current carrying capacity	A_{DC}	20	20	20	20	20
Rated power (DC link voltage 600 V_{DC} and pulse frequency 4 kHz)	kW	1.6	2.7	4.8	9.7	16
Max. pulse frequency without derating	kHz	4	4	4	4	4
Max. pulse frequency with derating	kHz	16	16	16	16	16
Max. ambient temp. without derating	°C	40	40	40	40	40
Max. ambient temperature with derating	°C	55	55	55	55	55
DC link capacitance	µF	110	110	110	220	705
Efficiency (4kHz)	η	0.97	0.97	0.97	0.97	0.97
Sound pressure level	dB(A)	<60	<60	<60	<60	<60
Cooling method		Internal fan	Internal fan	Internal fan	Internal fan	Internal fan
Cooling air requirement	m^3/h	29.6	29.6	29.6	29.6	56
Weight	kg	5.1	5.1	5	5	6.9

Table 4-10 Technical specifications for Single Motor Modules booksize (45 to 200 A)

Internal air cooling	**6SL3120–**	**1TE24-5AAx**	**1TE26-0AAx**	**1TE28-5AAx**	**1TE31-3AAx**	**1TE32-0AAx**
Rated current	**A**	**45**	**60**	**85**	**132**	**200**
Voltage						
Supply: DC link voltage Electronics power supply	 V_{DC} V_{DC}	 510 – 750 24 (20.4 - 28.8)				
Output voltage	V_{ACrms}	0 – 480				
Overvoltage tripping Undervoltage tripping	V_{DC} V_{DC}	820 ± 2% 380				
Electronics current consumption at 24 V	A_{DC}	1.2	1.2	1.5	1.5	1.5
Power loss[1]	W	430	590	750	1250	2050
Rated output current (I_n)	A_{ACrms}	45	60	85	132	200
Base load current (I_{geund})	A	38	51	68	105	141
Intermittent duty current (I_{s6}) 40%	A_{ACrms}	60	80	110	150	230
Peak current (I_{max})	A_{ACrms}	85	113	141	210	282
DC link busbar current carrying capacity	A_{DC}	100	100	200	200	200
24 V busbar current carrying capacity	A_{DC}	20	20	20	20	20
Rated power (DC link voltage 600 V_{DC} and clock frequency 4 kHz)	kW	24	32	46	71	107
Max. pulse frequency without derating	kHz	4	4	4	4	4
Max. pulse frequency with derating	kHz	16	16	16	16	16
Max. ambient temperature without derating	°C	40	40	40	40	40
Max. ambient temperature with derating	°C	55	55	55	55	55
DC link capacitance	µF	1175	1410	1880	2820	3995
Efficiency (4kHz)	η	0.97	0.97	0.97	0.97	0.97
Sound pressure level	dB(A)	<65	<65	<60	<73	<73
Cooling method (with fan)		Internal fan	Internal fan	Internal fan	Separate mounted fan	Separate mounted fan
Cooling air requirement	m^3/h	112	112	160	520	520
Weight	kg	9	9	15	21	21

Table 4-11 Technical specifications for Double Motor Modules booksize (2x3 to 2x18A)

Internal air cooling	**6SL3120-**	**2TE13-0AAx**	**2TE15-0AAx**	**2TE21-0AAx**	**2TE21-8AAx**
Rated current	**A**	**2x3**	**2x5**	**2x9**	**2x18**
Voltage					
Supply:					
DC link voltage	V_{DC}	510 – 750			
Electronics power supply	V_{DC}	24 (20.4 - 28.8)			
Output voltage	V_{ACrms}	0-480			
Overvoltage tripping	V_{DC}	820 ± 2%			
Undervoltage tripping	V_{DC}	380			
Electronics current consumption at 24 V	A_{DC}	1.0	1.0	1.0	1.0
Power loss[1]	W	70	105	160	320
Rated output current (I_n)	A	2x3	2x5	2x9	2x18
Base load current (I_{base})	A	2x2.6	2x4.3	2x7.7	2x15.3
Intermittent duty current (I_{S6}) 40%	A_{ACrms}	3.5	6	10	24
Peak current (I_{max})	A_{ACrms}	6	10	18	36
DC link busbar current carrying capacity	A	100	100	100	100
24 V busbar current carrying capacity	A	20	20	20	20
Rated power (600V, 4kHz)	kW	1.6	2.7	4.8	9.7
Max. pulse frequency without derating	kHz	4	4	4	4
Max. pulse frequency with derating	kHz	16	16	16	16
Max. ambient temperature without derating	°C	40	40	40	40
Max. ambient temperature with derating	°C	55	55	55	55
DC link capacitance	µF	110	220	220	705
Efficiency (4kHz)	η	0.97	0.97	0.97	0.97
Sound pressure level	dBA	<60	<60	<60	<60
Cooling method		Internal fan	Internal fan	Internal fan	Internal fan
Cooling air requirement	m^3/h	29.6	29.6	29.6	56
Weight	kg	5.3	5.3	5.5	6.8

[1] For an overview, see the power loss tables in Cabinet Design.

Rated duty cycles of Motor Modules booksize

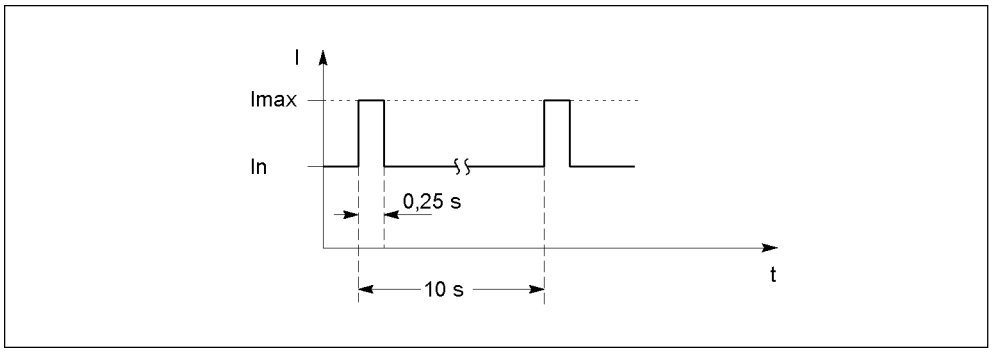


Figure 4-10 Peak current duty cycle with prior loading

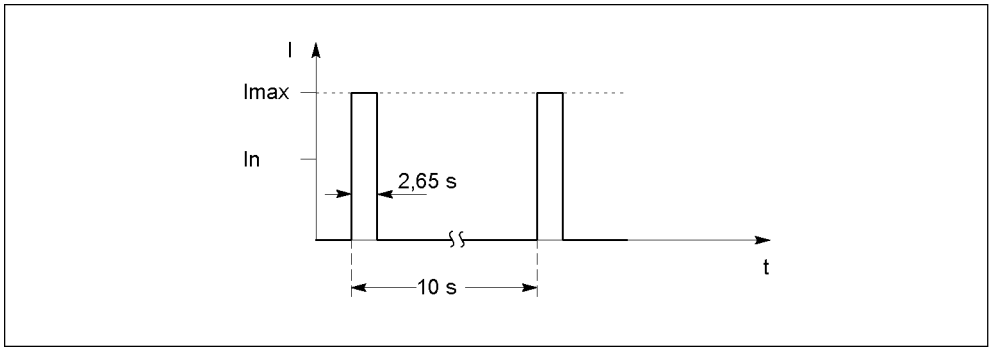


Figure 4-11 Peak current duty cycle without prior loading

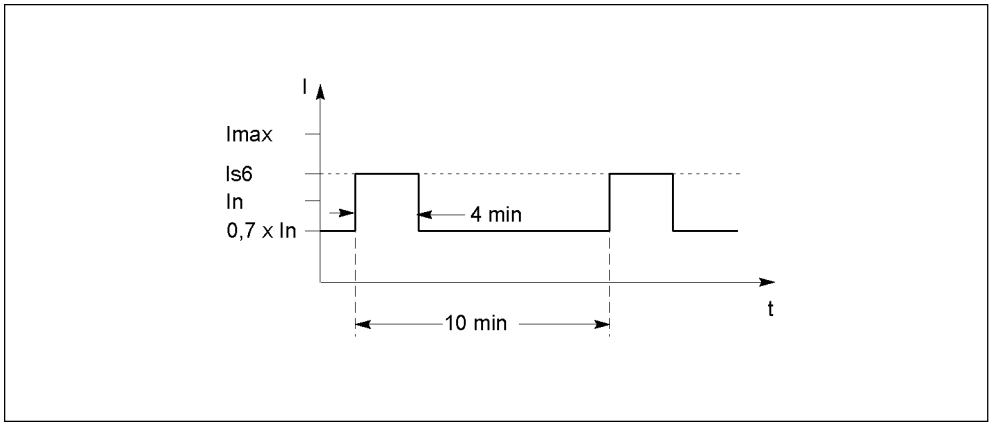


Figure 4-12 S6 current duty cycle with prior loading

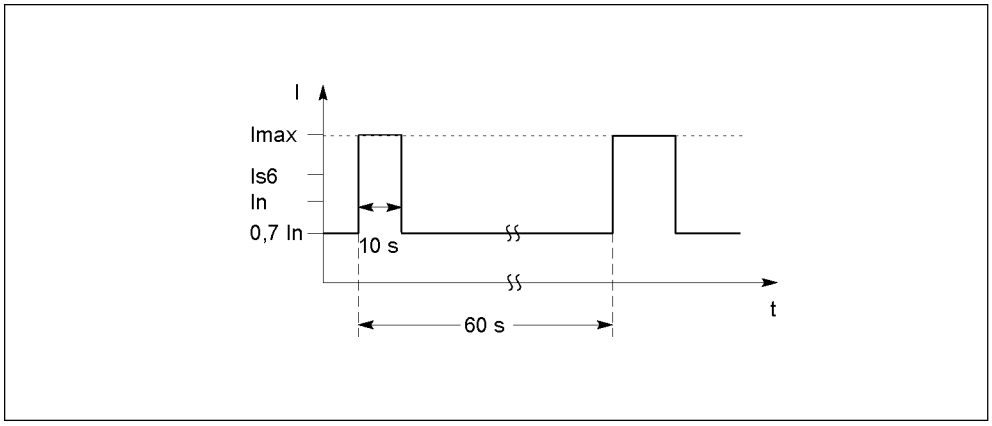


Figure 4-13 S6 peak current duty cycle with prior loading

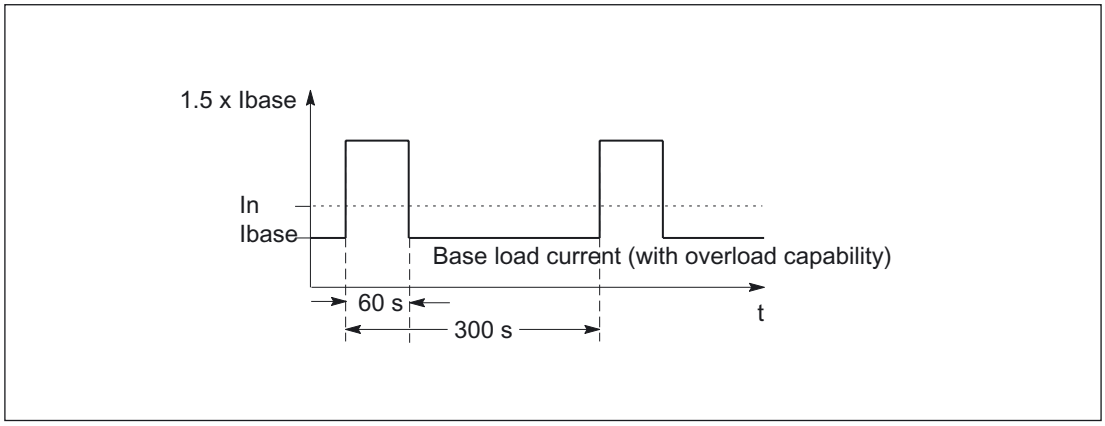


Figure 4-14 Current duty cycle with prior loading

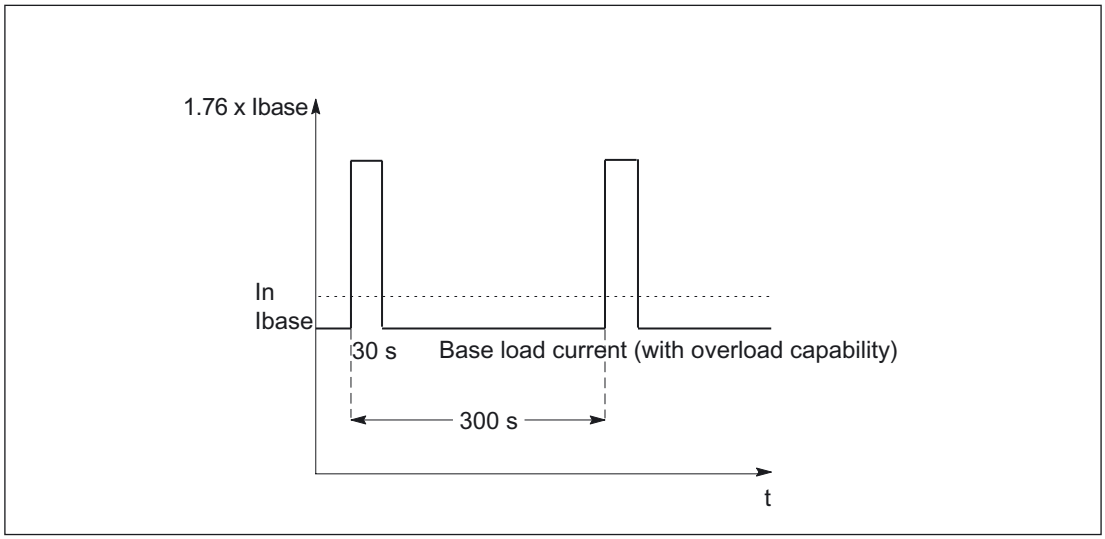


Figure 4-15 Current duty cycle with prior loading

Derating as a function of the ambient temperature

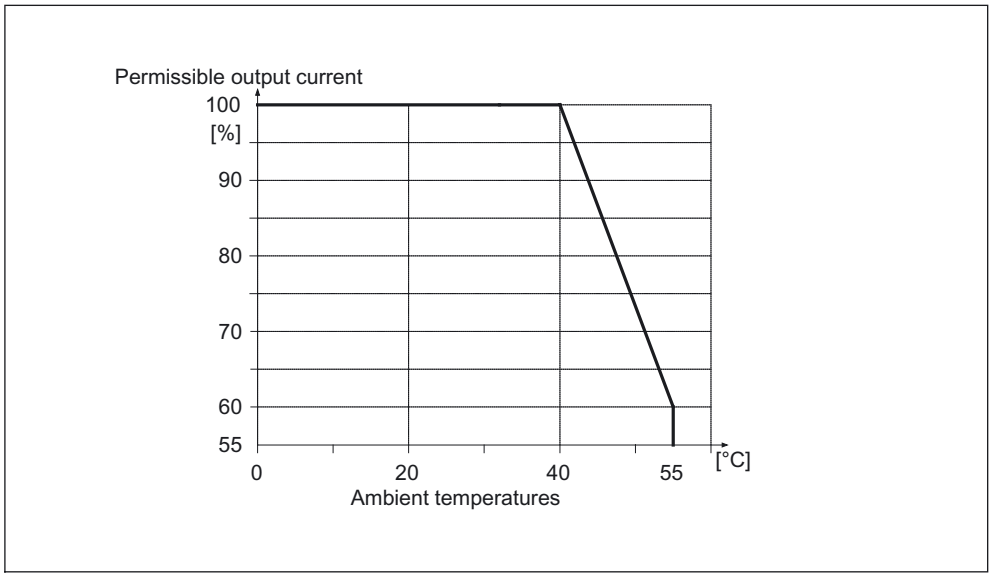


Figure 4-16 Derating as a function of the ambient temperature

Derating as a function of the pulse frequency

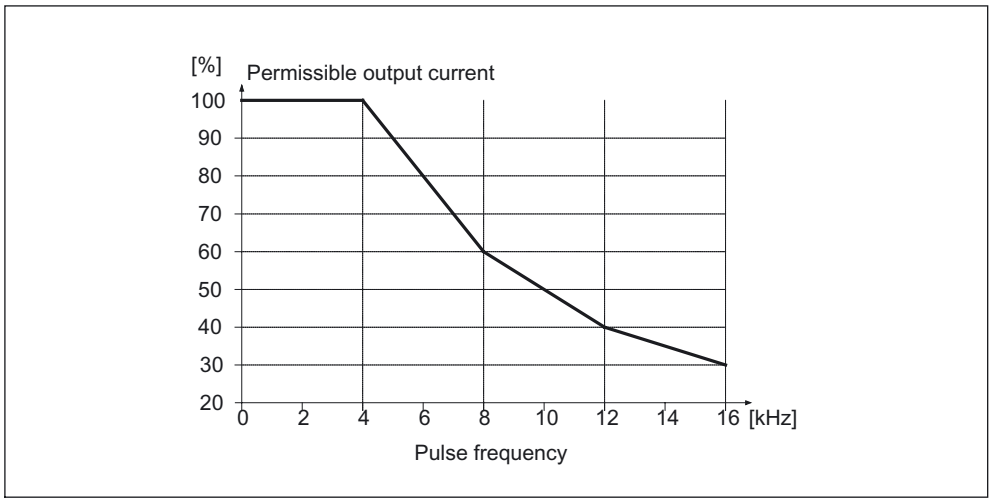


Figure 4-17 Derating as a function of the pulse frequency

Derating as a function of the installation altitude

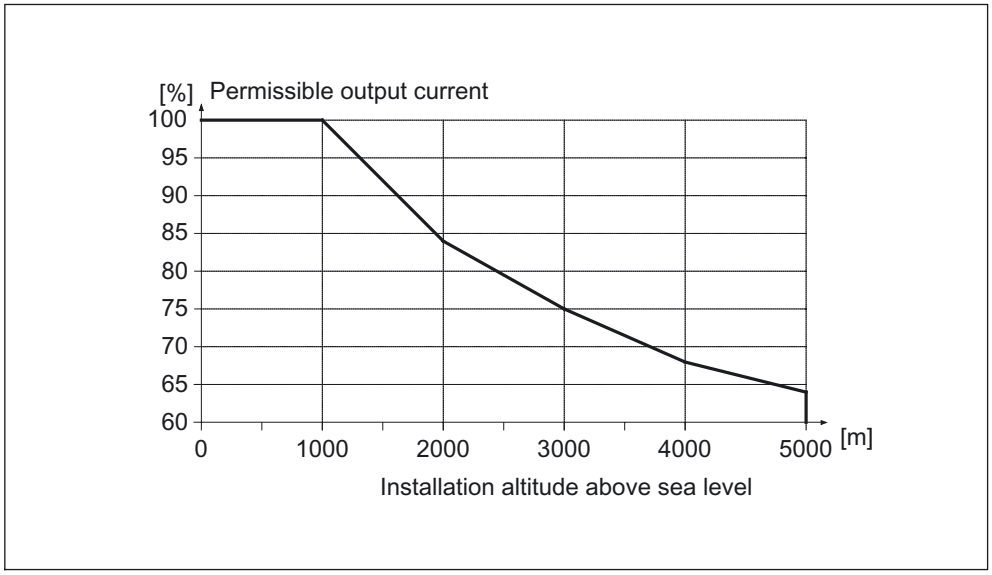


Figure 4-18 Derating as a function of the installation altitude

4.3 Motor modules with external air cooling

4.3.1 Description

A motor module with external air cooling is a power unit (inverter) that provides the power supply for the connected motor(s). 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 for the motor module are stored in the control unit.

Single motor modules and double motor modules are available.
Just one motor can be connected to and operated using a single motor module. Two motors can be connected to and operated with a double-motor module.

External air cooling uses the "through-hole" method. This is a cooling method for SINAMICS power units that is only available for booksize devices. The power unit and its heat sink can be inserted in a rectangular knockout at the rear of the switching cabinet and mounted with a seal. The heat sink fins and the fan (included in the scope of supply) project beyond the rear of the switching cabinet and the heat is dissipated outside the switching cabinet or in a separate air duct.

4.3.2 Safety Information

Warning

After disconnecting all the supply voltages, a hazardous voltage will be present in all components for another 5 minutes. The protective cover must not be opened until this time has elapsed.

When opening the protective cover for the DC link, you must activate the release. A suitable tool (e.g. screwdriver) must be used for this purpose.

The components must only be operated when the protective cover of the DC link is closed. Damaged components must not be used, otherwise this could result in secondary damage or accidents.

Caution

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

A set of labels in 12 languages is available using order number: 6SL3166-3AB00-0AAx.

Notice

The 80 mm clearances above and below the components must be observed.

Caution

The tightening torque of the DC link busbar screws (1.8 Nm) must be checked before startup.

Warning

Cable shields and unused power cable conductors (e.g. brake conductors) must be connected to PE potential to prevent capacitive cross-talk charges.

Non-observance can cause lethal shock voltages.

Caution

For DRIVE-CliQ connections self-prefabricated cables or couplings must not be used.

Notice

The external air cooling can cause the fans and the heat sink to become heavily contaminated, which may trigger the temperature monitor in the power section. The fans and heat sink must be checked for contamination at regular intervals and, if necessary, cleaned.

Note

After installation, the seal on the rear of the device must be checked to ensure that it is tight. Additional sealing can be used, if necessary.

Note

The mounting frames can only be used if the cabinet has an unpainted metal surface.

Note

A regulated DC power supply is required to operate motors with a built-in holding brake. The voltage is supplied via the internal 24 V busbars. The voltage tolerances of the motor holding brakes and the voltage drops of the connection cables must be taken into account.

The DC power supply should be set to 26 V. This ensures that the voltage supply for the brake remains within the permissible range when the following conditions are fulfilled:

- Using Siemens three-phase motors
- Using Siemens MOTION-CONNECT power cables
- Motor cable lengths: max. 100 m

Caution

The DC link busbar in a drive line-up must be sealed at both ends using DC link side covers (order no.: 6SL3162-5AA00-0AA0).

4.3.3 Interface description

4.3.3.1 Overview

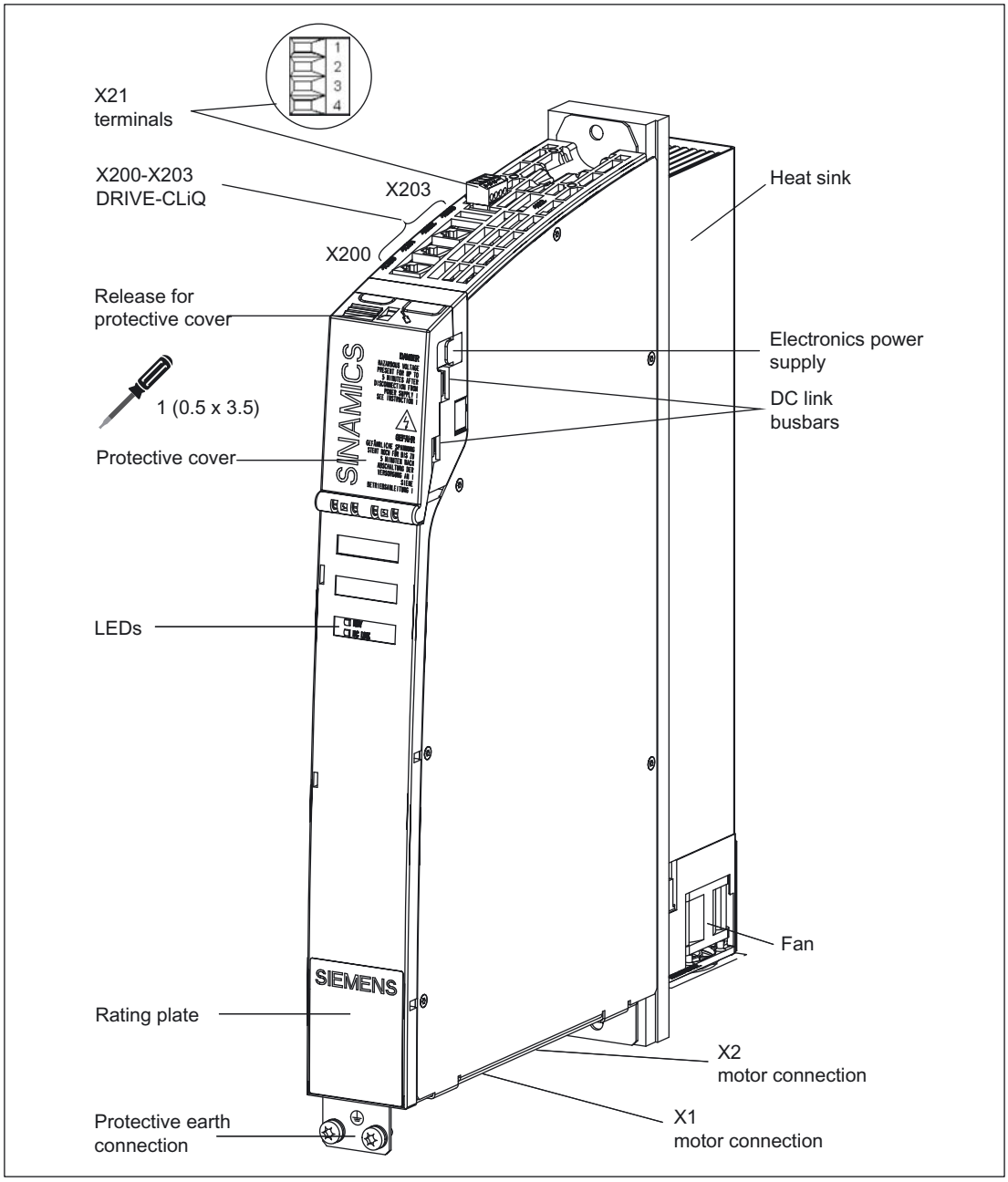
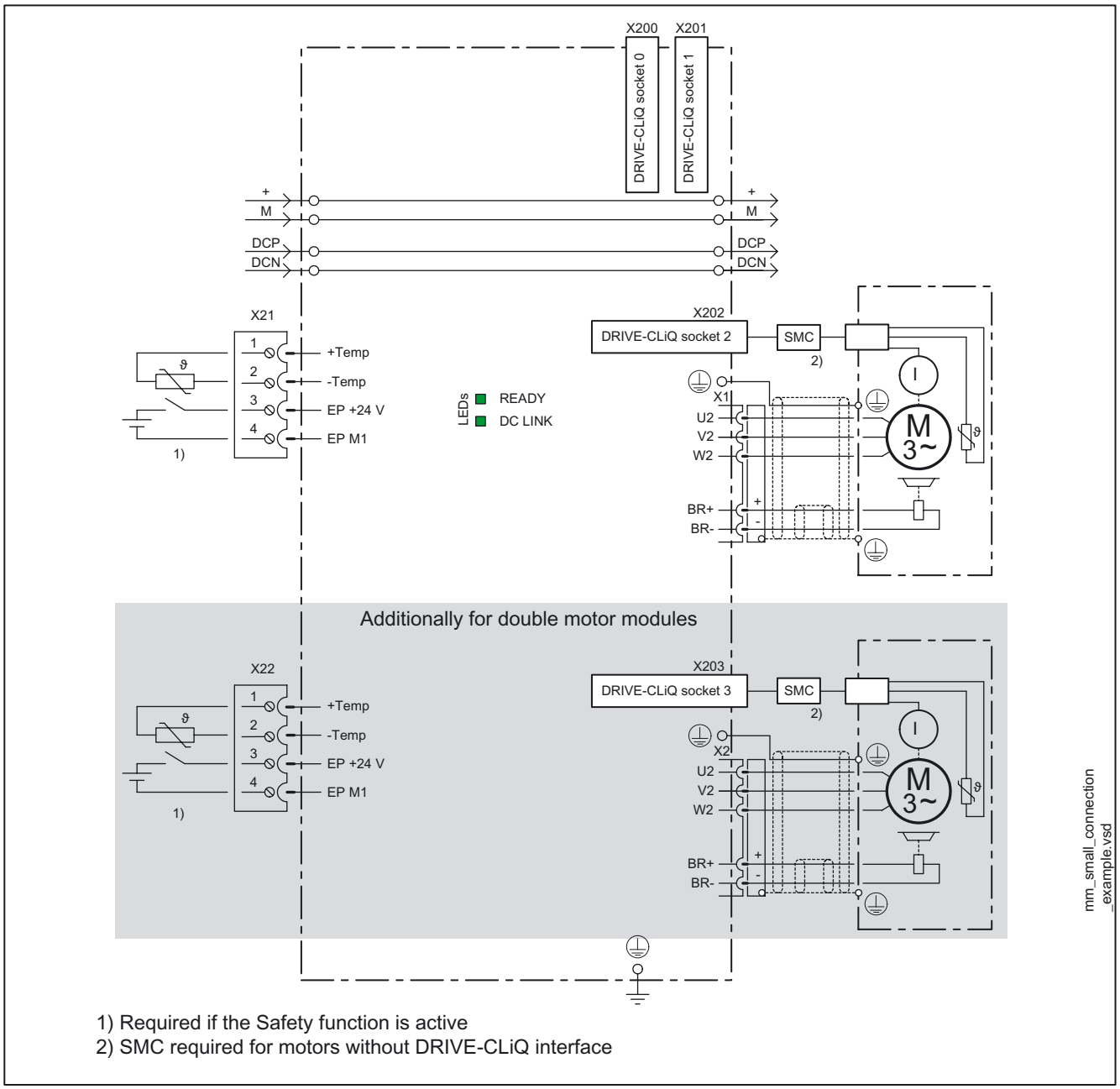


Figure 4-19 Example: Single motor module with external air cooling (5 A)

4.3.3.2 Connection Examples



1) Required if the Safety function is active
2) SMC required for motors without DRIVE-CLiQ interface

Figure 4-20 Example connection of motor modules 3 A to 30 A and 2x3 A to 2x18 A

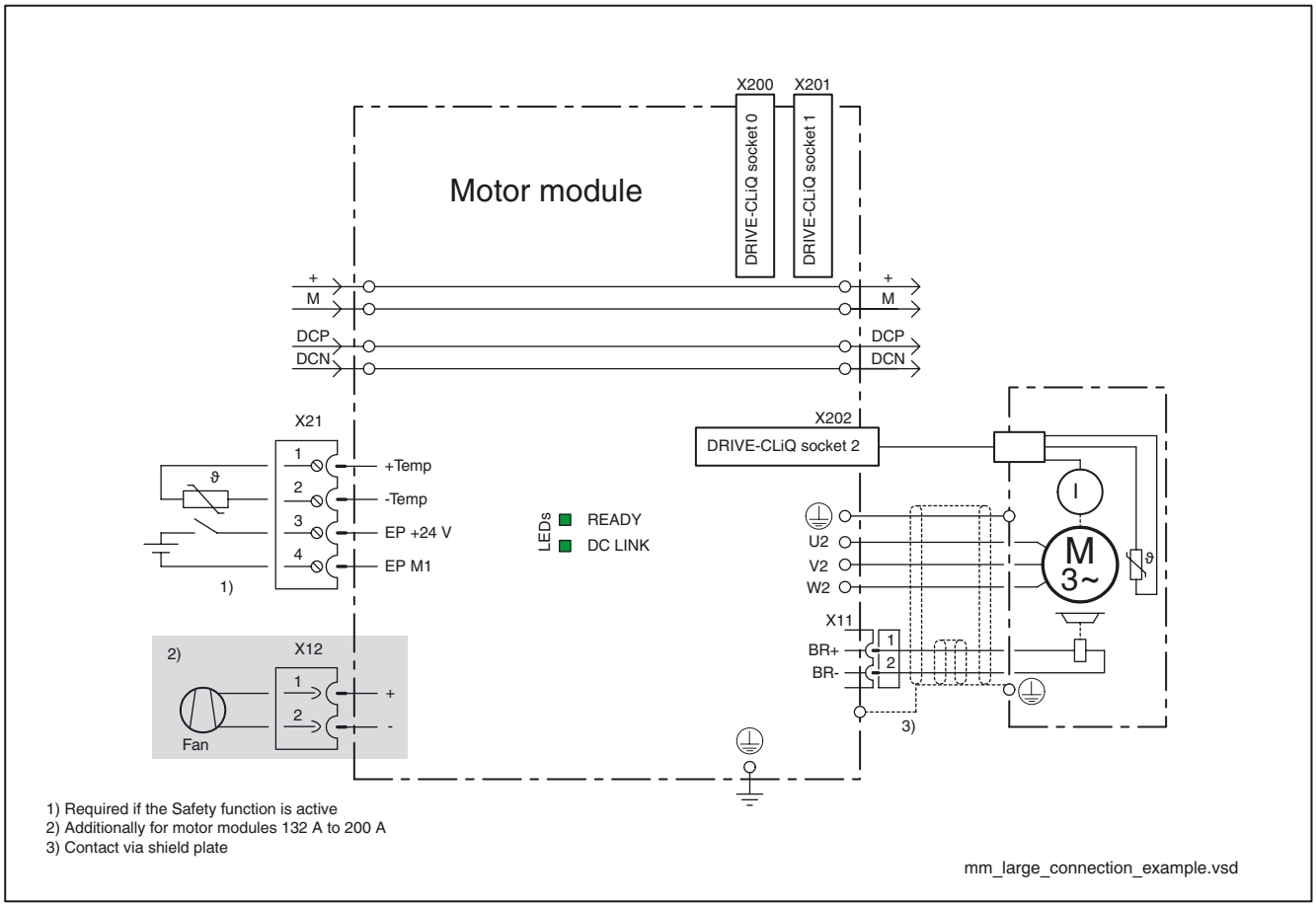
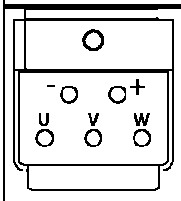
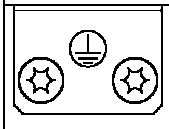


Figure 4-21 Example connection of single motor modules 45 A to 200 A

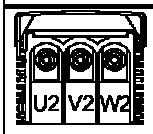
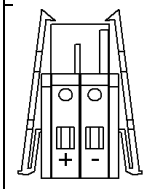
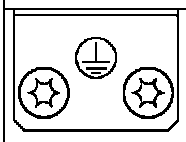
4.3.3.3 Motor/brake connection

Table 4-12 Terminal block X1/X2 motor modules 3 A to 30 A and 2x3 A to 2x18 A

	Terminal	Technical specifications
	U (U2)	Motor connection
	V (V2)	
	W (W2)	
	+ (BR+)	Brake connection
	- (BR-)	
	PE connection	Threaded hole M5/3 Nm [1]

[1] for ring cable lugs to DIN 46234

Table 4-13 Terminal block single motor module 45 A to 200 A

	Terminals	Technical specifications
	U2 V2 W2	**45 A to 60 A:** Threaded bolt M6/6 Nm [1] **85 A:** Threaded bolt M8/13 Nm [1] **132 A to 200 A:** Threaded bolt M8/13 Nm [1]
	+ (BR+) - (BR-)	X11 brake connector [2]: Voltage: 24 V DC Max. load current: 2 A Min. load current: 0.1 A Max. connectable cross-section: 2.5 mm^2 Type: Spring-loaded terminal 2 (see Connection Methods) Manufacturer: Wago; order number: 231-102/037-000 The brake connector is part of the prefabricated cable.
	PE connection	**Single motor module with a rated output current of 45 A to 132:** Threaded bolt for motor cables: M6/6 Nm [1] Threaded hole for PE: M6/6 Nm[1] **Single motor module with a rated output current of 85 A** Threaded bolt for motor cables: M8/13 Nm [1] Threaded hole for PE: M6/6 Nm[1] **Single motor module with a rated output current of 132 A to 200A** Threaded bolt for motor cables: M8/13 Nm [1] Threaded hole for PE: M8/6 Nm [1]

[1] For ring cable lugs to DIN 46234

[2] The circuit for protecting the brakes against overvoltage is in the motor module and does not need to be installed externally. The max. load current is 2 A, the min. load current 0.1 A.

Note

The total length of the shielded power cables (motor supply cables and DC link cables) must not exceed 350 m.

Note

The motor brake must be connected via connector X11. Cable BR - must not be connected directly to electronic ground (M).

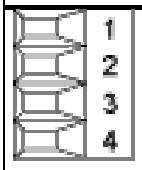
Warning

Only protective extra-low voltages (PELVs) that comply with EN60204-1 must be connected to all connections and terminals between 0 and 48 V DC.

The voltage tolerances of the motor holding brakes must be taken into account.

4.3.3.4 X21/X22 EP terminals / temperature sensor connection motor module

Table 4-14 Terminal block X21/X22

	Terminal	Function	Technical specifications
	1	+Temp	Temperature sensor connection KTY84–1C130/PTC
	2	-Temp	
	3	EP +24 V (Enable Pulses)	Supply voltage: 24 V DC (20.4 V - 28.8 V) Current consumption: 10 mA Isolated input Signal propagation times: L → H 100 µs H → L: 1000 µs
	4	EP M1 (Enable Pulses)	
Max. connectable cross-section 1.5 mm^2 Type: Screw terminal 1 (see Connection Methods)			

Notice

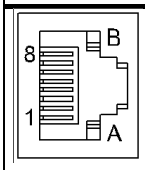
The KTY temperature sensor/the PTC must be connected with the correct polarity.

Note

The temperature sensor connection is required for motors whose temperature value is not transmitted by DRIVE-CLiQ.
To operate, 24 V DC must be applied to terminal 3 and terminal 4 must be grounded if the "Safe Standstill" function is selected. Upon removal, pulse inhibit is activated.

4.3.3.5 X200-X203 DRIVE-CLiQ interface

Table 4-15 DRIVE-CLiQ interface X200-X202: single motor module
DRIVE-CLiQ interface X200-X203: double motor module

	Pin	Name	Technical specifications
	1	TXP	Transmit data +
	2	TXN	Transmit data -
	3	RXP	Receive data +
	4	Reserved, do not use	
	5	Reserved, do not use	
	6	RXN	Receive data -
	7	Reserved, do not use	
	8	Reserved, do not use	
	A	+ (24 V)	Power supply
	B	GND (0 V)	Electronic ground
Blanking plate for DRIVE-CLiQ interface: Molex, order number: 85999-3255			

4.3.3.6 Meaning of the LEDs on the motor module

Table 4-16 Meaning of the LEDs on the motor module

LED	Color	State	Description
READY	-	OFF	Electronics power supply outside permissible tolerance range.
	Green	Continuous	The component is ready for operation and cyclic DRIVE-CLiQ communication is taking place.
	Orange	Continuous	DRIVE-CLiQ communication is being established.
	Red	Continuous	At least one fault is present in this component.
	Green Red	Flashing 2 Hz	Firmware is being downloaded.
	Green/ Orange or Red/ Orange	Flashing 2 Hz	Component recognition via LED is activated (p0124). Note: Both options depend on the LED status when module recognition is activated via p0124 = 1.
DC LINK	-	OFF	Electronics power supply outside permissible tolerance range.
	Orange	Continuous	DC link voltage within permissible tolerance range (only when ready for operation)
	Red	Continuous	DC link voltage outside permiss. tol. range (only when ready for operation)

Cause and rectification of faults

The following reference contains information about the cause and rectification of faults:

Reference: /IH1/ SINAMICS S120 Commissioning Manual

4.3.4 Dimension Drawing

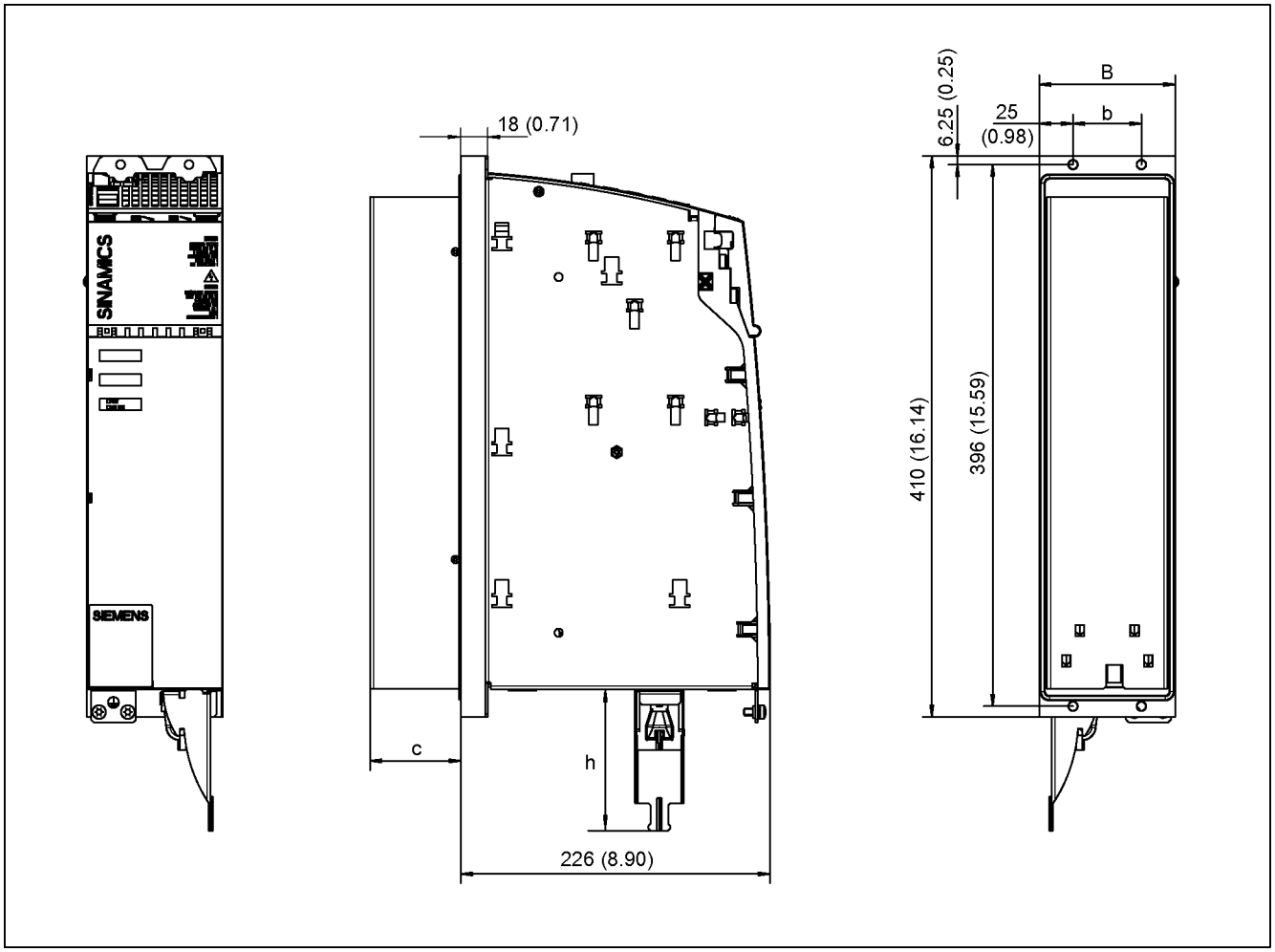


Figure 4-22 Dimension drawing of motor module with external air cooling (3 A to 30 A)

Table 4-17 Dimensions of motor module with external air cooling (3 A to 30 A)

Motor module type	Order number	W [mm] (inches)	w [mm] (inches)	c [mm] (inches)	h [mm] (inches)
Single motor module 3 A	6SL3121-1TE13-0AAx	50 (1.97)	-	66.5 (2.62)	89 (3.50)
Single motor module 5 A	6SL3121-1TE15-0AAx	50 (1.97)	-	66.5 (2.62)	89 (3.50)
Single motor module 9 A	6SL3121-1TE19-0AAx	50 (1.97)	-	66.5 (2.62)	89 (3.50)
Single motor module 18 A	6SL3121-1TE21-8AAx	50 (1.97)	-	66.5 (2.62)	89 (3.50)
Single motor module 30 A	6SL3121-1TE23-0AAx	100 (3.94)	50 (1.97)	66.5 (2.62)	89 (3.50)
Double motor module 3 A	6SL3121-2TE13-0AAx	50 (1.97)	-	66.5 (2.62)	89 (3.50)
Double motor module 5 A	6SL3121-2TE15-0AAx	50 (1.97)	-	66.5 (2.62)	89 (3.50)
Double motor module 9 A	6SL3121-2TE19-0AAx	50 (1.97)	-	66.5 (2.62)	89 (3.50)
Double motor module 18 A	6SL3121-2TE21-8AAx	100 (3.94)	50 (1.97)	66.5 (2.62)	89 (3.50)

