SIEMENS

SIMOTION

Additional SINAMICS System Components for SIMOTION

Manual

03/2007

Safety Guidelines

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

Danger

indicates that death or severe personal injury **will** result if proper precautions are not taken.

Warning

indicates that death or severe personal injury **may** result if proper precautions are not taken.

Caution

with a safety alert symbol, indicates that minor personal injury can result if proper precautions are not taken.

Caution

without a safety alert symbol, indicates that property damage can result if proper precautions are not taken.

Notice

indicates that an unintended result or situation can occur if the corresponding information is not taken into account.

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

Qualified Personnel

The device/system may only be set up and used in conjunction with this documentation. Commissioning and operation of a device/system may only be performed by **qualified personnel**. Within the context of the safety notes in this documentation qualified persons are defined as persons who are authorized to commission, ground and label devices, systems and circuits in accordance with established safety practices and standards.

Prescribed Usage

Note the following:

Warning

This device may only be used for the applications described in the catalog or the technical description and only in connection with devices or components from other manufacturers which have been approved or recommended by Siemens. Correct, reliable operation of the product requires proper transport, storage, positioning and assembly as well as careful operation and maintenance.

Trademarks

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

Disclaimer of Liability

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

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℗ 03/2007

Preface

Scope

This manual describes the supplementary SINAMINCS system components in use under SIMOTION D or under SINAMICS S120 in connection with SIMOTION C, P, or D.

This manual is aimed at machine manufacturers, plant engineers, commissioning personnel, and service personnel who use SINAMICS or who use SIMOTION in connection with SINAMICS.

Sections in this manual

The following is a list of chapters included in this manual along with a description of the information presented in each chapter.

- System overview

  Provides information about the applications, versions, and integration of the hardware components of the SINAMICS S system in connection with operation under SIMOTION.

- Components
  - Description

    Provides a brief description of each system component and its interfaces.
  - Interfaces

    Provides information about the different interfaces of the devices, their pin assignment, and possible applications.
  - Installation/Mounting

    Provides information about installation and uninstallation of the devices.
  - Electrical connection

    Provides information about the electrical connection of system components.
  - Technical data

    Provides information about the relevant technical data for the device.
- Appendix

  Provides information about spring-loaded terminals/screw-type terminals, the EC Declaration of Conformity, and the ESD Guidelines.

SIMOTION documentation

An overview of the SIMOTION documentation can be found in a separate list of references.

The list of references is supplied on the "SIMOTION SCOUT" CD.

The SIMOTION documentation consists of 9 documentation packages containing approximately 60 SIMOTION documents and documents on other products (e.g. SINAMICS).

The following documentation packages are available for SIMOTION V4.1:

- SIMOTION Engineering System
- SIMOTION System and Function Descriptions
- SIMOTION Diagnostics
- SIMOTION Programming
- SIMOTION Programming - References
- SIMOTION C2xx
- SIMOTION P350
- SIMOTION D4xx
- SIMOTION Supplementary Documentation

This manual is part of the SIMOTION supplementary documentation package.

If you have any technical questions, please contact our hotline (worldwide):

A&D Technical Support:

- Phone: +49 (180) 50 50 222
- Fax: +49 (180) 50 50 223
- E–mail: adsupport@siemens.com
- Internet: http://www.siemens.de/automation/support-request

If you have any questions, suggestions, or corrections regarding the documentation, please fax or e-mail them to:

- Fax: +49 (9131) 98 63315
- E–mail: docu.motioncontrol@siemens.com

Siemens Internet address

The latest information about SIMOTION products, product support, and FAQs can be found on the Internet at:

- General information:
  - **http://www.siemens.de/simotion** (German)
  - **http://www.siemens.com/simotion** (international)
- Product support:
  - **http://support.automation.siemens.com/WW/view/en/10805436**

Additional support

We also offer introductory courses to help you familiarize yourself with SIMOTION.

Please contact your regional training center or our main training center at D-90027 Nuremberg, phone +49 (911) 895 3202.

Safety Instructions

Danger

Commissioning shall not start until it has been absolutely 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.

Operation of electrical equipment and motors inevitably involves electrical circuits with dangerous voltages.

Dangerous mechanical movements may occur in the system during operation.

All work on the electrical system may only be carried-out when the system has been disconnected from the power supply and locked-out so that it cannot be accidently restarted.

Warning

Safe, problem-free operation of SINAMICS S equipment assumes proper transportation, storage, setup, and installation, as well as careful operation and maintenance.

Information contained in catalogs and quotations also apply to the special equipment version designs.

In addition to the danger and warning information provided in the technical customer documentation, the applicable national, local, and plant-specific regulations and requirements must be taken into account.

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

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.

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Introduction

1

1.1 Application

SINAMICS is the new line of drives from Siemens designed for the mechanical equipment manufacturing and

plant construction industries. SINAMICS offers solutions for all drive tasks:

- 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.

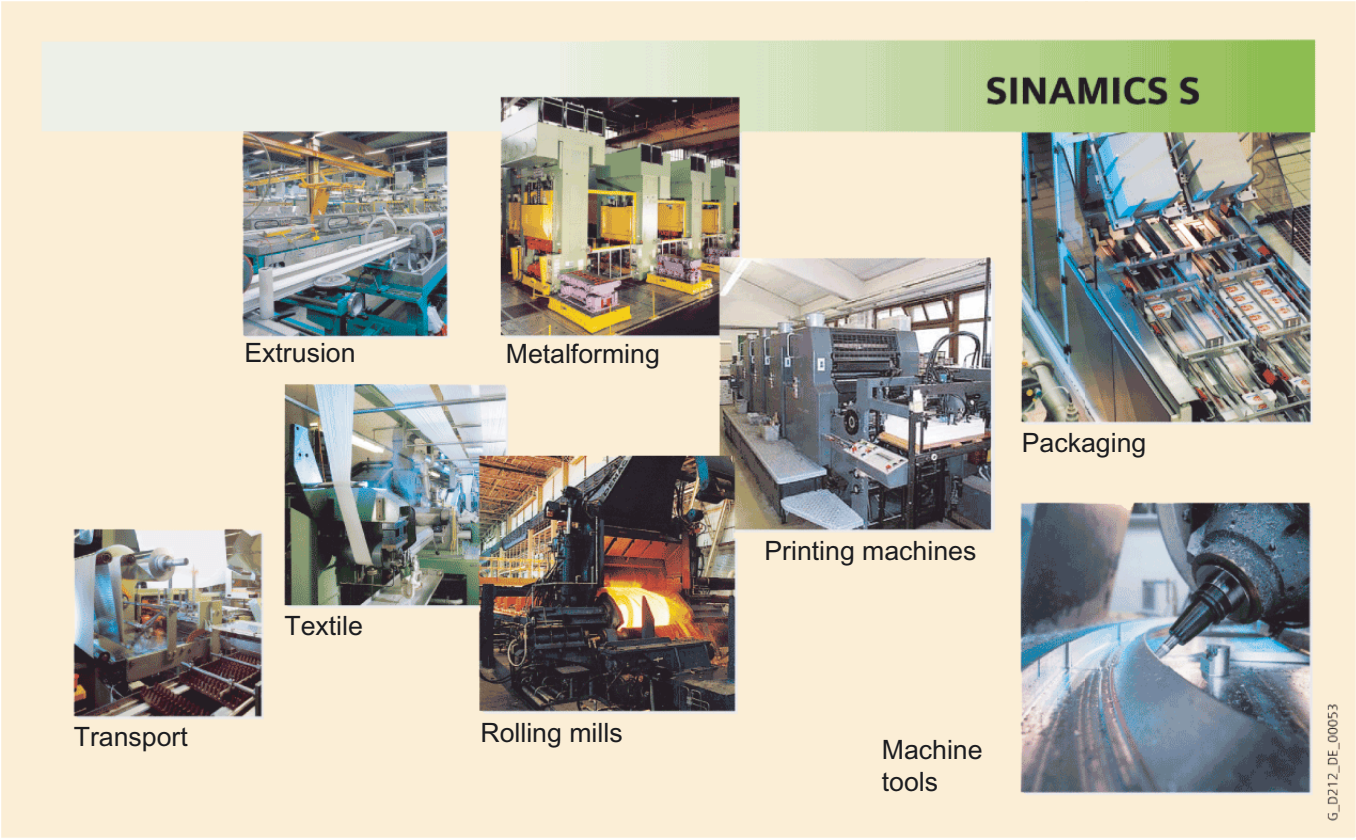


Figure 1-1 Applications

1.2 Product variants

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

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

The main focus for SIMOTION applications is on SINAMICS S. The SIMOTION D platform with integrated drive control is realized with SINAMICS S.

1.3 Overview

Additional SINAMICS system components

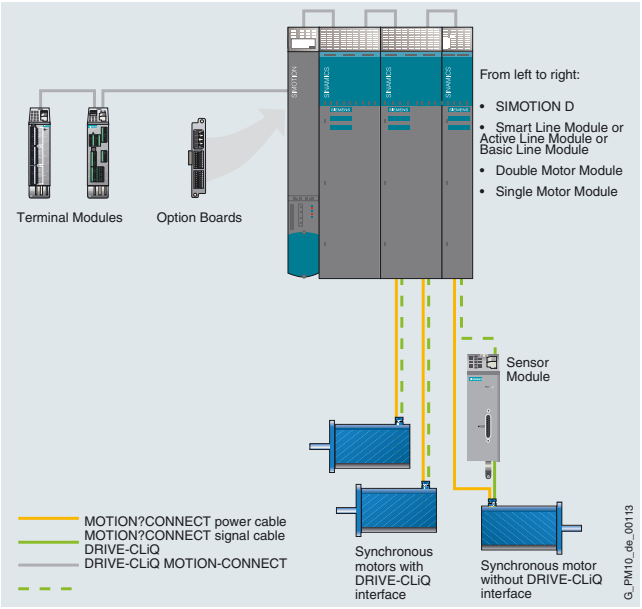


Figure 1-2 Additional SINAMICS system components

With **additional SINAMICS system components**, digital and analog inputs and outputs, as well as encoder interfaces, communication interfaces, and expansion modules can be added to the SINAMICS S120 drive system and the SIMOTION D Motion Control System to increase drive performance.

This is possible with the help of Option Boards (Terminal Board TB30 and Communication Board CBE30 are plugged into the option slot of the controller module) or the DRIVE-CLiQ interface (Terminal Modules TM31, TM15, TM17 High Feature, TM41; TM54F, Controller Extension CX32).

The design of the DRIVE-CLiQ as well as other components, including motor modules and encoder interfaces, are described in the SINAMICS S120 documentation.

DRIVE-CLiQ

DRIVE-CLiQ is used to connect the controller module with the power components, encoders and other system components such as Terminal Modules. Setpoints and actual values, control commands, status messages and type plate data of the components are transmitted via DRIVE-CLiQ.

DRIVE-CLiQ significantly simplifies commissioning and diagnostics since all connected components are identified automatically with the help of an electronic nameplate.

The use of standardized cables and connectors reduces the variety of different parts, thereby lowering storage costs.

Overview of additional SINAMICS system components

Table 1-1 Overview of additional SINAMICS system components

Component	Brief description
TB30	4 DI, 4 DO, 2 AI, 2 AO
TM15	24 isolated bidirectional DI/O, with measuring input and output cam functionality
TM17 High Feature	16 non-floating, bidirectional DI/O with sensor and cam functionality for the highest demands with respect to resolution, accuracy and short input delay times. In addition, enabling inputs can be parameterized.
TM31	8 DI, 4 bidirectional DI/O, 2 relay outputs, 2 AI, 2 AO, 1 temperature sensor input (KTY84-130 or PTC)
TM41	4 DI, 4 DI/O, 1 AI, 1 TTL encoder output
TM54F	4 fail-safe digital outputs (F-DO), 10 fail-safe digital inputs (F-DI), 4 digital inputs for testing the F-DO (with test stop)
CBE30	This module supports PROFINET IO with RT or IRT.
CX32	The Controller Extension CX32 permits the drive-side computer performance to be scaled within the SIMOTION D product series.

Note

If you are using Terminal Modules (TMs), TB30, and CX32, note that these utilize drive computer performance and, thus, can reduce the available axis quantity structures. For details, see Appendix B "Drive Computer Performance".

1.4 Integration of drive I/O

Two main options are available for SIMOTION for integrating the drive I/O via DRIVE-CLiQ:

- System configuration with integrated drives

  In this configuration, the drive I/O are connected directly to SIMOTION D or to the CX32 Controller Extension (not shown in figure).

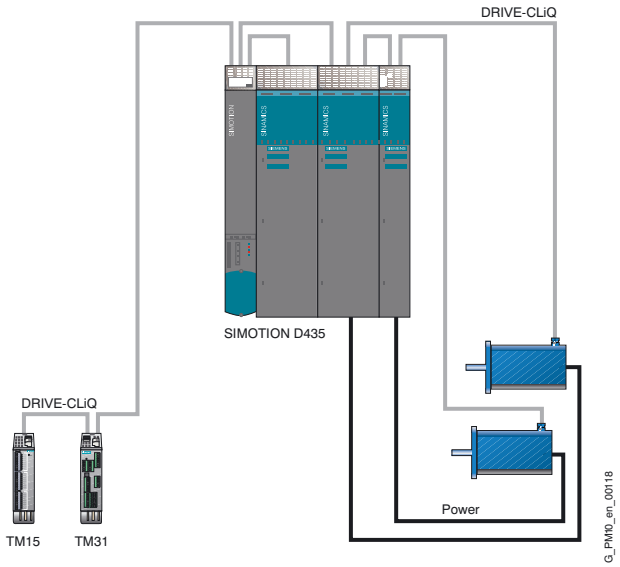


Figure 1-3 TM15 and TM31 connected to SIMOTION D4x5

- System configuration with external drives

  In this configuration, the drive I/O are connected to a SINAMICS S120 Control Unit CU320 or CU310, which is connected to:

  – SIMOTION C, P or D (see figure) via PROFIBUS DP, or

  – SIMOTION P or D via PROFINET IO

  AC/AC power units can also be connected to the SINAMICS CUA31/32 on a SIMOTION D.