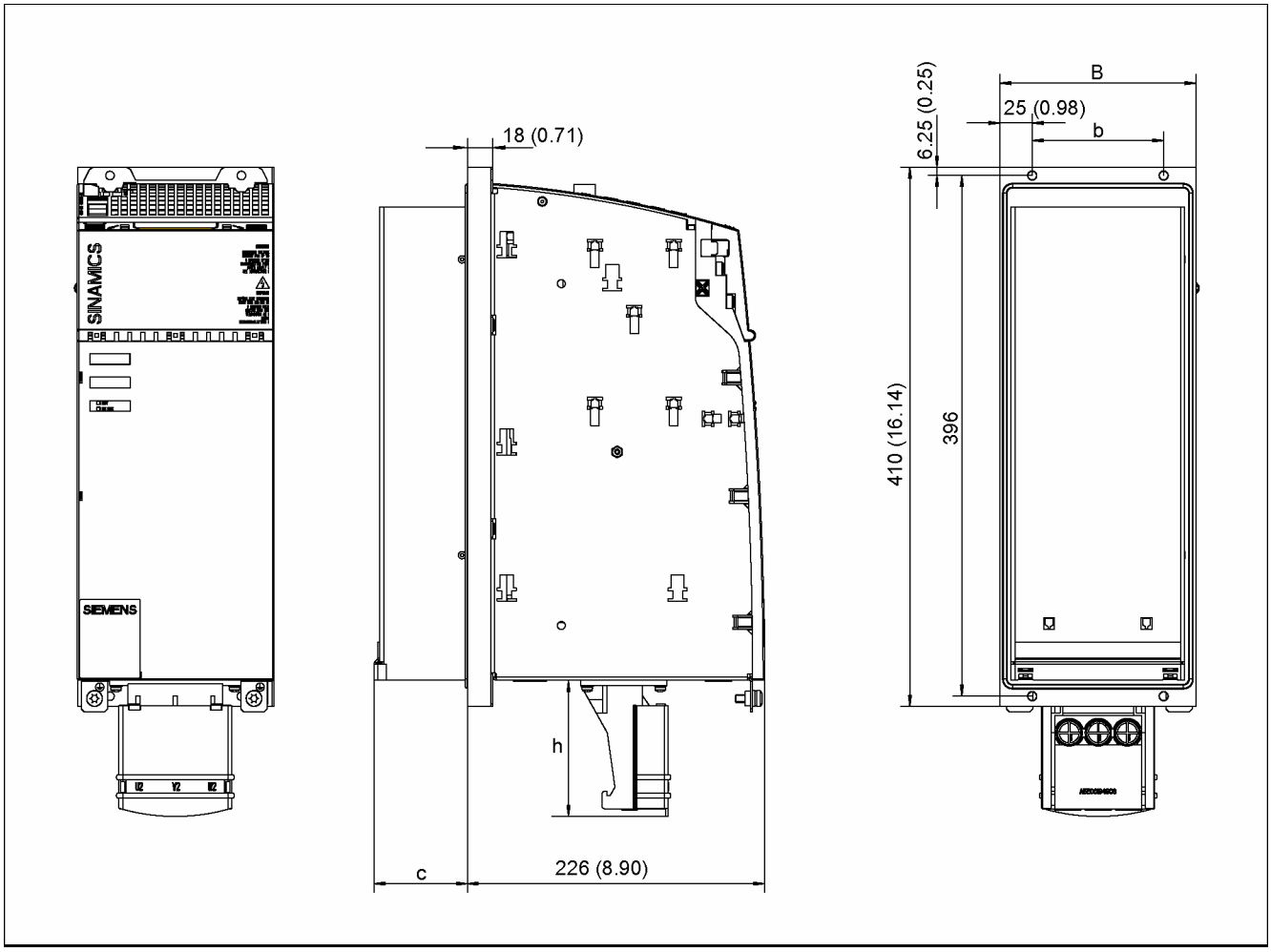


Figure 4-23 Dimension drawing of motor module with external air cooling (45 A, 60 A, and 85 A)

Table 4-18 Dimensions of motor module with external air cooling (45 A, 60 A, and 85 A)

Motor module type	Order number	W [mm] (inches)	w [mm] (inches)	c [mm] (inches)	h [mm] (inches)
Motor Module with External Air Cooling					
Single motor module 45 A	6SL3121-1TE24-5AAx	150 (5.91)	-	71 (2.80)	89 (3.50)
Single motor module 60 A	6SL3121-1TE26-0AAx	150 (5.91)	100 (3.94)	71 (2.80)	89 (3.50)
Single motor module 85 A	6SL3121-1TE28-5AAx	200 (7.87)	150 (5.91)	92 (3.62)	89 (3.50)

4.3.5 Installation

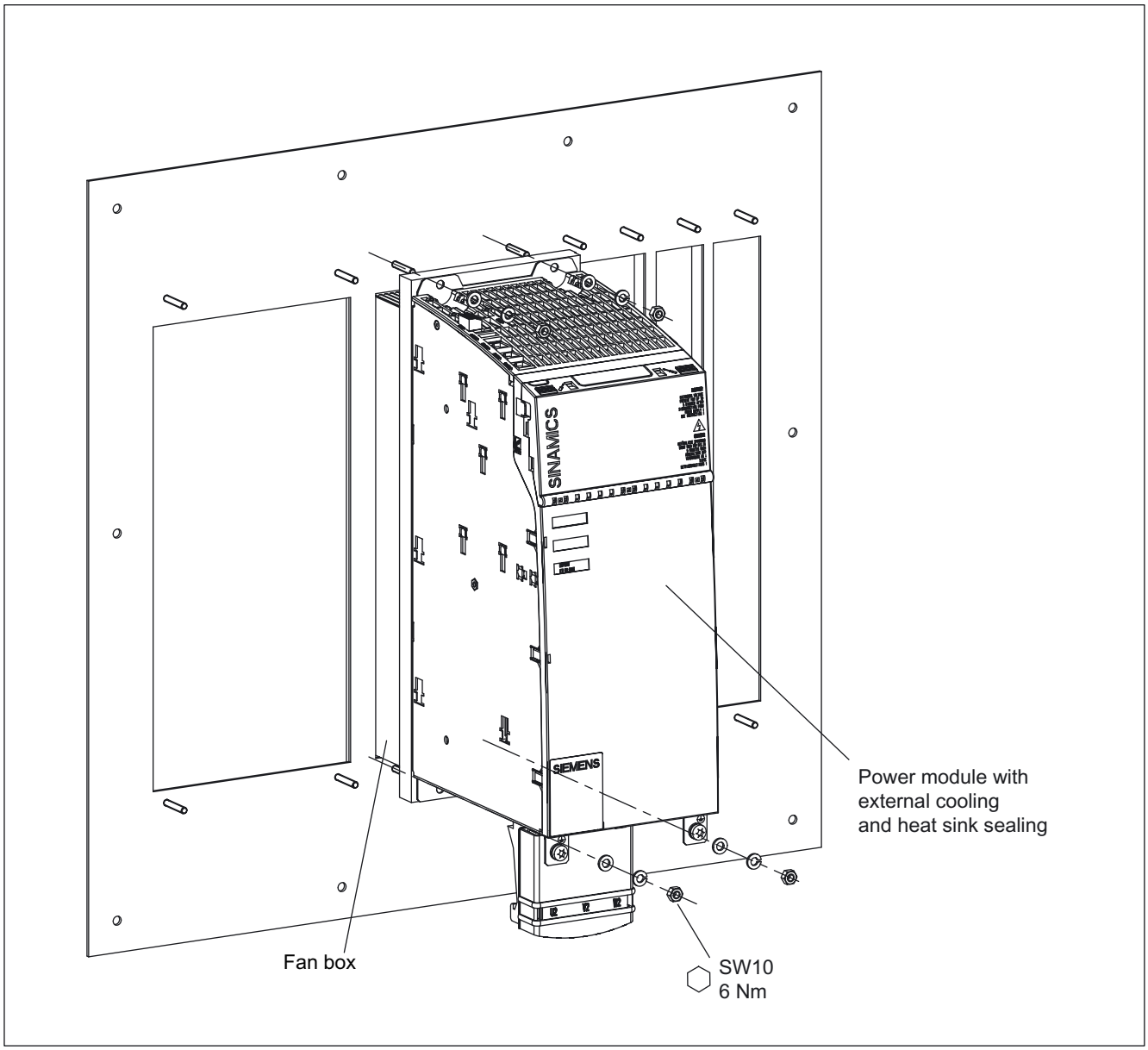


Figure 4-24 Example: installing the power module with external air cooling

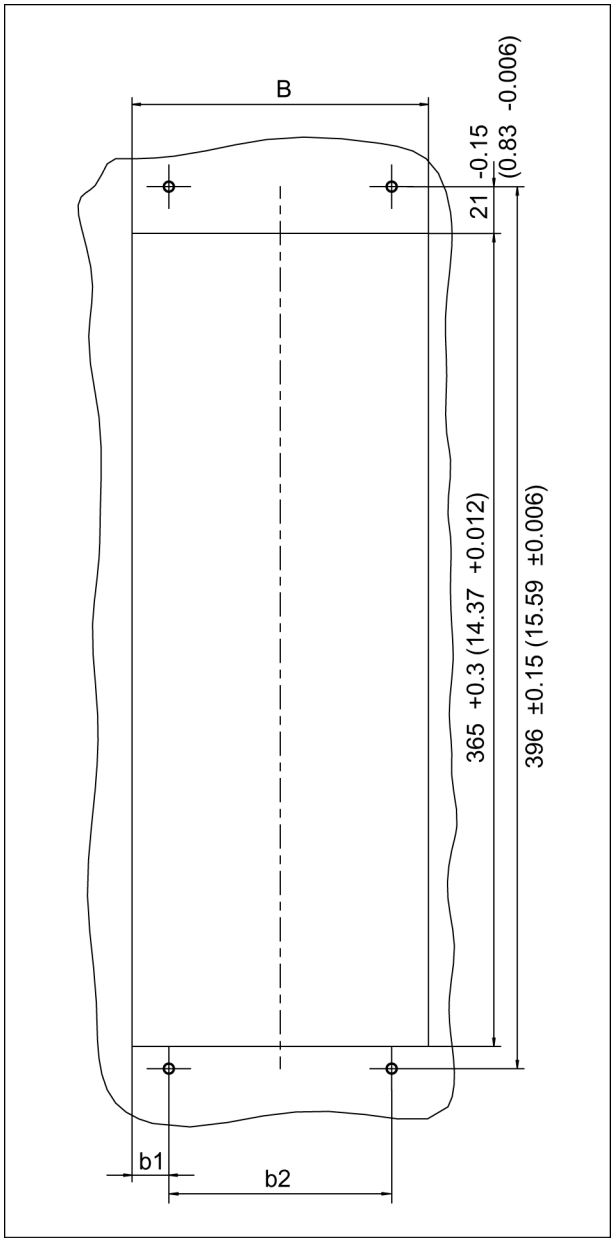


Figure 4-25 Installation openings for the power module with external air cooling

Table 4-19 Dimensions of the installation openings for the power module with external air cooling

Module width	W [mm] (inches)	w1 [mm] (inches)	w2 [mm] (inches)
50 mm	41.5 + 0.3 (1.63 + 0.012)	20.75 +0.15 (0.82 +0.006)	0
100 mm	89.5 + 0.3 (3.52 + 0.012)	19.75 +0.15 (0.78 +0.006)	50 ± 0.15 (1.97 ± 0.006)
150 mm	133 + 0.3 (5.24 + 0.012)	16.5 +0.15 (0.65 +0.006)	100 ± 0.15 (3.94 ± 0.006)
200 mm	173 + 0.3 (6.81 + 0.012)	11.5 +0.15 (0.45 +0.006)	150 ± 0.15 (5.91 ± 0.006)

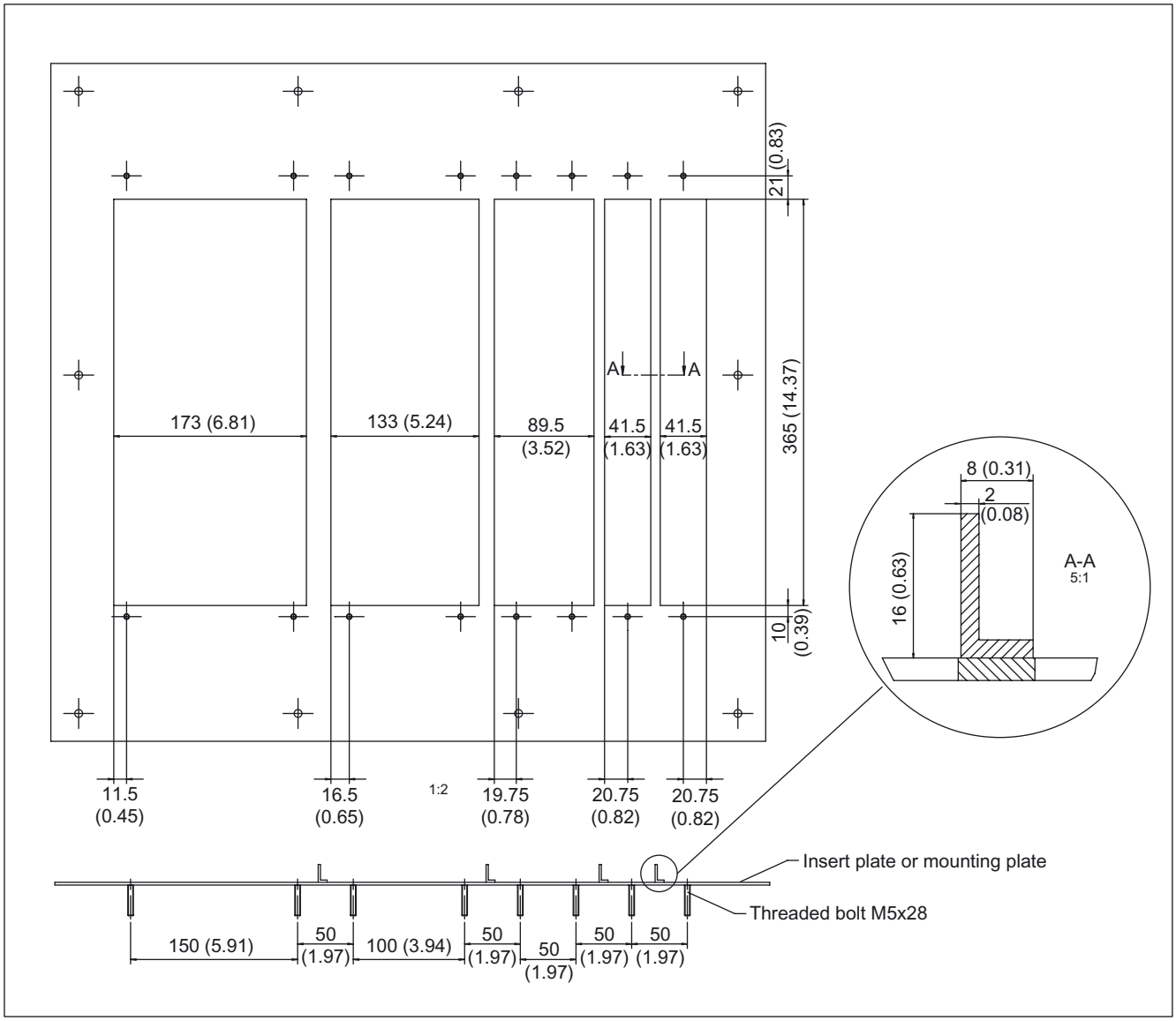


Figure 4-26 Example: mounting plate with a drive line-up

When installing the module, you must ensure that the module seal is tight all round. The cross-pieces must be sufficiently stable.

If required, we recommend that you reinforce the cross-pieces for the recesses.

In our example, the cross-pieces have been reinforced using brackets to EN 755-9.

Any means necessary can be used to secure the bracket to the insert plate.

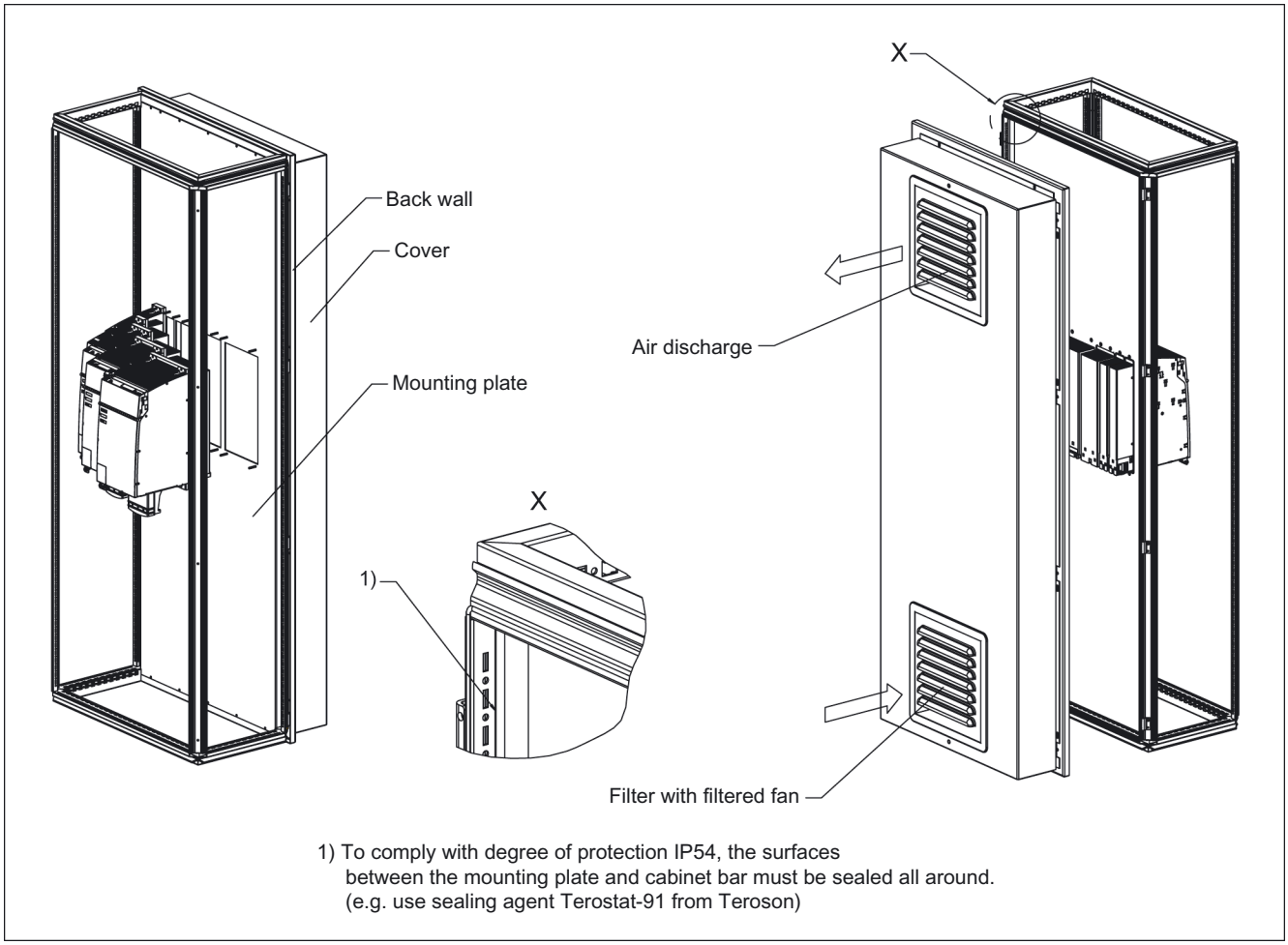


Figure 4-27 Example 1: installation in cabinet with mounting plate

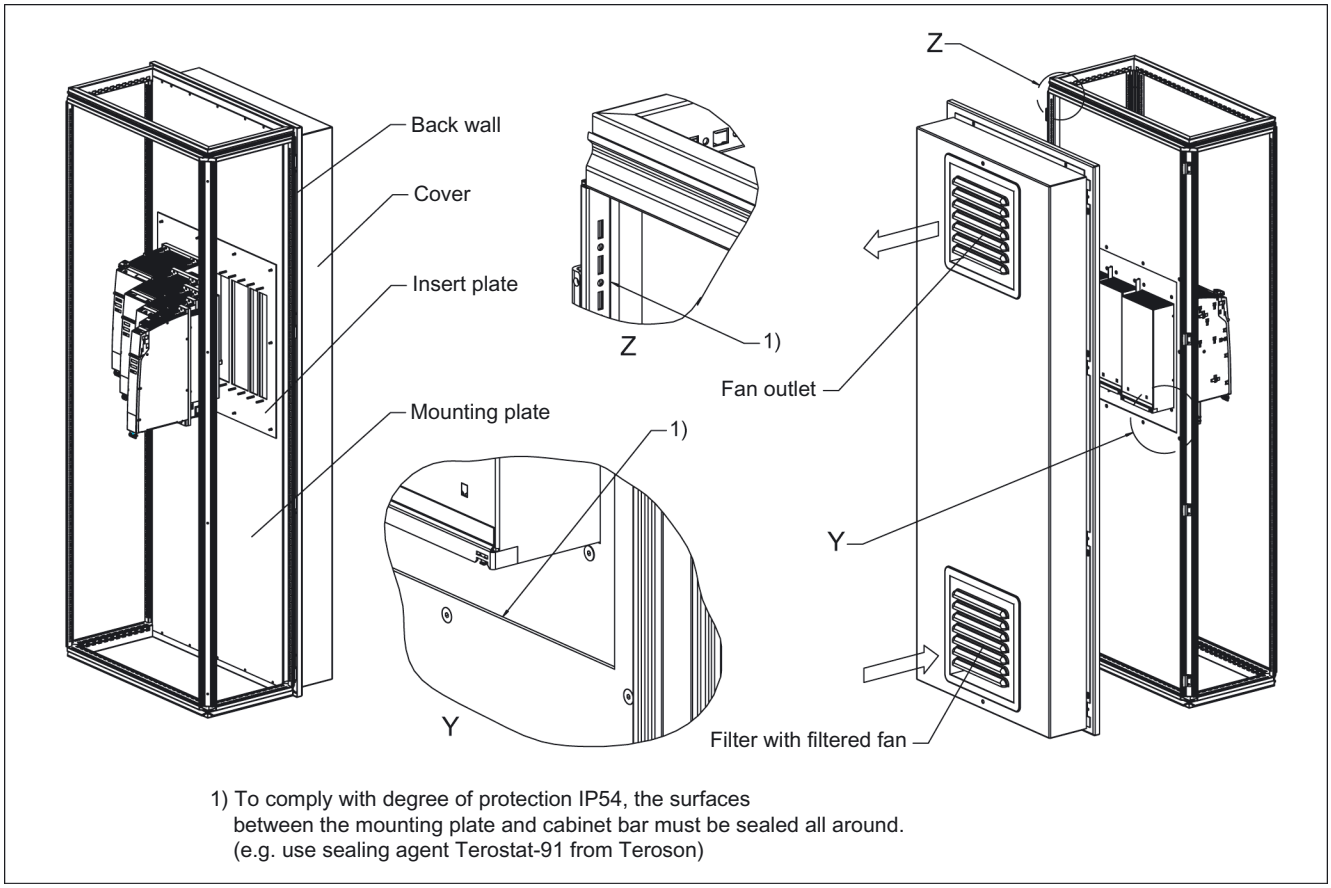


Figure 4-28 Example 2: installation in cabinet with mounting plate

We recommend that you attach a cover and filtered fan to the cabinet.

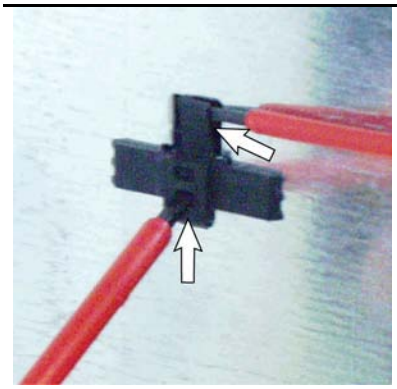
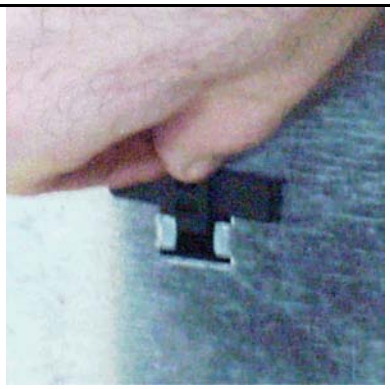
The filtered fan must be fitted in such a way that the cooling air required by the drive line-up is not restricted. This can be determined by establishing the total cooling air required by the individual components. This information is available in the technical specifications.

Note

If the cooling air requirement is not covered by the filtered fan, the components cannot output their specified power.
The filter must be serviced at regular intervals.

Removing the holders for securing the control unit

If an additional component is to be flush-mounted to the left of the component, the holders for securing the control unit must be removed.

		
Use suitable tools to lift the latching device and push up the holder.	Remove the holder.	The holder removed

4.3.6 Electrical connection

Shield contact for the terminals

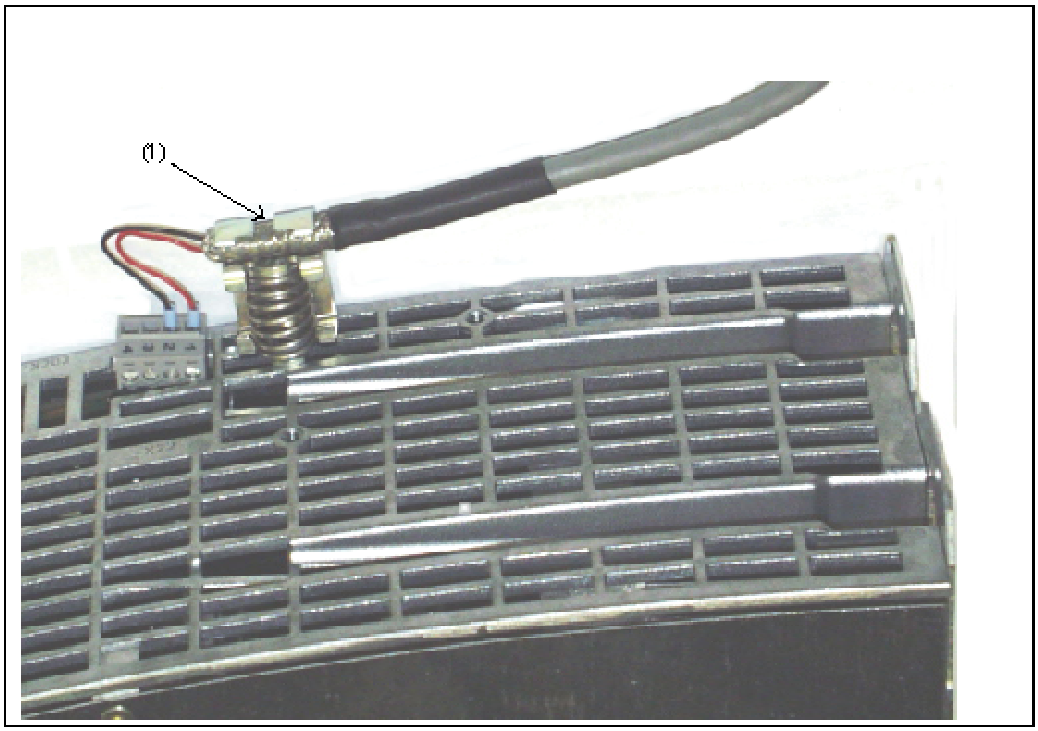


Figure 4-29 Shield contact for the terminals

Internet address:

Weidmüller: http://www.weidmueller.com

4.3.7 Technical specifications

Table 4-20 Technical specifications for single motor modules booksize (3 to 30 A)

External air cooling	6SL3120–	1TE13-0AAx	1TE15-0AAx	1TE21–0AAx	1TE21–8AAx	1TE23-0AAx
Rated current	**A**	**3**	**5**	**9**	**18**	**30**
Voltage						
Supply: DC link voltage Electr. power supply	 V_{DC} V_{DC}	 510 – 750 24 (20.4 - 28.8)				
Output voltage	V_{ACrms}	0 – 480				
Overvoltage tripping Undervolt. tripp.	V_{DC} V_{DC}	820 ± 2% 380				
Electronics curr. cons. at 24 V	A_{DC}	0.85	0.85	0.85	0.85	0.9
Power loss[1]	W (int./ext.)	15/15	23/30	35/45	75/90	80/210
Rated output curr. (I_n)	A_{ACrms}	3	5	9	18	30
Base load curr. (I_{base})	A	2.6	4.3	7.7	15.3	25.5
Intermittent duty current (I_{s6}) 40%	A_{ACrms}	3.5	6	10	24	40
Peak current (I_{max})	A_{ACrms}	6	10	18	36	56
DC link busbar curr. carrying capacity	A_{DC}	100	100	100	100	100
24 V busbar current carrying capacity	A_{DC}	20	20	20	20	20
Rat. power (DC link volt. 600 V_{DC} and pulse freq. 4 kHz)	kW	1.6	2.7	4.8	9.7	16
Max. pulse frequency without derating	kHz	4	4	4	4	4
Max. pulse frequency with derating	kHz	16	16	16	16	16
Max. ambient temperature without derating	°C	40	40	40	40	40
Max. ambient temperature with derating	°C	55	55	55	55	55
DC link capacitance	µF	110	110	110	220	705
Efficiency (4kHz)	η	0.97	0.97	0.97	0.97	0.97
Sound pressure level	dB(A)	<60	<60	<60	<60	<60
Cooling air requirement	m^3/h	29.6	29.6	29.6	29.6	56
Weight	kg	5.69	5.69	5.7	5.7	8.43

Table 4-21 Technical specifications for single motor modules booksize (45 to 200 A)

External air cooling	**6SL3120–**	**1TE24-5AAx**	**1TE26-0AAx**	**1TE28-5AAx**
Rated current	**A**	**45**	**60**	**85**
Voltage				
Supply: DC link voltage Electronics power supply	 V_{DC} V_{DC}	 510 – 750 24 (20.4 - 28.8)		
Output voltage	V_{ACrms}	0 – 480		
Overvoltage tripping Undervoltage tripping	V_{DC} V_{DC}	820 ± 2% 380		
Electronics current consumption at 24 V	A_{DC}	1.2	1.2	1.5
Power loss[1]	W (int./ext.)	110/320	135/455	160/590
Rated output current (I_n)	A_{ACrms}	45	60	85
Base load current (I_{geund})	A	38	51	68
Intermittent duty current (I_{s6}) 40%	A_{ACrms}	60	80	110
Peak current (I_{max})	A_{ACrms}	85	113	141
DC link busbar current carrying capacity	A_{DC}	100	100	200
24 V busbar current carrying capacity	A_{DC}	20	20	20
Rated power (DC link voltage 600 V_{DC} and clock frequency 4 kHz)	kW	24	32	46
Max. pulse frequency without derating	kHz	4	4	4
Max. pulse frequency with derating	kHz	16	16	16
Max. ambient temperature without derating	°C	40	40	40
Max. ambient temperature with derating	°C	55	55	55
DC link capacitance	µF	1175	1410	1880
Efficiency (4kHz)	η	0.97	0.97	0.97
Sound pressure level	dB(A)	<65	<65	<60
Cooling air requirement	m^3/h	112	112	160
Weight	kg	13.2	13.35	To be added.

Table 4-22 Technical specifications for double motor modules booksize (2x3 to 2x18A)

External air cooling	**6SL3120-**	**2TE13-0AAx**	**2TE15-0AAx**	**2TE21-0AAx**	**2TE21-8AAx**
Rated current	**A**	**2x3**	**2x5**	**2x9**	**2x18**
Voltage					
Supply: DC link voltage Electronics power supply	 V_{DC} V_{DC}	 510 – 750 24 (20.4 - 28.8)			
Output voltage	V_{ACrms}	0-480			
Overvoltage tripping Undervoltage tripping	V_{DC} V_{DC}	820 ± 2% 380			
Electronics current consumption at 24 V	A_{DC}	1.0	1.0	1.0	1.0
Power loss[1]	W (int./ext.)	25/35	45/60	65/95	80/240
Rated output current (I_n)	A	2x3	2x5	2x9	2x18
Base load current (I_{base})	A	2x2.6	2x4.3	2x7.7	2x15.3
Intermittent duty current (I_{S6}) 40%	A_{ACrms}	3.5	6	10	24
Peak current (I_{max})	A_{ACrms}	6	10	18	36
DC link busbar current carrying capacity	A	100	100	100	100
24 V busbar current carrying capacity	A	20	20	20	20
Rated power (600V, 4kHz)	kW	1.6	2.7	4.8	9.7
Max. pulse frequency without derating	kHz	4	4	4	4
Max. pulse frequency with derating	kHz	16	16	16	16
Max. ambient temperature without derating	°C	40	40	40	40
Max. ambient temperature with derating	°C	55	55	55	55
DC link capacitance	µF	110	220	220	705
Efficiency (4kHz)	η	0.97	0.97	0.97	0.97
Sound pressure level	dBA	<60	<60	<60	<60
Cooling air requirement	m^3/h	29.6	29.6	29.6	56
Weight	kg	5.8	5.8	5.7	8.6

[1] For an overview, see the power loss tables in Cabinet Design.

Rated duty cycles of motor modules booksize

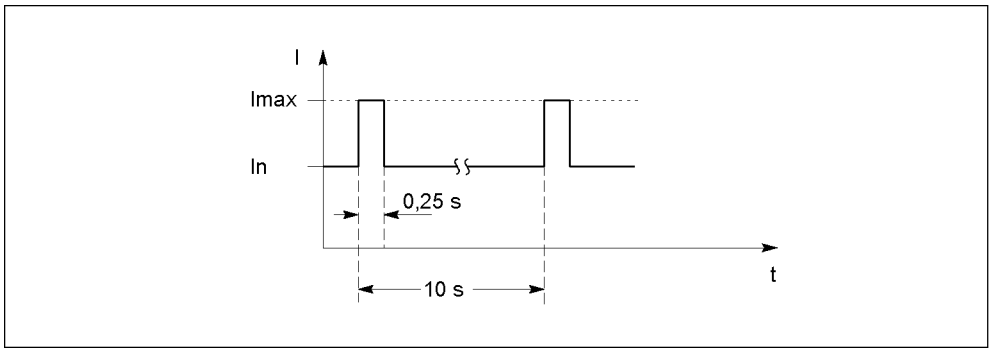


Figure 4-30 Peak current duty cycle with prior loading

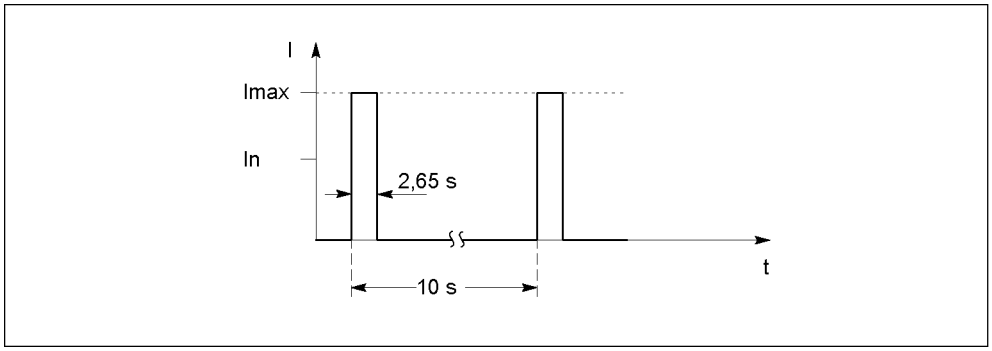


Figure 4-31 Peak current duty cycle without prior loading

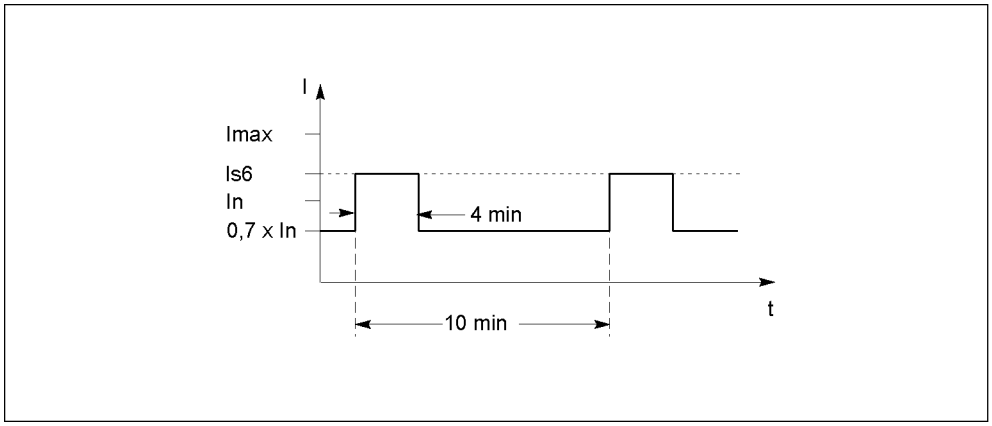


Figure 4-32 S6 current duty cycle with prior loading

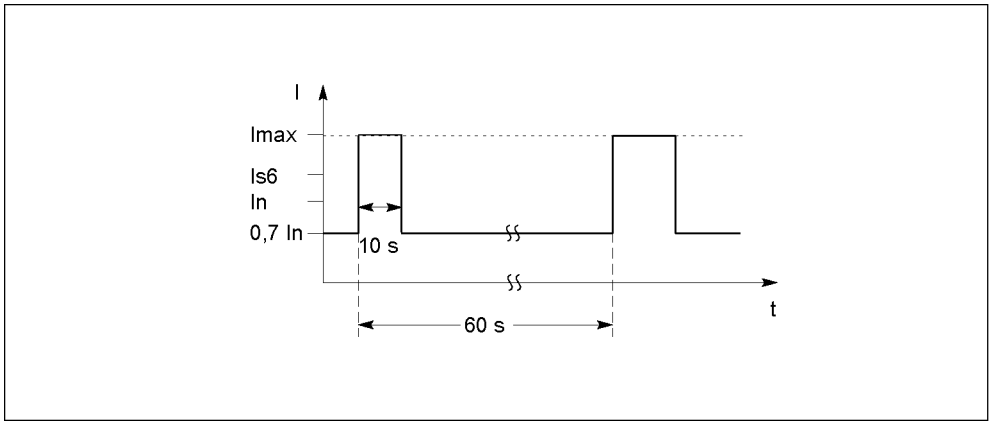


Figure 4-33 S6 peak current duty cycle with prior loading

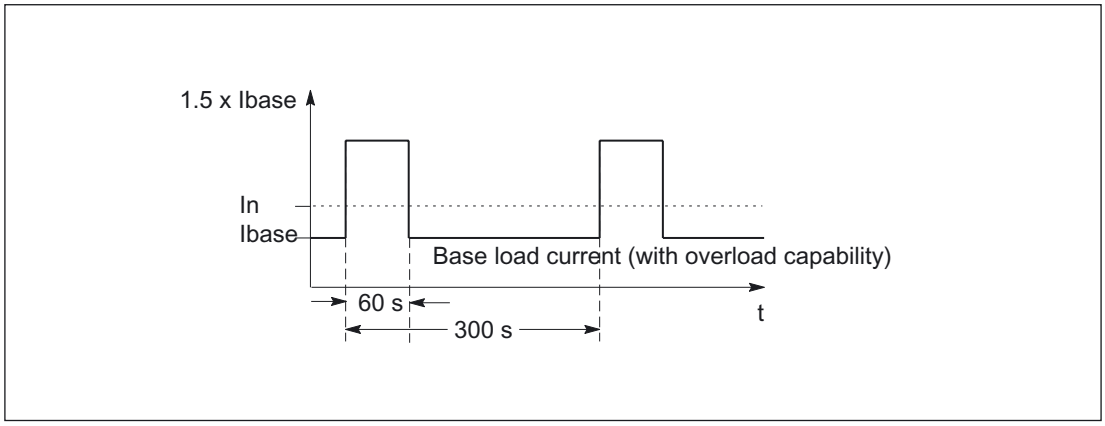


Figure 4-34 Current duty cycle with prior loading

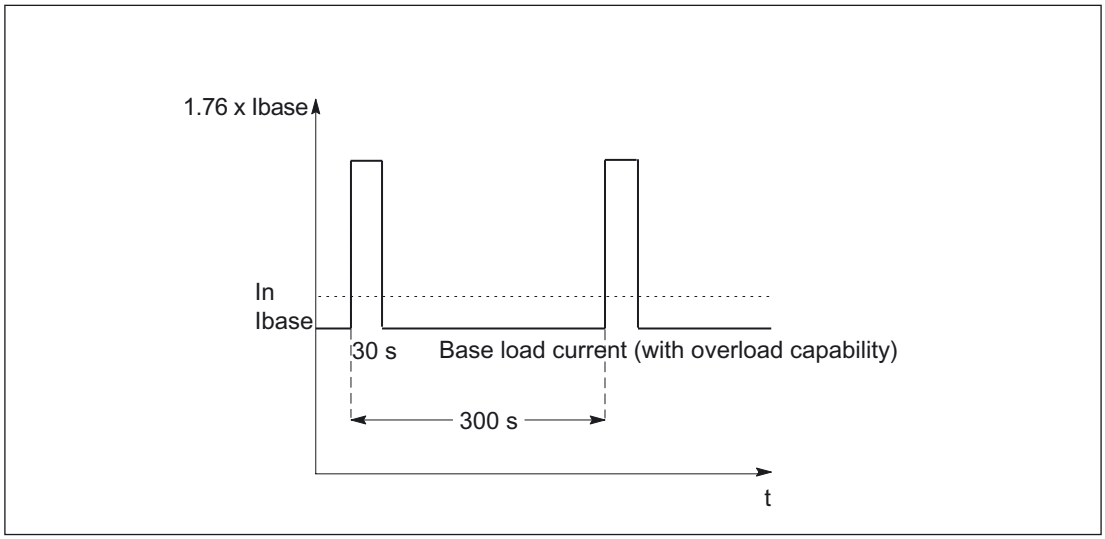


Figure 4-35 Current duty cycle with prior loading

Derating as a function of the ambient temperature

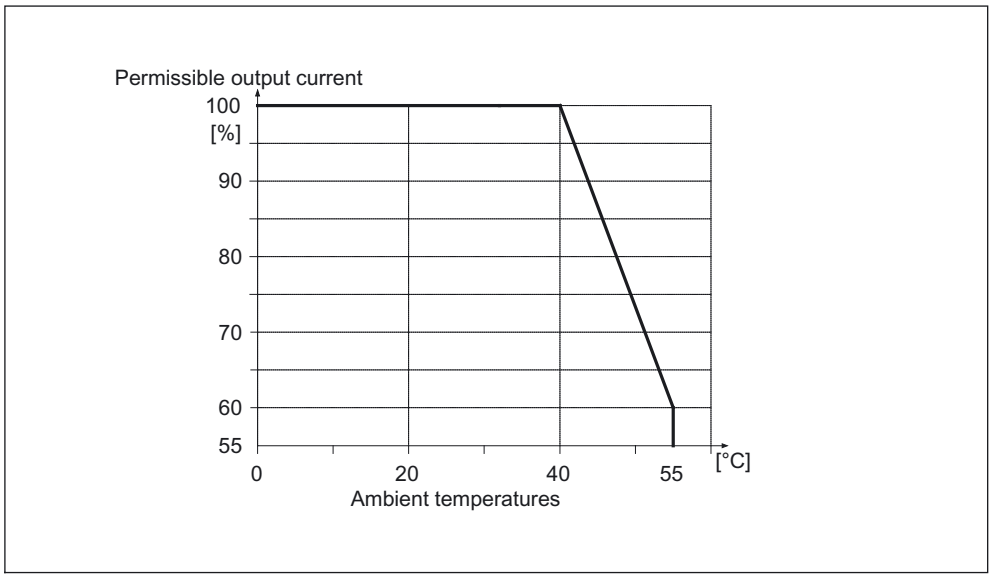


Figure 4-36 Derating as a function of the ambient temperature

Derating as a function of the pulse frequency

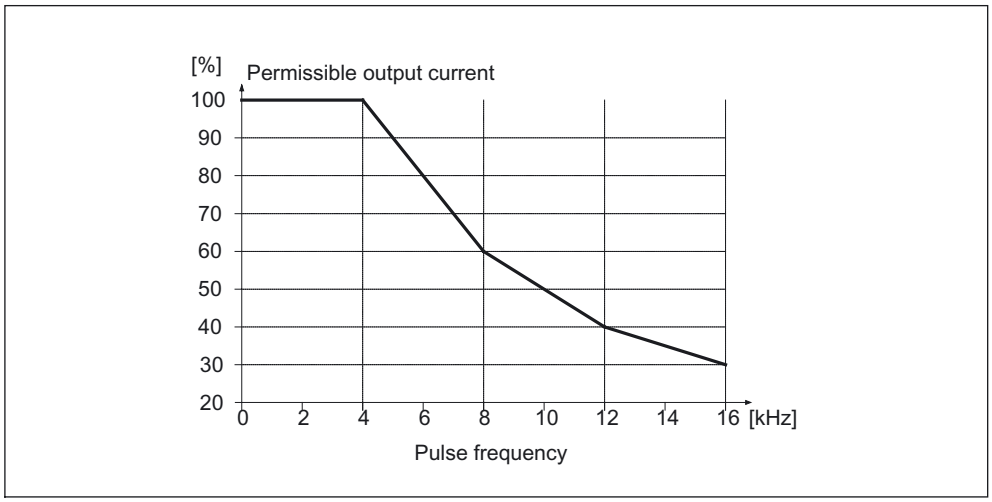


Figure 4-37 Derating as a function of the pulse frequency

Derating as a function of the installation altitude

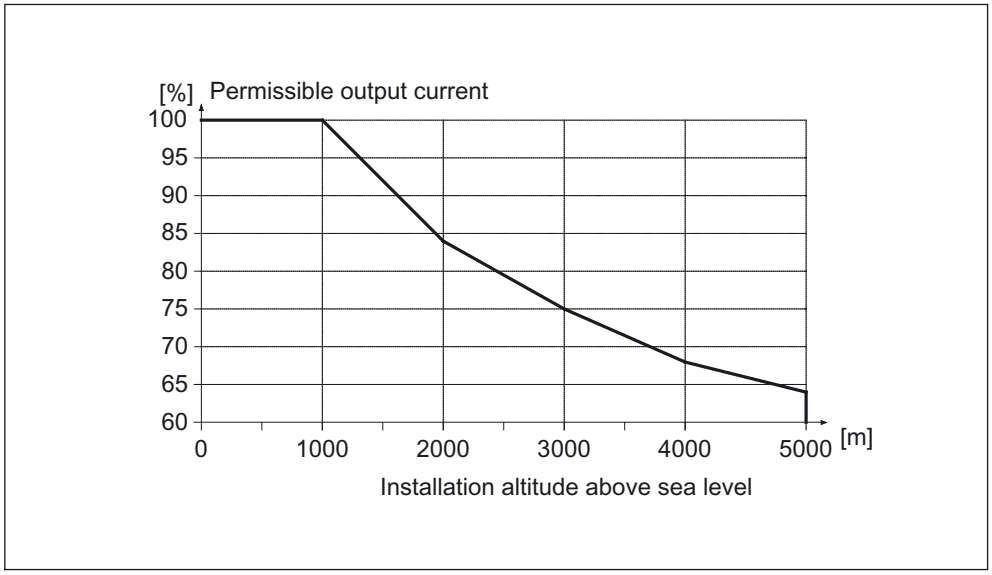


Figure 4-38 Derating as a function of the installation altitude

DC Link Components Booksize

5

5.1 Braking Module Booksize

5.1.1 Description

A Braking Module (and an external braking resistor) is required to bring drives to a controlled stop in the event of a line failure (e.g. emergency retraction or EMERGENCY OFF category 1) or to limit the DC link voltage during short-time regeneration if, for example, the regenerative capability of the Line Module has been deactivated or has not been dimensioned sufficiently.
The Braking Module contains the required power electronics and the associated control. When the Braking Module is operated, the energy supplied back is dissipated via an external braking resistor. The resistor is installed outside the cabinet.