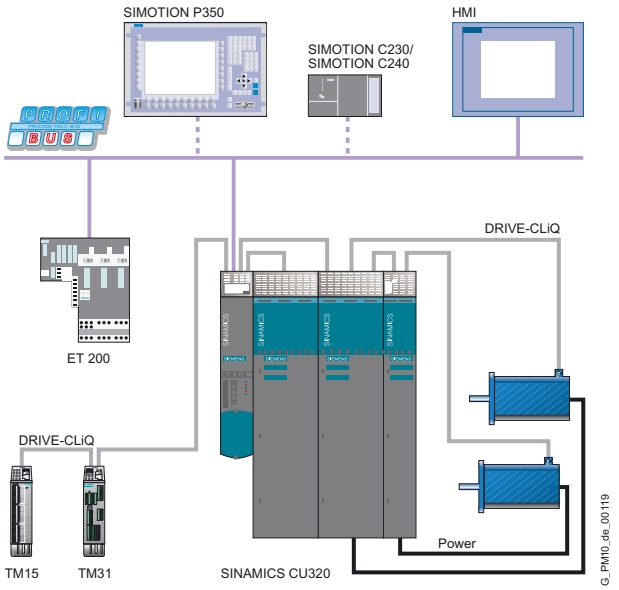


Figure 1-4 TM15 and TM31 connected via CU320 to SIMOTION C or SIMOTION P

1.5 Expansion of the drive-side computer performance with CX32

The CX32 controller extension is a SINAMICS S120-type component and permits the drive-side computing performance to be scaled within the SIMOTION D product range. Each CX32 can control up to six additional servo axes.

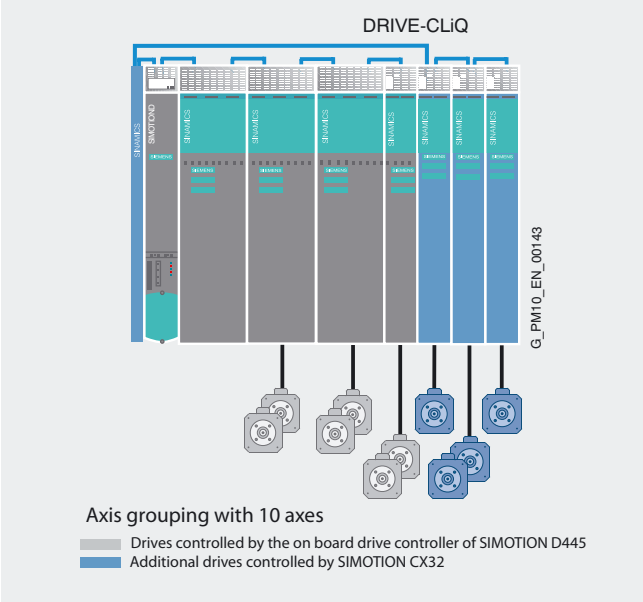


Figure 1-5 Example of an axis group for 10 axes

The controller is connected to SIMOTION D over DRIVE-CLiQ which ensures high-performance isochronous drive control without additional modules. The communication interfaces on the SIMOTION D remain available for other connections. With a width of 25 mm the module requires very little space and is therefore perfectly suited for use in compact machines.

The data for the SIMOTION CX32 is stored exclusively on the SIMOTION D, which means no action has be taken when the module is replaced. The SIMOTION CX32 can be operated on the SIMOTION D445 and D435.

1.6 System data

Technical specifications

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

Electrical specifications	
Electronic power supply	24 V DC, -15/+20 %
Conducted radio interference Standard	 No conducted radio interference
Overvoltage category	Class I to EN 60 664-1

Ambient conditions	
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.	
Degree of protection	IP20 to EN 60 529
Class of protection	Class I (with protective-conductor system) and Class III (PELV) to EN 61 800-5-1
Permissible ambient temperature in operation for Control Units and additional system components	0 °C to +55 °C up to 2000 m above sea level. Above an altitude of 2000 m, the maximum ambient temperature decreases by 7°C every 1000 m. Installation altitude: max. 5000 m above sea level.

Information on storage, transport and operation:	
Environmental class • Storage • Transport • 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 • Transport • 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
Vibratory load • Long-term storage • Transport • Operation	 EN 60 721-3-1, Class 1M2 in transport packaging EN 60 721-3-2, Class 2M3 in transport packaging Test values: Frequency range 10 ... 58 Hz With constant deflection = 0.075 mm Frequency range above 58 ... 150 Hz With constant acceleration = 9.81 m/s^2 (1 g)

Information on storage, transport and operation:	
Shock stressing • Long-term storage • Transport • Operation	 EN 60 721-3-1, Class 1M2 in transport packaging EN 60 721-3-2, Class 2M3 in transport packaging Test values for modules/devices with components that are sensitive to shock: 49.05 m/s^2 (5 g) / 30 ms Test values for modules/devices that do not have components that are sensitive to shock: 147.15 m/s^2 (15 g) / 11 ms
Ambient climatic conditions • Storage • Transport • Operation	 Class 1K3 to EN 60 721-3-1 Temperature: -40 °C to +70 °C Class 2K4 acc. to EN 60 721-3-2 Temperature -40 °C to +70 °C Max. humidity 95% at 40 °C Class 3K3 acc. to EN 60 721-3-3 Moisture condensation, water spray and the formation of ice are not permissible (EN 60 204, Part 1)
Degree of contamination	2 to EN 60 664-1
Installation altitude	Up to 5000 m above sea level

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

Test values for SME20/25/120/125	
Vibratory load • Operation	 Duration, frequency sweep: 10 cycles/axis. Sweep rate 1 octave/min. 1 cycle = start frequency...maximum frequency...start frequency 2 sweeps. Frequency 10-58 Hz Defection 0.37 mm Frequency 58-200 Hz Acceleration 5 g Requirements standard: DIN EN 60721-3-3, Kl. 3M8 Test standards: DIN EN 60068-2-6 Test Fc
Shock stressing • Operation	 3 shocks in each direction, for a total of 18. The shock cycle time is 1 second. Peak acceleration: 25 g Shock duration: 6 ms Requirements standards DIN EN 60721-3-3, 3 M4 Test standards: DIN EN 60068-2-27, Ea
Ambient temperature	-20 °C to 55 °C
Degree of protection	IP67, with assembled connecting plugs

Note

The specified tests and associated test values involve reproducible loads on a device, which approximate the loads accumulated over the service life of a device, and NOT the permissible load values that are observed continuously by the device.

Terminal Module TM15

2

2.1 Description

The Terminal Module TM15 is a terminal expansion module for snapping on to a DIN EN 60715 mounting rail. The TM15 can be used to increase the number of available digital inputs/outputs within a drive system.

Table 2-1 Interface overview of the TM15

Type	Quantity
Digital inputs/outputs	24 (isolation in 3 groups each with 8 DI/O)

2.2 Safety Information

Danger

The 50 mm clearances above and below the components must be observed.

2.3 Description of Ports

2.3.1 Overview

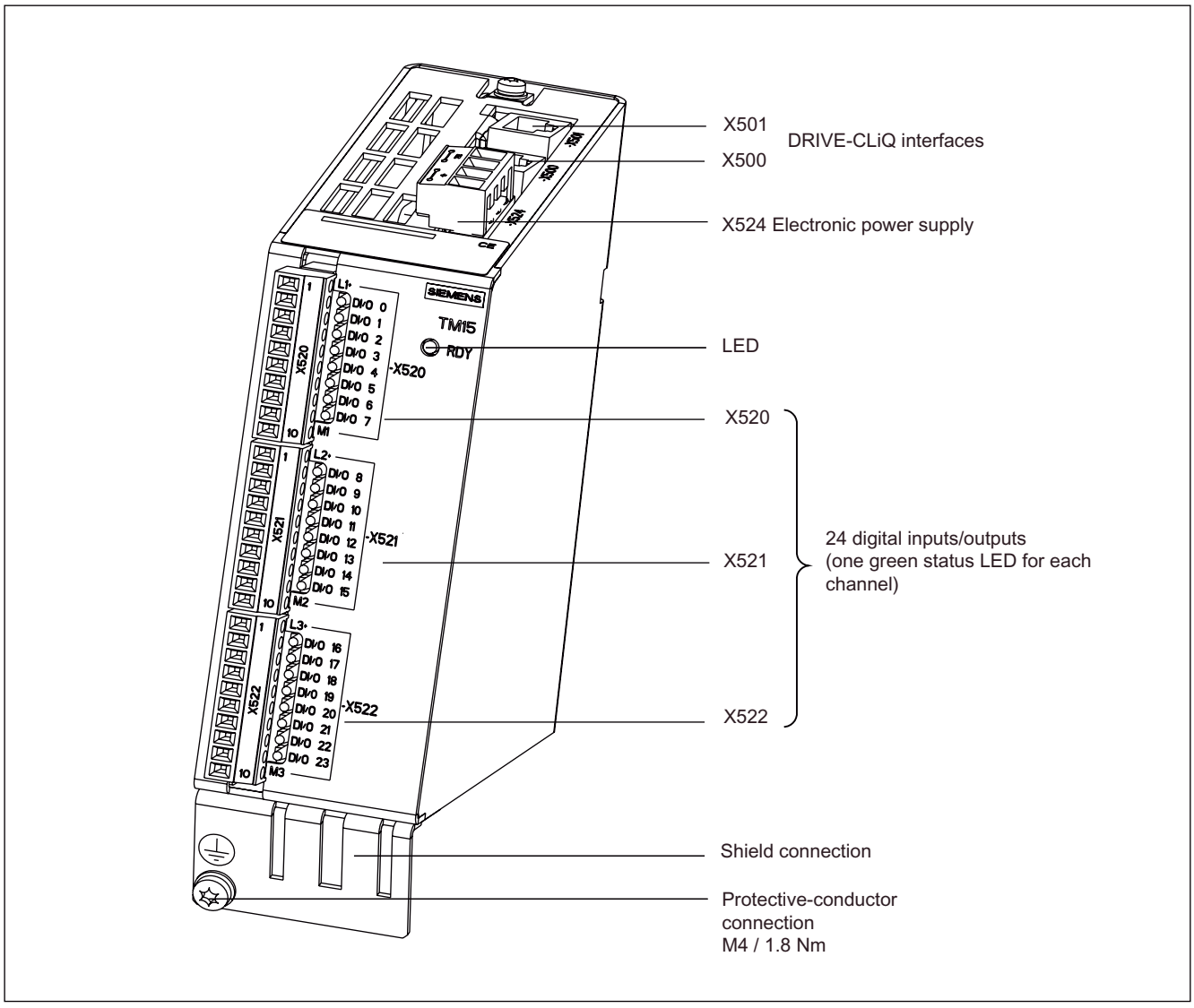


Figure 2-1 Interface description TM15

2.3.2 Connection example

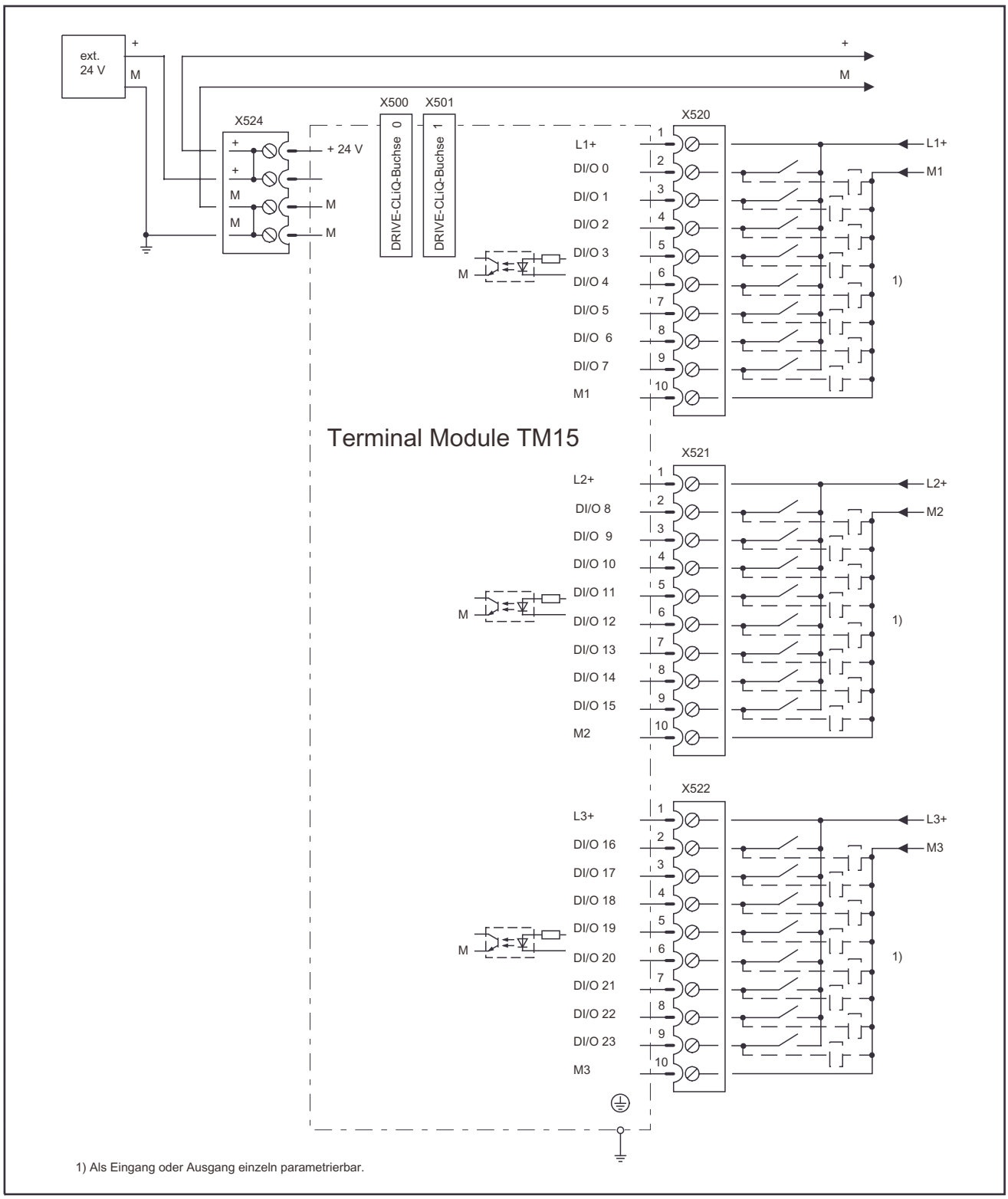
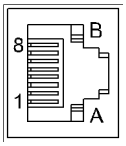