The Braking Module can also be used with a braking resistor for fast discharging of the DC link. The DC link is discharged in a controlled manner via the braking resistor once the rectifier unit has been switched off and the line-up has been disconnected from the power supply (e.g. main circuit-breaker, line contactor). The function can be activated via a digital input on the Braking Module.

To operate the Braking Modules, a minimum capacitance is required in the DC link. Depending on the braking resistor used, this is:
braking resistor 25 kW, DC link capacitance 220 µF;
braking resistor 100 kW, DC link capacitance 330 µF.
The capacitance of the Braking Module (110 µF) is included in the total capacitance. When the Braking Modules are connected in parallel, the above-mentioned minimum capacitance must be available for each Braking Module.

Note

Only the modules that are connected to each other via the DC link busbar can be included in the total capacitance.

The cable between the Braking Module and the braking resistor is limited to 10 m.

5.1.2 Safety information

Warning

After disconnecting all the supply voltages, a hazardous voltage will be present in all components for another 5 minutes. The protective cover must not be opened until this time has elapsed.

When opening the protective cover for the DC link, you must activate the release. A suitable tool (e.g. screwdriver) must be used for this purpose.

The components must only be operated when the protective cover of the DC link is closed. Damaged components must not be used, otherwise this could result in secondary damage or accidents.

Caution

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

A set of labels in 12 languages is available using order number: 6SL3166-3AB00-0AAx.

With a connected braking resistor, the Braking Module is ground-fault proof.

Notice

The 80 mm clearances above and below the components must be observed.

Caution

The connection to the braking resistors must be made using a shielded cable.

The tightening torque of the DC link busbar screws (1.8 Nm) must be checked before startup.

Note

If braking resistors that are not listed in catalog D21.2 are used, they can be destroyed.

Caution

The DC link busbar in a drive line-up must be sealed at both ends using DC link side covers (order no.: 6SL3162-5AA00-0AA0).

5.1.3 Interface description

5.1.3.1 Overview

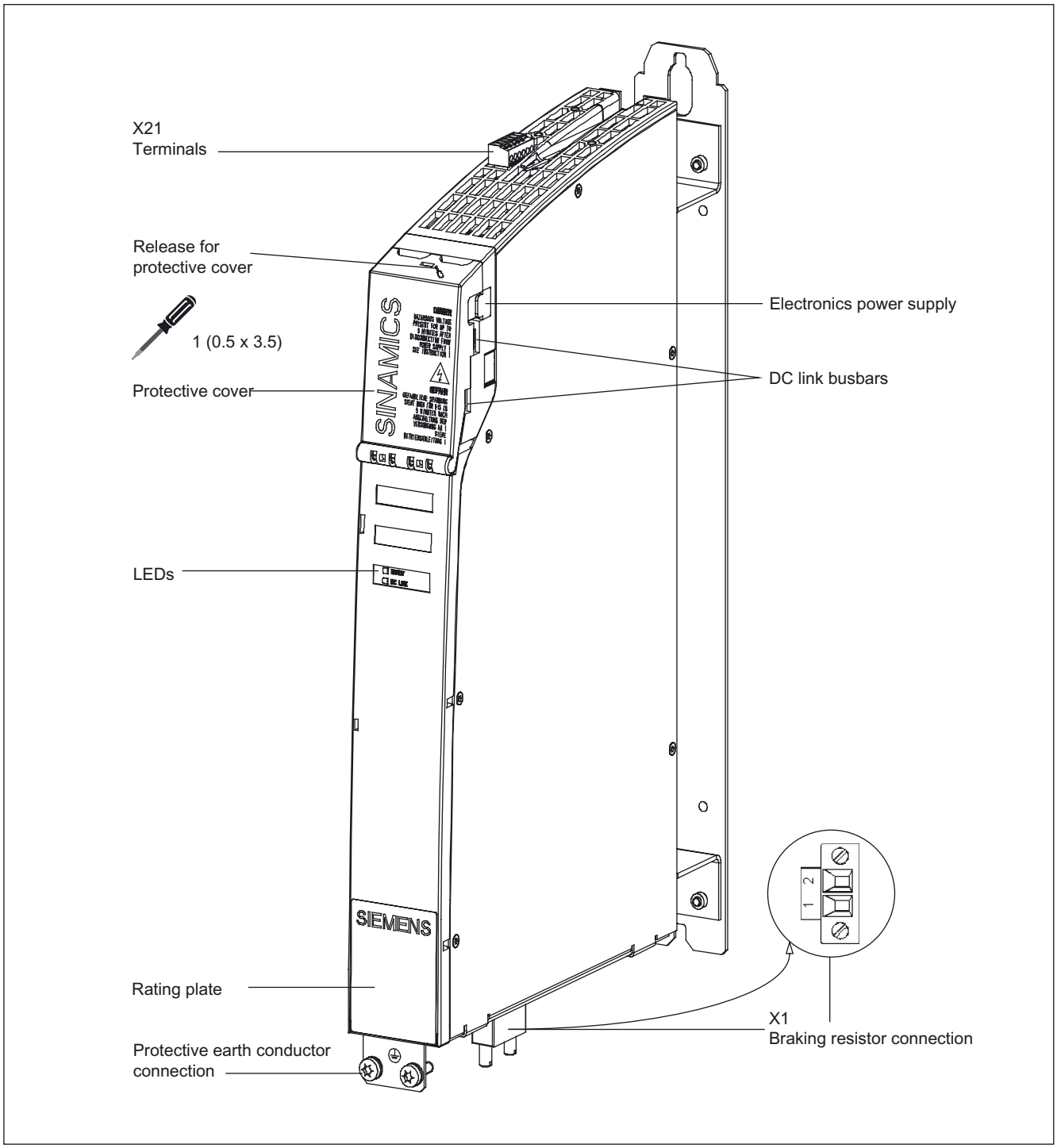


Figure 5-1 Interface description of Braking Module

5.1.3.2 Connection example

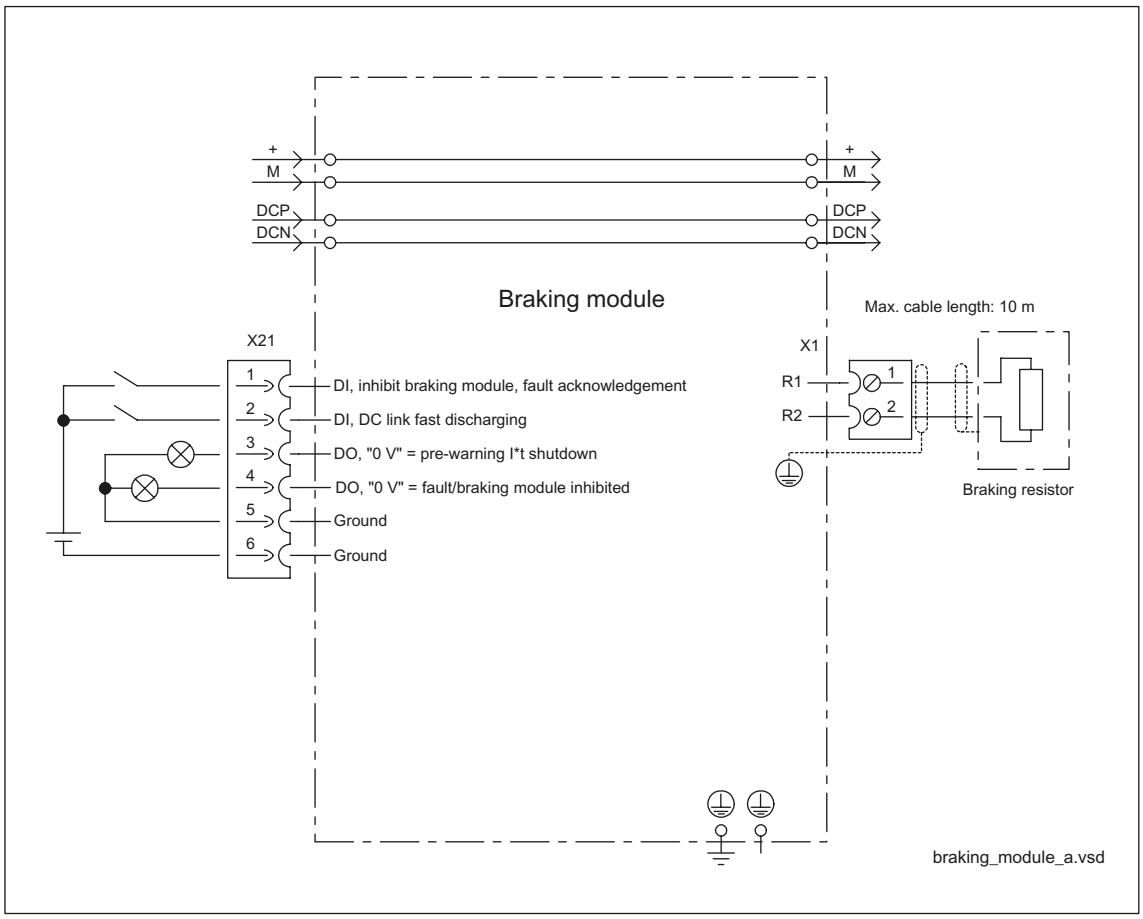
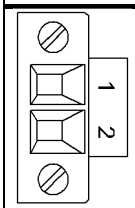


Figure 5-2 Example connection of Braking Module

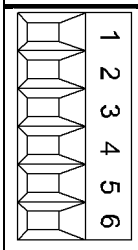
5.1.3.3 Braking resistor connection X1

Table 5-1 Terminal block X1

	Terminal	Name	Technical specifications
	1	Braking resistor connection R1	Continued-short-circuit-proof
	2	Braking resistor connection R2	
Max. connectable cross-section: 4 mm^2 Type: Screw terminal 4 (see Connection Methods)			

5.1.3.4 X21 digital inputs/outputs

Table 5-2 Terminal block X21

	Terminal	Name[1)]	Technical specifications
	1	DI low: enable Braking Module DI high: Braking Module inhibited Edge change high -> low: fault acknowledgement	Voltage: -3 V to 30 V Typical current consumption: 10 mA at 24 V DC Level (incl. ripple) High level: 15 V to 30 V Low level: -3 V to 5 V
	2	DI low: braking resistor not activated manually DI high: braking resistor activated manually (fast discharge) Safety functions remain active, I*t protection remains active	
		If X21.1 and 2 are activated simultaneously, the Braking Module inhibit has priority.	
	3	DO high: no pre-warning for I*t shutdown DO low: pre-warning for I*t shutdown (80% of max. ON time reached)	Max. load current per output: 100 mA Continued-short-circuit-proof Voltage: 24 V DC
	4	DO high: ready for operation, no fault DO low: fault; Braking Module inhibited	
	5	Ground	
	6		
Max. connectable cross-section 1.5 mm^2 Type: Screw terminal 1 (see Connection Methods)			

1) DI: digital input; DO: digital output; M: Electronic ground

Note

Applying a high signal to terminal X21.1 inhibits the Braking Module. On a falling edge, pending error signals are acknowledged.

The pre-warning for I*t monitoring is output as a high level on reaching 80% of the maximum braking resistor ON time.
Only braking resistors approved by Siemens for this component are identified automatically.

5.1.3.5 Meaning of the LEDs on the Braking Module

Table 5-3 Meaning of the LEDs on the Braking Module

LED	Color	State	Description
READY	-	OFF	Electronics power supply outside permissible tolerance range.
	Green	Continuous	The component is ready for operation.
	Red	Continuous	• Braking Module inhibited via DI X21.1 • Braking Module shutdown Possible reasons: – Overcurrent – Overtemperature heat sink – Braking resistor overload (I*t shutdown)
DC LINK	-	OFF	Braking resistor switched off (DC link discharge not active)
	Green	Flashing	Braking resistor switched on (DC link discharge active)

Note

To protect the braking resistor, the current fault cannot be acknowledged until after a waiting period of approx. 3 min after an I*t shutdown of the Braking Module.

5.1.4 Dimension drawing

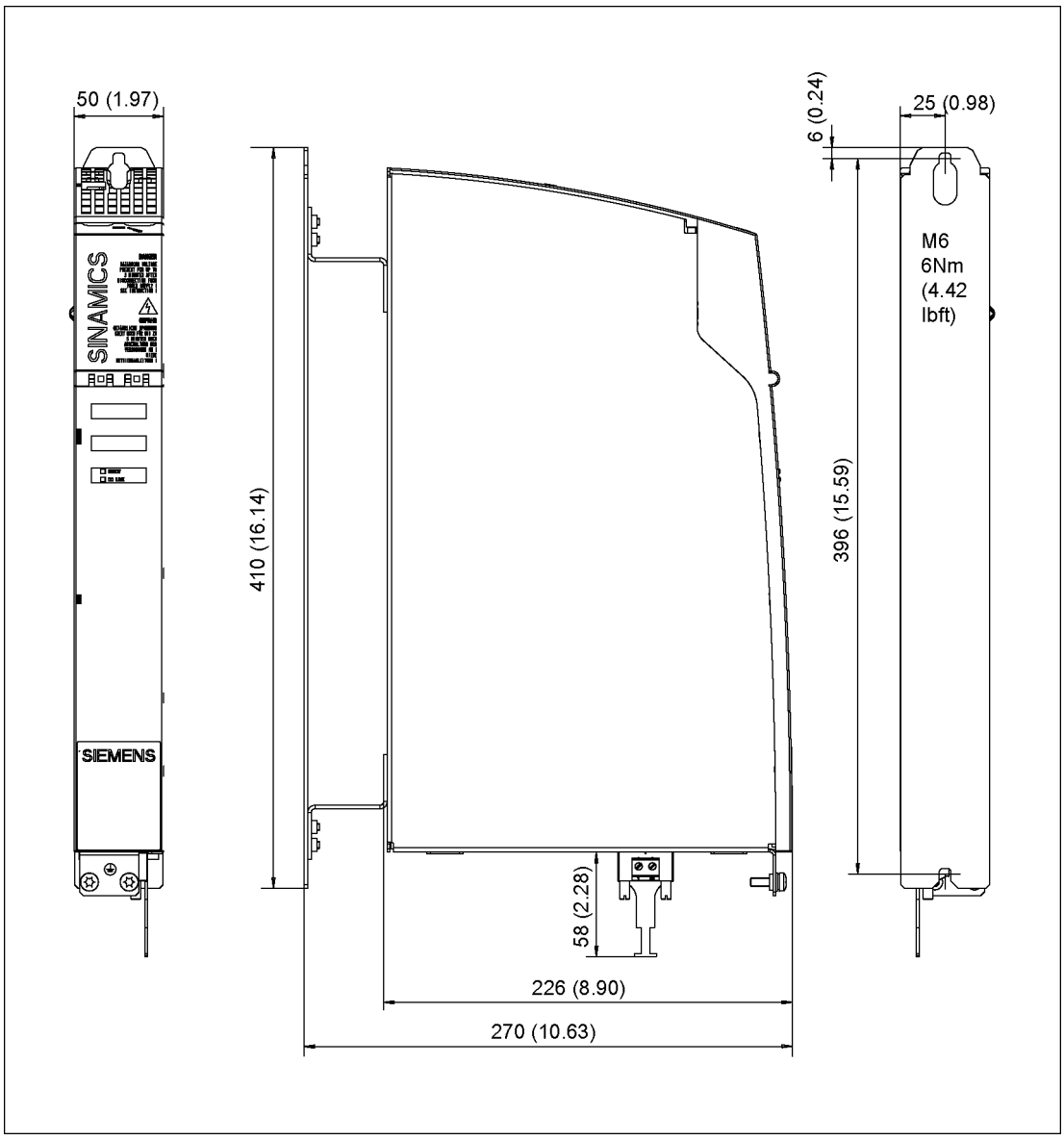


Figure 5-3 Dimension drawing of the Braking Module

5.1.5 Mounting

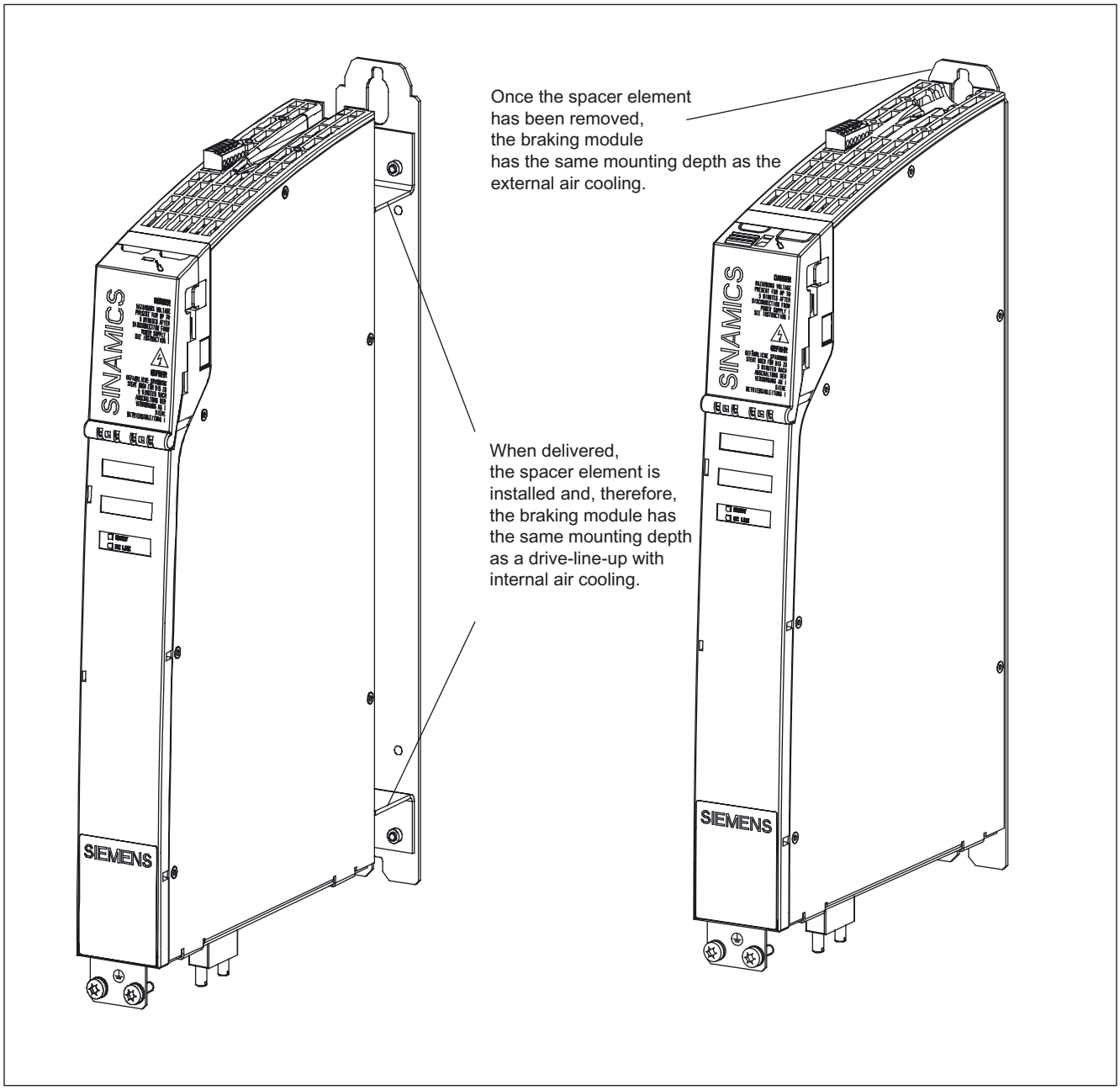


Figure 5-4 Methods of installing Braking Modules with/without spacer elements

5.1.6 Technical specifications

Table 5-4 Technical Specifications

Braking Module booksize		
Voltages		
Supply: DC link voltage	V_{DC}	510 - 750
ON threshold	V	770
Electronics power supply	V_{DC}	24 (20.4 - 28.8)
Electronics current consumption (at 24 V DC)	A_{DC}	0.5
26 V DC busbar current carrying capacity	A_{DC}	100
26 V DC busbar current carrying capacity	A_{DC}	20
Max. braking power	kW	100
Continuous braking power	kW	1.5
Power loss[1]	W	20
• Cooling method		Natural convection
• Weight	kg	4.1

[1] For an overview, see the power loss tables in Cabinet Design.

5.2 Braking resistors

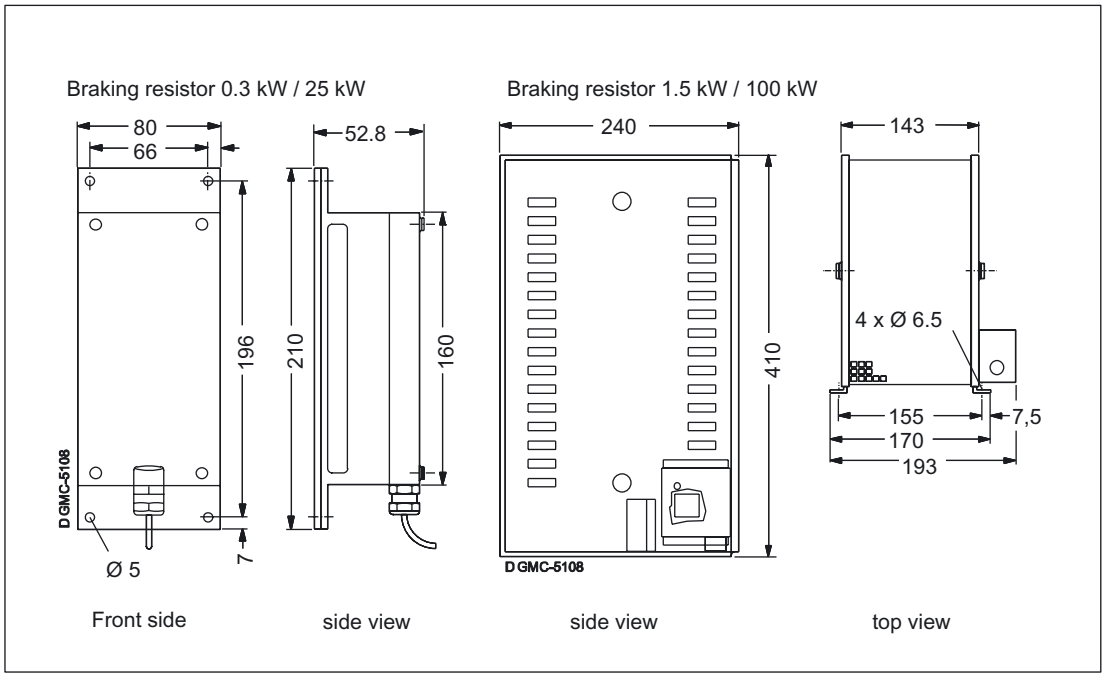


Figure 5-5 Dimension drawings of braking resistors

Caution

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

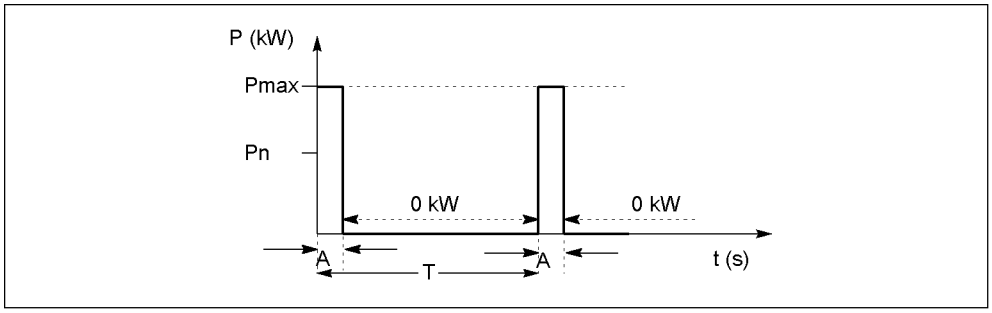


Figure 5-6 Duty cycle for braking resistors

T [s] period duration of braking duty cycle

A [s] load duration

P_n [W] continuous braking power of braking resistor

P_{max} [W] peak braking power of braking resistor

Table 5-5 Example of duty cycles

	Unit	R 25 kW		R 100 kW	
		Short duty cycle	Long duty cycle	Short duty cycle	Long duty cycle
A	s	0.1	0.4	1	2
T	s	11.5	210	68	460

Table 5-6 Technical Specifications

	Unit	Braking resistor 6SN1113–1AA00–0DA0	Braking resistor 6SL3100–1BE31–0AAx
P_{max}	kW	25	100
P_n	kW	0.3	1.5
Weight	kg	3.4	5.6
Degree of protection		IP54	IP20

Connection cables

A shielded connection cable (3 m long; 1.5 mm^2) is supplied with braking resistor 6SN1113-1AA00-0DA0.

Braking resistor 6SL3100-1BE31-0AA0 is supplied without a connection cable (4 mm^2).

The maximum cable length for both braking resistors is 10 m.

5.3 Capacitor Module

5.3.1 Description

Capacitor Modules are used to increase the DC link capacitance to bridge momentary power losses.

Capacitor Modules are connected to the DC link voltage via the integrated DC link busbars. Capacitor Modules function autonomously.

Several Capacitor Modules can be operated in parallel.

5.3.2 Safety Information

Warning

After disconnecting all the supply voltages, a hazardous voltage will be present in all components for another 5 minutes. The protective cover must not be opened until this time has elapsed.

When opening the protective cover for the DC link, you must activate the release. A suitable tool (e.g. screwdriver) must be used for this purpose.

The components must only be operated when the protective cover of the DC link is closed. Damaged components must not be used, otherwise this could result in secondary damage or accidents.

Caution

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

A set of labels in 12 languages is available using order number: 6SL3166-3AB00-0AAx.

Notice

The 80 mm clearances above and below the components must be observed.

Notice

The Capacitor Module is precharged by the Line Module. The relevant charging limits of the Line Modules must be taken into account.

Caution

The DC link busbar in a drive line-up must be sealed at both ends using DC link side covers (order no.: 6SL3162-5AA00-0AA0).

5.3.3 Interface description

5.3.3.1 Overview

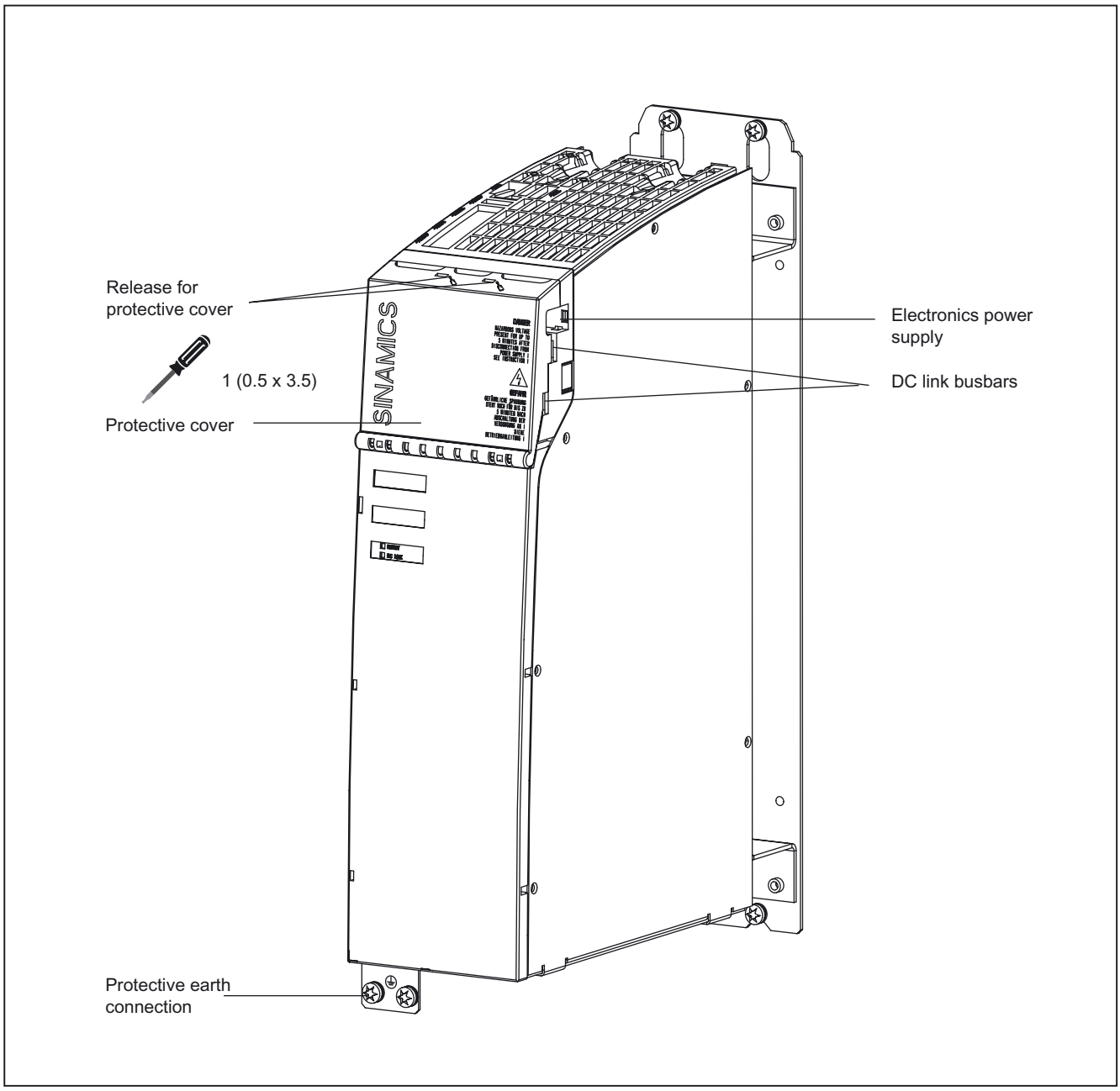


Figure 5-7 Interface description of the Capacitor Module

5.3.4 Dimension Drawing

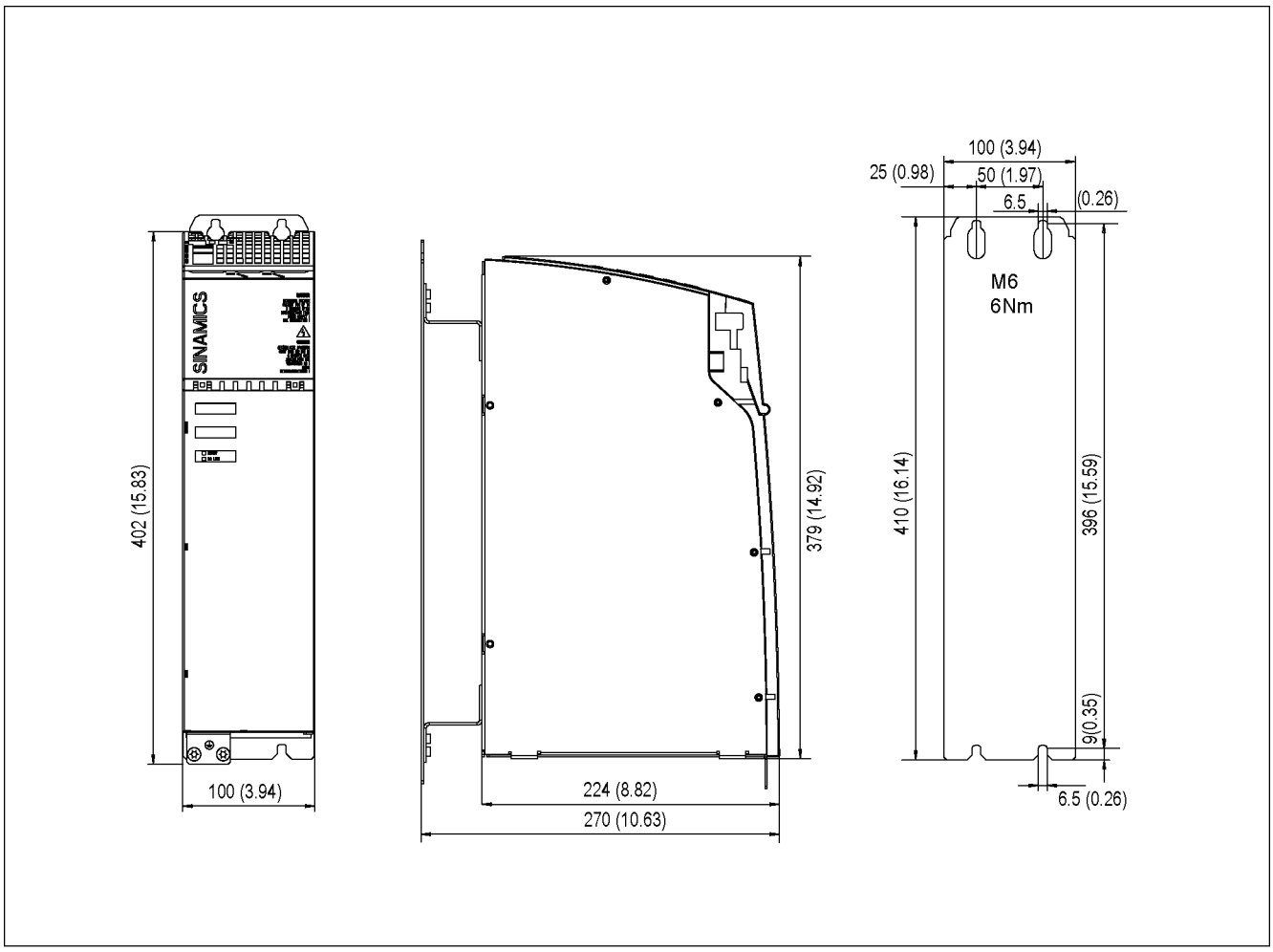


Figure 5-8 Dimension drawing of the Capacitor Module

5.3.5 Installation

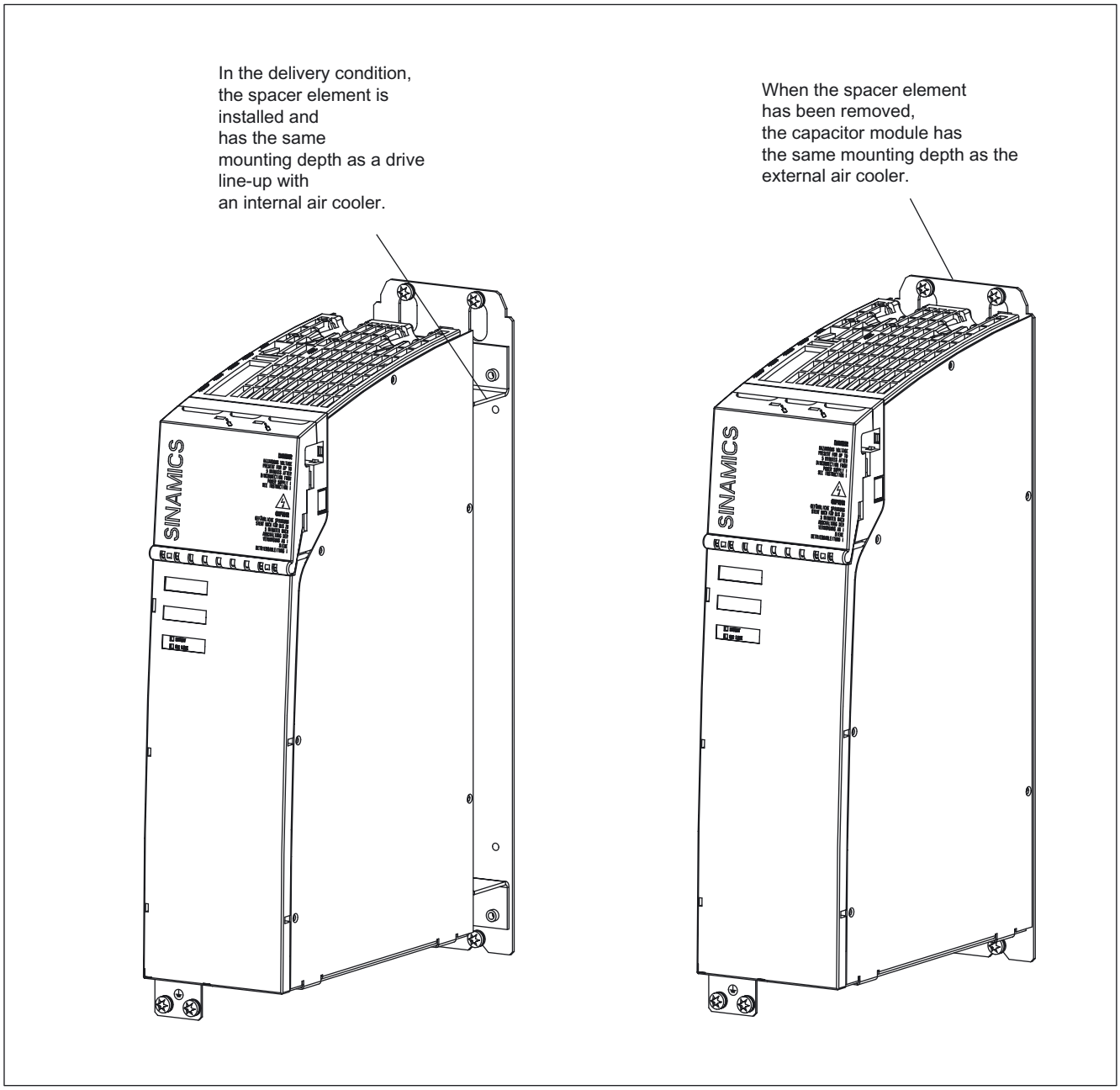


Figure 5-9 Installing a Capacitor Module with/without spacer elements

The Capacitor Module can be attached to the cabinet with or without spacer elements.

5.3.6 Technical Specifications

Table 5-7 Technical Specifications

Capacitor Module		
Electronics power supply	V_{DC}	24 (20.4 - 28.8)
DC link voltage	V_{DC}	510 - 750
Capacitance	µF	4000
24 V DC busbar current carrying capacity	A	20
DC link busbar current carrying capacity	A	100
Power loss[1]	W	25
Weight	kg	7.2

[1] For an overview, see the power loss tables in Cabinet Design.

5.4 Control Supply Module

5.4.1 Description

The Control Supply Module provides a 24 V DC power supply via the line or DC link. In this way, controlled emergency retraction movements can be made in the event of a power failure, for example, provided that the DC link voltage is available.

The supply voltage is a PELV (protective extra low voltage). The earth potential for the protective conductor system is connected in the Control Supply Module.

5.4.2 Safety Information

Warning

After disconnecting all the supply voltages, a hazardous voltage will be present in all components for another 5 minutes. The protective cover must not be opened until this time has elapsed.

When opening the protective cover for the DC link, you must activate the release. A suitable tool (e.g. screwdriver) must be used for this purpose.

The components must only be operated when the protective cover of the DC link is closed. Damaged components must not be used, otherwise this could result in secondary damage or accidents.

Caution

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

A set of labels in 12 languages is available using order number: 6SL3166-3AB00-0AAx.

Notice

The 80 mm clearances above and below the components must be observed.

Caution

The tightening torque of the DC link busbar screws (1.8 Nm) must be checked before startup.

Caution

The DC link busbar in a drive line-up must be sealed at both ends using DC link side covers (order no.: 6SL3162-5AA00-0AA0).

5.4.3 Interface description

5.4.3.1 Overview

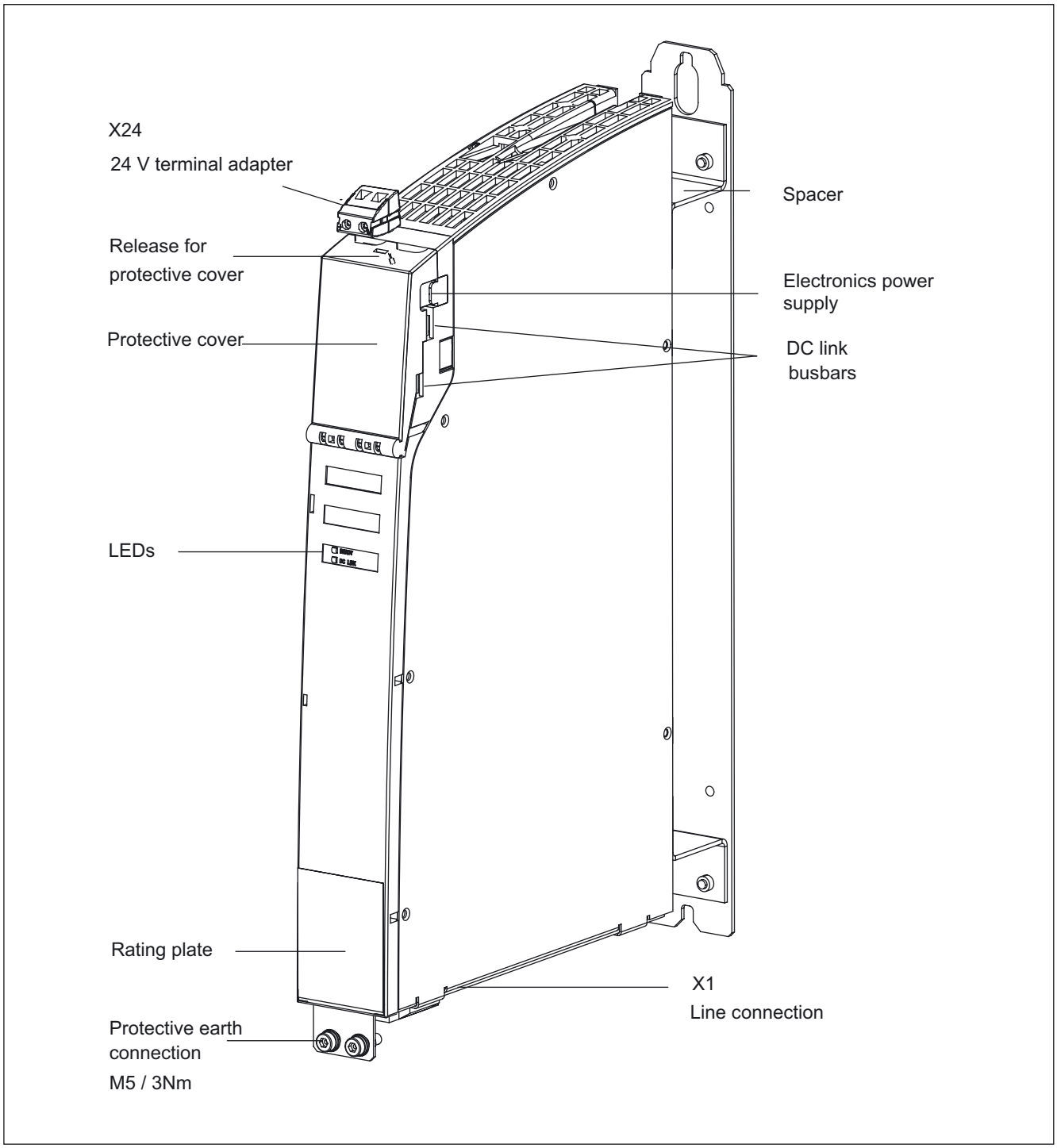


Figure 5-10 Interface description: Control Supply Module

5.4.3.2 Connection example

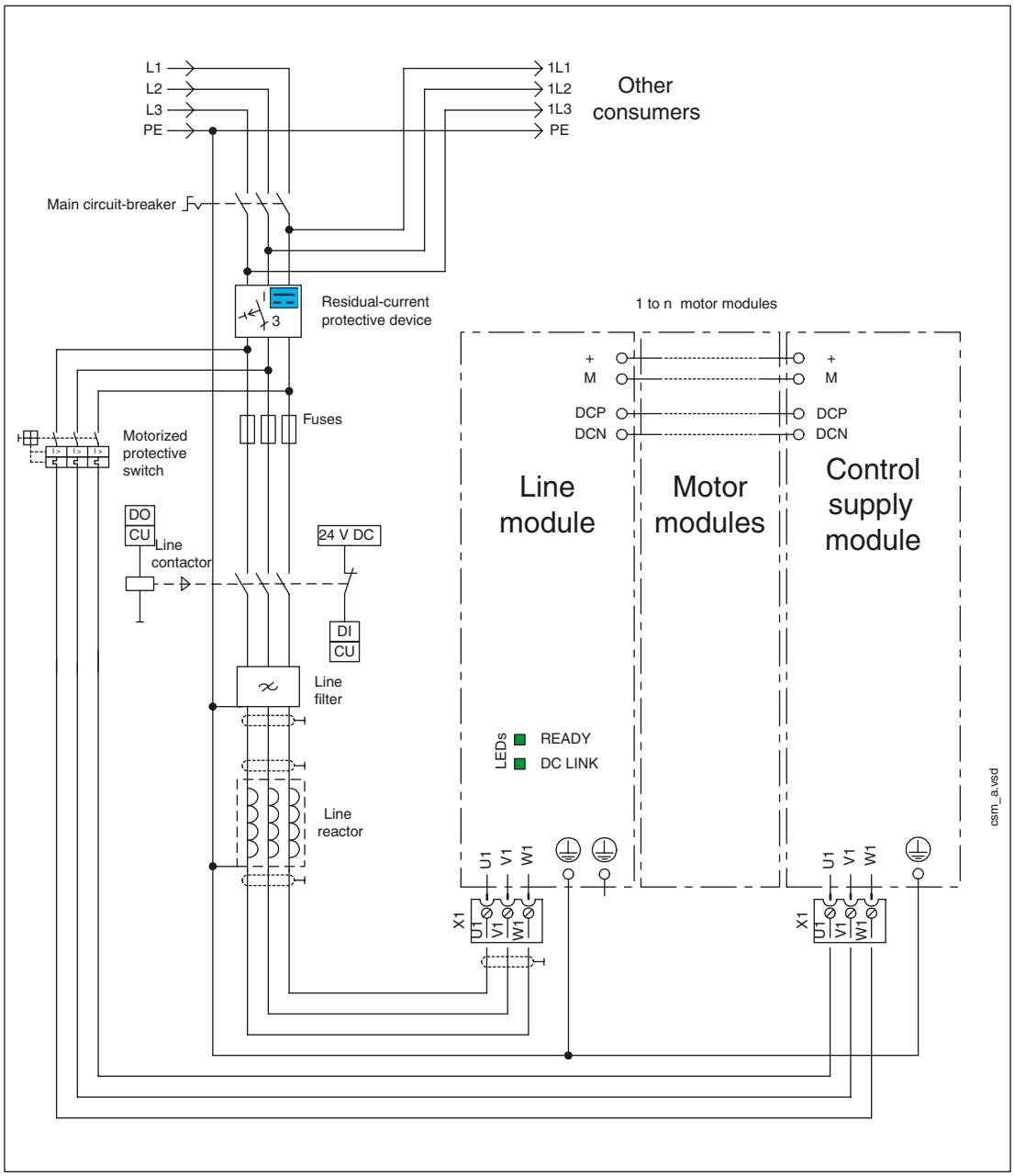


Figure 5-11 Example connection of Control Supply Module

5.4.3.3 Meaning of the LEDs on the Control Supply Module

Table 5-8 Control Supply Module - Description of the LEDs

LED	Color	State	Description
READY	-	OFF	Electronics power supply outside permissible tolerance range.
	Green	Continuous	Ready for operation. Output voltage within tolerance range.
DC LINK	-	OFF	DC input voltage within tolerance range, buffer operation possible.
	Orange	Continuous	System DC link voltage (DC input voltage) within permissible tolerance range (only when ready for operation).
	Red	Continuous	DC input voltage outside tolerance range, as far as display is possible.

5.4.4 Dimension Drawing

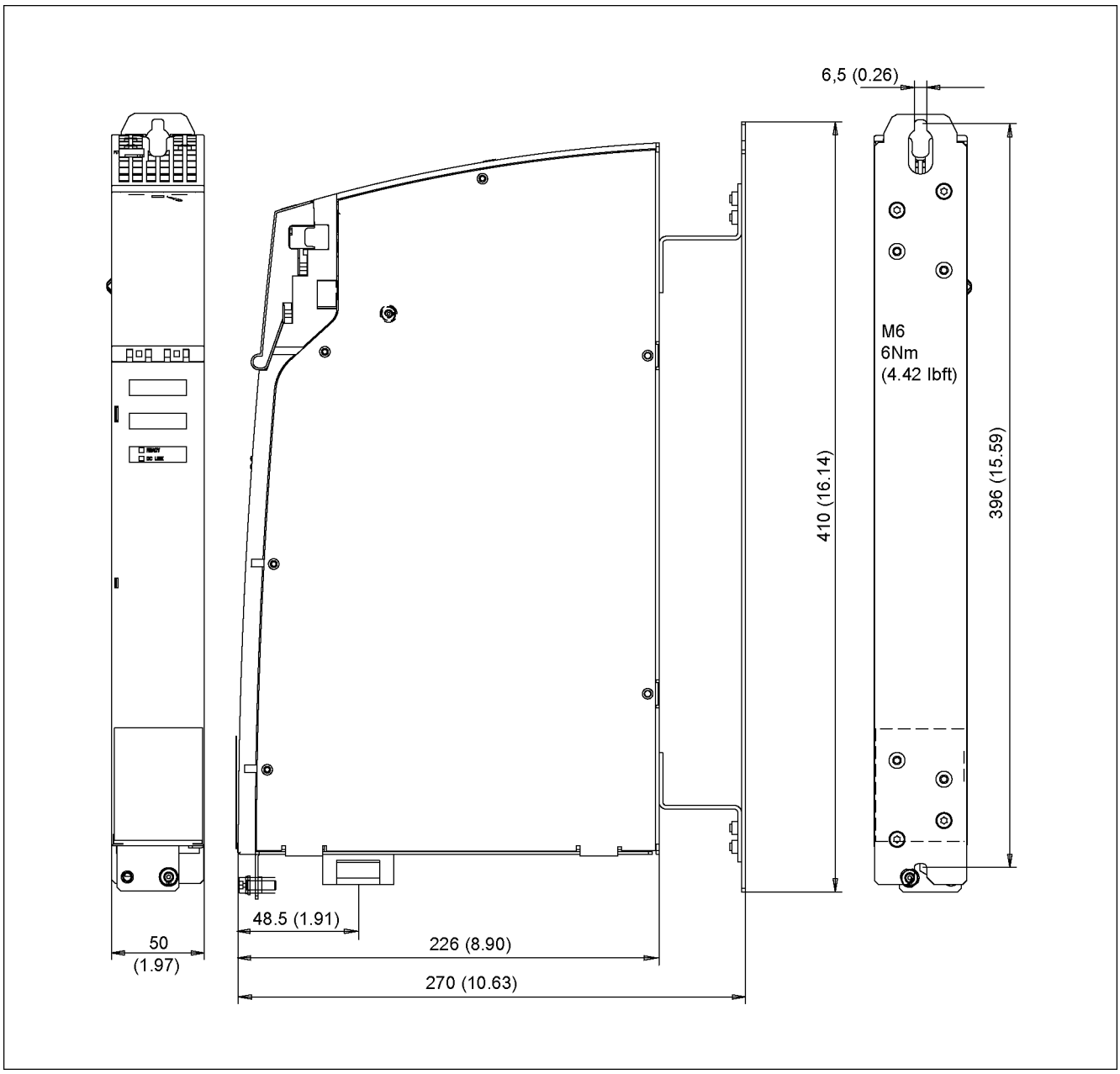


Figure 5-12 Dimension drawing of the Control Supply Module

5.4.5 Technical Specifications

Table 5-9 Technical Specifications

Control Supply Module	Unit	Value
Input data		
Line voltage	V_{AC}	3AC 380 -10% to 3AC 480 +10% (-15% < 1 min)
Line frequency	Hz	47 to 63
Connection currents Rated value (for UeRated)	A_{AC}	approx. 2
Starting current inrush	A_{DC}	< 80
Power loss ride-through (at 400 V_{AC})	ms	5
DC link voltage	V_{DC}	430 to 800 (300 to 430 < 1 min)
Supply current (at 600 V)	A_{DC}	1.1
Output data		
Output voltage	V_{DC}	26 +/- 2%
Output current	A_{DC}	20
Startup to short-circuit Short-circuit during operation	A_{DC} A_{DC}	$\leq$ 24 Normally 23 (continuous)
26 V DC busbar current carrying capacity	A_{DC}	20
Efficiency U_{aRated} I_{aRated}	-	> 83%
Residual ripple (clock frequency approx. 50 kHz)	mV_{pp}	< 100
Cycle peaks (bandwidth 20 MHz)	mV_{pp}	< 200
Power loss[1]	W	60
Weight	kg	4.8

[1] For an overview, see the power loss tables in Cabinet Design.

Options

6

6.1 Shielded terminal plates

6.1.1 Description

The line and motor cable shields are connected to the shielded terminal plates. This ensures EMC compliance.

6.1.2 Overview

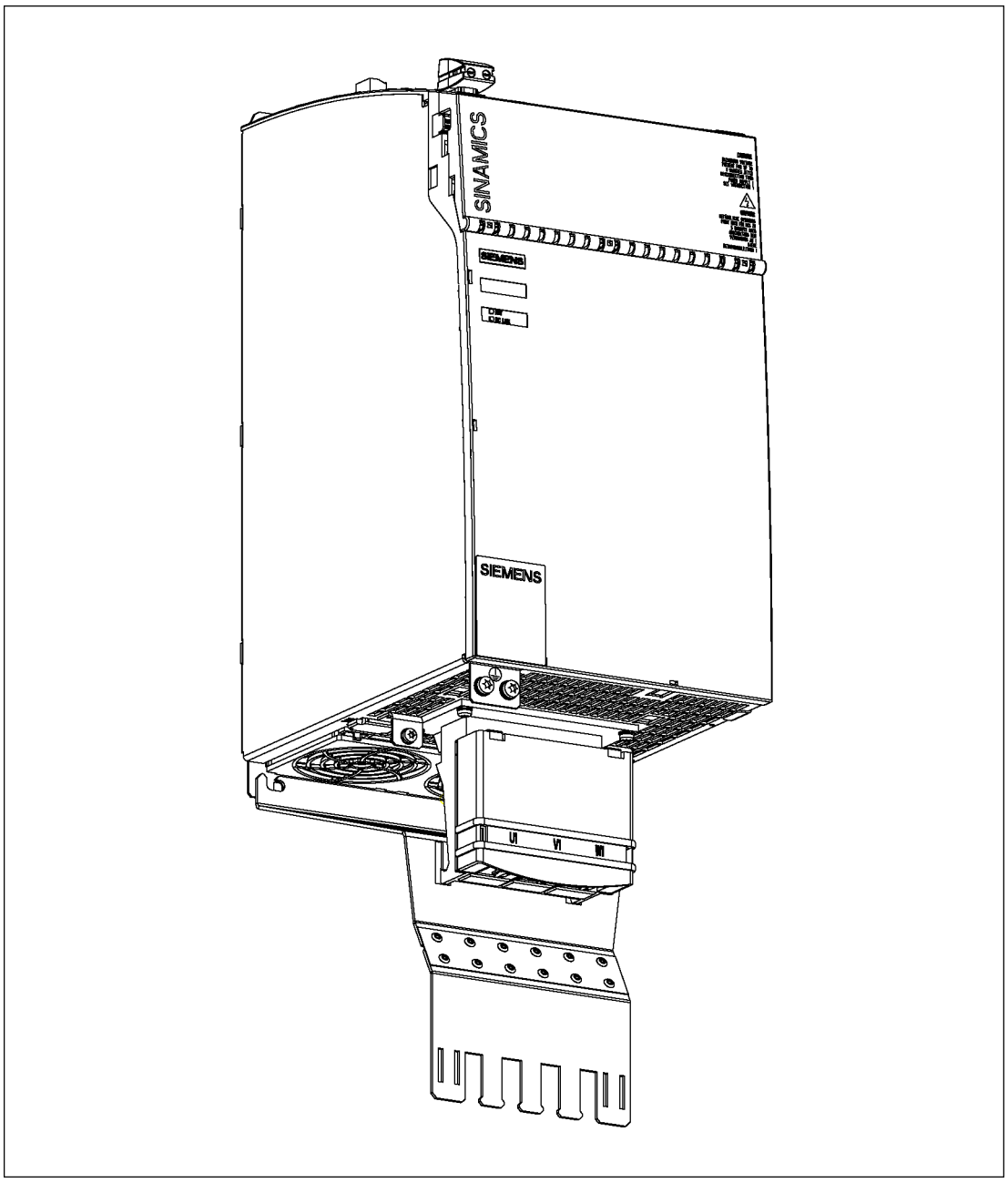


Figure 6-1 Shielded terminal plate for a 200 mm module with internal air cooling

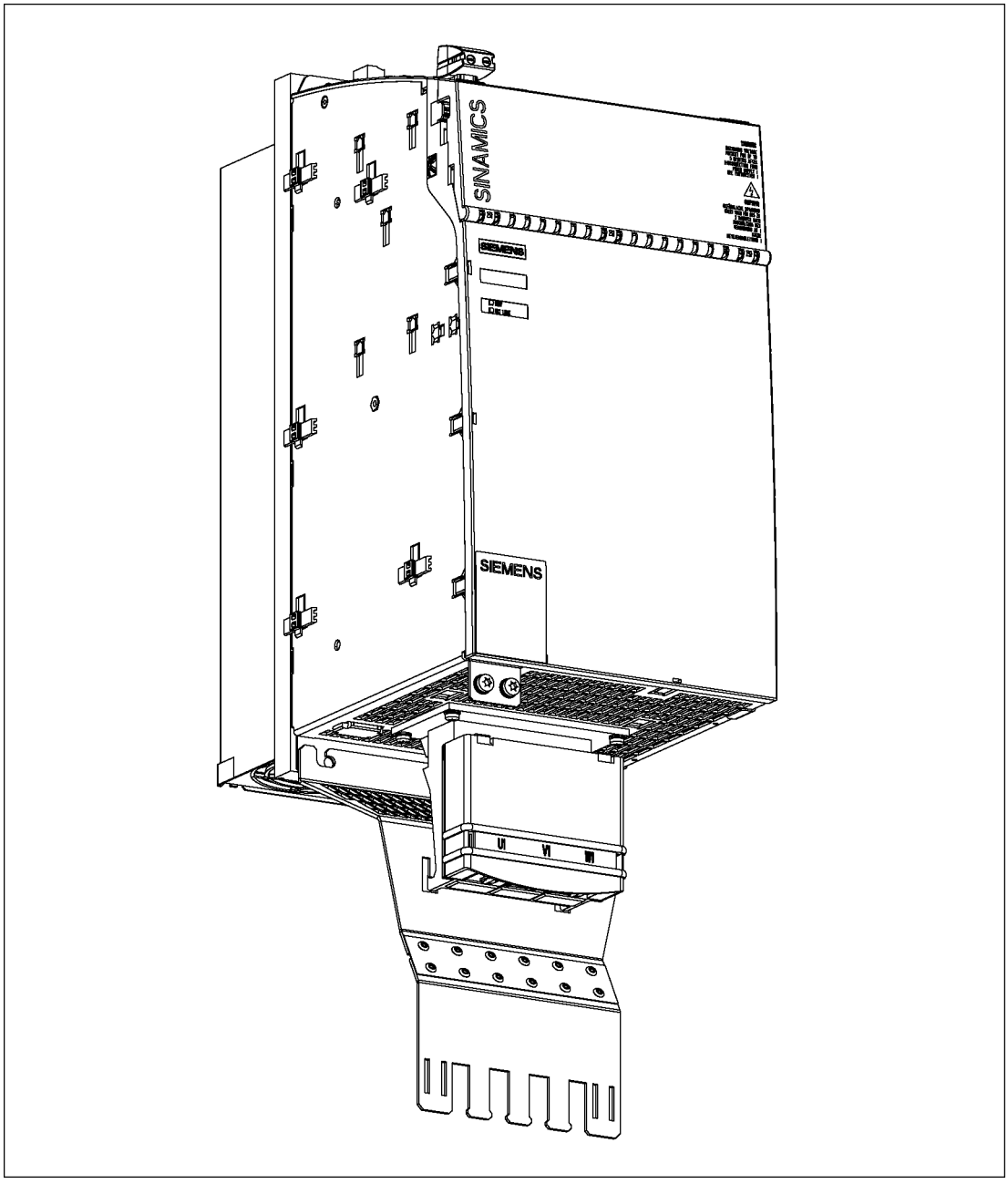


Figure 6-2 Shielded terminal plate for a 200 mm module with external air cooling

6.1.3 Dimension Drawings

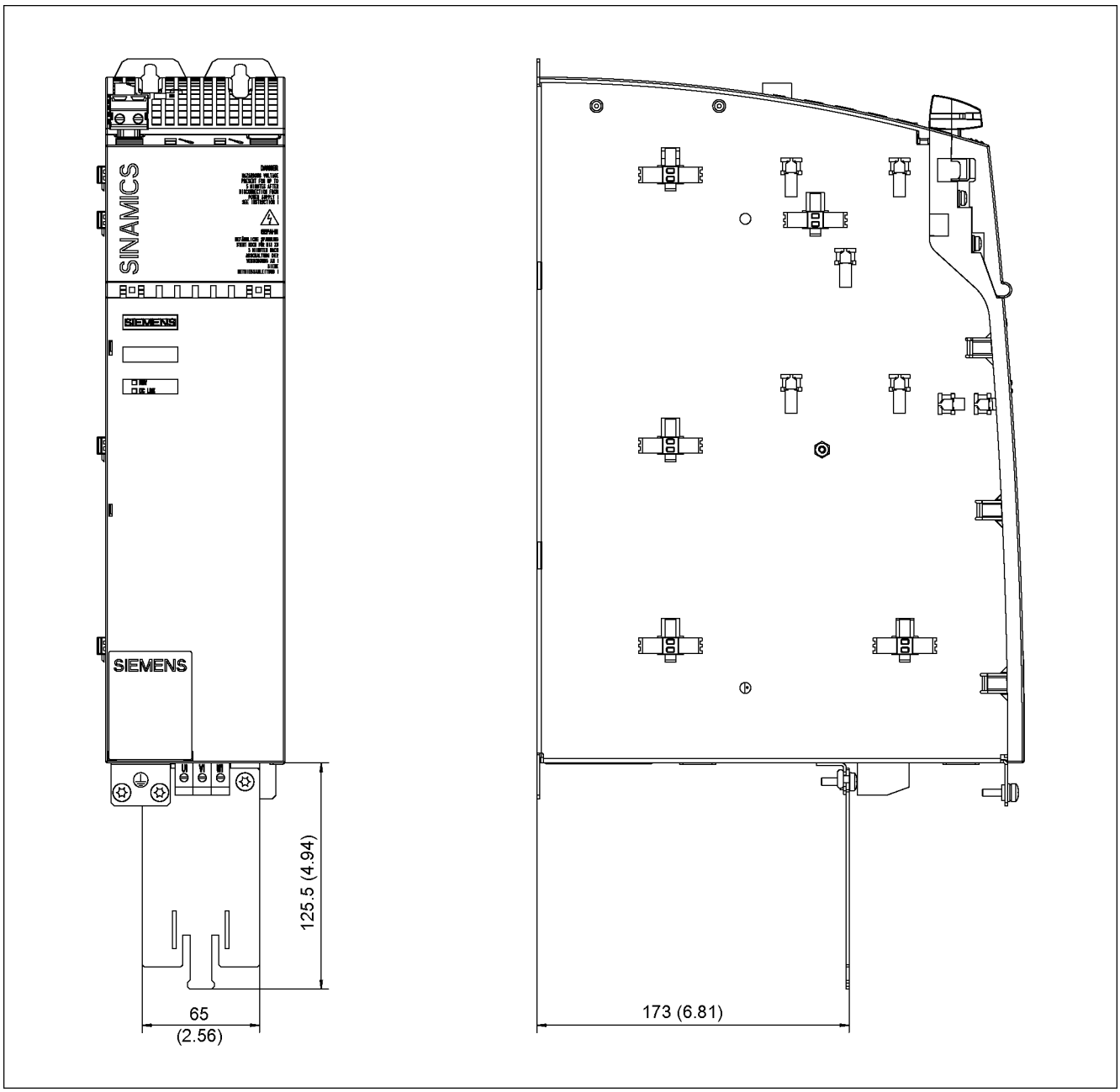


Figure 6-3 Dimension drawing of shielded terminal plate on a 100 mm module with internal air cooling

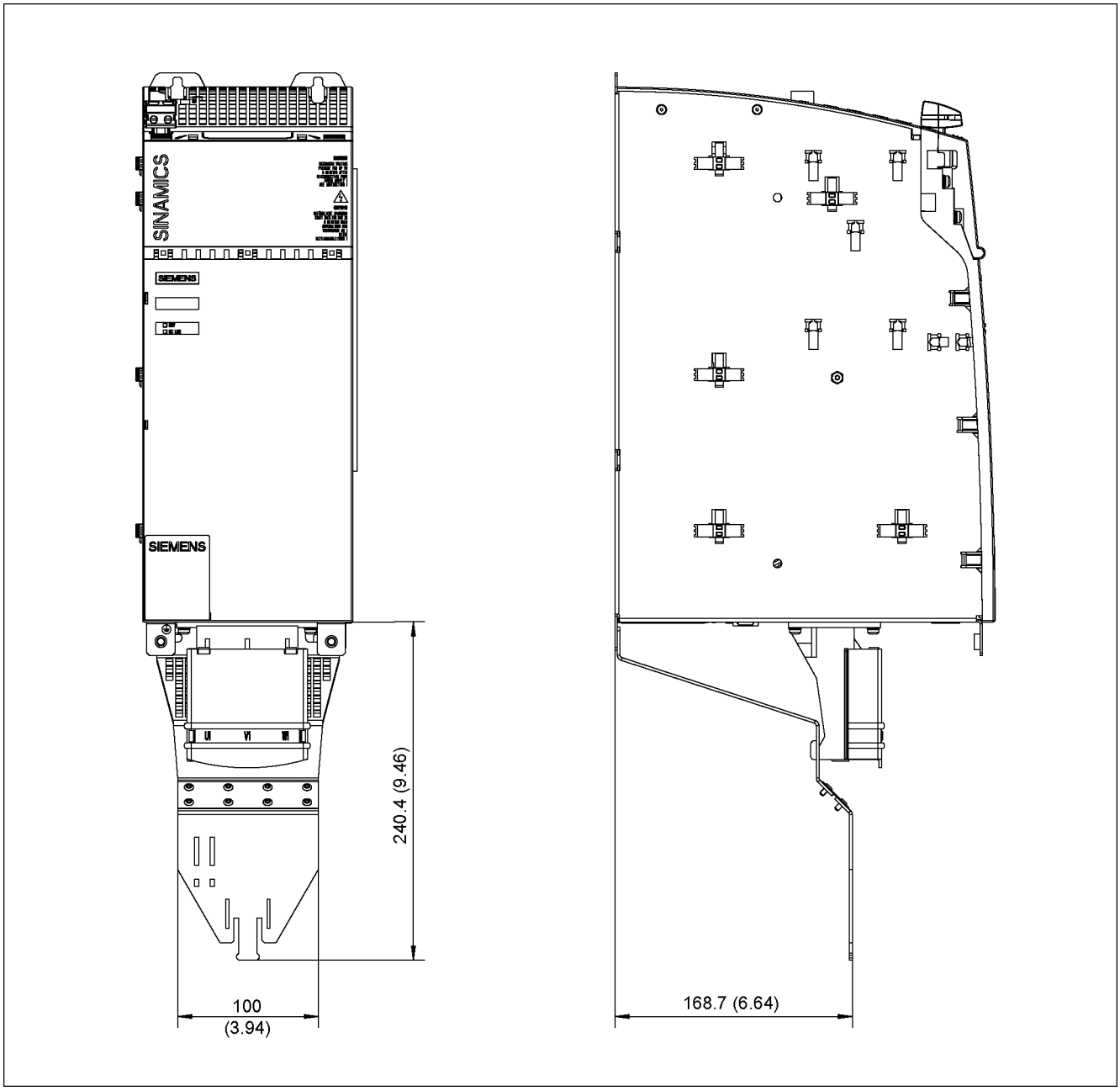


Figure 6-4 Dimension drawing of shielded terminal plate on a 150 mm module with internal air cooling

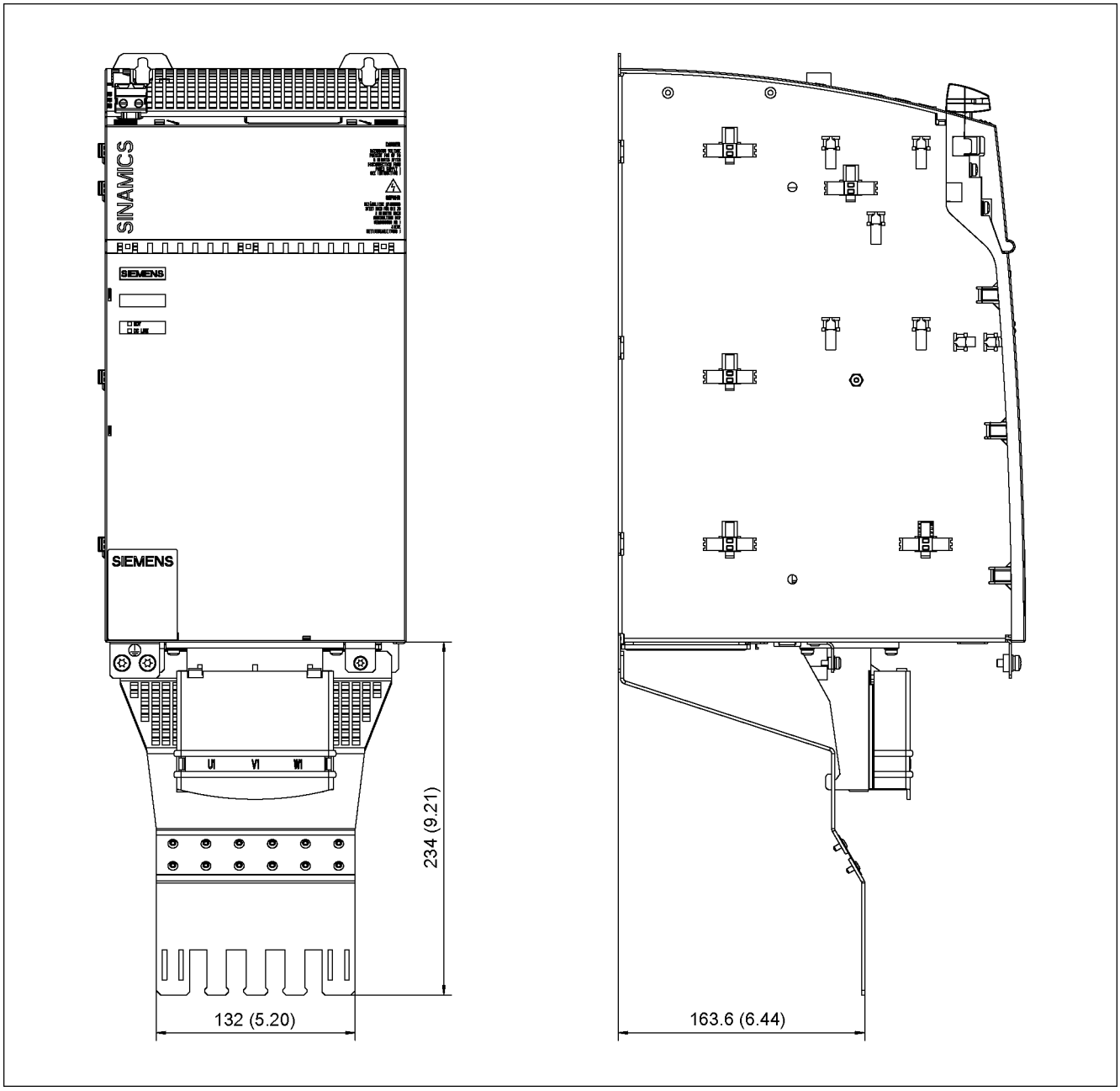


Figure 6-5 Dimension drawing of shielded terminal plate on a 200 mm module with internal air cooling

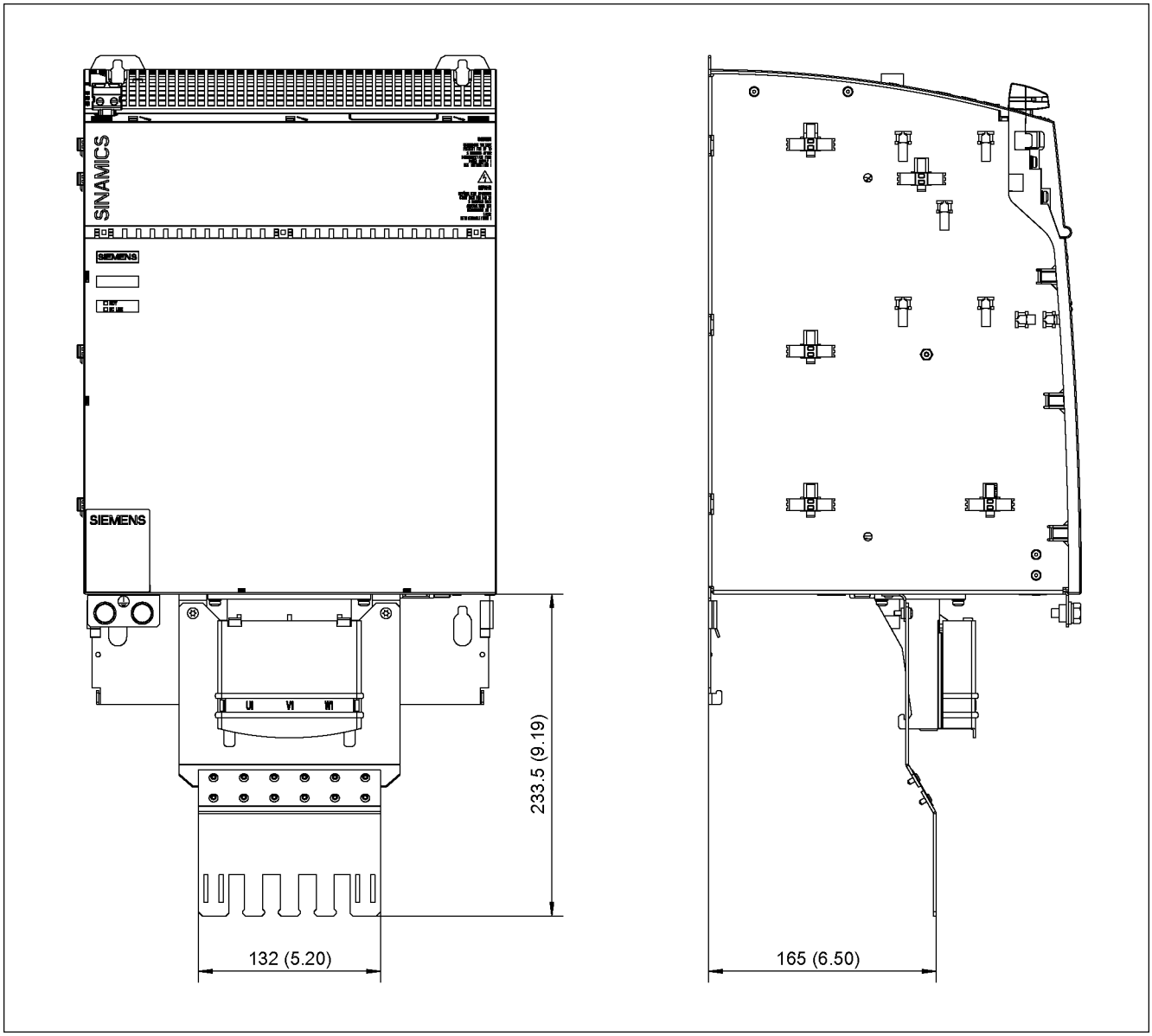


Figure 6-6 Dimension drawing of shielded terminal plate on a 300 mm module with internal air cooling

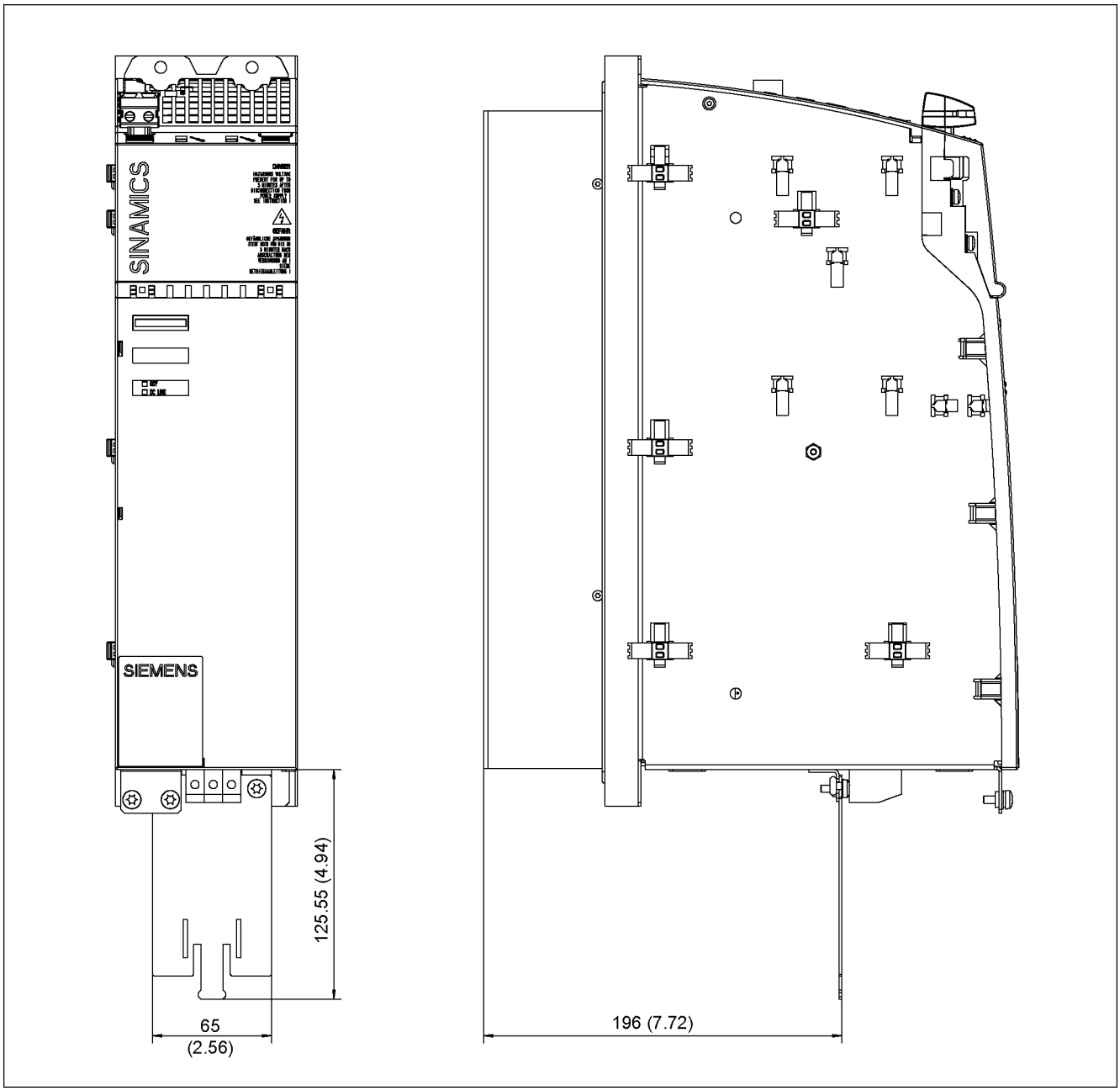


Figure 6-7 Dimension drawing of shielded terminal plate on a 100 mm module with external air cooling

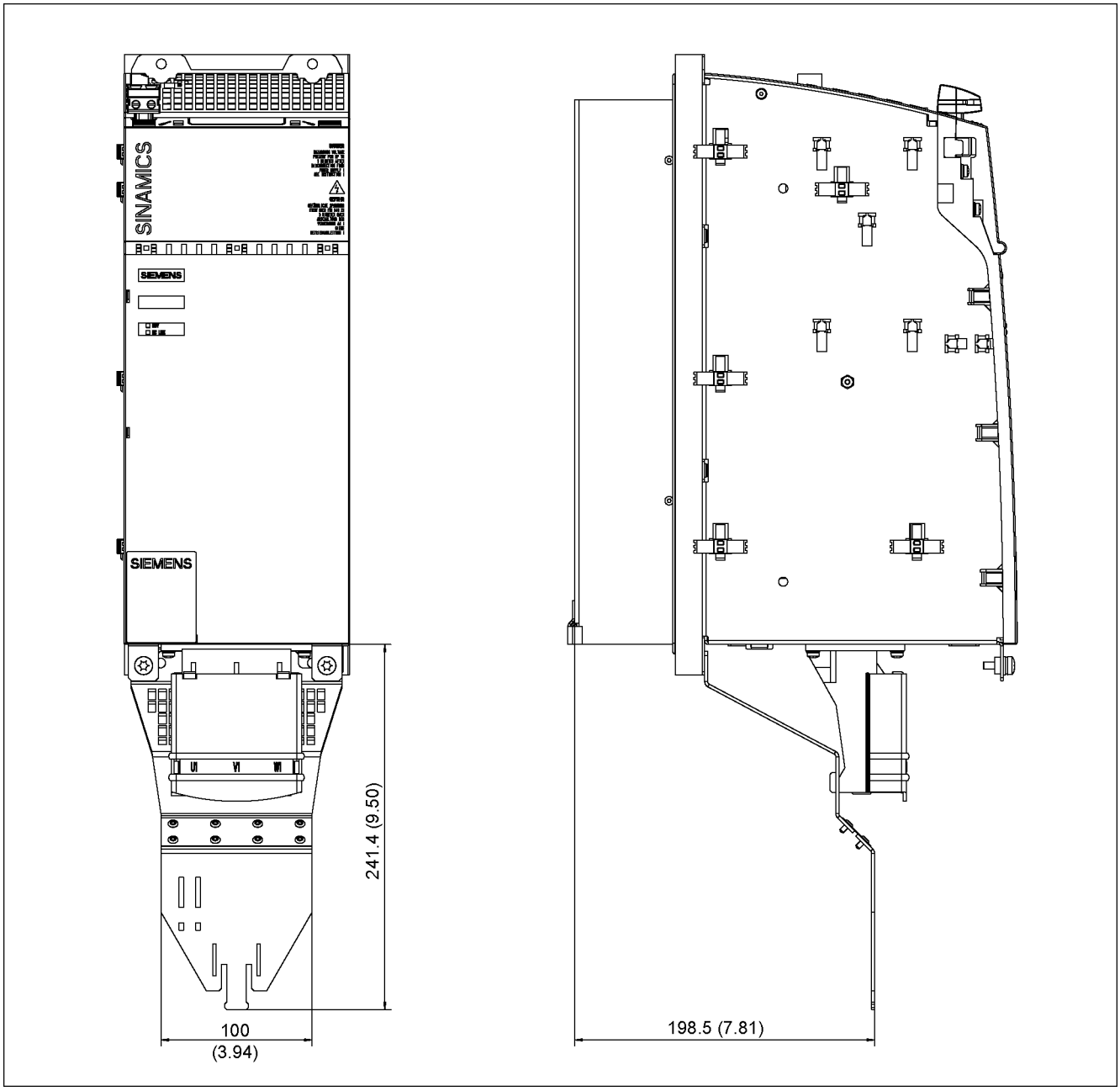


Figure 6-8 Dimension drawing of shielded terminal plate on a 150 mm module with external air cooling