Figure 2-2 Example connection of TM15

2.3.3 X500 and X501 DRIVE-CLiQ interface

Table 2-2 DRIVE-CLiQ interface X500 and X501

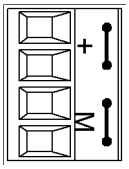
	Pin	Signal name	Technical specifications
	1	TXP	Transmit data +
	2	TXN	Transmit data -
	3	RXP	Receive data +
	4	Reserved, do not use	
	5	Reserved, do not use	
	6	RXN	Receive data -
	7	Reserved, do not use	
	8	Reserved, do not use	
	A	+ (24 V)	Power supply
	B	GND (0 V)	Electronic ground
Blanking plate for DRIVE-CLiQ interface: Yamaichi, order number: Y-ConAS-13			

2.3.4 X524 Electronic power supply

Caution

It is essential to ensure that the external 24 VDC power supply to the terminal module is not interrupted for longer than 3 ms. After an interruption of 3 ms, the command to reset the component is issued, causing all outputs to be reset.

Table 2-3 Terminals for the electronic power supply

	Terminal	Designation	Technical specifications
	+	Electronic power supply	Voltage: 24 V DC (20.4 V – 28.8 V) Current consumption: max. 0.15 A Max. current via jumper in connector: 20 A at 60 °C
	+	Electronic power supply	
	M	Electronic ground	
	M	Electronic ground	
Max. connectable cross-section: 2.5 mm² Type: Screw terminal 2 (see Appendix A)			

Note

The two "+" and "M" terminals are jumpered in the connector. This ensures that the supply voltage is looped through.

The current consumption increases by the value for the DRIVE-CLiQ node. The digital outputs are supplied via terminals X520, X521, and X522.

Requirements for the power supply

Requirements for the power supply are as follows:

Table 2-4 Requirements for the electronic power supply

Parameter	Requirement
Current	150 mA[1] per module (TM15)

[1] Does not include the current provided for the DI/O or for the DRIVE-CLiQ Interface.

The maximum supply current for TM15 is calculated from the sum of the 3 currents below:

- 150 mA, maximum, via X524 connection

  (module logic must always be taken into account)
- 450 mA, maximum, via X524

  (24 V supply via DRIVE-CLiQ; relevant only if a module connected downcircuit of the TM15 is supplied via DRIVE-CLiQ, e.g. encoder without a separate 24 V connection)
- 24 x 0.5 A, maximum, via X520/X521/X522

  (all channels are parameterized as DO and loaded with 0.5 A)

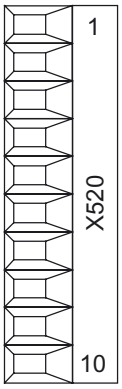
The terminal module monitors the electronic power supply for both overvoltage and undervoltage conditions.

Note

Avoid long cables. The 24 VDC power supply should be located as close as possible to the terminal modules. The total length of all power cables, when added together, must not exceed 10 meters.

2.3.5 X520 digital inputs/outputs

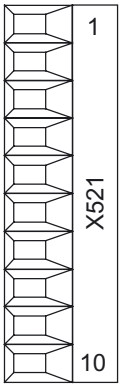
Table 2-5 Screw terminal X520

	Terminal	Designation[1]	Technical specifications
	1	L1+	See "Technical specifications"
	2	DI/O 0	
	3	DI/O 1	
	4	DI/O 2	
	5	DI/O 3	
	6	DI/O 4	
	7	DI/O 5	
	8	DI/O 6	
	9	DI/O 7	
	10	M1 (GND)	
Max. connectable cross-section: 1.5 mm^2 Type: Screw terminal 1 (see Appendix A)			

[1] L1+: A 24 V DC power supply for DI/O 0 to 7 (first potential group) must always be connected if at least one DI/O of the potential group is used as output.
M1: A reference ground for DI/O 0 to 7 (first potential group) must always be connected if at least one DI/O of the potential group is used as either input or output.
DI/O: Digital input/output

2.3.6 X521 digital inputs/outputs

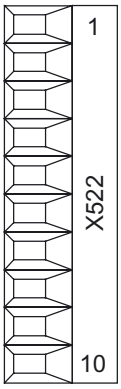
Table 2-6 Screw terminal X521

	Terminal	Designation[1]	Technical specifications
	1	L2+	See "Technical specifications"
	2	DI/O 8	
	3	DI/O 9	
	4	DI/O 10	
	5	DI/O 11	
	6	DI/O 12	
	7	DI/O 13	
	8	DI/O 14	
	9	DI/O 15	
	10	M2 (GND)	
Max. connectable cross-section: 1.5 mm^2 Type: Screw terminal 1 (see Appendix A)			

[1] L2+: A 24 VDC infeed for DI/O 8 to 15 (second potential group) must always be connected when at least one DI/O of the potential group is used as an output.
M2: A reference ground for DI/O 8 to 15 (second potential group) must always be connected if at least one DI/O of the potential group is used as either input or output.
DI/O: Digital input/output

2.3.7 X522 digital inputs/outputs

Table 2-7 Screw terminal X522

	Terminal	Designation[1]	Technical specifications
	1	L3+	See "Technical specifications"
	2	DI/O 16	
	3	DI/O 17	
	4	DI/O 18	
	5	DI/O 19	
	6	DI/O 20	
	7	DI/O 21	
	8	DI/O 22	
	9	DI/O 23	
	10	M3 (GND)	
Max. connectable cross-section: 1.5 mm^2 Type: Screw terminal 1 (see Appendix A)			