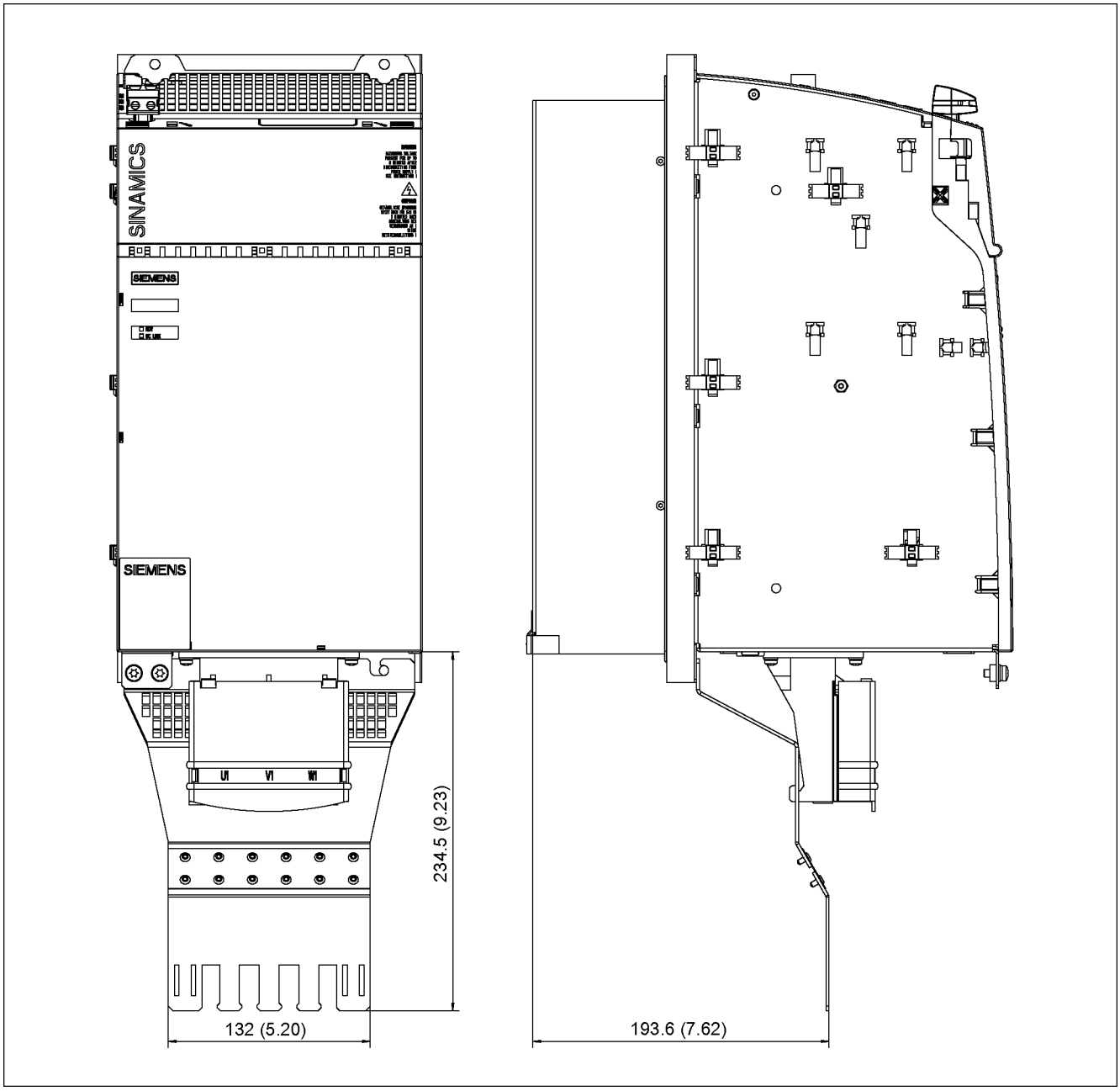


Figure 6-9 Dimension drawing of shielded terminal plate on a 200 mm module with external air cooling

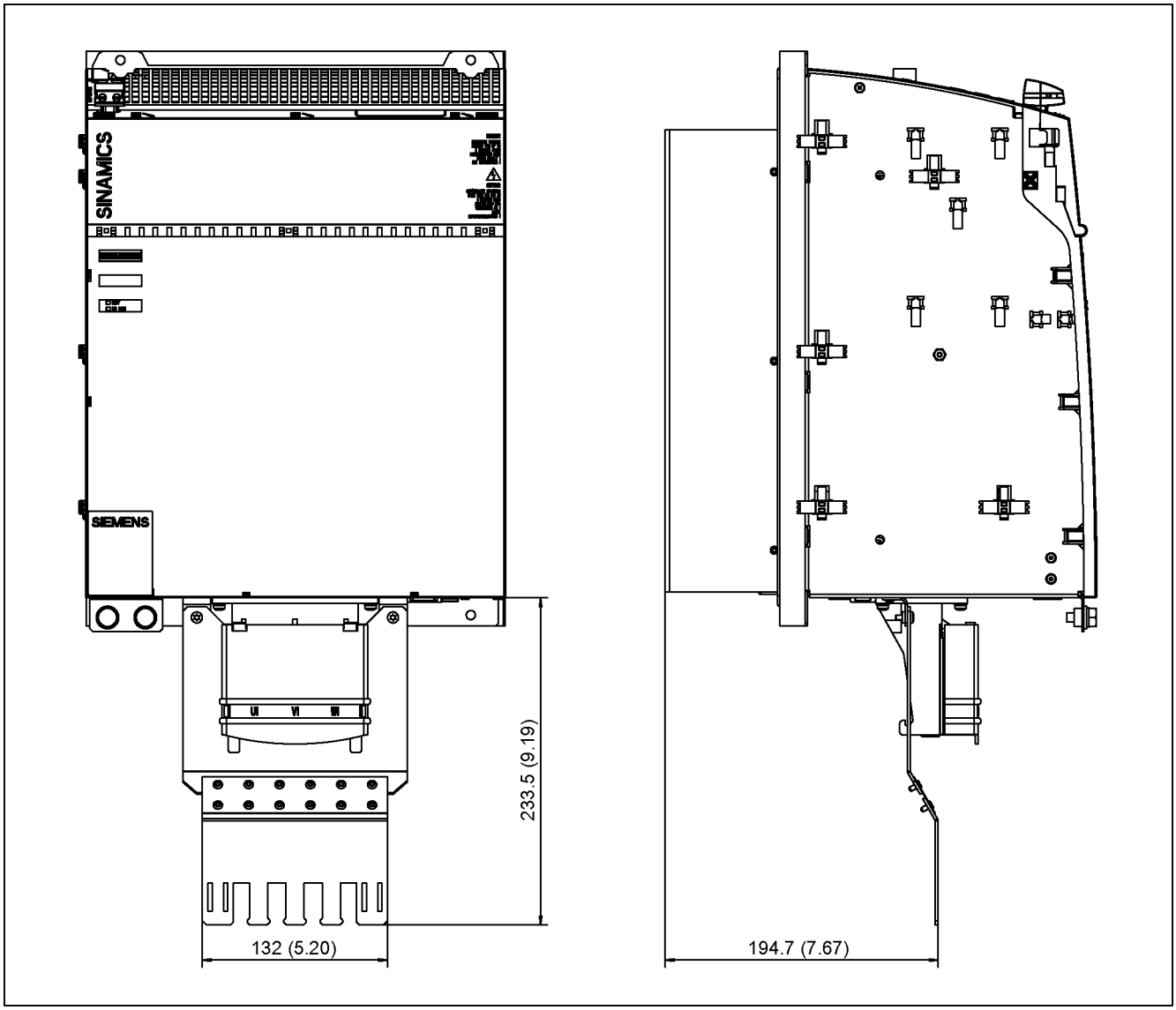


Figure 6-10 Dimension drawing of shielded terminal plate on a 300 mm module with external air cooling

6.1.4 Installation

Table 6-1 Installing the shielded terminal plate on a 100 mm module (e.g. with internal air cooling)

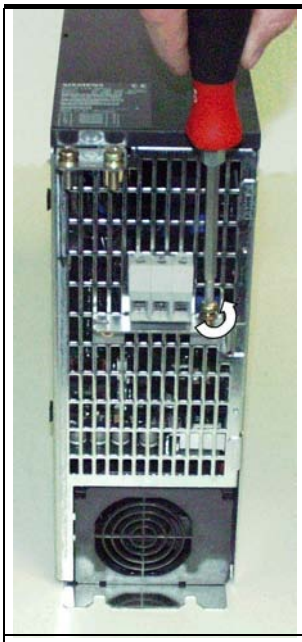
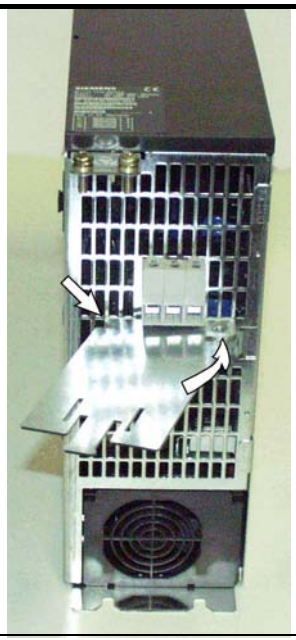
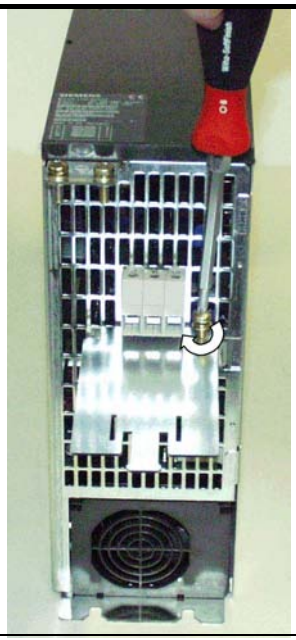
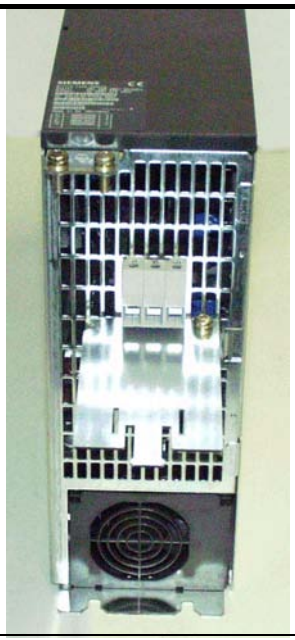
			
Unscrew the screw with screwdriver T25.	Hook in the shielded plate.	Secure the shielded terminal plate with screwdriver T25/3 Nm.	The shielded terminal plate is installed.

Table 6-2 Installing the shielded terminal plate on a 200 mm module (e.g. with internal air cooling)

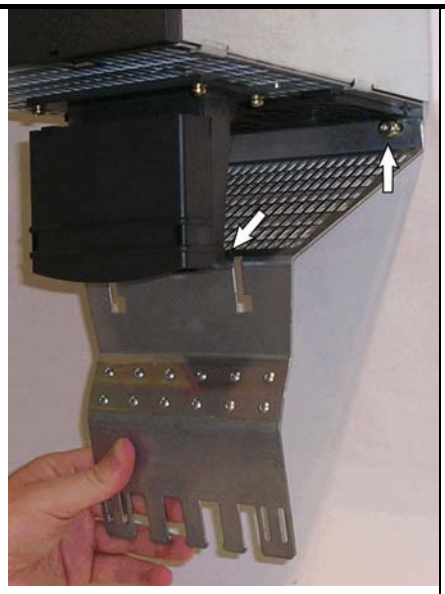
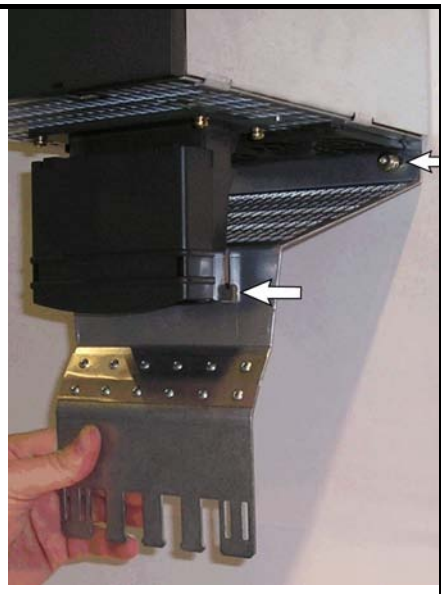
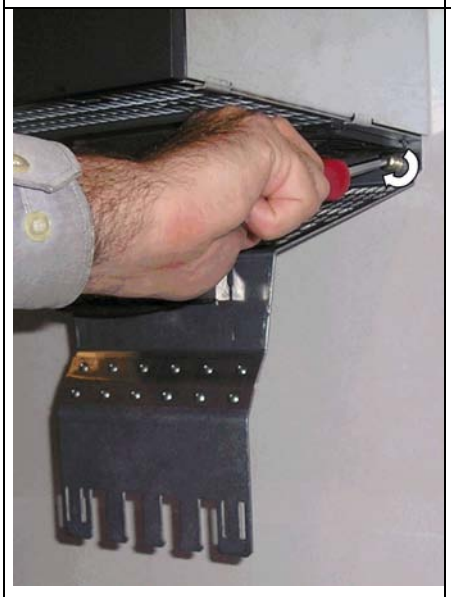
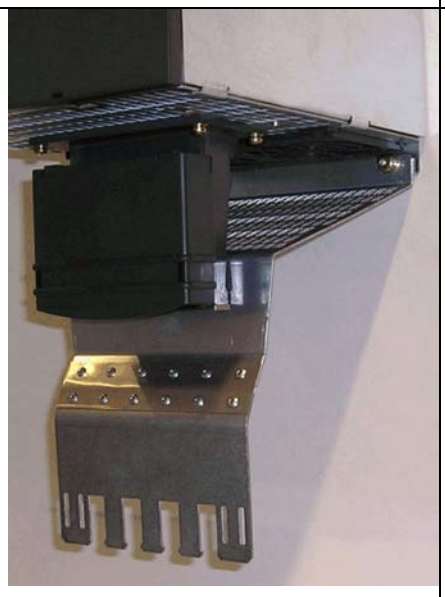
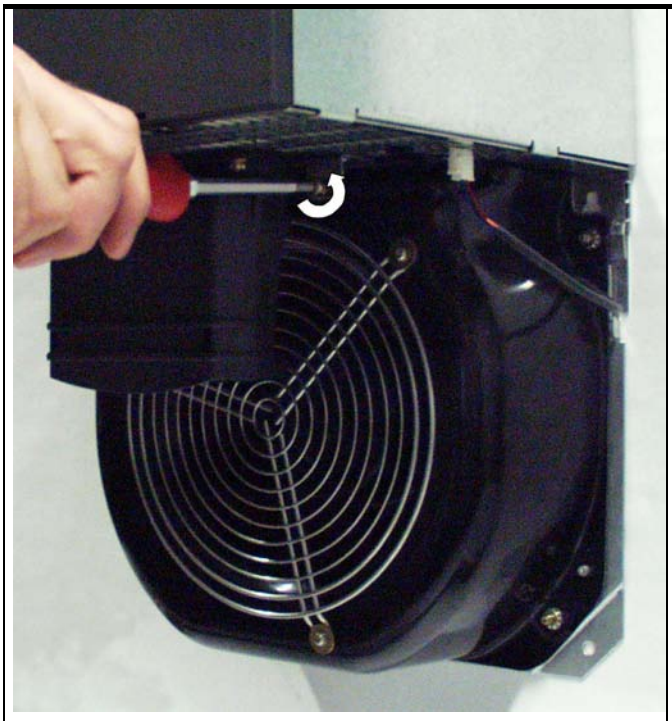
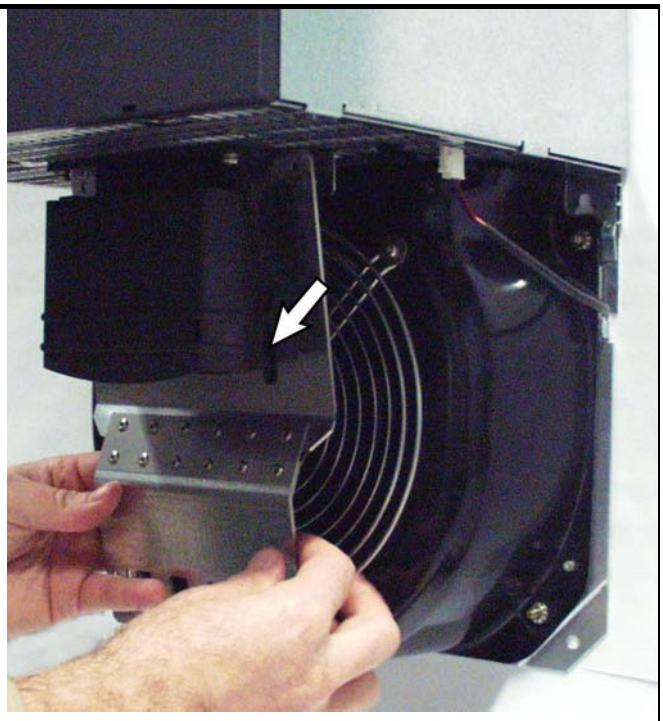
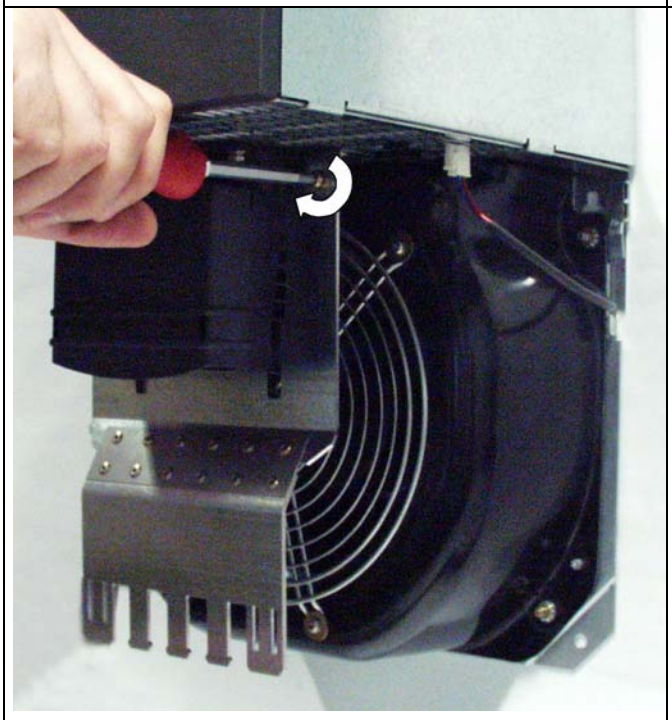
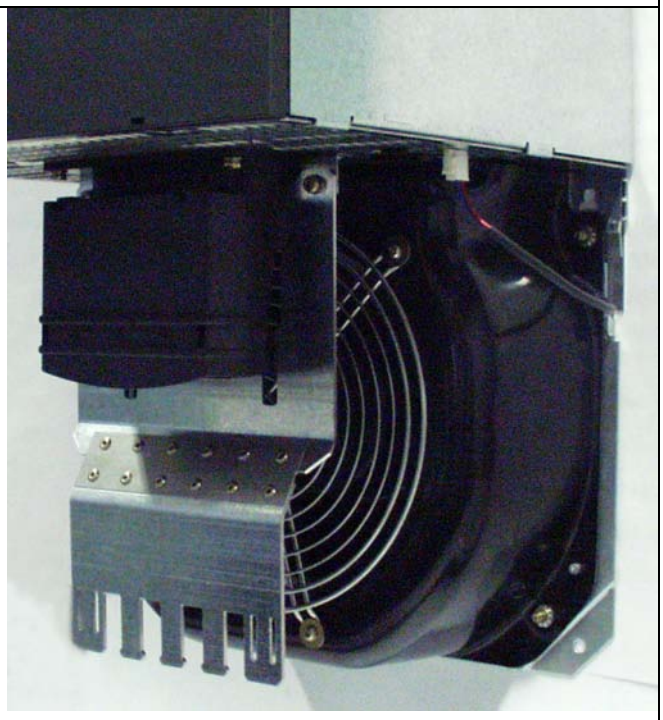
		
Loosen the lower mounting screws using a screwdriver.	Hook the shielded terminal plate into the screws and on the line/motor connection.	Secure the shielded terminal plate by shifting it to the left.
		
Secure the shielded terminal plate with screwdriver 6 Nm.	The shielded terminal plate is installed.	

Table 6-3 Installing the shielded terminal plate on a 300 mm module (e.g. with internal air cooling)

	
Unscrew the screw with screwdriver T25.	Hook the shielded terminal plate into the line/motor connection.
	
Secure the shielded terminal plate with screwdriver T25/3 Nm.	The shielded terminal plate is installed.

6.1.5 Electrical Connection

Table 6-4 Electrical connection to shielded terminal plate for 100 mm module (e.g. with internal air cooling)

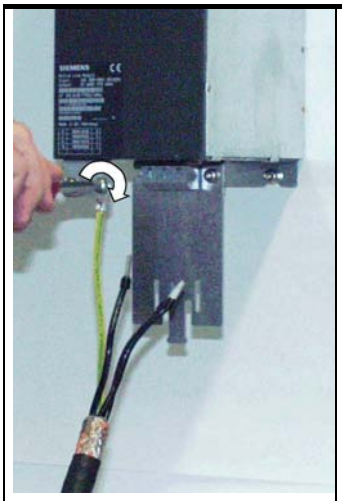
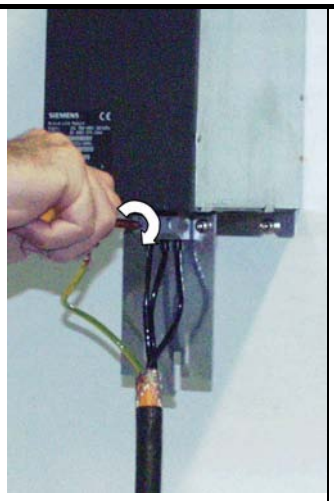
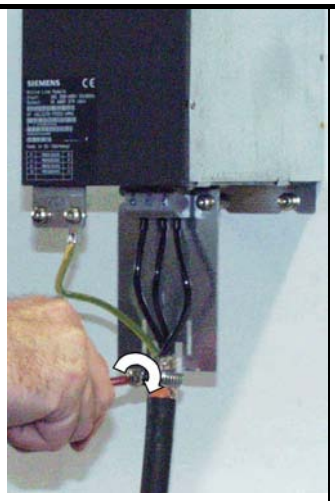
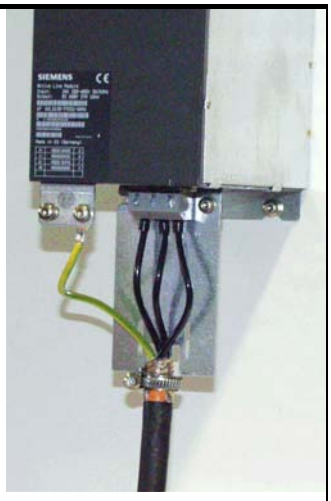
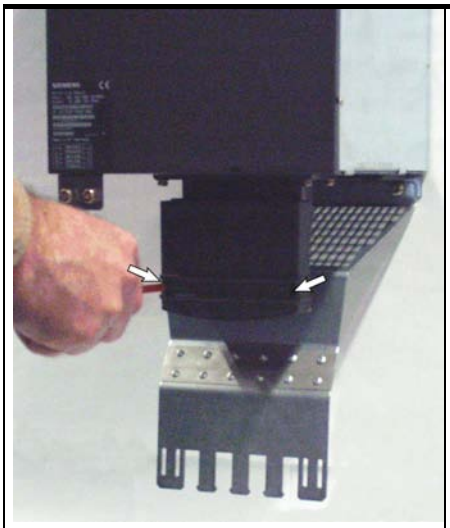
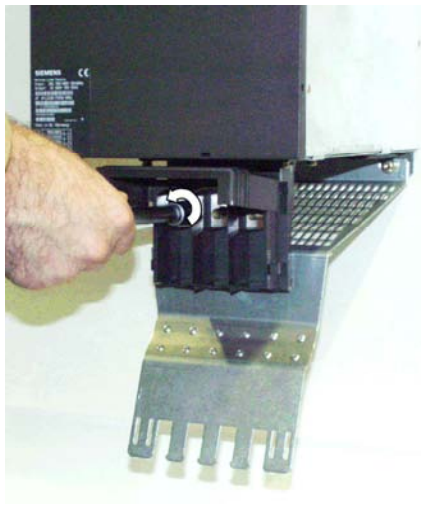
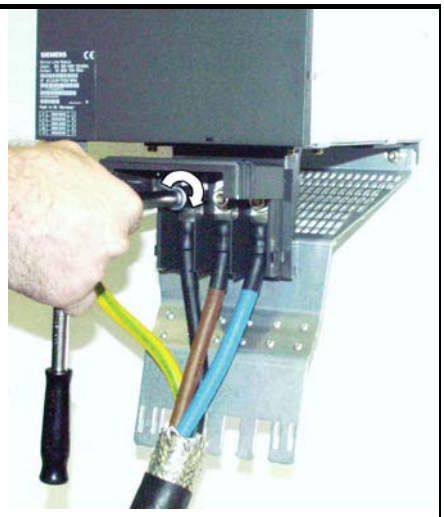
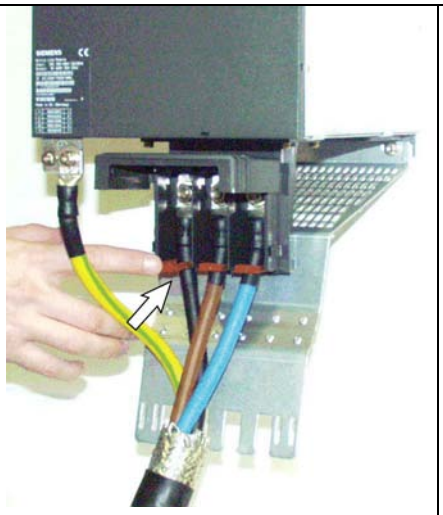
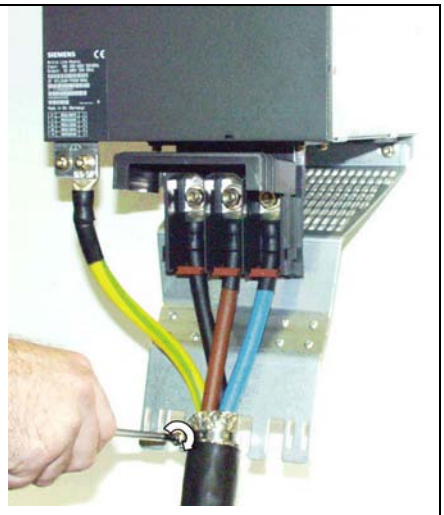
			
Secure the earthing cable with screwdriver T25/3 Nm.	Secure the power cable with flat-bladed screwdriver 4/1.8 Nm.	Secure the shield clip to the shielded terminal plate using a suitable tool.	The power cable is connected.

Table 6-5 Electrical connection to shielded terminal plate for 200 mm module (e.g. with internal air cooling)

		
Unlock and remove the cover of the terminal block.	Remove nuts M8 using a suitable tool.	Secure the earthing cable with screwdriver T25 and the power cable with torque spanner M8/13 Nm.

		
Adjust the shock-hazard protection using a suitable tool.	Attach the shock-hazard protection.	Secure the shield clip to the shielded terminal plate using a suitable tool.
		
Close the cover of the terminal block.		

6.2 DC link supply adapter

6.2.1 Description

The DC link supply adapter supplies the DC link voltage directly. With a direct supply, each module is connected to the DC link separately. The internal DC link busbar is not used here.

The connection cables must be fused accordingly.

Table 6-6 The DC link supply adapter is available in two sizes.

For Line/Motor Modules with a width of 50 mm and 100 mm	For Line/Motor Modules with a width of 150 mm, 200 mm, and 300 mm
Screw terminals (4 to 10 mm²)	Screw terminals (35 to 95 mm²)

6.2.2 Safety Information

Danger

A hazardous voltage is present for 5 minutes after the power supply has been disconnected. The adapter cannot be installed until this time has elapsed.

When opening the protective cover for the DC link, you must activate the release. A suitable tool (e.g. screwdriver) must be used for this purpose.

The components must only be operated when the protective cover of the DC link is closed. Damaged components must not be used, otherwise this could result in secondary damage or accidents.

Danger

Components for which the recesses for the DC link supply adapter have been removed must no longer be operated without them. If components need to be operated without neither the recess nor DC link supply adapter, the DC link cover must be replaced.

Caution

The DC link discharge voltage hazard warning on the modules on which the adapter is installed must be in the local language.

A set of labels in 12 languages is available using order number: 6SL3166-3AB00-0AAx.

Caution

The screw tightening torque (1.8 Nm) for securing components to the module-side DC link busbar must be checked before commissioning to ensure that it is correct.

Caution

To ensure safe electrical separation, the 24 V supply cables and those for the DC link connection cables must be physically separated (> 100 mm), or the 24 V cables must be doubly insulated (e.g. light plastic-sheathed cable).

Warning

The DC link connection cables must be routed in such a way as to ensure that they are ground-fault and short-circuit proof in accordance with DIN/VDE 0100 or suitable fuse protection must be provided.

Caution

The total length of the DC link (including the connection cables) must not exceed 10 m.

6.2.3 Interface description

6.2.3.1 Overview

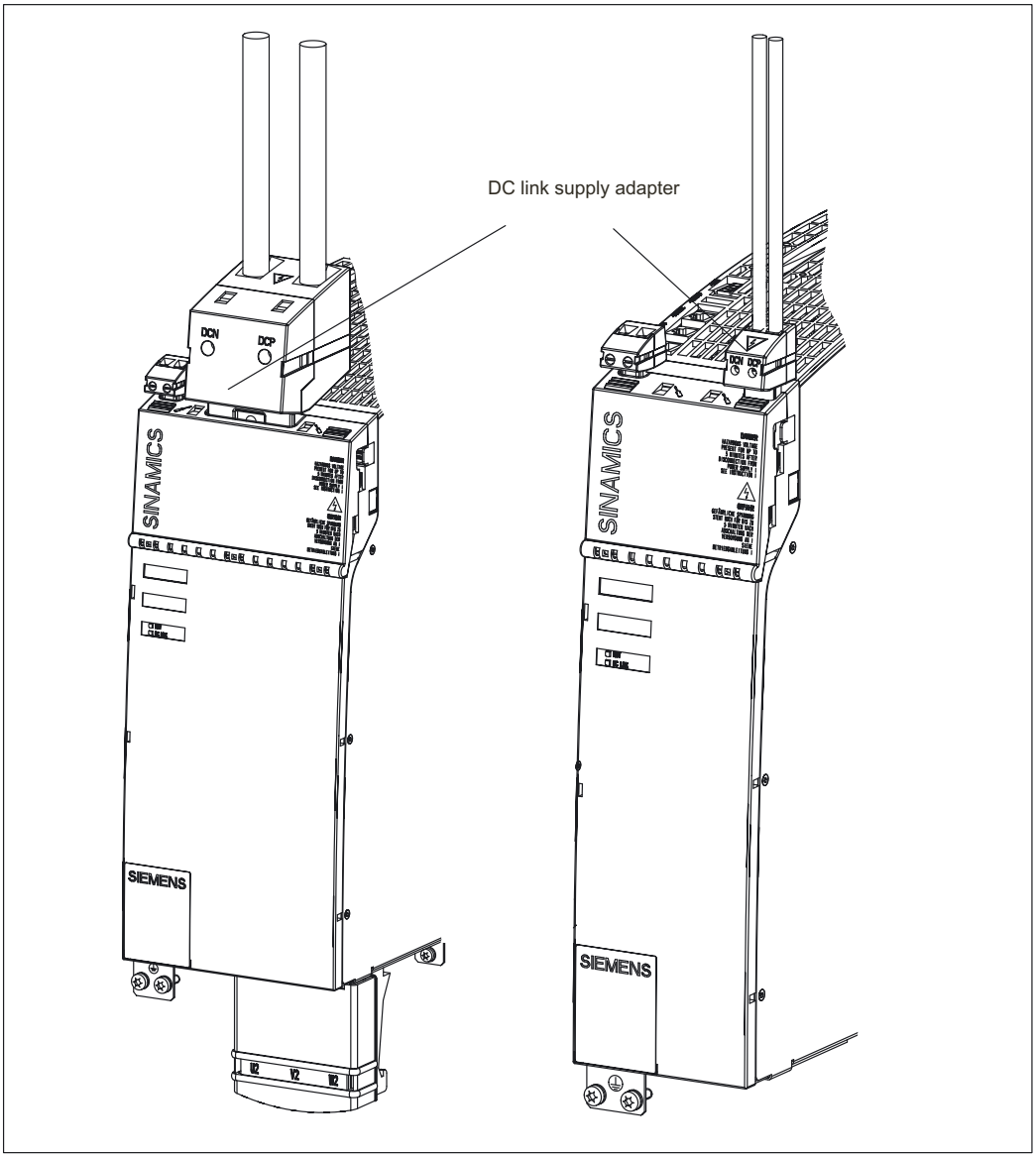


Figure 6-11 150 mm modules with DC link supply adapter for 35 mm² to 95 mm² and 100 mm modules with DC link supply adapter for 4 mm² to 10 mm²

6.2.3.2 DC link connection

Table 6-7 DC link supply adapter – description of the terminals

Terminal	Function	Technical specifications
DCP	DC link positive	**Connection voltage:** 750 V-VDE/600 V-UL **Direct supply 4 – 10 mm²** Current carrying capacity: 36 A connection cross-section: 4 – 10 mm² Stripped length: 11 mm **Direct supply 35 – 95 mm²** Current carrying capacity: 240 A connection cross-section: 35 – 95 mm² Stripped length: 27 mm
DCN	DC link negative	

6.2.4 Dimension Drawings

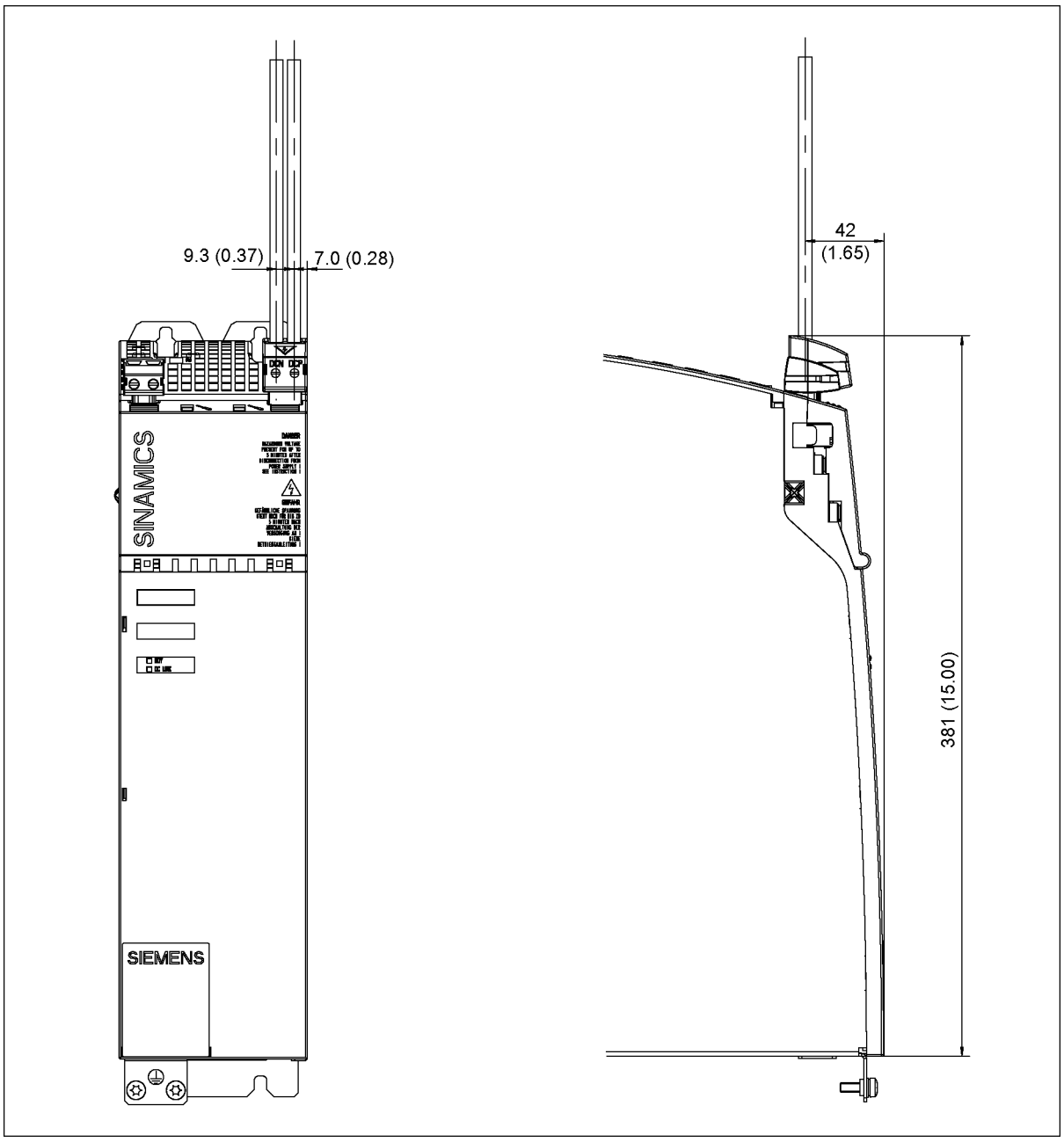


Figure 6-12 Dimension drawing of 100 mm module with DC link supply adapter for 0.5 mm² to 10 mm²

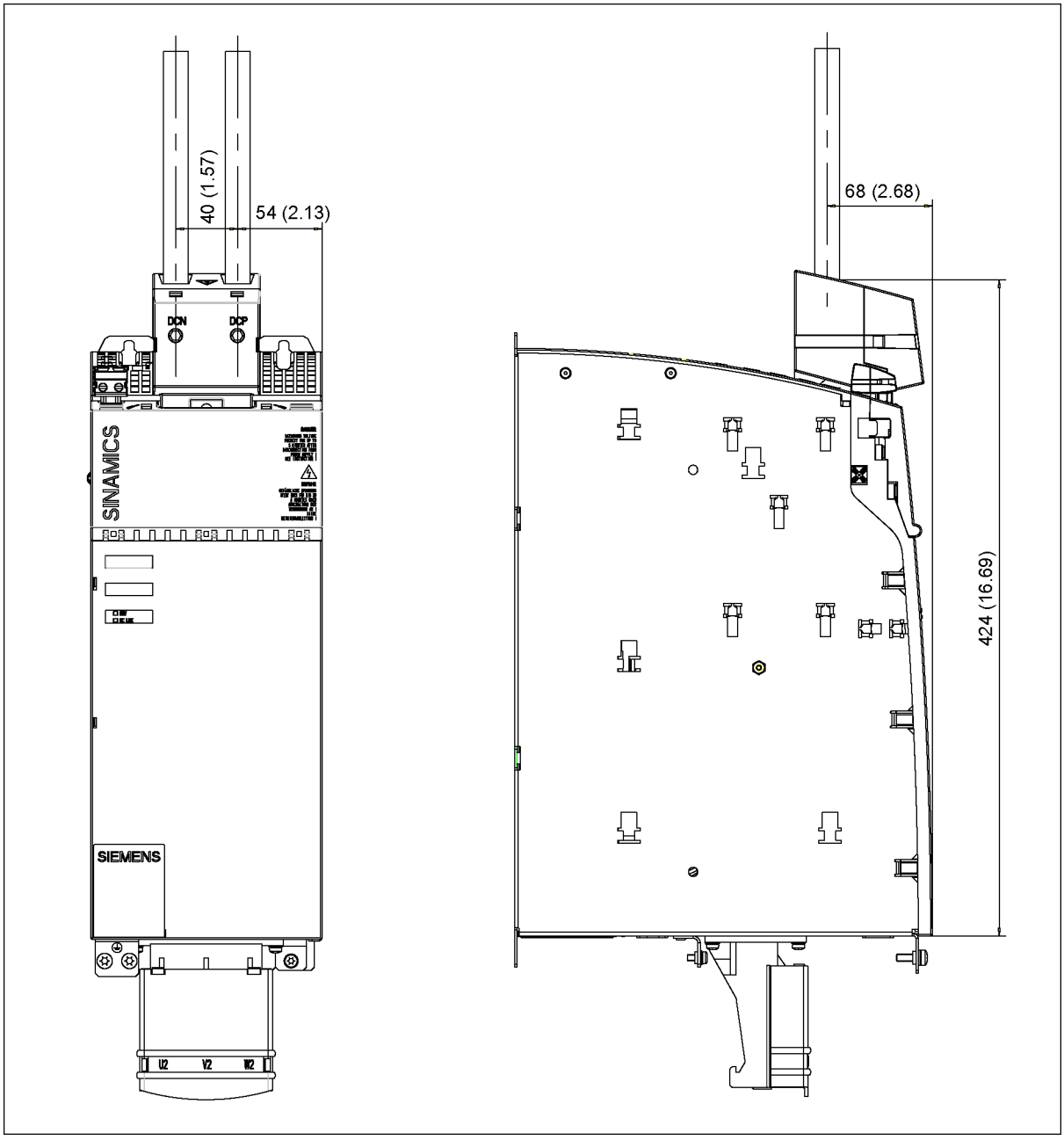


Figure 6-13 Dimension drawing of 150 mm module with DC link supply adapter for 35 mm² to 95 mm²

6.2.5 Installation

Required tools:

- Flat-bladed screwdriver 1 (0.5 x 3.5)
- Torx screwdriver T10
- Torx screwdriver T20

Table 6-8 Installing the DC link supply adapter for 50 mm and 100 mm modules

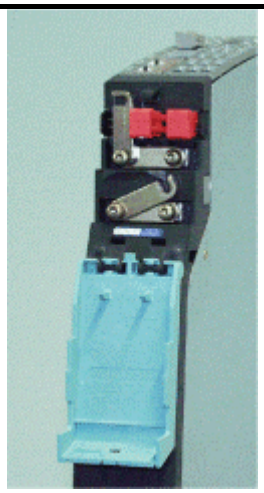
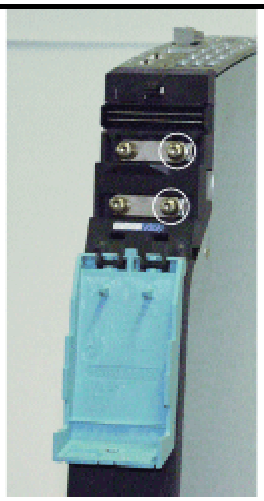
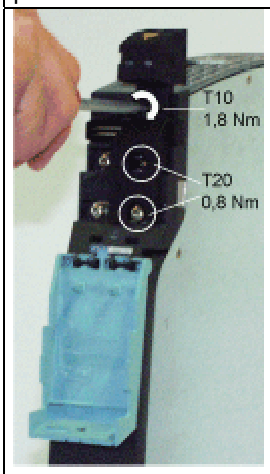
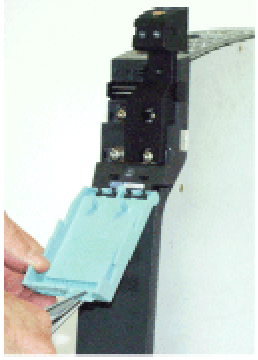
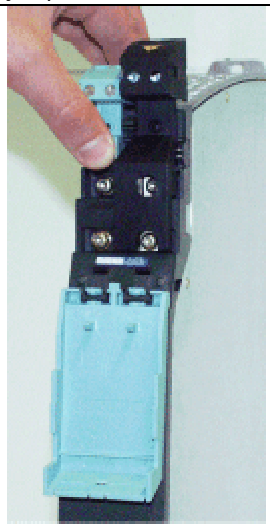
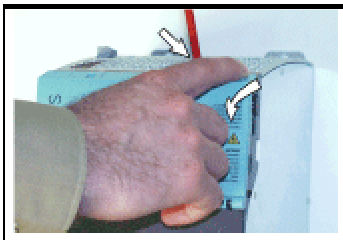
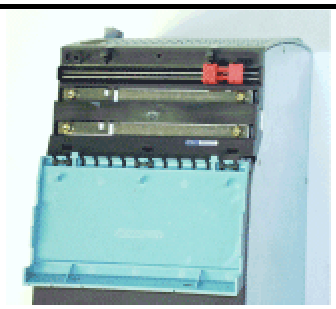
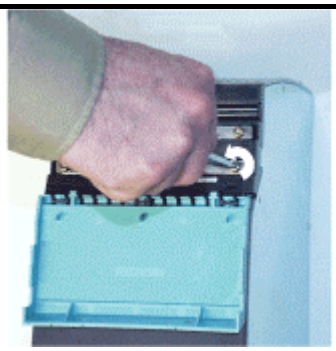
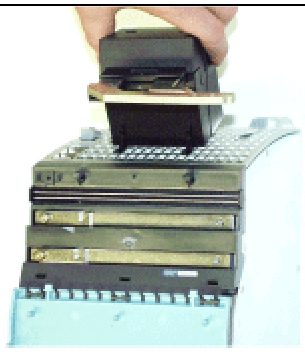
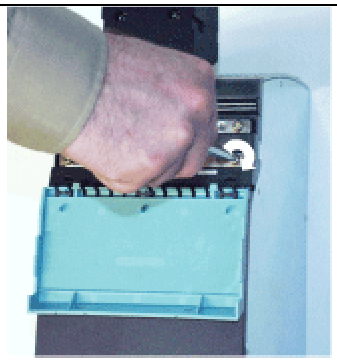
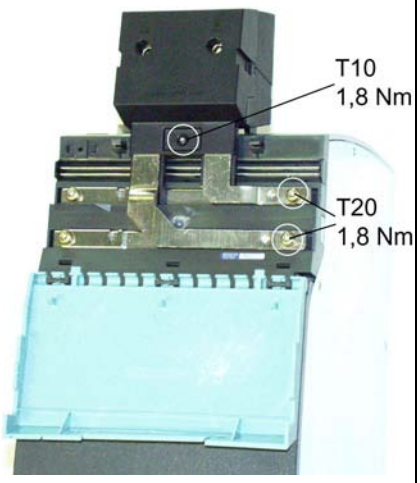
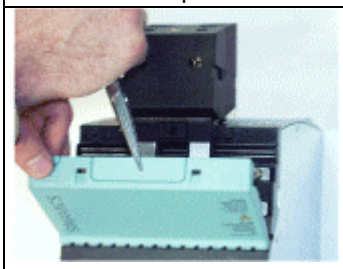
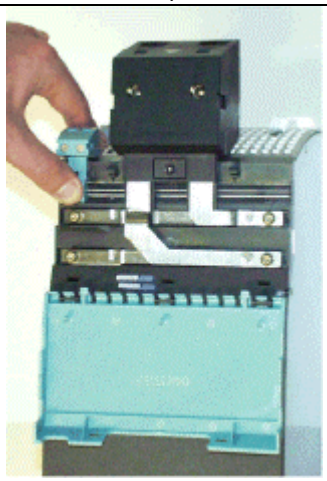
			
Unlock and open the protective cover.	Opened cover with 24 V jumper and DC link bridge.	The DC link bridge and 24 V jumper have been removed.	The screws have been removed.
			
Secure the adapter.	Create the recess using suitable pliers.	Attach the 24 V adapter.	Close the protective cover.

Table 6-9 Installing the DC link supply adapter for 150 mm, 200 mm, and 300 mm modules

		
Unlock and open the protective cover.	Opened cover with 24 V jumper	Remove the 24 V jumper and unscrew the DC link screws.
		
Hook in the adapter.	Secure the adapter.	The adapter has been screwed in.
		
Create the recess using suitable pliers.	Attach the 24 V adapter.	Close the protective cover.

6.2.6 Electrical Connection

Table 6-10 Connecting the DC link supply adapter for 50 mm and 100 mm modules

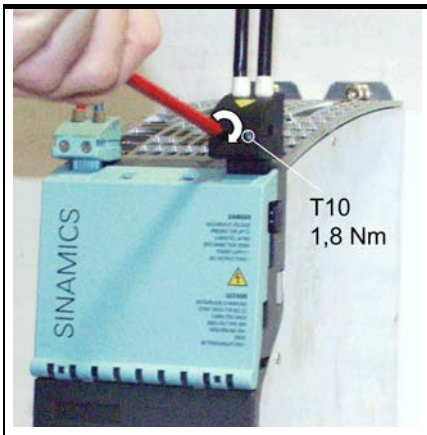
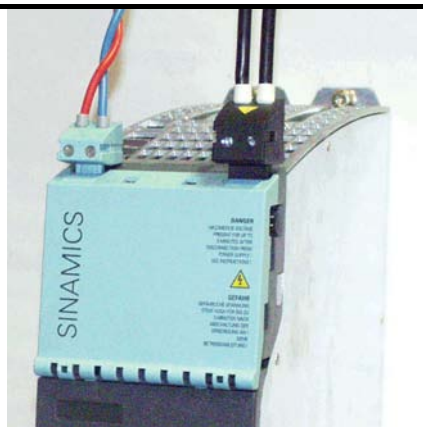
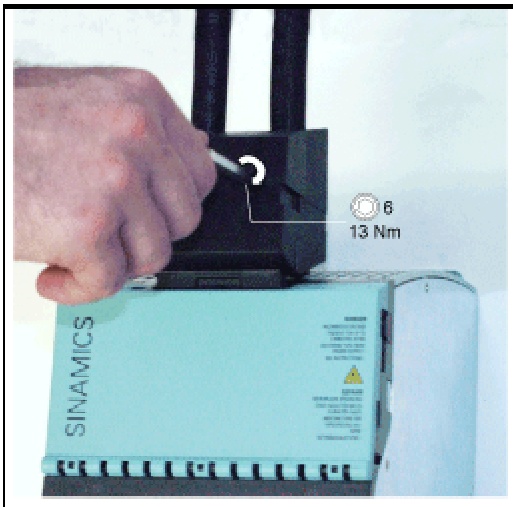
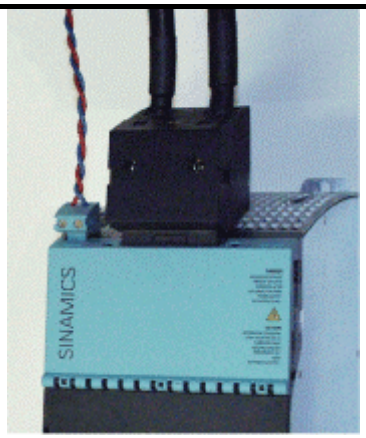
	
Connect the cable to the DC link supply adapter.	Electrical connection of the DC link supply adapter.

Table 6-11 Connecting the DC link supply adapter for 150 mm, 200 mm, and 300 mm modules

	
Connect the cable to the DC link supply adapter.	Electrical connection of the DC link supply adapter.

6.3 DC link adapter

6.3.1 Description

The DC link adapter is required when the drive line-up needs to be divided up (e.g. into two rows). The sub-line-ups are connected using cables (35 mm^2 to 95 mm^2). Shielded individual cores are recommended.

The DC link adapter can be used for all Line Modules/Motor Modules in booksize format.

6.3.2 Safety Information

Danger

A hazardous voltage is present for 5 minutes after the power supply has been disconnected. The adapter cannot be installed until this time has elapsed.

The components must only be operated when the protective cover of the DC link is closed. Damaged components must not be used, otherwise this could result in secondary damage or accidents.

Caution

The DC link discharge voltage hazard warning on the modules on which the adapter is installed must be in the local language.

A set of labels in 12 languages is available using order number: 6SL3166-3AB00-0AAx.

Caution

The screw tightening torque (1.8 Nm) for securing components to the module-side DC link busbar must be checked before commissioning to ensure that it is correct.

Warning

The DC link connection cables must be routed in such a way that they are ground-fault and short-circuit proof in accordance with DIN/VDE 0100.

Caution

The total length of the DC link (including the connection cables) must not exceed 10 m.

6.3.3 Interface description

6.3.3.1 Overview

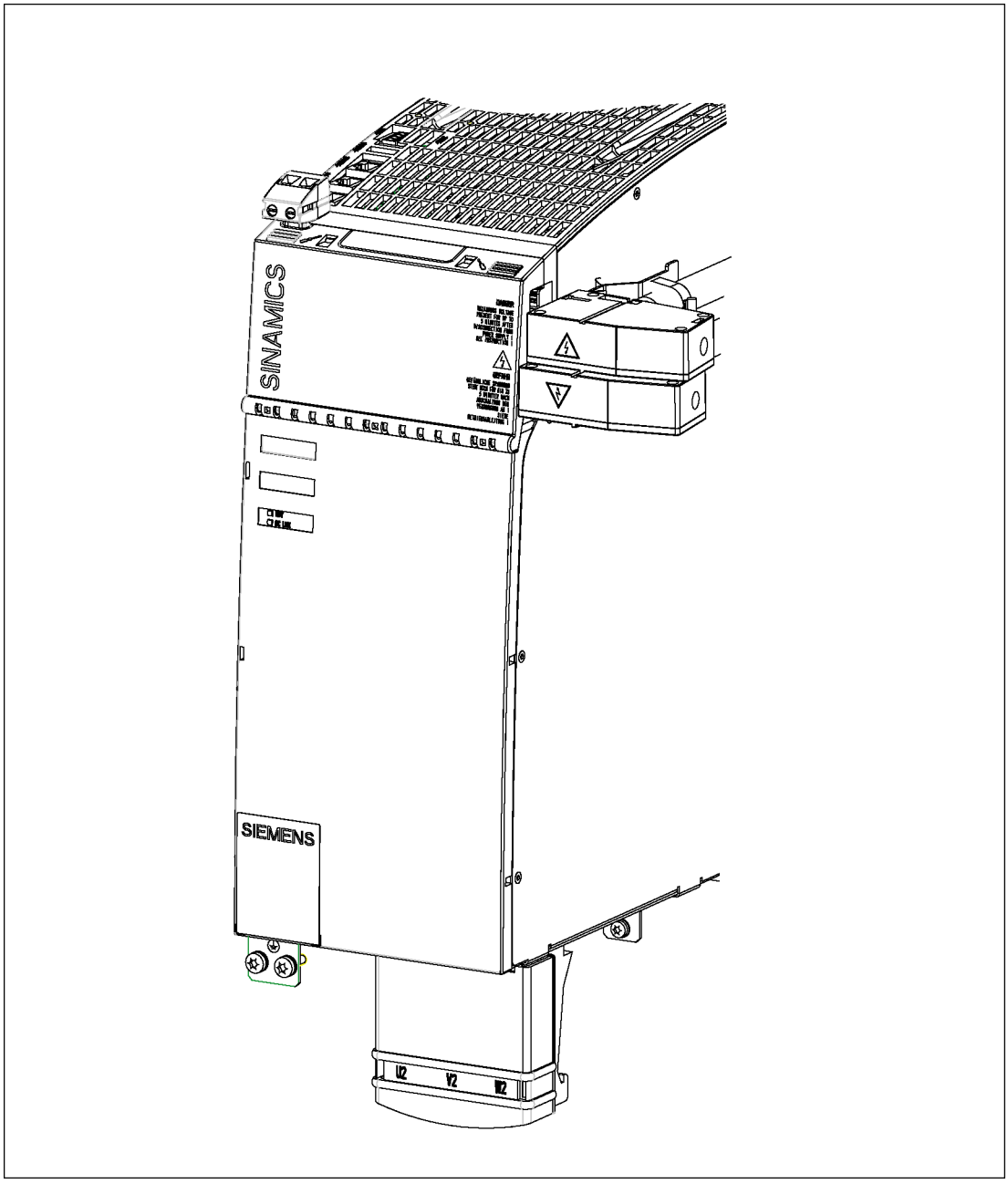


Figure 6-14 150 mm module with DC link adapter for two-row configuration (35 mm² to 95 mm²)

6.3.3.2 DC link connection

Table 6-12 DC link adapter – description of the terminals

Terminal	Function	Technical specifications
DCP	DC link positive	**Two-row configuration of adapter 35 – 95 mm²** Current carrying capacity: 240 A Voltage: 750 V-VDE/600 V-UL Connection cross-section: 35 – 95 mm² Stripped length: 27 mm
DCN	DC link negative	

6.3.4 Dimension Drawing

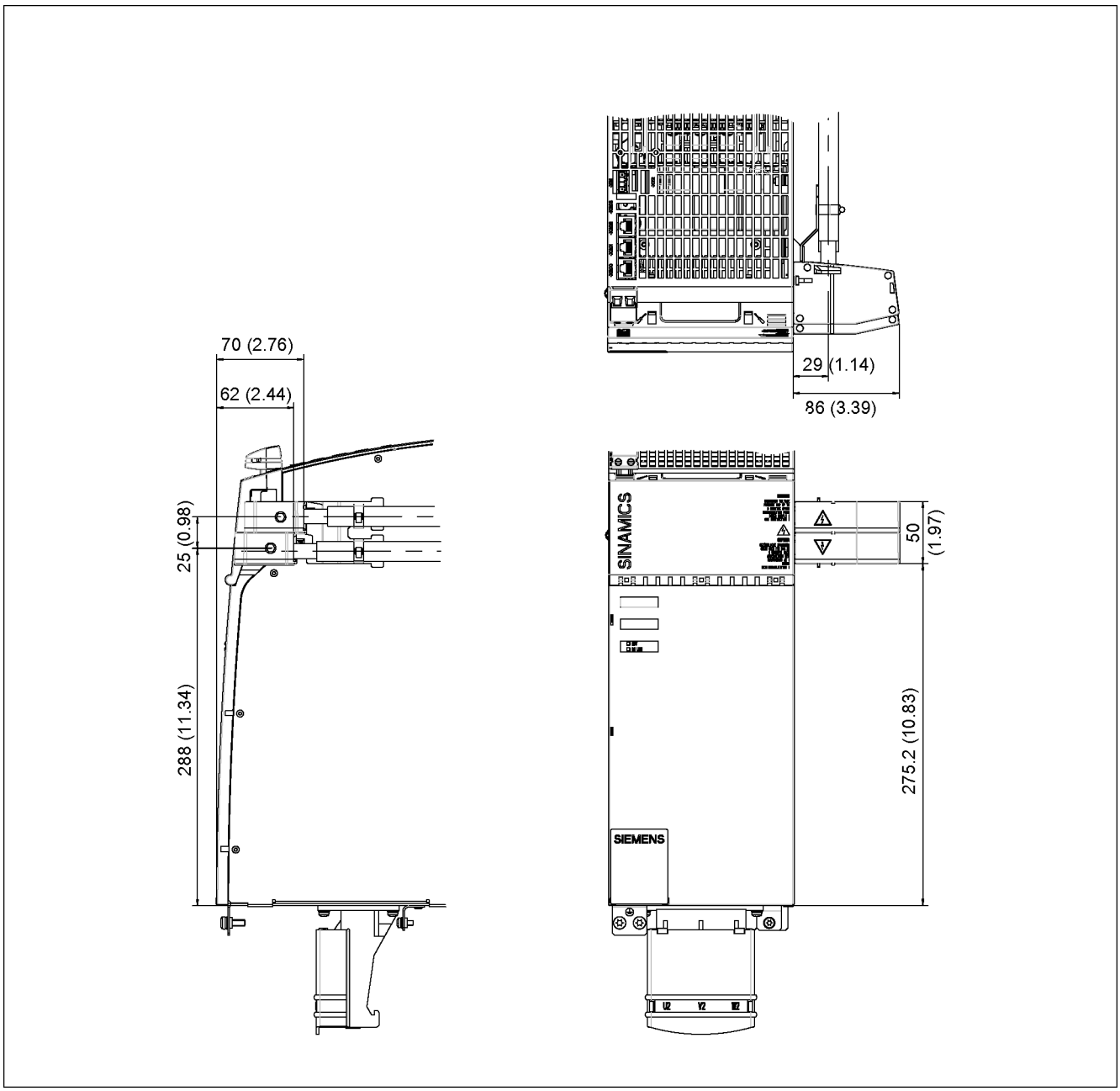


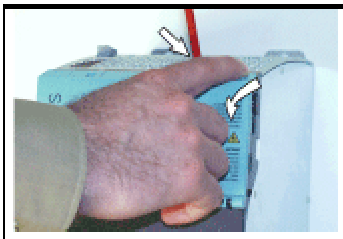
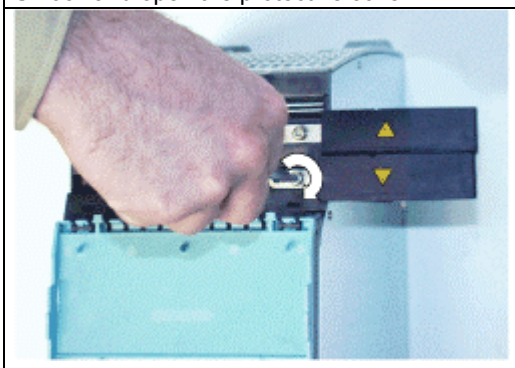
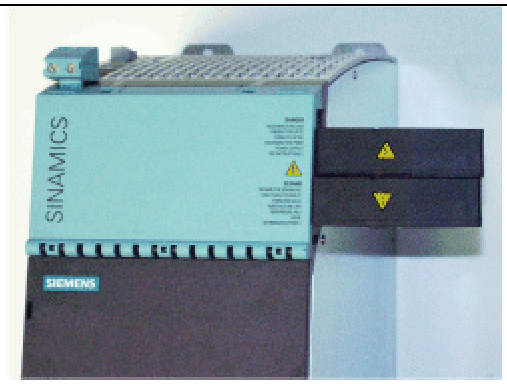
Figure 6-15 Dimension drawing of 150 mm module with DC link adapter for two-row configuration (35 mm² to 95 mm²)

6.3.5 Installation

Required tools:

- Torx screwdriver T20
- Flat-bladed screwdriver 1 (0.5 – 3.5)

Table 6-13 Installing the DC link adapter for a 150 mm module

	
Unlock and open the protective cover.	Unscrew the screws.
	
Secure the adapter (1.8 Nm).	The 24 V adapter is installed and the protective cover is closed.

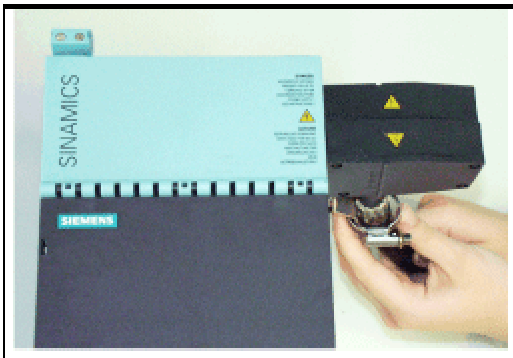
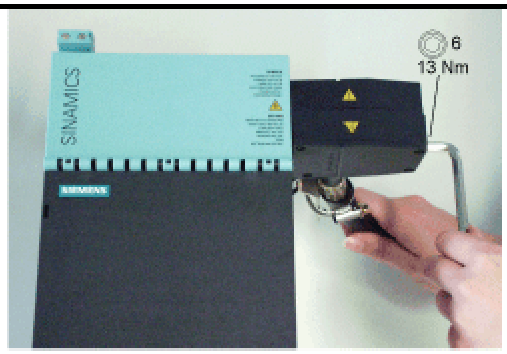
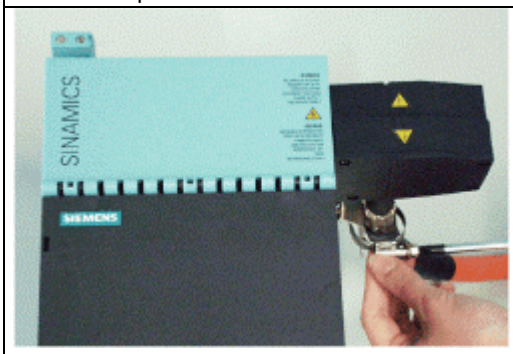
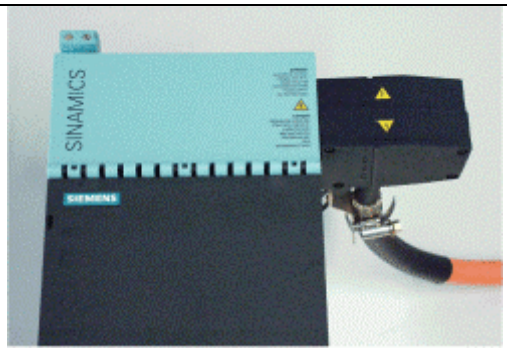
Note:
by moving the adapter housing, the DC link adapter can be fitted on either the left-hand or right-hand side of the module.

6.3.6 Electrical Connection

Required tools:

- Hexagon-socket spanner (size 6)
- Suitable tool for tube clips (e.g. flat-bladed screwdriver)

Table 6-14 Electrical connection of the DC link adapter for a 150 mm module

	
Route the cable through the tube clip and insert it into the DC link adapter.	Secure the cable.
	
Secure the tube clip.	The cable is connected.

Only shielded connection cables should be used.

Cabinet Configuration and EMC Booksize

7

7.1 Information

7.1.1 General

The SINAMICS S components are designed in accordance with degree of protection IP20 to EN 60529 and as open-type devices to UL 50. This ensures protection against electric shocks. To ensure protection against mechanical stress and climatic conditions too, the components should only be operated in housing/cabinets/rooms that fulfill at least degree of protection IP54 and, as enclosure types, are designed to UL 50.

Prefabricated MOTION CONNECT cables are recommended.

The Safety-Integrated safety function:

The components must be protected against conducted contamination (e.g. by installing them in a cabinet with degree of protection IP54).
Provided that conducted interference can be prevented at the installation site, the degree of protection for the cabinet can be decreased accordingly.

Low-voltage switchgear and controlgear assemblies

Part 1: Type-tested and partially type-tested low-voltage switchgear assemblies

If the SINAMICS S drive line-up is used for the electrical equipment of machines, the applicable requirements of EN 60204-1 must also be adhered to.

Safety of machinery

Electrical equipment of machines

Part 1: General requirements

All information for device selection in this section applies to

- Operation in a TN system
- Operating voltage range 3AC 360 V to 3AC 440 V

7.1.2 Safety information

Note

When installing the equipment in cabinets, the ventilation slots must be covered to prevent drill swarf, wire end ferrules, and the like from falling into the housing.

Safety regulations governing shock protection must be observed. See also EN 60204–1.

Caution

The tightening torque of the DC link busbar screws (1.8 Nm) must be checked before startup.

To ensure that the encoder system works properly, you are advised to use the original Siemens accessories from catalogs D21.2 and NC Z.

Only motors with a safe electrically isolated holding brake may be connected. The brake conductors must also be safely electrically isolated.

If the motor power cable is connected to intermediate terminals, the power cables and brake cables must be routed apart (≥ 300 mm).

After an intermediate terminal (e.g. due to a terminal block), it is best to continue routing using the approved MOTION-CONNECT cable.

Warning

Cable shields and unused conductors of power cables (e.g. brake conductors) must be connected to PE potential.

Non-observance can cause lethal shock voltages.

7.1.3 Directives and standards

The following directives and standards apply within the European Union:

Table 7-1 Directives

Directive	Description
73/23/EEC	Directive of the Council of February 19, 1973, on the approximation of the laws of the member states relating to electrical equipment designed for use within certain voltage limits Low-Voltage Directive
98/37/EC	Directive of the Council of August 12, 1998, on the approximation of laws of the member states relating to machinery Machine Directive
93/68/EEC	Directive of the Council on the approximation of laws of the member states relating to electromagnetic compatibility EMC guidelines

Conformance with the harmonized standards is an indication of conformance with the basic requirements of these laws.

The following table lists some application-relevant standards:

Table 7-2 Standards

Standard	Description
EN 292–1	Safety of machinery General principles for design Part 1: Basic terminology, methodology
EN 292–2	Safety of machinery General principles for design Part 2: General requirements
EN 954–1	Safety of machinery General principles for design Part 1: Safety-related parts of control systems
EN 1037	Safety of machinery Prevention of unexpected startup
EN 1921	Safety of integrated manufacturing systems
EN 61000-6-4	Electromagnetic compatibility (EMC) Generic standard emission Part 2: Industrial environments
EN 50178	Electronic equipment for use in power installations
EN 60204–1	Safety of machinery Electrical equipment of machines Part 1: General requirements
EN 60439–1	Low-voltage switchgear and controlgear assemblies Part 1: Type-tested and partially type-tested assemblies
EN 60529	Degrees of protection provided by enclosures
EN 61000-6-2	Electromagnetic compatibility (EMC) Part 2: Generic standard immunity, industrial environments
EN 61800–3	Adjustable speed electrical power drive systems Part 3: EMC product standard including specific test methods
UL 508C	Power conversion equipment

7.2 Selection of devices required for operation of SINAMICS

7.2.1 General

The following components are required for connection to the power supply network:

- Line Disconnecting Device
- Line fuse
- Line contactor (required with electrical isolation)
- Line filter (see Line Connection)
- Line reactor (see Line Connection)

7.2.2 Information about line isolating devices

A line disconnecting device for the electrical equipment may be used for correct isolation of the drive line-up from the power supply. The line disconnecting device must be suitable for electrical equipment of machinery in conformance with the requirements of EN 60204-1, Section 5.3. The relevant technical specifications must be taken into account during selection. Further loads of the electrical equipment must be included in the selection where applicable.

The line disconnecting device must be fitted with a leading auxiliary switch ($t \geq 10$ ms), which must be integrated in the switching-off path of the Active Line Modules (EP terminals).

The necessary accessories for line disconnecting devices must be selected from the appropriate manufacturer catalogs. See also catalog D21.2.

7.2.3 Overcurrent Protection by Means of Line Fuses or Circuit-Breakers

The cables for the drive line-up power supply must be protected against overcurrent. LV HBC, D-type, and DO-type fuses with a gL characteristic or suitable circuit-breakers can be used.
The following tables list the requirements regarding line fuses and circuit-breakers for the Active Line Modules and Smart Line Modules.

Table 7-3 Requirements regarding line fuses and circuit-breakers for the Active Line Modules

	16 kW	**36 kW**	**55 kW**	**80 kW**	**120 KW**
I_{rated} fuse	35 A	80 A	125 A	160A	250A
I_{fuse} 0.2s	>180 A	>360 A	>450 A	>650 A	>865 A
I_{fuse} 4s	>130 A	>260 A	>350 A	>505 A	>675 A
I_{fuse} 10 s	>100 A	>200 A	>250 A	>360 A	>480 A
I_{fuse} 240 s	>60 A	>135 A	>200 A	>280 A	>380 A

Table 7-4 Requirements regarding line fuses and circuit-breakers for the Smart Line Modules

	5 kW	**10 kW**
I_{rated} fuse	16 A	35 A
I_{fuse} 0.2s	>70 A	>100 A
I_{fuse}4s	>50 A	>80 A
I_{fuse} 10 s	>42 A	>65 A
I_{fuse} 240 s	>30 A	>45 A

See catalog D21.2

7.2.4 Line contactors

Line contactors are required for electrical isolation of the drive line-up from the power supply network.

For selection of the line contactor, the characteristic values in the technical specifications apply. The cable routing, the bundling factor, and the factor for the ambient temperature according to EN 60204-1 must be taken into account in rating the conductors to be connected.

Caution

Line contactors must not be switched under load.

When the digital output is used to control the line contactor, the make/break capacity must be taken into account.

You are advised to connect overvoltage limiters to the contactor coils to limit the opening overvoltage. See catalog D21.2.

7.3 24 V DC supply voltage

7.3.1 General

The 24 V DC voltage is required for the power supply of:

1. The electronics of the SINAMICS components via the integrated 24 V busbar
2. The electronics of the control units, option boards, Sensor Modules, and Terminal Modules, as well as the process voltage of their digital inputs
3. The load voltage of the digital outputs
4. The motor holding brakes

Other loads can be connected to these power supply units if they are separately protected from overcurrent.

Notice

If other consumers are connected to the power supply, connected inductance devices (contactors, relays) must be fitted with suitable overvoltage protection circuits.

Notice

A regulated DC power supply is required to operate motors with a built-in holding brake. The voltage is supplied via the internal 24 V busbars. The voltage tolerances of the motor holding brakes and the voltage drops of the connection cables must be taken into account.

The DC power supply should be set to 26 V. This ensures that the voltage supply for the brake remains within the permissible range when the following conditions are fulfilled:

- Using Siemens three-phase motors
- Using Siemens MOTION-CONNECT power cables
- Motor cable lengths: max. 100 m

Warning

Only protective extra-low voltages (PELVs) that comply with EN60204-1 must be connected to all connections and terminals between 0 and 48 V DC.

The voltage tolerances of the motor holding brakes must be taken into account.

7.3.2 Selection of power supply units

You are advised to use the devices in the following table. These devices meet the applicable requirements of EN 60204-1.

Table 7-5 Recommended SITOP Power

Rated output current [A]	Input voltage range [V]	Short-circuit current [A]	Order number
5	2AC 85-132/170 – 550	5.5	6EP1333-3BA00
10	2AC 85-132/176 – 550	30 for 25 ms	6EP1334-3BA00
20	3AC 320 – 550	23	
40	3AC 320 – 550	46	

Table 7-6 Recommendation for Control Supply Module

Rated output current [A]	Input voltage range [V]	Short-circuit current [A]	Order number
20	3AC 380 -10% to 3AC 480 +10% (-15% < 1 min) DC 300 – 800	< 24 V	6SL3100-1DE22-0AA0

See catalog D21.2.

Warning

When an external power supply is used (e.g. SITOP), the earth potential must be connected to the protective conductor system (PELV).

7.3.3 Typical 24-V component power consumption

A separate 24 V power supply must be used for the SINAMICS S120 drive line-up.

The following table can be used to calculate the 24 V DC power supply. The values for typical current consumption are used as a basis for configuration.

Table 7-7 Overview of 24 V DC current consumption

Component	Typical current consumption [A_{DC}]
CU320 without load per digital output PROFIBUS Teleservice	0.8 0.1
TB30 (without digital outputs) per digital output	< 0.05 0.1
CBC10	0.1
Active Line Modules	
16 kW	1.1
36 kW	1.5
55 kW	1.9
80 kW	2
120 kW	2.5
Smart Line Modules	
5 kW	1.0
10 kW	1.3
DRIVE-CLiQ and brake	
DRIVE-CLiQ (e.g. motors with DRIVE-CLiQ interface)	Typ. 0.25, max. 0.45
Brake (e.g. motor holding brake)	Typ. 0.4 to 1.1; max. 2
Single Motor Modules	
3 A (+1 x DRIVE–CLiQ; +1 x brake)	0.85
5 A (+1 x DRIVE–CLiQ; +1 x brake)	0.85
9 A (+1 x DRIVE–CLiQ; +1 x brake)	0.85
18 A (+1 x DRIVE–CLiQ; +1 x brake)	0.85
30 A (+1 x DRIVE–CLiQ; +1 x brake)	0.9
45 A (+1 x DRIVE–CLiQ; +1 x brake)	1.2
60 A (+1 x DRIVE-CLiQ; +1 x brake)	1.2
85 A (+1 x DRIVE–CLiQ; +1 x brake)	1.5
132 A (+1 x DRIVE–CLiQ; +1 x brake)	1.5
200 A (+1 x DRIVE–CLiQ + 1 x brake)	1.5
Double Motor Modules	
2 x 3 A (+2 x DRIVE–CLiQ; +2 x brake)	1.0
2 x 5 A (+2 x DRIVE–CLiQ; +2 x brake)	1.0

Component	Typical current consumption [A_{DC}]
2 x 9 A (+2 x DRIVE–CLiQ; +2 x brake)	1.0
2 x 18 A (+2 x DRIVE–CLiQ; +2 x brake)	1.0
Braking Module	0.5
Sensor Modules	
SMC10	0.25
SMC20	0.25
SMC30	0.33
Additional system components	
TM31 (without digital outputs) per digital output	0.12 0.1

7.3.4 Overcurrent protection

Cables on both the primary and the secondary side of the power supply unit must be protected from overcurrent. Primary side protection must be implemented according to the manufacturer's instructions. Secondary side protection must be rated to deal with the actual conditions. In particular:

- Loading due to loads, possibly the simultaneity factor in response to machine operation
- Current carrying capacity of the conductors used and cables in normal and short-circuit conditions
- Ambient temperature
- Cable bundling (e.g. laying in a common duct)
- Cable laying method to EN 60204-1

EN 60204-1, Section 14, can be used to determine the overcurrent protection devices.

The recommended overcurrent protection devices on the primary side are circuit-breakers as specified in Siemens catalog NSK.

The recommended overcurrent protection devices on the secondary side are MCBs or SITOP select (6EP1961-2BA00). The MCBs can be selected according to Siemens catalog I1.2.

The 24 V DC power supply of booksize

- Line Modules
- Motor Modules
- Braking Modules
- Capacitor Modules

is implemented in the components by means of a 24 V busbar for 24 V DC and reference potential. The current carrying capacity of these bars is 20 A. The power supply is connected via a 24 V terminal adapter. MCBs are recommended to protect the cables from overcurrent. These overcurrent protection devices also protect the 24 V busbars.
When an external power supply is used (e.g. SITOP), the earth potential must be connected to the protective conductor system (PELV).

The Control Supply Module is integrated in the drive line-up and supplies the 24 V directly to the 24 V busbars. A 24 V terminal adapter can be used to supply additional components. The earth potential for the Control Supply Module is connected to the protective conductor system inside the device.

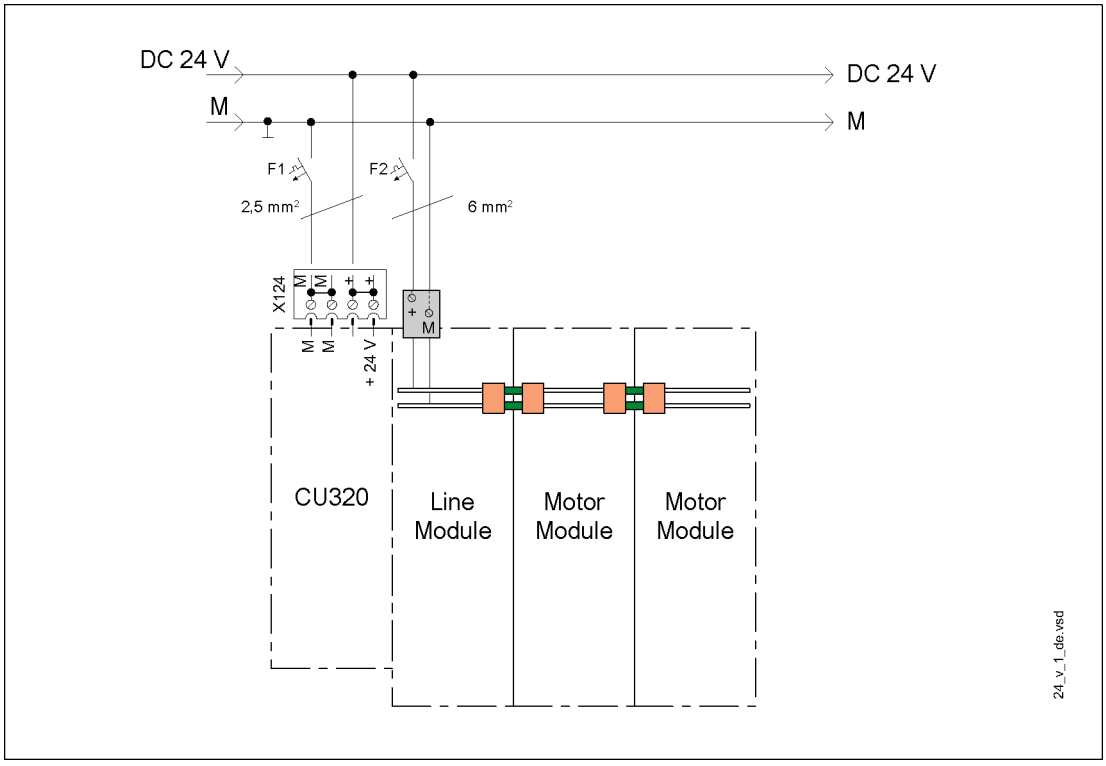


Figure 7-1 Example of 24 V DC fuse protection

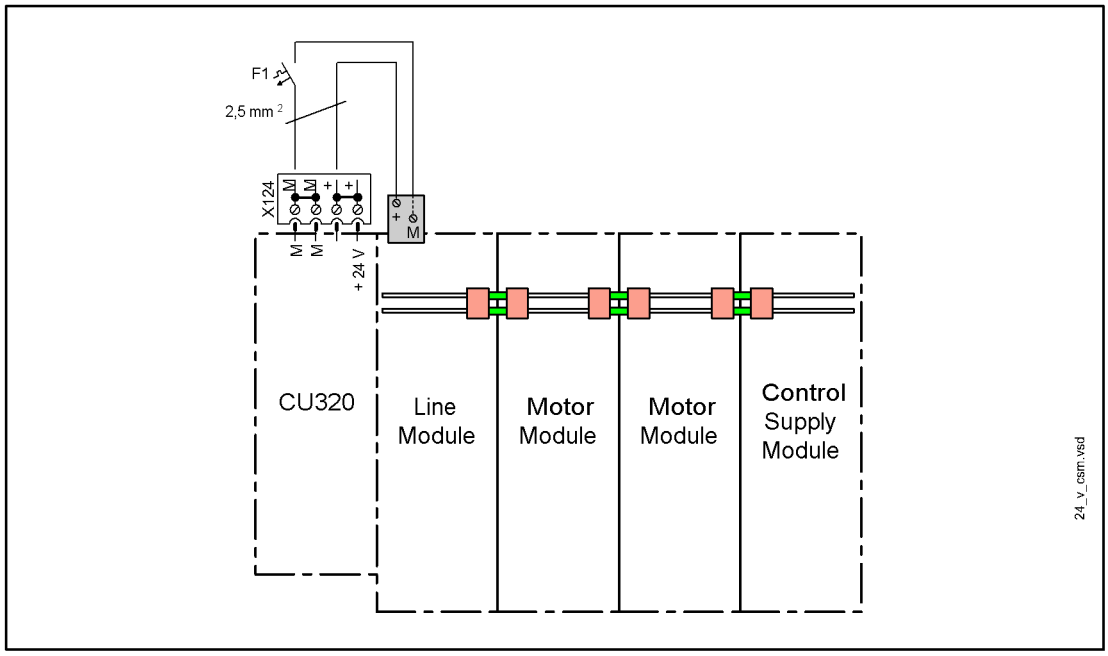


Figure 7-2 Example: 24 V supply with Control Supply Module

The following conditions apply to the cables when the MCBs are selected from the following table:

- Ambient temperature 40°C or 55°C
- Max. 1 conductor pair, bundled
- Conductor limit temperature 70°C for normal operation
- Cable length max.:
  - 10 m for the supply cables
  - 30 m for signal lines
- To be routed separately from other cables and conductors carrying operating current.
- Cable type: PVC conductor cable

Table 7-8 MCBs by conductor cross-section and temperature

Conductor cross-section	Max. value up to 40°C	Max. value up to 55°C
1.5 mm^2	10 A	10 A
2.5 mm^2	20 A	10 A
4 mm^2	25 A	16 A
6 mm^2	32 A	20 A
24 V busbar	20 A	20 A

The trip characteristic of the MCBs must be selected to match the loads to be protected and the max. current provided by the power supply unit in the event of a short-circuit.

Example: calculating 24 V DC current requirements

Table 7-9 Example of 24 V DC current requirements

Component	Number	Current consumption [A]	Total current consumption [A]
CU320	1	0.8	0.8
8 digital outputs	8	0.4	3.2
Active Line Module 36 kW	1	1.1	1.1
Motor Module 18 A	2	0.85	1.7
Motor Module 30 A	3	0.9	2.7
Encoders	5	0.25	1.25
Brake	5	1.1	5.5
Total:			17.5

7.4 Arrangement of components and devices

7.4.1 General

The arrangement of the components and equipment takes account of

- Space requirements
- Cable routing
- Bending radius of connection cables
  For MOTION-CONNECT cables, see catalog D21.1 or D21.2.
- Heat dissipation
- EMC

Components are usually located centrally in a cabinet.

7.4.2 Drive line-up

Due to the current carrying capacity of the DC link busbars and their function, the components must be arranged according to the following rule. From left to right:

- Line Module
- Motor Modules in order of power from the highest power to the lowest power
- DC link components (e.g. Braking Module, Control Supply Module, Capacitor Module)

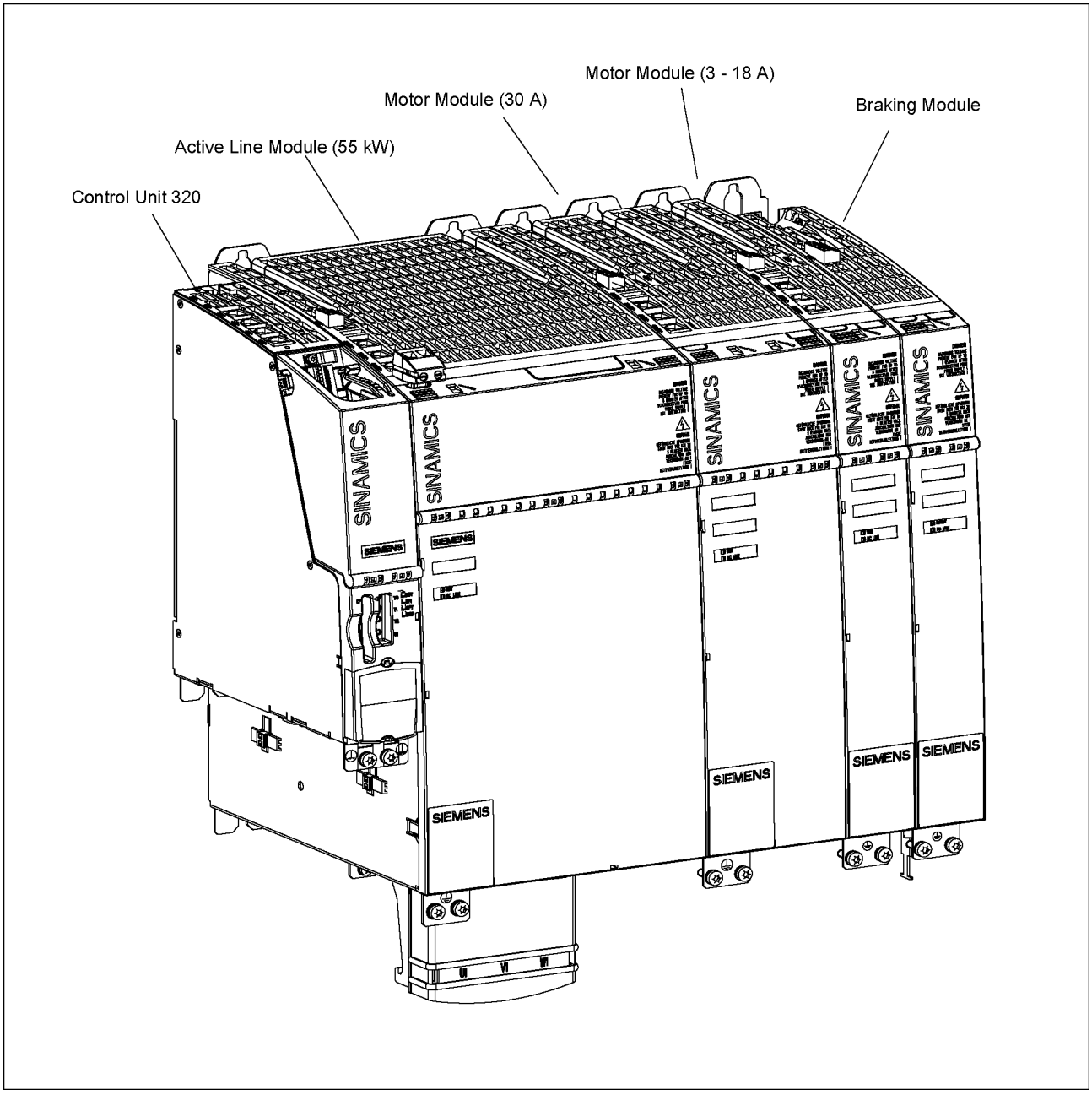


Figure 7-3 Example of a drive line-up

Note

When the power supply input is on the right-hand side of the drive line-up (e.g. in a multiple-tier configuration), the above rules apply in reverse.

The components of the drive line-up should preferably be installed on a conductive mounting surface to ensure low impedance between the component and the mounting surface. Mounting plates with a galvanized surface are suitable.

The components can be arranged in one or more tiers. In a multiple-tier arrangement, vertical installation or, in a cabinet row, side-by-side installation in different cabinet sections is possible.

To determine the cross-section, use the DC link busbar current carrying capacity given in the relevant technical specifications.

Note regarding the use of modules with a width of 50 mm

Danger

If a Motor Module with a width of 50 mm or a DC link component is located on the left-hand side of the drive line-up, the bridges there must be removed.
If not, this could result in damage or accidents.

Figure 7-4 Removing the DC link bridges (two-tier arrangement)

The DC link bridges must be removed by unscrewing the M4 screws.