[1] L3+: A 24 V DC power supply for DI/O 16 to 23 (third potential group) must always be connected if at least one DI/O of the potential group is used as output.
M3: A reference ground for DI/O 16 to 23 (third potential group) must always be connected if at least one DI/O of the potential group is used as either input or output.
DI/O: Digital input/output

2.3.8 Description of the LEDs on the Terminal Module TM15

Table 2-8 Description of the LED

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	Flashing 2 Hz	Component detected: no fault present
	Red/Orange	Flashing 2 Hz	Component detected: Fault(s) present

Cause and rectification of faults

The following reference contains information about the cause of faults and how they can be rectified:

- SINAMICS S Commissioning Manual
- SIMOTION D4x5 Commissioning and Hardware Installation Manual
- TM15 / TM17 High Feature Commissioning Manual

2.4 Dimension Drawing

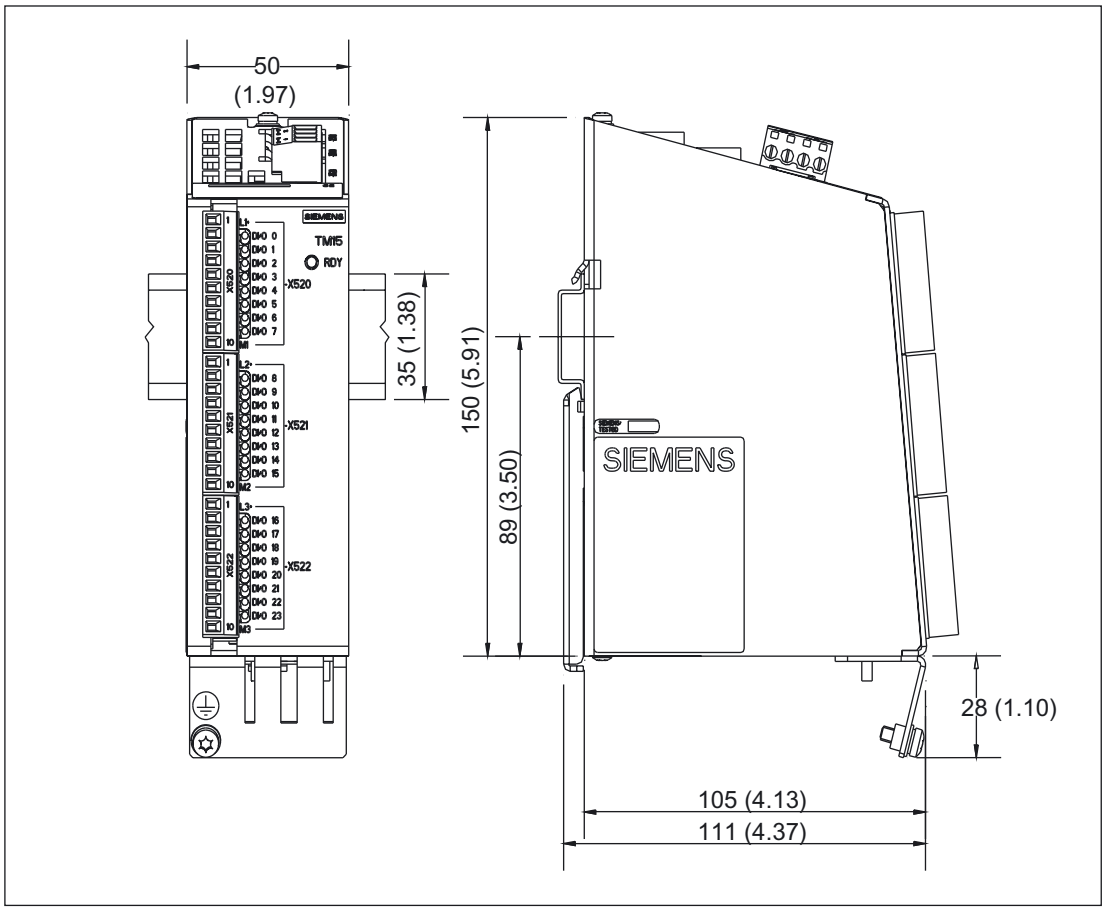


Figure 2-3 Dimension drawing of the TM15

2.5 Installation

Installation

1. Place the component on the DIN rail.
2. Snap the component on to the DIN rail. Make sure that the mounting slides at the rear latch into place.
3. You can now move the component on the DIN rail to the left or to the right to its final position.