Two-tier configuration

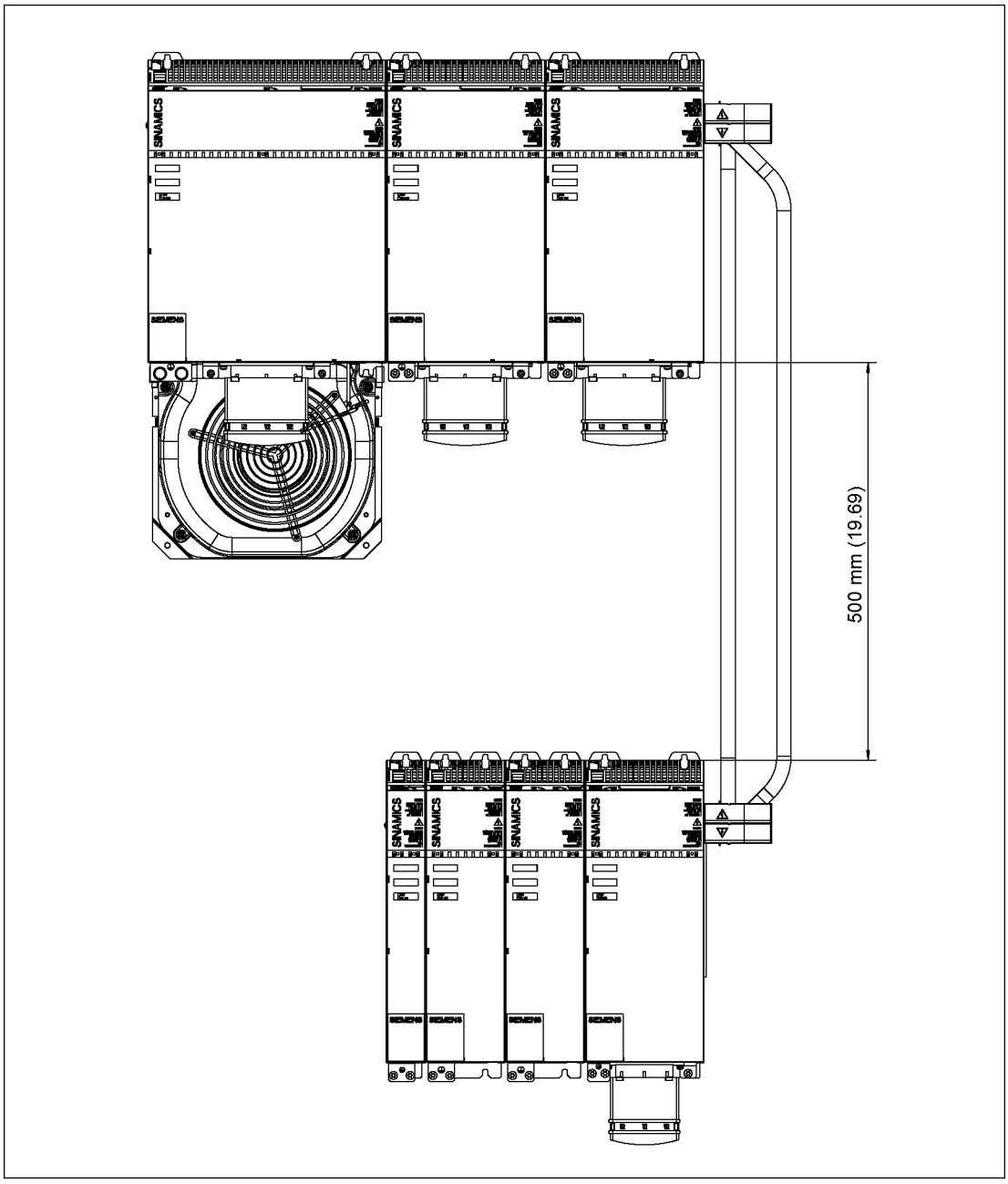


Figure 7-5 Example of a two-tier configuration with modules between 200 and 300 mm wide

Continuation of the DC link with the DC link adapter (installation above) external to the components is achieved using single-core, finely-stranded and shielded cables that are laid so as to ensure they are short-circuit and ground-fault proof.

The distance between the two module rows depends on the wiring and cable cross-section.

For modules with a width of between 50 and 100 mm, the distance between the upper and lower module row must be at least 300 mm.

For modules with a width of between 150 and 300 mm, the distance between the upper and lower module row must be at least 500 mm.

Caution

Signal cables must not be routed parallel to power cables.

Wiring rules for DRIVE-CLiQ

See the Commissioning Manual.

Overview of the DC link supply adapter and DC link adapter

	Suitable for module width:	Max. connectable cross-section	Max. current carrying capacity
DC link supply adapter (cable outlet on top)			
6SL3162-2BD00-0AAx	50 mm, 100 mm	10 mm^2	36 A
6SL3162-2BM00-0AAx	150 mm, 200 mm, 300 mm	95 mm^2	240 A
DC link adapter (cable outlet on side)			
6SL3162-2BM01-0AAx	all	95 mm^2	240 A

Note

The current carrying capacity of the DC link busbars must be taken into account. For the specifications, see the technical specifications for the module.

7.5 Information about electromagnetic compatibility (EMC) and cable laying

7.5.1 General

EMC requirements can be found in EN 60439-1 and recommendations in EN60204-1. For installation of components in cabinets, the following conditions must be ensured to comply with the EMC Directive. The EMC Directive kann be ordered
(Order no.: 6FC5297-□AD30-0AP□).

- Operation in TN systems with SINAMICS line filters
- Observance of information about cable shielding and equipotential bonding
- The recommended Siemens power and signal cables must be used.
- For DRIVE-CliQ connections self-prefabricated cables or couplings must not be used.

For MOTION-CONNECT cables, see catalog D21.1 or D21.2

Caution

With DRIVE-CliQ connections, couplings or self-made cables must be used.

7.5.2 Cable Shielding and Routing

In order to comply with the EMC requirements, certain cables must be routed apart from other cables and from certain components. To full EMC requirements, the following cables must be used with shields:

- Power supply cables from line filter via line reactor to Line Module
- All motor cables (if necessary, including cables for motor holding brake)
- Cables for "fast inputs" of the control unit
- Cables for analog direct voltage/current signals
- Signal cables for sensors
- Cables for temperature sensors

The EMC measures described above ensure CE compliance with the EMC Directive. Alternative measures (e.g. routing behind mounting plates, suitable clearances) can also be used provided they have similar results. This excludes measures that relate to the design, installation, and routing of motor power cables and signal cables. If unshielded cables are used between the line connection point and line filter, make sure that no interfering cables are routed in parallel.

The cable shields must be connected as close to the conductor terminal connections as possible to ensure a low-impedance connection with cabinet ground. For Siemens power cables in which the shield is connected to the connector shell (see relevant catalog), this is a sufficiently good shield contact.

With components that do not have any special shield connection or where the shield connection is not sufficient, the cable shields can be connected to the metal mounting plate using hose clamps and toothed rails. The cable length between the shield contact point and the terminals for cable conductors must be kept as short as possible.

Shield contact plates with pre-prepared clip contacts are available for contacting the shields for power cables of Line Modules and Motor Modules. Up to a module width of 100 mm, these plates are part of the scope of supply of the components, or they are integrated in the connector.

All cables inside the cabinet must be connected as closely as possible to parts connected with cabinet ground, such as a mounting plate or cabinet wall. Ducts made of sheet steel or routing cables between between steel sheets (e.g. between the mounting plate and back wall) should provide adequate shielding.

Avoid, where possible, routing unshielded cables, connected to the drive line-up, in the immediate vicinity of noise sources, e.g. transformers. Signal lines (shielded and unshielded) connected to the drive line-up, must be routed as far as possible away from strong external magnetic fields (e.g. transformers, line reactors). In both cases, a distance of $\geq$ 300 mm is usually sufficient.

Signal and direct current supply cables

Operating unshielded signal and direct current supply cables (e.g. 24 V infeed with external supply):

- Direct current supply cables: Max. permissible length: 10 m
- Unshielded signal cables: Max. permissible length: 30 m (without additional wiring)

For greater lengths, suitable wiring must be connected by the user to provide overvoltage protection. For example:

Table 7-10 Recommendations for overvoltage protection

DC supply	24 V signal cables
Weidmüller Type no.: PU DS 24V 16A	Weidmüller Type no.: MCZ OVP TAZ
Weidmüller GmbH & Co. KG An der Talle 89 33102 Paderborn Tel. 05252/960-0 Fax 05252/960-116 http://www.weidmueller.com	

Caution

The connected signal and power cables must not cover the ventilation slots.

Caution

Unshielded signal cables must not be routed parallel to power cables.

Table 7-11 Maximum cable lengths

Type	Maximum length [m]
24 V DC power cables [2]	10
24 V signal cables [2]	30
DC link, including extensions	10
Power supply cables from line power outlet up to Line Module + motor power cables	350 (shielded) 560 (unshielded)
Power cable between line filter and line reactor	10 (shielded/unshielded) [1]
Power cable between line reactor and Line Module	10 (shielded/unshielded) [1]
Power cable between Motor Module and motor $\leq$ 30 A	50 (shielded) 75 (unshielded)
Power cable between Motor Module and motor $\geq$ 45 A	100 (shielded) 150 (unshielded)
DRIVE-CLiQ signal cables MC500	100
DRIVE-CLiQ signal cables MC80	50
DRIVE-CLiQ signal cables FIX	100
Cable between the Braking Module and braking resistor	10

[1] To comply with EMC limit values, shielded cables (preferably Motion Connect cables) must be used.

[2] For greater lengths, suitable wiring must be connected by the user to provide overvoltage protection.

7.5.3 Equipotential bonding

The SINAMICS S booksize drive system is designed for use in cabinets with a PE conductor connection.

If the drive line-up is arranged on a common unpainted metal-surfaced mounting plate, e.g. with a galvanized surface, no additional equipotential bonding is needed within the drive line-up as:

- All parts of the switchgear assembly are connected to the protective conductor system.
- The mounting plate is connected with the external PE conductor by means of a finely-stranded copper conductor with a cross-section of 16 mm², including the outer conductor. As of a cross-section of 25 mm² copper, the outer cross-section of the finely-stranded conductor is halved.

For other installation methods, equipotential bonding must be implemented using conductor cross-sections as stated in the second item in the list or at least equal to the conductance.

If components are mounted on DIN rails, the data listed in the second item applies for equipotential bonding. If only smaller connection cross-sections are permissible on components, the largest must be used (e.g. 6 mm² for TM31 and SMC). These requirements also apply to distributed components located outside the cabinet.

If, for example, the PROFIBUS or DRIVE-CLiQ cable is routed through several cabinets, the "PROFIBUS equipotential bonding conductor connection" on the control unit interface must be used for connecting the equipotential bonding conductor. A finely stranded copper conductor with a 4 mm² cross-section must be used. This conductor must be routed together with the PROFIBUS cable.

Equipotential Bonding and Shielding for PROFIBUS

The cable shield must be connected over a large contact surface area.

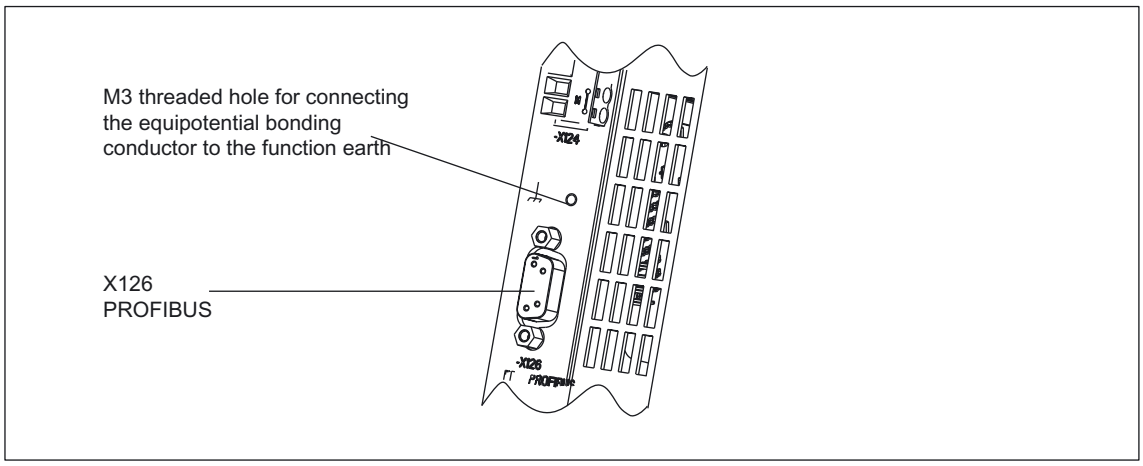


Figure 7-6 Functional ground connection for PROFIBUS

7.6 Connection methods

7.6.1 Spring-Loaded Terminals/Screw Terminals

Connectable conductor cross-sections of spring-loaded terminals

Table 7-12 Spring-loaded terminals

Spring-loaded terminal type			
1	Connectable conductor cross-sections	Flexible With wire end ferrule, without plastic sleeve With wire end ferrule, with plastic sleeve	0.14 mm^2 to 1.5 mm^2 0.25 mm^2 to 1.5 mm^2 0.25 mm^2 to 0.5 mm^2
	Insulation stripping length	7 mm	
	Tool	Screwdriver 0.4 x 2.0 mm	
2	Connectable conductor cross-sections	Flexible	0.08 mm^2 to 2.5 mm^2
	Insulation stripping length	8 to 9 mm	
	Tool	Screwdriver 0.4 x 2.0 mm	

Connectable conductor cross-sections of screw terminals

Table 7-13 Screw terminals

Screw terminal type			
1	Connectable conductor cross-sections	Flexible With wire end ferrule, without plastic sleeve With wire end ferrule, with plastic sleeve	0.14 mm^2 to 1.5 mm^2 0.25 mm^2 to 1.5 mm^2 0.25 mm^2 to 0.5 mm^2
	Insulation stripping length	7 mm	
	Tool	Screwdriver 0.4 x 2.0 mm	
	Tightening torque	0.22 to 0.25 Nm	
2	Connectable conductor cross-sections	Flexible With wire end ferrule, without plastic sleeve With wire end ferrule, with plastic sleeve	0.2 mm^2 to 2.5 mm^2 0.25 mm^2 to 1 mm^2 0.5 mm^2 to 1 mm^2
	Insulation stripping length	7 mm	
	Tool	Screwdriver 0.6 x 3.5 mm	
	Tightening torque	0.5 to 0.6 Nm	
3	Connectable conductor cross-sections	Flexible With wire end ferrule, without plastic sleeve With wire end ferrule, with plastic sleeve	0.2 mm^2 to 2.5 mm^2 0.25 mm^2 to 1 mm^2 0.25 mm^2 to 1 mm^2
	Insulation stripping length	9 mm	
	Tool	Screwdriver 0.6 x 3.5 mm	
	Tightening torque	0.5 to 0.6 Nm	
4	Connectable conductor cross-sections	Flexible With wire end ferrule, without plastic sleeve With wire end ferrule, with plastic sleeve	0.2 mm^2 to 4 mm^2 0.25 mm^2 to 4 mm^2 0.25 mm^2 to 4 mm^2
	Insulation stripping length	7 mm	
	Tool	Screwdriver 0.6 x 3.5 mm	
	Tightening torque	0.5 to 0.6 Nm	
5	Connectable conductor cross-sections	Flexible With wire end ferrule, without plastic sleeve With wire end ferrule, with plastic sleeve	0.5 mm^2 to 6 mm^2 0.5 mm^2 to 6 mm^2 0.5 mm^2 to 6 mm^2
	Insulation stripping length	12 mm	
	Tool	Screwdriver 1.0 x 4.0 mm	
	Tightening torque	1.2 to 1.5 Nm	
6	Connectable conductor cross-sections	Flexible With wire end ferrule, without plastic sleeve With wire end ferrule, with plastic sleeve	0.5 mm^2 to 10 mm^2 0.5 mm^2 to 10 mm^2 0.5 mm^2 to 10 mm^2
	Insulation stripping length	11 mm	
	Tool	Screwdriver 1.0 x 4.0 mm	
	Tightening torque	1.5 to 1.8 Nm	

7.6.2 Motor connector

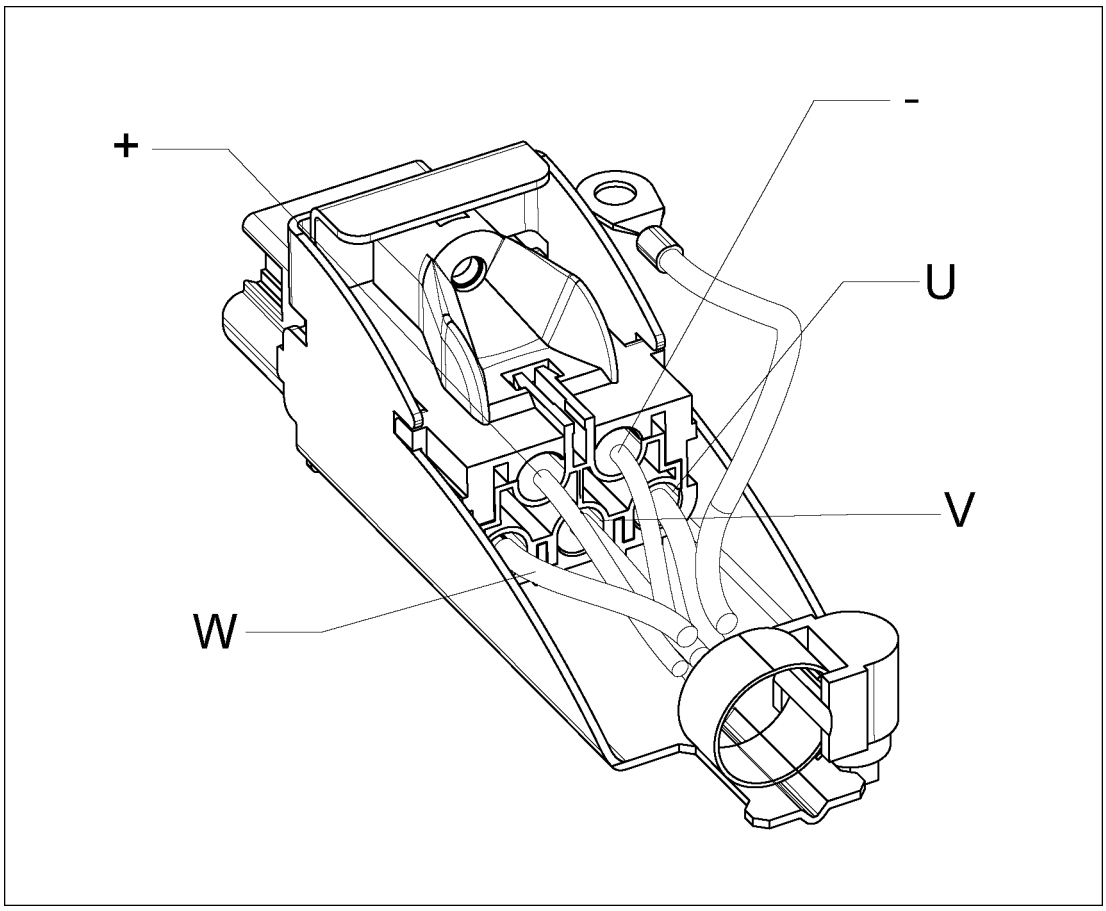


Figure 7-7 Motor connector

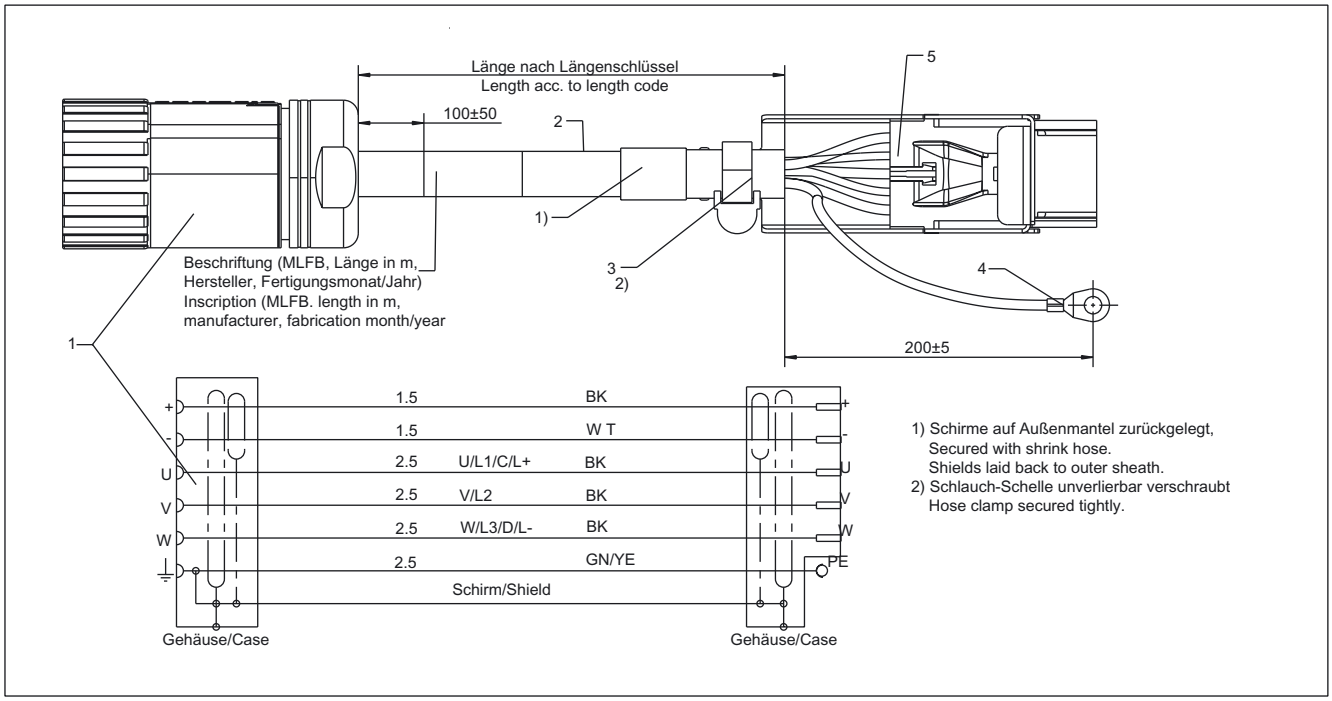


Figure 7-8 Structure of the motor connector

The figure below shows how to remove the motor connector using a pair of engineer's pliers, for example, to pull the cable through narrow cable bushings.

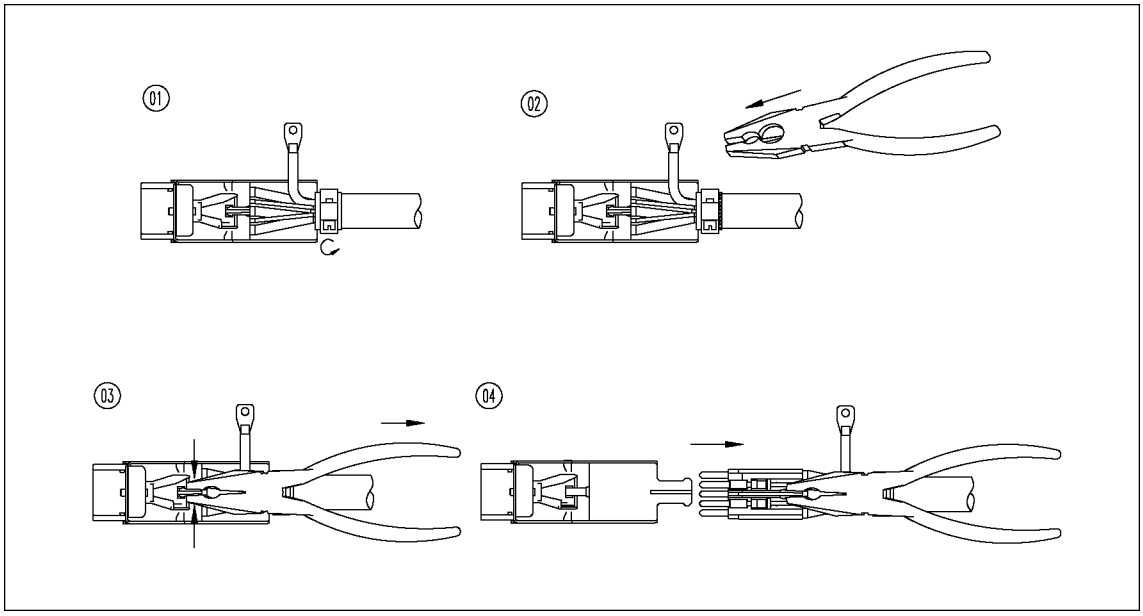


Figure 7-9 Removing the motor connector

Crimping tool for fabricating the motor connector

To crimp the cables, you will need the following crimping tools:

For the PE conductor contact: ring cable lug to DIN 46234

Amphenol manufactures a manual crimping tool for the power cables/brake cables. This comprises two components (crimping tool and contact holder) and a 4–item test probe set, which allows you to set the different cross-sections on the crimping tool:

- Crimping tool TB0200146
- Contact holder TB00001460007
- Test probe set TP00001461200

The following figure shows how the motor connector is coded to prevent incorrect connection (especially relevant for Double Motor Modules).

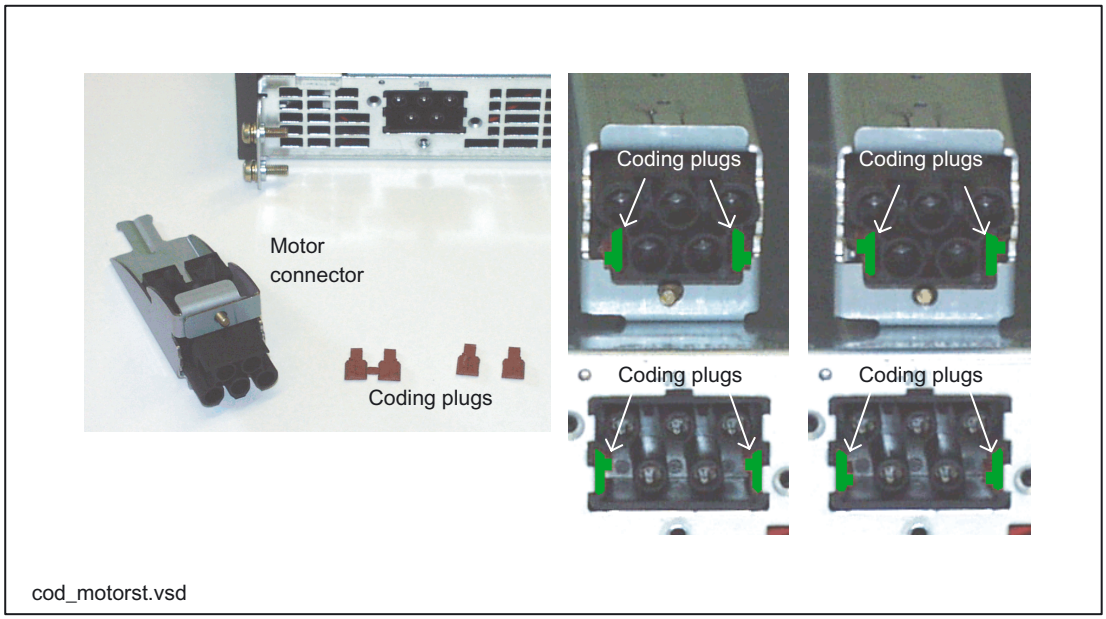


Figure 7-10 Coding the motor connector

The coding plugs are supplied with the motor cables.

7.6.3 24-V terminal adapter

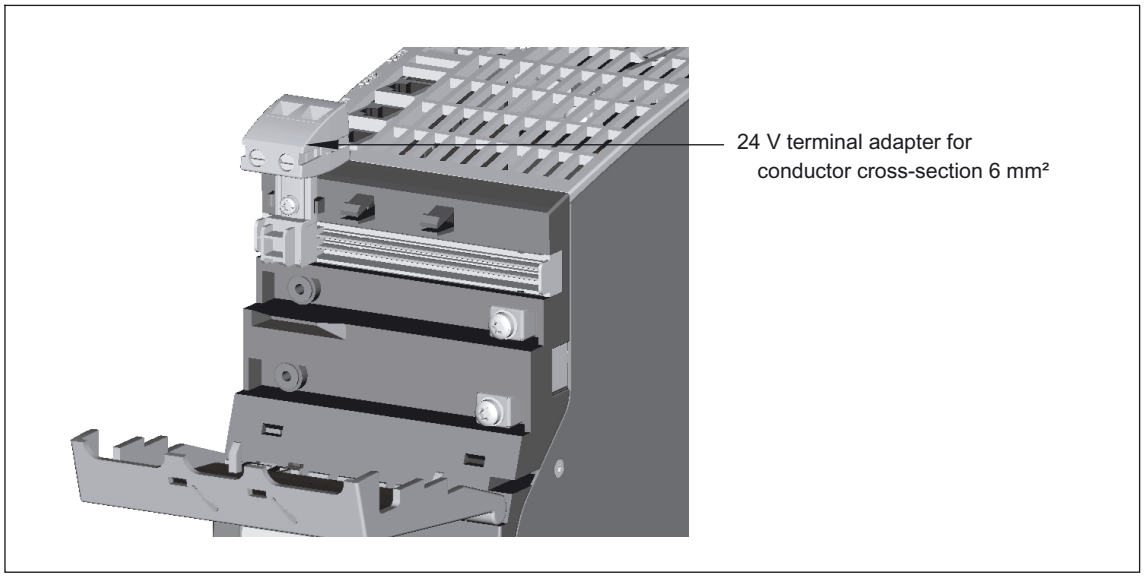


Figure 7-11 24 V terminal adapter

The terminal adapter can be fitted to any power module. To do so, a recess must be provided on the protective cover of the DC link using suitable pliers.

24 V terminal adapter for a conductor cross-section of 6 mm^2
Supplied with the Line Modules and Control Supply Modules..

7.7 Cooling

7.7.1 General

The following devices are available as cooling equipment:

- filtered fans
- heat exchangers or
- cooling units.

The decision in favor of one of these methods will depend on the prevailing ambient conditions and the cooling power required.

The ventilation clearances stated here must be observed. No other components or cables must be located in these areas.

Caution

If you do not observe the guidelines for installing SINAMICS equipment in the cabinet, this can reduce the service life of the equipment and result in premature component failure.

You must take into account the following specifications when installing a SINAMICS drive line-up:

- Ventilation clearance
- Cable routing
- Air guidance, air-conditioner

Table 7-14 Ventilation clearances above and below the components

Component	Order number	Clearance [mm]
CU320	6SL3040-0MA00-0AAx	80
SMCxx	6SL3055-0AA00-5xAx	50
TM31	6SL3055-0AA00-3AAx	50
Line filter for Line Module 5 kW - 120 kW	6SL3000-0BExx-xAAx	100
Line reactor for Active Line Module 16 kW – 120 kW	6SN1111-0AA00-xxAx	100
Line reactor for Smart Line Module 5 kW – 10 kW	6SL3000-0CExx-0AAx	100
Active Line Module 16 kW – 55 kW 80 kW – 120 kW	6SL3130-7TExx-xAAx 6SL3130-7TExx-xAAx	80 80 (additional 50 in front of fan)
Smart Line Module 5 kW – 10 kW	6SL3130-6AExx-0AAx	80
Motor Module < 132 A	6SL312x-1TExx-xAAx	80
Motor Module 132 A and 200 A	6SL312x-1TE3x-xAAx	80 (additional 50 in front of fan)
Braking Module	6SL3100-1AE31-0AAx	80
Control Supply Module	6SL3100-1DE22-0AAx	80
Capacitor Module	6SL3100-1CE14-0AAx	80

The specifications regarding ventilation clearances for two-tier configurations are provided in Drive Line-Up.

Note

The distance between the blow-out aperture of the air conditioner and the electronic equipment must be at least 200 mm.

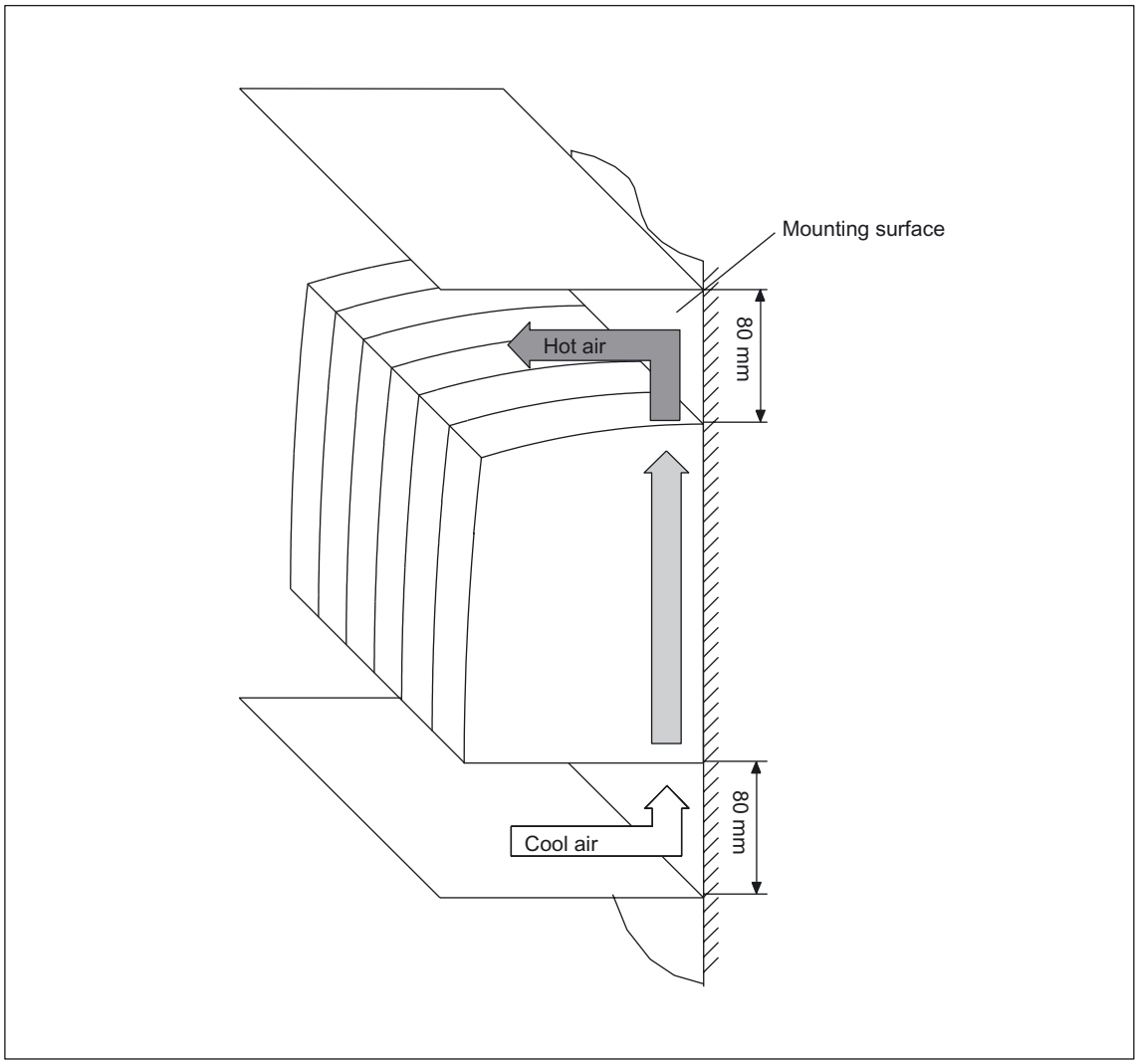


Figure 7-12 Clearances for booksize drive line-up with internal air cooling

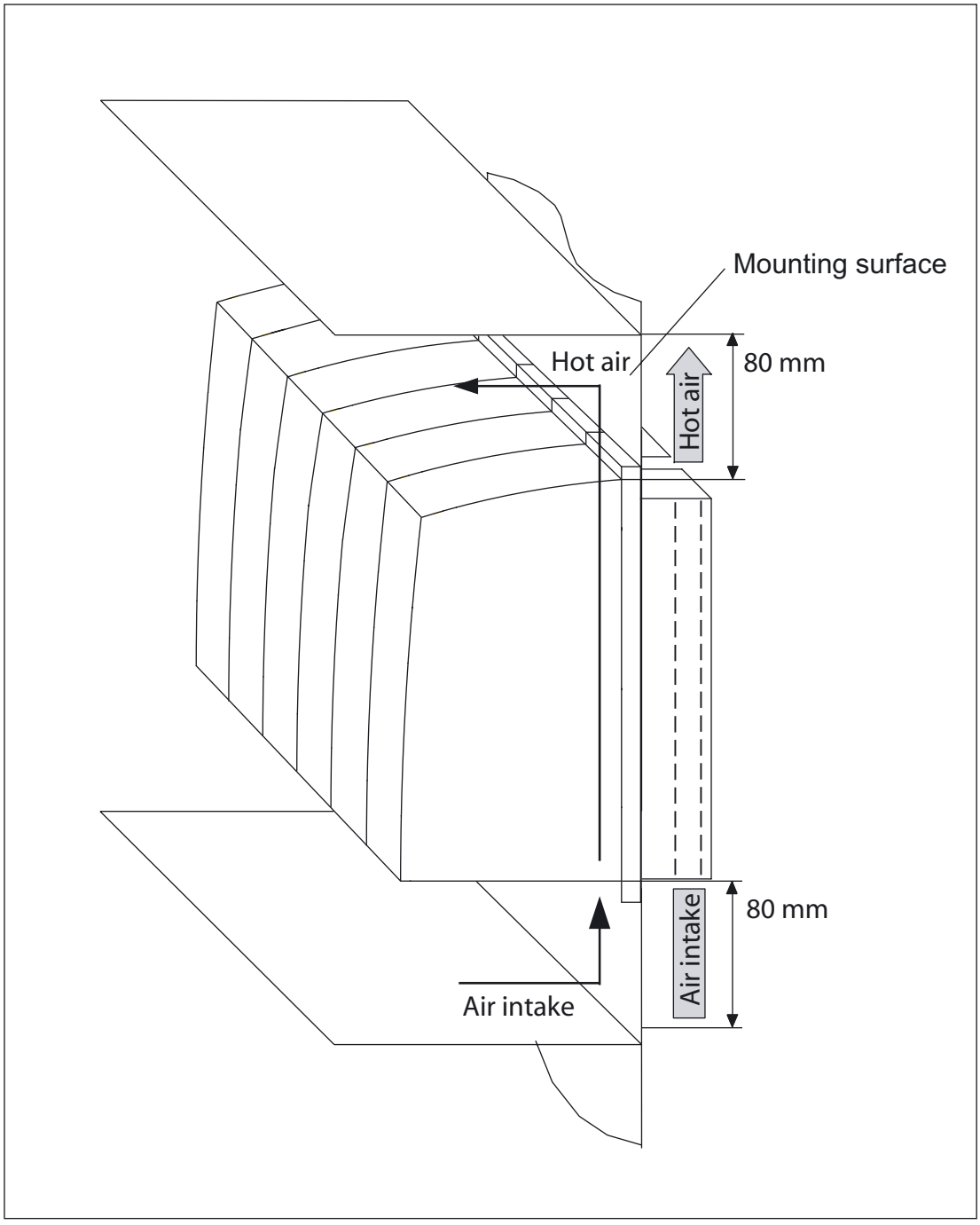


Figure 7-13 Clearances for booksize drive line-up with external air cooling

Note

If the components are installed in a sealed cabinet, an internal fan must be installed to prevent hot spots. It is best to install the fan above the modules to optimize the air flow (suction).

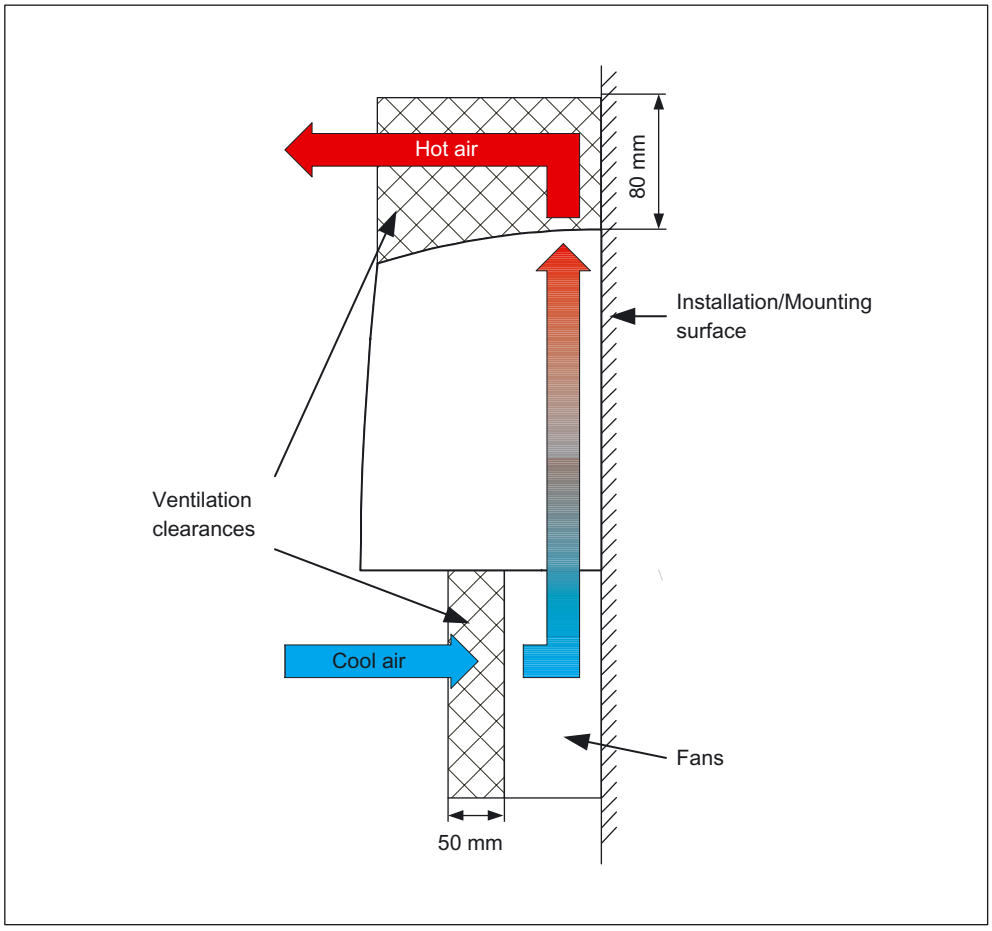


Figure 7-14 Ventilation clearances for 300 mm modules

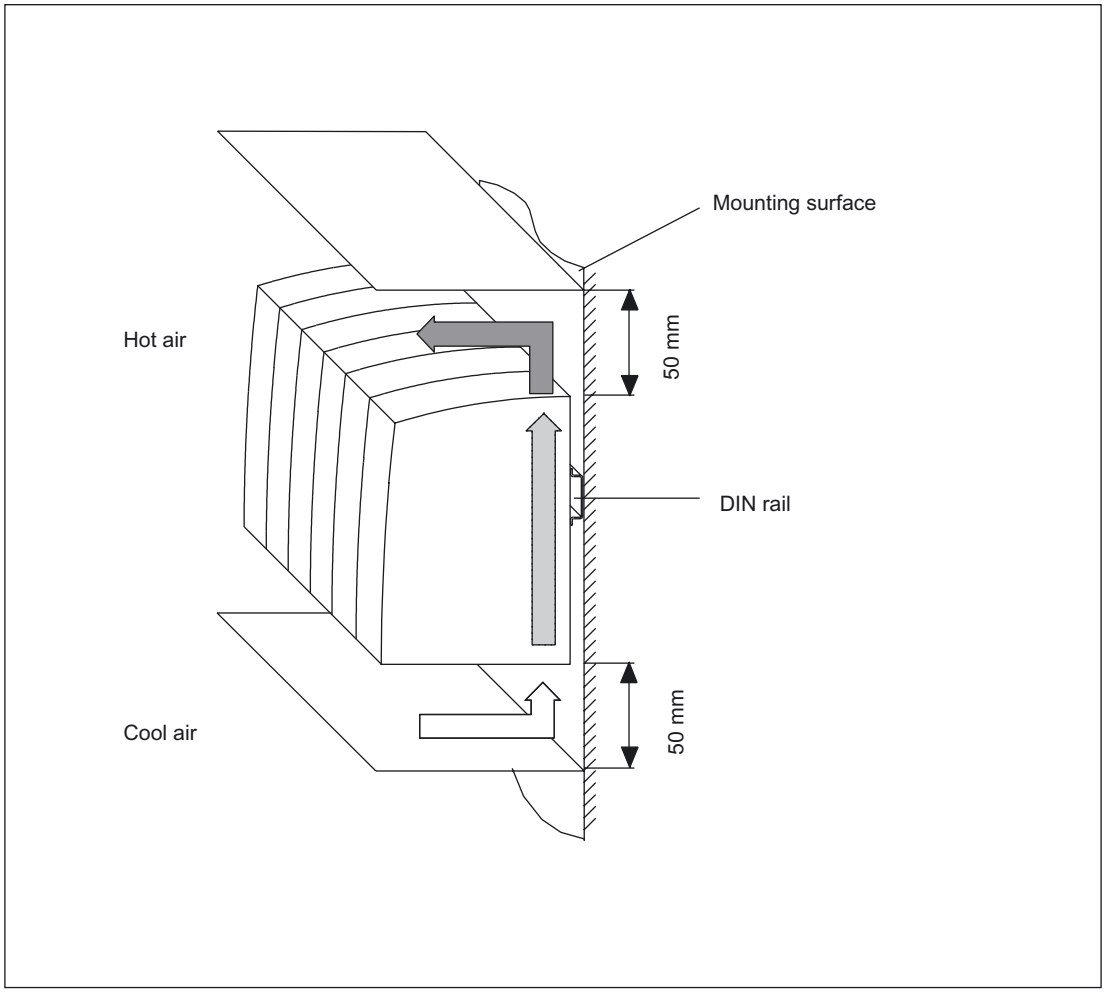


Figure 7-15 Ventilation clearances for DIN rail modules

7.7.2 Information about ventilation

The SINAMICS equipment is ventilated separately by means of integrated fans and is in some cases cooled by means of natural convection.