Disassembly

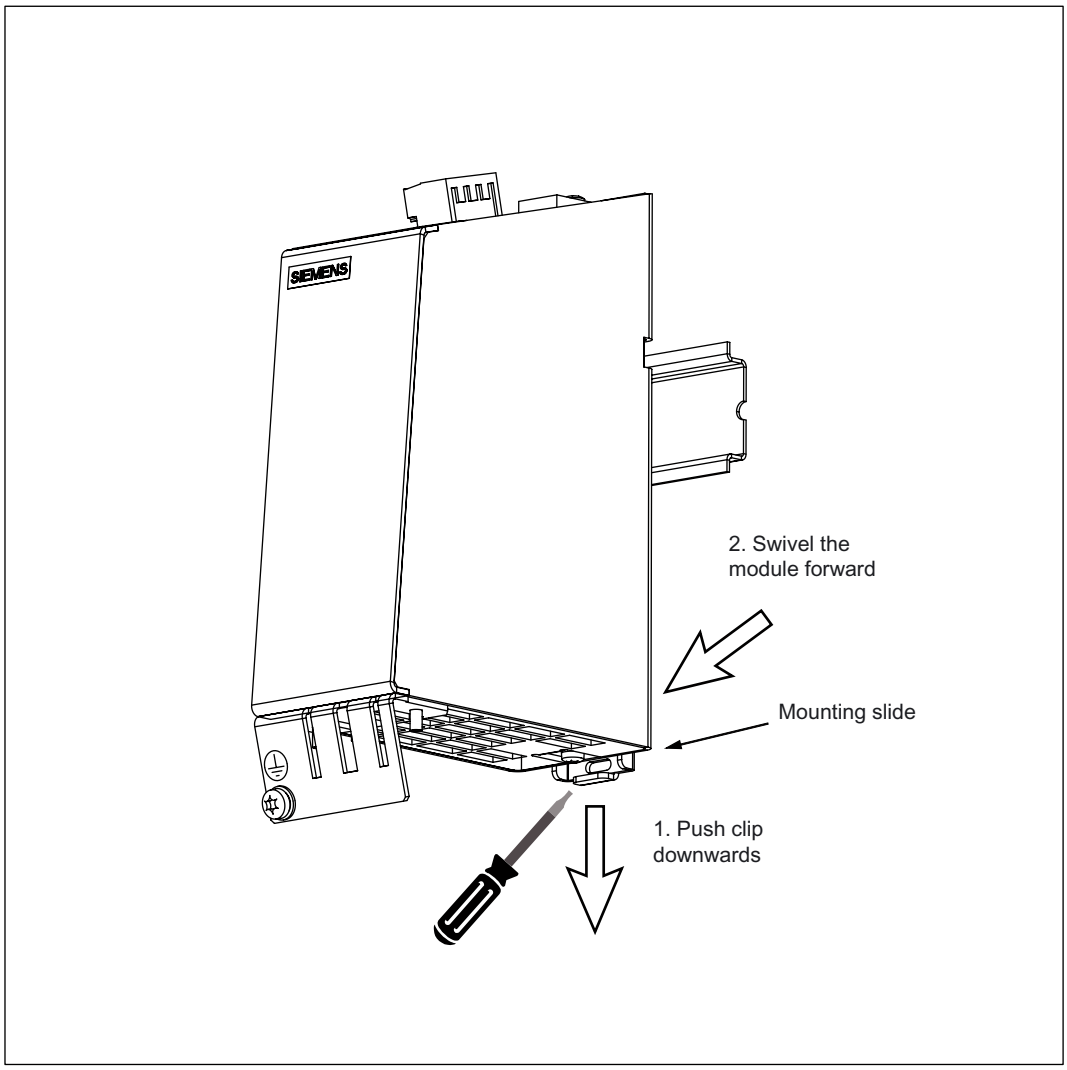


Figure 2-4 Releasing the component from a DIN rail

2.6 Electrical Connection

It is always advisable to shield the digital input/output wiring.

The following pictures show two typical shield connections from Weidmüller.

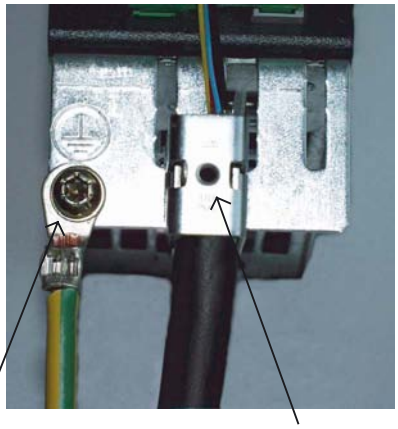


Figure 2-5 Shield connections

Internet address of the company:

Weidmüller: http://www.weidmueller.com

Danger

If the shielding procedures described and the specified cable lengths are not observed, the machine may not operate properly.

The TM15 housing is connected to the ground terminal of the module supply (terminal X524). As long as the chassis is grounded, the housing is also grounded. An additional ground connection using the M4 screw is especially necessary if high potential bonding currents can flow (e.g. through the cable shield).

Connector coding

Siemens supplies a series of coding keys (coding sliders) with each Terminal Module TM15. To code a connector, you must insert at least one coding slider and cut off at least one coding projection on the connector:

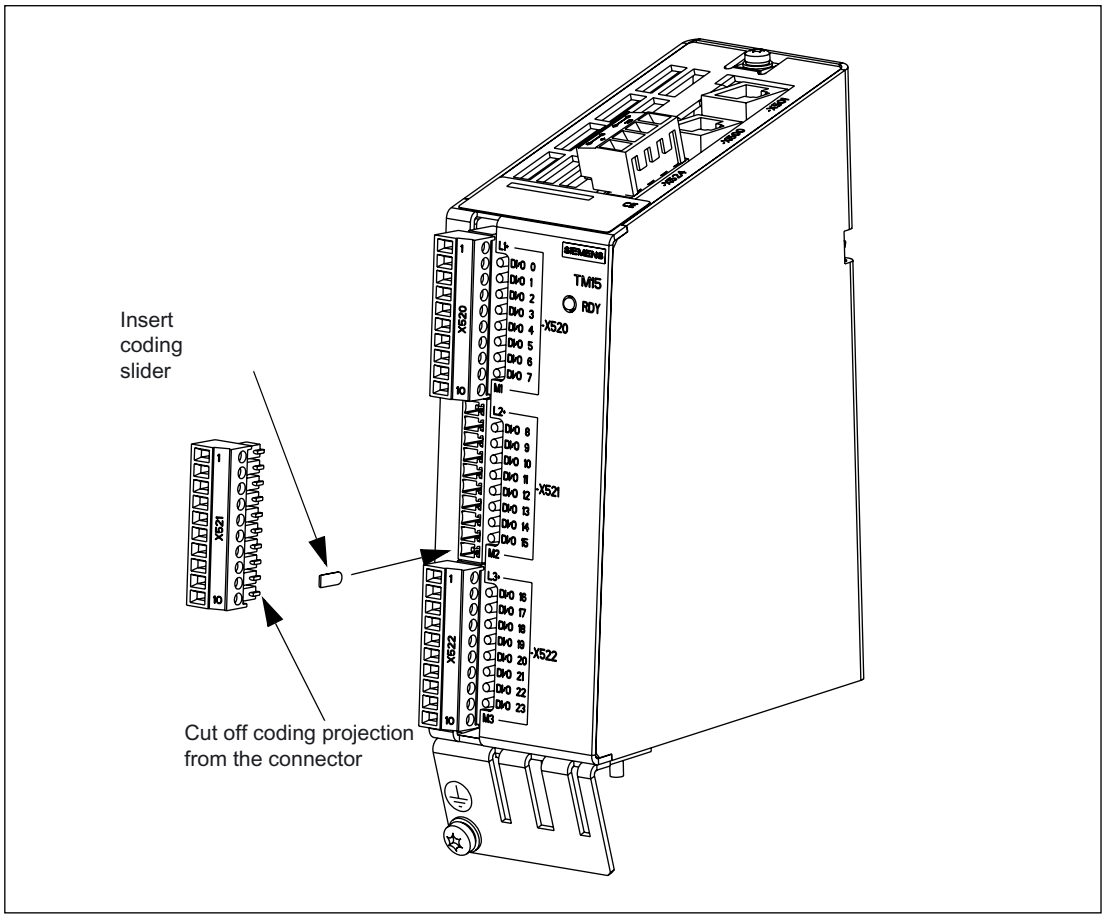


Figure 2-6 Procedure for encoding a connector

To avoid incorrect wiring, unique connector coding schemes for the I/O connectors X520, X521, and X522 may be defined. Examples of possible patterns:

- Different coding between the 3 plugs of a component (i.e., X520, X521, and X522).
- Different component types are encoded differently.
- Identical components on the same machine are encoded differently (e.g. several TM15-type components).

2.7 Commissioning

Note

For information about commissioning , see the *SIMOTION Terminal Modules TM15 / TM17 High Feature* Commissioning Manual.