The cooling air must flow through the components vertically from bottom (cooler region) to top (region heated by operation).

If filtered fans, heat exchangers, or air conditioners are used, 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. A ventilation clearance of at least 80 mm above and below must be observed.

Note

Cables must not be routed on the modules; the ventilation grilles must not be covered.

Cold air must not be allowed to blow directly onto electronic equipment.

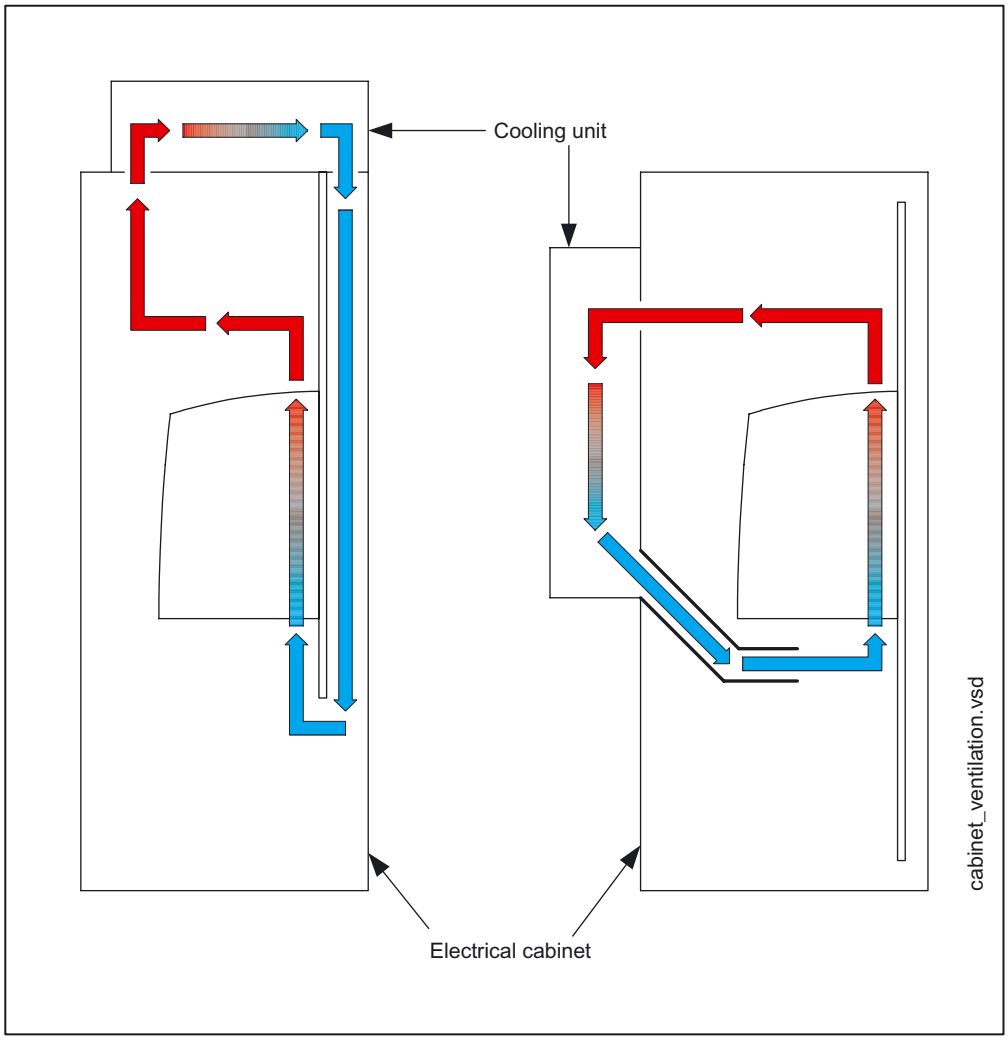


Figure 7-16 Examples of cabinet ventilation

Caution

The air guidance and arrangement of the cooling equipment must be chosen in such a way as to prevent condensation from forming.

If necessary, cabinet enclosure heating may have to be installed.

If air conditioners are used, the relative air humidity of the expelled air increases as the air in the air conditioner cools and may exceed the dew point. If the relative humidity of the air entering the SINAMICS equipment is over 80% for an extended period of time, the insulation in the equipment may fail to function properly due to electrochemical reactions (see System Overview). Using air baffle plates, for example, you must ensure that the cold air expelled from the air conditioner mixes with warm air in the cabinet before it enters the equipment. This reduces the relative air humidity to uncritical values.

7.7.3 Power loss of components in rated operation

The following table shows the power loss for components with internal cooling. The characteristic values apply for the following conditions:

- Line voltage for Line Modules 400 V
- Pulse frequency of the Motor Modules 4 kHz
- Rated pulse frequency of the Active Line Modules 8 kHz
- Operation of components with rated power

Table 7-15 Overview of power losses

	Unit	Power loss
Control units and option boards		
CU320	W	20
TB30	W	<3
CBC10	W	<3
Line filters for Active Line Modules		
16 kW	W	70
36 kW	W	90
55 kW	W	110
80 kW	W	150
120 kW	W	200
Line filters for Smart Line Modules		
5 kW	W	5
10 kW	W	9
Line reactors for Active Line Modules		
16 kW	W	170
36 kW	W	250
55 kW	W	350
80 kW	W	450
120 kW	W	590
Line reactors for Smart Line Modules		
5 kW	W	62
10 kW	W	116
Sensor Modules		
SMC20	W	<10
Additional system components		
TM31	W	<10
DC link components		
Braking Module	W	20
Capacitor Module	W	25
Control Supply Module	W	60

Overview: power loss with internal cooling

Table 7-16 Overview: power loss with internal cooling

	Unit	Power loss
Active Line Modules		
16 kW	W	260
36 kW	W	630
55 kW	W	900
80 kW	W	1350
120 kW	W	2200
Smart Line Modules		
5 kW	W	89
10 kW	W	170
Single Motor Modules		
3 A	W	30
5 A	W	55
9 A	W	80
18 A	W	165
30 A	W	290
45 A	W	430
60 A	W	590
85 A	W	750
132 A	W	1250
200 A	W	2050
Double Motor Modules		
2x3 A	W	70
2x5 A	W	105
2x9 A	W	160
2x18 A	W	320

Overview: power loss with external cooling

Table 7-17 Overview of power loss with external cooling -> data to be added!

	Unit	Internal power loss	External power loss	Total power loss
Active Line Modules				
16 kW	W	60	200	260
36 kW	W	135	495	630
55 kW	W	200	700	900
80 kW	W	305	1045	1350
120 kW	W	490	1710	2200
Smart Line Modules				
5 kW	W	39	50	89
10 kW	W	65	105	170
Single Motor Modules				
3A	W	15	15	30
5 A	W	23	30	53
9 A	W	35	45	80
18 A	W	75	90	165
30 A	W	80	210	290
45 A	W	110	320	430
60 A	W	135	455	590
85 A	W	160	590	750
132 A	W	250	1000	1250
200 A	W	435	1615	2050
Double Motor Modules				
2x3 A	W	25	35	60
2x5 A	W	45	60	105
2x9 A	W	65	95	160
2x18 A	W	80	240	320

7.7.4 Dimensioning Climate Control Equipment

Cabinet manufacturers provide calculation programs for selecting climate control equipment. It is always necessary to know the power loss of the components and equipment installed in the cabinet.

The physical relationship is shown in the following example.

$$q = \frac{Q}{\Delta T} - k * A$$

Figure 7-17 Example of dimensioning climate control equipment

q = thermal power that has to be dissipated through a cooling unit [W / K]

Q = power loss [W]

ΔT = temperature difference between the room and cabinet interior [K]

k = thermal resistance value, e.g. sheet-steel, painted 5.5 [W / (m^2 * K)]

A = free-standing cabinet surface area [m^2]

Table 7-18 Example of a power loss calculation

Component	Number	Power loss [W]	Total power loss [W]
CU320	1	20	20
Line Filters	1	250	250
Line reactor	1	250	250
Active Line Module 36 kW	1	580	580
Motor Module 18 A	2	165	330
Motor Module 30 A	3	290	870
Encoders	5	10	50
SITOP 20	1	53	53
Line Contactor	1	12	12
Total:			2415

Assumption:

Free-standing cabinet surface area A = 5 m^2

Temperature difference between the room and cabinet interior ΔT = 10 K

q = (2415 [W] / 10 [K]) - 5.5 [W / (m^2 * K)] * 5 [m^2] = 214 [W/K]

Service and Support Booksize

8

8.1 Technical Support

Technical Support

If you have any further questions, please call our hotline:

A&D Technical Support
Tel.: +49 (0) 180 5050 – 222
Fax: +49 (0) 180 5050 – 223
email: adsupport@siemens.com

Please send any questions about the documentation (suggestions for improvement, corrections, and so on) to the following fax number or e-mail address:

Fax: +49 (0) 9131 98 – 2176
email: motioncontrol.docu@erlf.siemens.de

Internet Address

Up-to-date information about our products can be found on the Internet at the following address:

http://www.siemens.com/motioncontrol

8.2 Replacing Fans

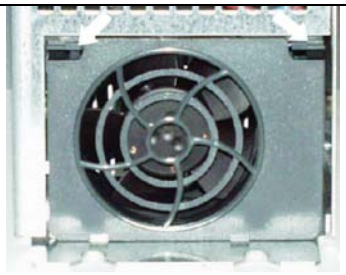
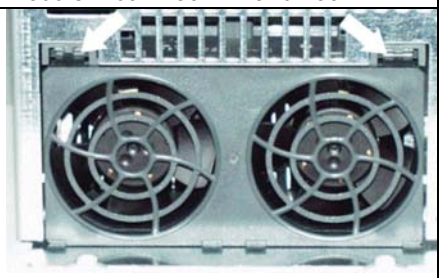
Notice

When replacing the fan, you must observe the ESD regulations.

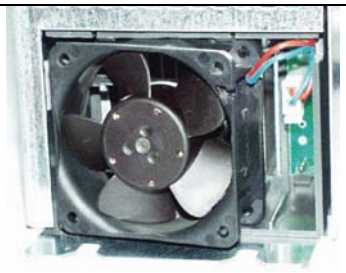
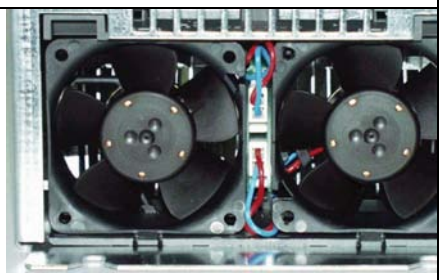
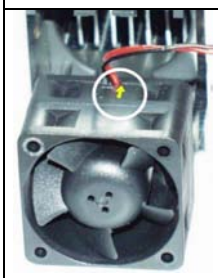
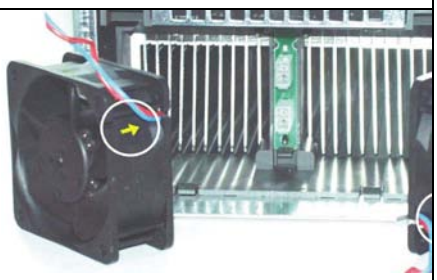
Parts must only be replaced by trained personnel (danger of damage to sensitive components due to static electricity)!

Removing the fan:

1. Disconnect the power supply (24 V DC and 400 V AC)
   Wait 5 minutes while the DC link energy discharges!
2. Remove the component from the drive line-up.
3. Open the fan cover.

Module width: 50 mm	Module width: 100 mm	Module width: 150 mm and 200 mm
		

1. Remove the fan.
2. Remove the connector.

Replacing a fan in a module with a width of 300 mm: See: Motor Modules with Internal Air Cooling – Installation

Installing the fan:

1. Before installing the fan, check the through-flow direction (the arrow on the fan must point towards the fins).
2. Insert the connector fully.
3. Insert the fan fully.
   Do not squash the connection cables!
4. Close the fan cover.

8.3 Spare parts

Table 8-1 List of spare parts for SINAMICS S120 (as at: October 08, 2003)

Order number	
Control Unit 320	**6SL3040-0MA00-0AA1**
24 V DC 4-pin tee unit (X124)	6SL3065-2AA00-0AA0
CU320 terminals (X122 or X132)	6SL3064-2AB00-0AA0
Protective cover for CU320	6SL3064-3AB00-0AA0
Cover (CU board)	6SL3064-3BB00-0AA0
Option slot protective cover for CU320	6SL3064-3CB00-0AA0
TB30	**6SL3055-0AA00-2TA0**
24 V DC 4-pin tee unit (X424)	6SL3065-2AA00-0AA0
TB30 terminal block (X481, X482, and X424)	6SL3065-2BA00-0AA0
TM31	**6SL3055-0AA00-3AA0**
24 V DC 4-pin tee unit (X524)	6SL3065-2AA00-0AA0
TM31 terminal block (X520, X521, X522, X530, X540, X541, X542, and X524)	6SL3065-2MB00-0AA0
SMC10	**6SL3055-0AA00-5AA0**
24 V DC 4-pin tee unit (X524)	6SL3065-2AA00-0AA0
SMC20	**6SL3055-0AA00-5BA1**
24 V DC 4-pin tee unit (X524)	6SL3065-2AA00-0AA0
SMC30	**6SL3055-0AA00-5CA0**
24 V DC 4-pin tee unit (X524)	6SL3065-2AA00-0AA0
SMC30 terminal block (X521, X531, and X524)	6SL3065-2CB00-0AA0

Order number	
Line Modules	
5kW Smart Line Module (50mm)	6SL3130-6AE15-0AA0
10kW Smart Line Module (50mm)	6SL3130-6AE21-0AA0
Line Module terminal block, 4 pole (X21)	6SL3162-2EA00-0AA0
24 V terminal adapter (X24)	6SL3162-2AA00-0AA0
Plastic inserts (CU<>Line Module)	6SL3064-3DB00-0AA0
Fan for 50mm Line/Motor Module (incl. fan cover)	6SL3162-0AB00-0AA0
DC link cover for 50mm Line/Motor Module	6SL3162-3AB00-0AA0
16kW Smart Line Module (100mm)	6SL3130-6TE21-6AA0
16kW Active Line Module (100mm)	6SL3130-7TE21-6AA1
Line Module terminal block, 4 pole (X21)	6SL3162-2EA00-0AA0
24 V terminal adapter (X24)	6SL3162-2AA00-0AA0
Plastic inserts (CU<>Line Module)	6SL3064-3DB00-0AA0
Fan for 100mm Line/Motor Module (incl. fan cover)	6SL3162-0AD00-0AA0
DC link cover for 100mm Line/Motor Module	6SL3162-3AD00-0AA0
36kW Smart Line Module (150mm)	6SL3130-6TE23-6AA0
36kW Active Line Module (150mm)	6SL3130-7TE23-6AA1
Line Module terminal block, 4 pole (X21)	6SL3162-2EA00-0AA0
24 V terminal adapter (X24)	6SL3162-2AA00-0AA0
Plastic inserts (CU<>Line Module)	6SL3064-3DB00-0AA0
Fan for 150mm Line/Motor Module (incl. fan cover)	6SL3162-0AF00-0AA0
DC link cover for 150mm Line/Motor Module	6SL3162-3AF00-0AA0
Terminal board cover for 150mm Smart/Active Line Module	6SL3163-3CF00-0AA0
55kW Active Line Module (200mm)	6SL3130-7TE25-5AA1
Line Module terminal block, 4 pole (X21)	6SL3162-2EA00-0AA0
24 V terminal adapter (X24)	6SL3162-2AA00-0AA0
Plastic inserts (CU<>Line Module)	6SL3064-3DB00-0AA0
Fan for 200mm Line/Motor Module (incl. fan cover)	6SL3162-0AH00-0AA0
DC link cover for 200mm Line/Motor Module	6SL3162-3AH00-0AA0
Terminal board cover for 200mm/300mm Smart/Active Line Module	6SL3163-3CM00-0AA0
80kW Active Line Module (300mm)	6SL3130-7TE28-0AA0
120kW Active Line Module (300mm)	6SL3130-7TE31-2AA0
Line Module terminal block, 4 pole (X21)	6SL3162-2EA00-0AA0
24 V terminal adapter (X24)	6SL3162-2AA00-0AA0
Plastic inserts (CU<>Line Module)	6SL3064-3DB00-0AA0
Fan for 300mm Line/Motor Module	6SL3162-0AM00-0AA0
DC link cover for 300mm Line/Motor Module	6SL3162-3AM00-0AA0
Terminal board cover for 200mm/300mm Smart/Active Line Module	6SL3163-3CM00-0AA0

Order number	
Motor Modules	
3A Single Motor Module (50mm)	6SL3120-1TE13-0AA0
5A Single Motor Module (50mm)	6SL3120-1TE15-0AA0
9A Single Motor Module (50mm)	6SL3120-1TE21-0AA1
18A Single Motor Module (50mm)	6SL3120-1TE21-8AA1
3A Double Motor Module (50mm)	6SL3120-2TE13-0AA0
5A Double Motor Module (50mm)	6SL3120-2TE15-0AA0
9A Double Motor Module (50mm)	6SL3120-2TE21-0AA0
DRIVE-CLiQ cable, IP20/IP20, without 24 V DC, 110 mm	6SL3060-4AB00-0AA0
Safe standstill/KTY84 terminal block, 4-pin (X21 or X22)	6SL3162-2EA00-0AA0
24 V jumper	6SL3162-2AA01-0AA0
Fan for 50mm Line/Motor Module (incl. fan cover)	6SL3162-0AB00-0AA0
DC link cover for 50mm Line/Motor Module	6SL3162-3AB00-0AA0
30A Single Motor Module (100mm)	6SL3120-1TE23-0AA1
18A Double Motor Module (100mm)	6SL3120-2TE21-8AA0
DRIVE-CLiQ cable, IP20/IP20, without 24 V DC, 160 mm	6SL3060-4AD00-0AA0
Safe standstill/KTY84 terminal block, 4-pin (X21 or X22)	6SL3162-2EA00-0AA0
24 V jumper	6SL3162-2AA01-0AA0
Fan for 100 mm Line/Motor Module (incl. fan cover)	6SL3162-0AD00-0AA0
DC link cover for 100mm Line/Motor Module	6SL3162-3AD00-0AA0
45A Single Motor Module (150mm)	6SL3120-1TE24-5AA1
60A Single Motor Module (150mm)	6SL3120-1TE26-0AA1
DRIVE-CLiQ cable, IP20/IP20, without 24 V DC, 210 mm	6SL3060-4AF00-0AA0
Safe standstill/KTY84 terminal block, 4-pin (X21)	6SL3162-2EA00-0AA0
24 V jumper	6SL3162-2AA01-0AA0
Fan for 150mm Line/Motor Module (incl. fan cover)	6SL3162-0AF00-0AA0
DC link cover for 150mm Line/Motor Module	6SL3162-3AF00-0AA0
Terminal board cover for 150mm Motor Module	6SL3162-3CF00-0AA0
85A Single Motor Module (200mm)	6SL3120-1TE28-5AA1
DRIVE-CLiQ cable, IP20/IP20, without 24 V DC, 260 mm	6SL3060-4AH00-0AA0
Safe standstill/KTY84 terminal block, 4-pin (X21)	6SL3162-2EA00-0AA0
24 V jumper	6SL3162-2AA01-0AA0
Fan for 200mm Line/Motor Module (incl. fan cover)	6SL3162-0AH00-0AA0
DC link cover for 200mm Line/Motor Module	6SL3162-3AH00-0AA0
Terminal board cover for 200mm/300mm Motor Module	6SL3162-3CM00-0AA0
132A Single Motor Module (300mm)	6SL3120-1TE31-3AA0
200A Single Motor Module (300mm)	6SL3120-1TE32-0AA0
DRIVE-CLiQ cable, IP20/IP20, without 24 V DC, 360 mm	6SL3060-4AM00-0AA0

Order number	
Safe standstill/KTY84 terminal block, 4-pin (X21)	6SL3162-2EA00-0AA0
24 V jumper	6SL3162-2AA01-0AA0
Fan for 300mm Line/Motor Module	6SL3162-0AM00-0AA0
DC link cover for 300mm Line/Motor Module	6SL3162-3AM00-0AA0
Terminal board cover for 200mm/300mm Motor Module	6SL3162-3CM00-0AA0
Line filters	
For Active Line Module 16 kW	6SL3000-0BE-21-6AA0
For Active Line Module 36 kW	6SL3000-0BE-23-6AA0
For Active Line Module 55 kW	6SL3000-0BE-25-5AA0
For Active Line Module 80 kW	6SL3000-0BE-28-0AA0
For Active Line Module 120 kW	6SL3000-0BE-31-2AA0
For Smart Line Module 5 kW	6SL3000-0HE-15-0AA0
For Smart Line Module 10 kW	6SL3000-0HE-21-0AA0
Line reactors	
For Active Line Module 16 kW	6SN1111-0AA00-0BA1
For Active Line Module 36 kW	6SN1111-0AA00-0CA1
For Active Line Module 55 kW	6SN1111-0AA00-0DA1
For Active Line Module 80 kW	6SN1111-0AA00-1EA0
For Active Line Module 120 kW	6SN1111-0AA00-1FA0
For Smart Line Module 5 kW	6SL3000-0CE-15-0AA0
For Smart Line Module 10 kW	6SL3000-0CE-21-0AA0
DC link components	
Braking Module (50mm)	
X1	Available on request
X21	Available on request
24 V jumper	6SL3162-2AA01-0AA0
DC link cover for 50mm Line/Motor Module	6SL3162-3AB00-0AA0
Capacitor Module (100mm)	
24 V jumper	6SL3162-2AA01-0AA0
DC link cover for 100mm Line/Motor Module	6SL3162-3AD00-0AA0
Control Supply Module (50mm)	
24 V terminal adapter (X24)	6SL3162-2AA00-0AA0
24 V jumper	6SL3162-2AA01-0AA0
DC link cover for 50mm Line/Motor Module	6SL3162-3AB00-0AA0

List of Abbreviations

A

Table A-1 List of Abbreviations

Abbreviation	English
A	
A...	Alarm
AC	Alternating Current
ADC	Analog Digital Converter
AI	Analog Input
AO	Analog Output
AOP	Advanced Operator Panel
ASCII	American Standard Code for Information Interchange
B	
BERO	Tradename for a type of proximity switch
BI	Binector Input
BIA	Berufsgenossenschaftliches Institut für Arbeitssicherheit (German Institute for Occupational Safety)
BICO	Binector Connector Technology
BLM	Basic Line Module
BOP	Basic Operator Panel
C	
C	Capacitance
CAN	Controller Area Network
CBC	Communication board CAN
CD	Compact Disc
CDS	Command Data Set
CI	Connector Input
CNC	Computer Numerical Control
CO	Connector Output
CO/BO	Connector Output/Binector Output
COB-ID	CAN object identification
COM	Common contact of a changeover relay
CP	Communications Processor
CPU	Central Processing Unit
CRC	Cyclic Redundancy Check
CU	Control Unit

Abbreviation	English
D	
DAC	Digital Analog Converter
DC	Direct Current
DCN	Direct Current Negative
DCP	Direct Current Positive
DDS	Drive Data Set
DI	Digital Input
DI/DO	Bidirectional Digital Input/Output
DMC	DRIVE-CLiQ Module Cabinet (Hub)
DO	Digital Output
DO	Drive Object
DPRAM	Dual-Port Random Access Memory
DRAM	Dynamic Random Access Memory
DRIVE CLiQ	Drive Component Link with IQ
DSC	Dynamic servo control
E	
EDS	Encoder Data Set
EGB	Electrostatic Sensitive Devices
EMC	Electromagnetic Compatibility
EMK	Electromagnetic force
EN	European Standard
EnDat	Encoder-Data-Interface
EP	Enable Pulses
ES	Engineering System
F	
F...	Fault
FAQ	Frequently Asked Questions
FCC	Function Control Chart
FCC	Flux Current Control
FEPROM	Flash-EPROM
FG	Function Generator
FI	Residual-Current Circuit-Breaker (RCCB)
FP	Function diagram
FW	Firmware
G	
GC	Global Control Telegram (broadcast telegram)
GSD	Device master file: describes the features of a PROFIBUS slave

Abbreviation	English
H	
HF	High Frequency
HFD	High frequency reactor
HLG	Ramp-Function Generator
HMI	Human Machine Interface
HTL	High threshold logic
HW	Hardware
I	
IBN	Commissioning
I/O	Input/Output
ID	Identifier
IEC	International Electrotechnical Commission
IGBT	Insulated Gate Bipolar Transistor
In preparation:	In preparation: this feature is currently not available
IT	Insulated three-phase supply network
J	
JOG	Jogging
K	
KDV	Data cross-checking
KIP	Kinetic buffering
Kp	Proportional gain
KTY	Positive temperature coefficient temperature sensor
L	
L	Inductance
LED	Light Emitting Diode
LSB	Least Significant Bit
M	
M	Reference potential, zero potential
MB	Megabyte
MCC	Motion Control Chart
MDS	Motor Data Set
MLFB	Machine-readable product designation
MMC	Man Machine Communication
MSB	Most Significant Bit
MSCY_C1	Master Slave Cycle Class 1
N	
N. C.	Not Connected
N...	No Report
NC	Normally Closed contact
NC	Numerical Control

Abbreviation	English
NEMA	National Electrical Manufacturers Association
NM	Zero mark
NO	Normally Open contact
O	
OEM	Original Equipment Manufacturer
OLP	Optical Link Plug
OMI	Option Module Interface
P	
p...	Adjustable parameter
PcCtrl	Master Control
PDS	Power Module Data Set
PE	Protective Earth
PELV	Protective Extra Low Voltage
PG	Programming terminal
PI	Proportional Integral
PID	Proportional Integral Differential
PLC	Programmable Logic Controller
PLL	Phase Locked Loop
PNO	PROFIBUS user organisation
PRBS	Pseudo Random Binary Signal
PROFIBUS	Process Field Bus
PS	Power Supply
PTC	Positive Temperature Coefficient
PTP	Point To Point
PWM	Pulse Width Modulation
PZD	PROFIBUS process data
Q	
R	
r …	Display parameter (read only)
RAM	Random Access Memory
RCCB	Residual-Current Circuit-Breaker
RCD	Residual Current Device
RJ45	Standard Describes an 8-pole plug connector with twisted pair Ethernet.
RO	Read Only
RPDO	Receive Process Data Object
RS232	Serial interface
RS485	Standard Describes the physical characteristics of a digital serial interface.

Abbreviation	English
S	
S1	Continuous duty
S3	Periodic duty
SBC	Safe Brake Control
SGE	Safe input signal
SH	Safe standstill
SI	Safety Integrated
SIL	Safety Integrity Level
SLM	Smart Line Module
SLVC	Sensorless Vector Control
SM	Sensor Modules
SMC	Sensor Module Cabinet
SPC	Setpoint Channel
SPS	Programmable Logic Controller (PLC)
STW	PROFIBUS Control Word
T	
TB	Terminal board
TIA	Totally Integrated Automation
TM	Terminal Module
TN	Grounded three-phase supply network
Tn	Integral time
TPDO	Transmit Process Data Object
TT	Grounded three-phase supply network
TTL	Transistor Transistor Logic
U	
UL	Underwriters Laboratories Inc.
V	
VC	Vector control
Vdc	DC link voltage
VDE	Association of German Electrical Engineers
VDI	Association of German Engineers
Vpp	Volt peak to peak
VSM	Voltage Sensing Module
W	
WZM	Machine tool
X	
XML	Extensible Markup Language
Y	
Z	
ZK	DC Link
ZSW	PROFIBUS status word

References

B

SINAMICS Documentation

Catalogs

/D11.1/ SINAMICS G110 Inverter Chassis Units 0.12 kW to 3 kW
Order no.: E86060-K5511-A111-A1-7600, 12.2003 Edition

/D11/ SINAMICS G130 Drive Converter Chassis Units, SINAMICS G150 Drive Converter Cabinet Units
Order no.: E86060-K5511-A101-A2-7600, 07.2004 Edition

/D21.1/ SINAMICS S120 Vector Control Drive System
Order no.: E86060-K5521-A111-A1-7600, 01.2005 Edition

/D21.2/ SINAMICS S120 Servo Control Drive System
Order no.: E86060-K5521-A121-A1-7600, 04.2004 Edition

/D21.3/ SINAMICS S150 Drive Converter Cabinet Units
75 kW to 1200 kW
Order no.: E86060-K5521-A131-A1-7600, 05.2004 Edition

Related catalogs

/ST70/ SIMATIC Components for Totally Integrated Automation, catalog ST70
Ordering information
Order no.: E86060-K4670-A111-A9-7600, 10.2004 Edition

/PM10/ Motion Control System SIMOTION, catalog PM10
Ordering information
Order no.: E86060-K4910-A101-A4-7600, 04.2003 Edition

Interactive catalogs

/CA01/ The Offline Mall of Automation and Drives
CD-ROM
Order no.: E86060-D4001-A100-C3-7600, 10.2004 Edition

/Mall/ A&D Mall, Catalog and Online Ordering System
http://www.siemens.com/automation/mall

Electronic documentation

/CD2/ SINAMICS
The SINAMICS System
Order no.: 6SL3097-2CA00-0YG1, 12.2004 Edition

User Documentation

/BA1/ SINAMICS G150
Operating Manual
Order no.: On request, 12.2004 Edition

/BA2/ SINAMICS G130
Operating Manual
Order no.: On request, 12.2004 Edition

/BA3/ SINAMICS S150
Operating Manual
Order no.: On request, 12.2004 Edition

/GH1/ SINAMICS S120
Equipment Manual for Control Units and Additional System Components
Order no.: 6SL3097-2AH00-0BP1, 12.2004 Edition

/GH2/ SINAMICS S120
Equipment Manual for Booksize Power Sections
Order no: 6SL3097-2AC00-0BP1, 12.2004 Edition

/GH3/ SINAMICS S120
Equipment Manual for Chassis Power Sections
Order no.: 6SL3097-2AE00-0BP0, 12.2004 Edition

/GH4/ SINAMICS S120
Equipment Manual for Booksize Cold-Plate Power Sections
Order no.: 6SL3097-2AJ00-0BP1, 12.2004 Edition

/GS1/ SINAMICS S120
Getting Started
Order no.: 6SL3097-2AG00-0BP1, 12.2004 Edition

/IH1/ SINAMICS S120
Commissioning Manual
Order no.: 6SL3097-2AF00-0BP2, 12.2004 Edition

/FH1/ SINAMICS S120
Functional Manual
Order no.: 6SL3097-2AB00-0BP0, 12.2004 Edition

/IH2/ SINAMICS S120
CANopen Commissioning Manual
Order no.: 6SL3097-2AA00-0BP1, 12.2004 Edition

/LH1/ SINAMICS S
List Manual
Order no.: 6SL3097-2AP00-0BP2, 12.2004 Edition

Further Supplementary Documentation

1 Drive ES Basic V5.1
Function Description
Engineering System for Drives from the SIEMENS A&D Product Range
Order no.: 6SW1700-0JA00-0BA0, 08.2001 Edition

2 SIMOTION Engineering System
Handhabung
Order no.: 6AU1900-1AB31-0BA0, 01.2004 Edition

/PJAL/ SIMODRIVE, SIMOVERT MASTERDRIVES, SINAMICS
General Part for Synchronous Motors
Planning Guide
Order no.: 6SN1197-0AD04-0BP2, 11.2004 Edition

/PFK7S/ SINAMICS Synchronous Motors 1FK7
Planning Guide
Order no.: 6SN1197-0AD16-0BP0, 10.2004 Edition

/PFT6S/ SINAMICS Synchronous Motors 1 FT6
Planning Guide
Order no.: 6SN-1197-0AD12-0BP0, 09.2004 Edition

/PFK7/ SIMODRIVE and SIMOVERT MASTERDRIVES Synchronous Motors 1FK7
Planning Guide
Order no.: 6SN1197-0AD06-0BP0, 01.2003 Edition

/PFT6/ SIMODRIVE and SIMOVERT MASTERDRIVES Synchronous Motors 1FT6
Planning Guide
Order no.: 6SN1197-0AD02-0BP0, 02.2004 Edition

PROFIBUS Documentation

/P1/ PROFIBUS-DP/DPV1 IEC 61158
Basic Information, Tips and Tricks for Users
Hüthig; Manfred Popp; 2nd edition
ISBN 3-7785-2781-9

/P2/ PROFIBUS-DP, Getting Started
PROFIBUS User Organization; Manfred Popp
Order no.: 4.071

/P3/ Decentralization with PROFIBUS-DP
Architecture and Fundamentals, Configuration and Use of PROFIBUS-DP with SIMATIC S7
SIEMENS; Publicis MCD Verlag; Josef Weigmann, Gerhard Kilian
Order no.: A19100-L531-B714
ISBN 3-89578-074-X

/P4/ Manual for PROFIBUS Networks, SIEMENS
Order no.: 6GK1970-5CA20-0BA0

/P5/ PROFIBUS Profile PROFIdrive Profile Drive Technology
PROFIBUS User Organization
Haid- und Neu-Straße 7, D-76131 Karlsruhe
Order no.: 3.172 Version 3.1 November 2002

/IKPI/ SIMATIC NET, Industrial Communication and Field Devices
Catalog
Order no.: E86060-K6710-A101-B4, 2005 Edition

/PDP/ PROFIBUS Installation Guidelines
Installation Guideline for PROFIBUS-FMS/DP
Installation and Wiring Recommendation for RS 485 Transmission
Order no. 2.112 Version 1.0

Documentation for Safety Equipment

Note

For more information about technical documentation for Safety Integrated, visit the following address:

http://www.siemens.com/safety

The following list contains some of the safety-related documentation available.

/LVP/ Low-Voltage Switchgear
Catalog
Order no.: E8606-K1002-P101-A5, 2005 Edition

/LV10/ Controlgear for Industry
Catalog
Order no.: E86060-K1002-A101-A4, 2004 Edition

/LV20/ BERO - Sensors for Automation
Catalog:
Order no.: E86060-K1803-A101-A3, 2004 Edition

/LV30/ Products and Systems for Low-Voltage Power Distribution
Catalog
Order no.: E86060-K1801-A101-A4, 2004 Edition

/MRL/ Directive 98/37/EG of the European Parliament and Council
Machinery Directive
Bundesanzeiger-Verlags GmbH, 22.06.1998 Edition

/SIAH/ Safety Integrated
Application Manual
Order no.: 6ZB5000-0AA01-0BA0, 4th edition

/SICD/ Safety Integrated
CD-ROM
Order no.: E20001-D10-M103-X-7400, 09.2004 Edition

Index

L

M

O

P

R

S

T

V

To

SIEMENS AG

A&D MC BMS

Postfach 3180

91050 ERLANGEN, GERMANY

Phone : +49 (0) 180 / 5050-222 (Hotline)

Fax.: +49 (0) 9131 / 98-2176 (Documentation)

E-mail: motioncontrol.docu@erlf.siemens.de

Suggestions

Corrections

For Publication/Manual:

SINAMICS S120

Booksize Power Section (GH2)

Manufacturer/Service Documentation

From

Name

Company/Dept.

Address

Phone: /

Fax: /

Equipment Manual

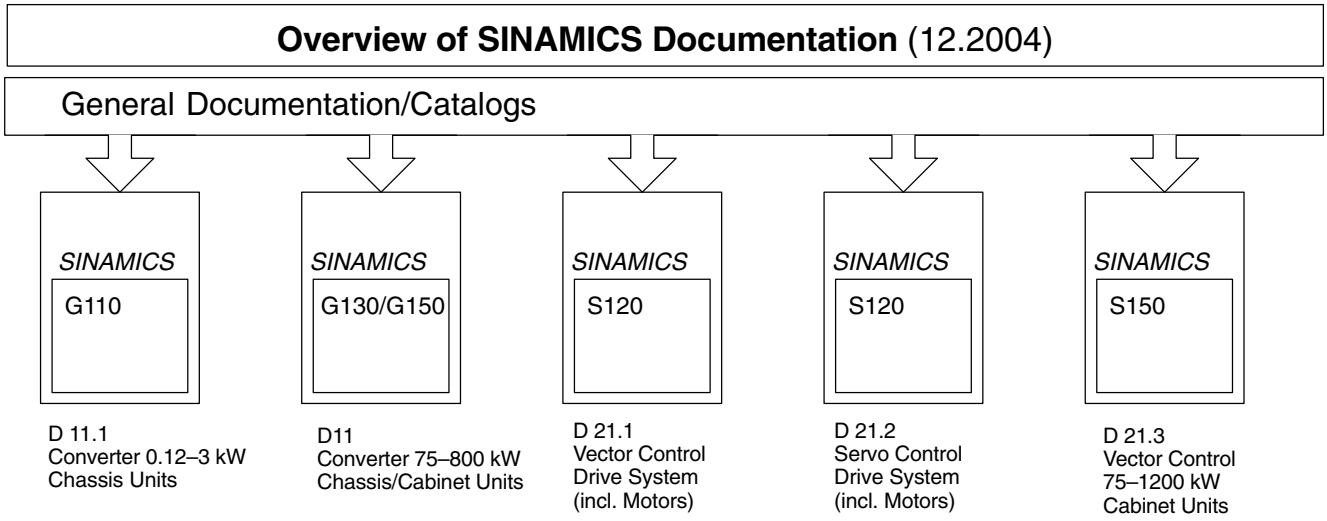
Order no.: 6SL3097-2AC00-0BP1

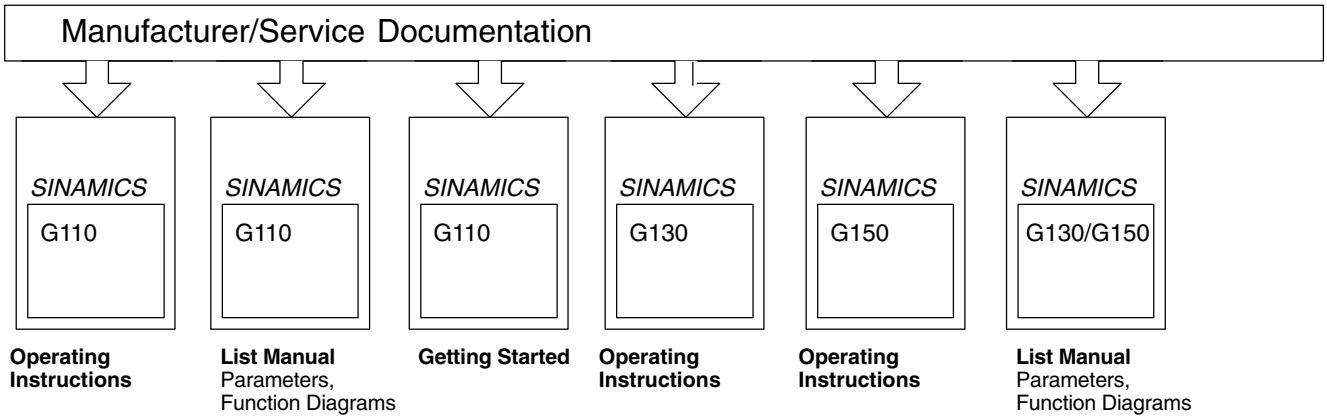
Edition: 12.04

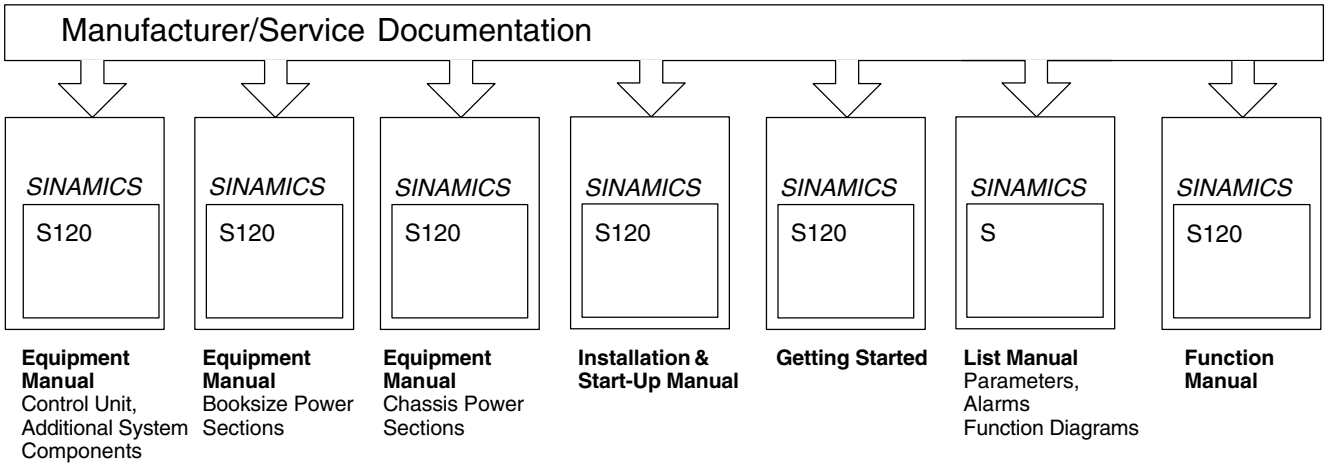
Should you notice any printing errors when reading this publication, please notify us on this sheet. Suggestions for improvement are also welcome.

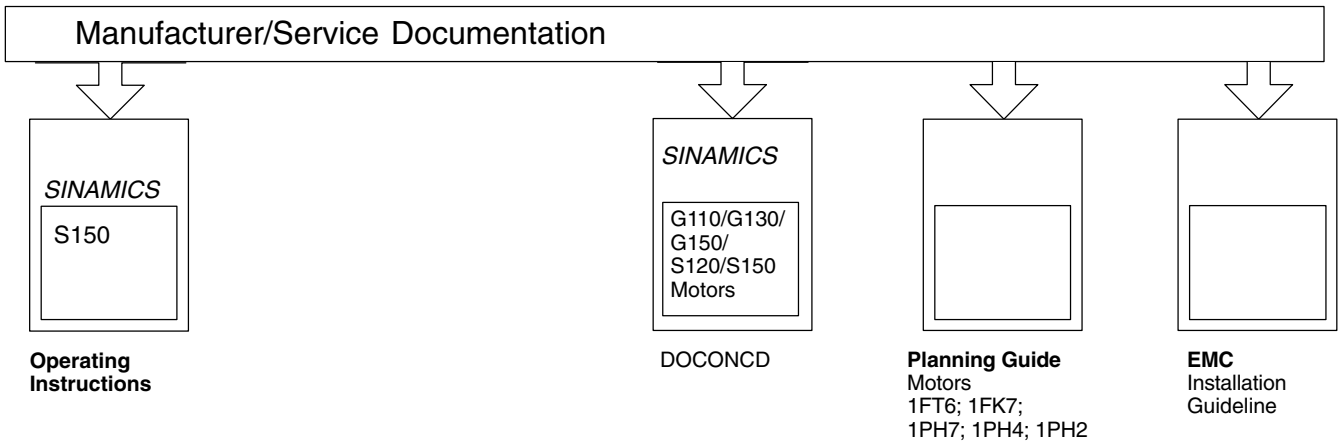
Suggestions and/or corrections

Overview of SINAMICS Documentation (12.2004)









Siemens AG
Automation & Drives
Motion Control Systems
Postfach 3180
91050 ERLANGEN
GERMANY

www.siemens.com/motioncontrol

Order no.: 6SL3097-2AC00-0BP1

Printed in Germany