2.8 Technical specifications

Table 2-9 Technical specifications

Terminal Module TM15 6SL3055-0AA00-3FAx	**Unit**	**Value**
Electronic power supply Voltage Current (without DRIVE-CLiQ or digital outputs) Power loss	 V_{DC} A_{DC} W	 24 DC (20.4 – 28.8) 0.15 <3
Ambient temperature up to an altitude of 2000 m	°C	0 - 60
Storage temperature	°C	-40 to +85
Relative humidity	5% to 95%, no condensation	
I/O		
• Digital inputs/outputs	Each can be parameterized separately as DI or DO	
• Number of digital inputs/outputs	24	
• Isolation	Yes, in groups of 8	
• Max. cable length	m	30
Digital inputs		
• Voltage	V_{DC}	-30 to +30
• Low-level (an open digital input is interpreted as "low")	V_{DC}	-30 to +5
• High level	V_{DC}	15 to 30
• Input impedance	kΩ	2.8
• Current consumption (at 24 V DC)	mA	11
• Max. voltage in OFF state	V_{DC}	5
• Current in OFF state	mA	0.0 to 1.0 (per channel)
• Input delay of digital inputs, typical [1)]	µs	For "0" to "1" 50 For "1" to "0" 100

Terminal Module TM15 **6SL3055-0AA00-3FAx**	**Unit**	**Value**
Digital outputs (sustained short-circuit-proof)		
• Voltage	V_{DC}	24
• Max. load current per digital output	A_{DC}	0.5
• Output delay (ohmic load)		
• typical	µs	For "0" to "1" 50 For "1" to "0" 150
• maximum	µs	For "0" to "1" 100 For "1" to "0" 225
• Min. output pulse (100% amplitude, 0.5 A with resistive load)	µs	125 (typ.) 350 (max.)
• Max. switching frequency (100% amplitude, 50%/50% duty cycle, with 0.5 A and a resistive load)	kHz	1 (typ.)
• Voltage drop in ON state	V_{DC}	0.75 (max.) with all circuits fully loaded
• Leakage current in OFF state	µA	max. 10 per channel
• Output voltage drop (I/O power supply to the output)	V_{DC}	0.5
• Max. total current of the outputs (per group) to 60 °C to 50 °C to 40 °C	 A_{DC} A_{DC} A_{DC}	 2 3 4
IEC enclosure specification	IP20 degree of protection	
Protective-conductor connection	On the housing with M4/1.8 Nm screw	
Response time	The response time for the digital inputs/outputs (TM15 DI/DO) consists of the following elements: • Response time on the component itself (approx. 1/2 DRIVE-CLiQ cycle). • Transmission time via the DRIVE-CLiQ connection (approx. 1 DRIVE-CLiQ cycle). • Evaluation on the control unit (see function diagram) **Reference:**SINAMICS S Parameter Manual – "Function diagrams" chapter.	
Weight	kg	0.86
Approval	UL and cULus http://www.ul.com File: E164110, Vol. 2, Sec. 9	

1) Pure hardware delay

Terminal Module TM17 High Feature

3

3.1 Description

The Terminal Module TM17 High Feature is a terminal expansion module for snapping on to a DIN EN 60715 mounting rail. The TM17 High Feature can be used to increase the number of available digital inputs/outputs within a drive system.

Table 3-1 Interface overview of the TM17 High Feature

Type	Quantity
Digital inputs/outputs	16 (non-isolated, 2 voltage groups, each with 8 DI/O)

3.2 Safety Information

Danger

The 50 mm clearances above and below the components must be observed.

3.3 Description of Ports

3.3.1 Overview

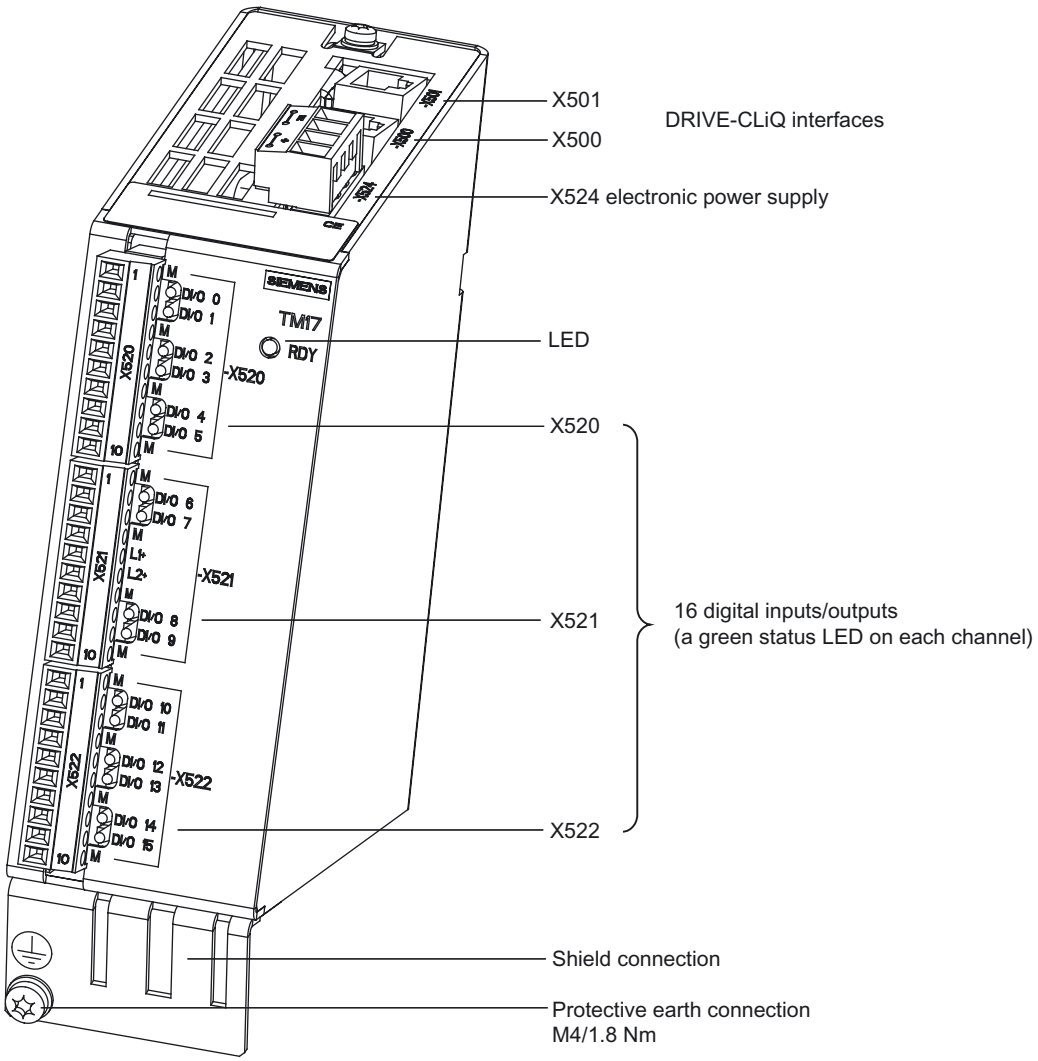


Figure 3-1 TM17 High Feature interface description

3.3.2 Sample connection

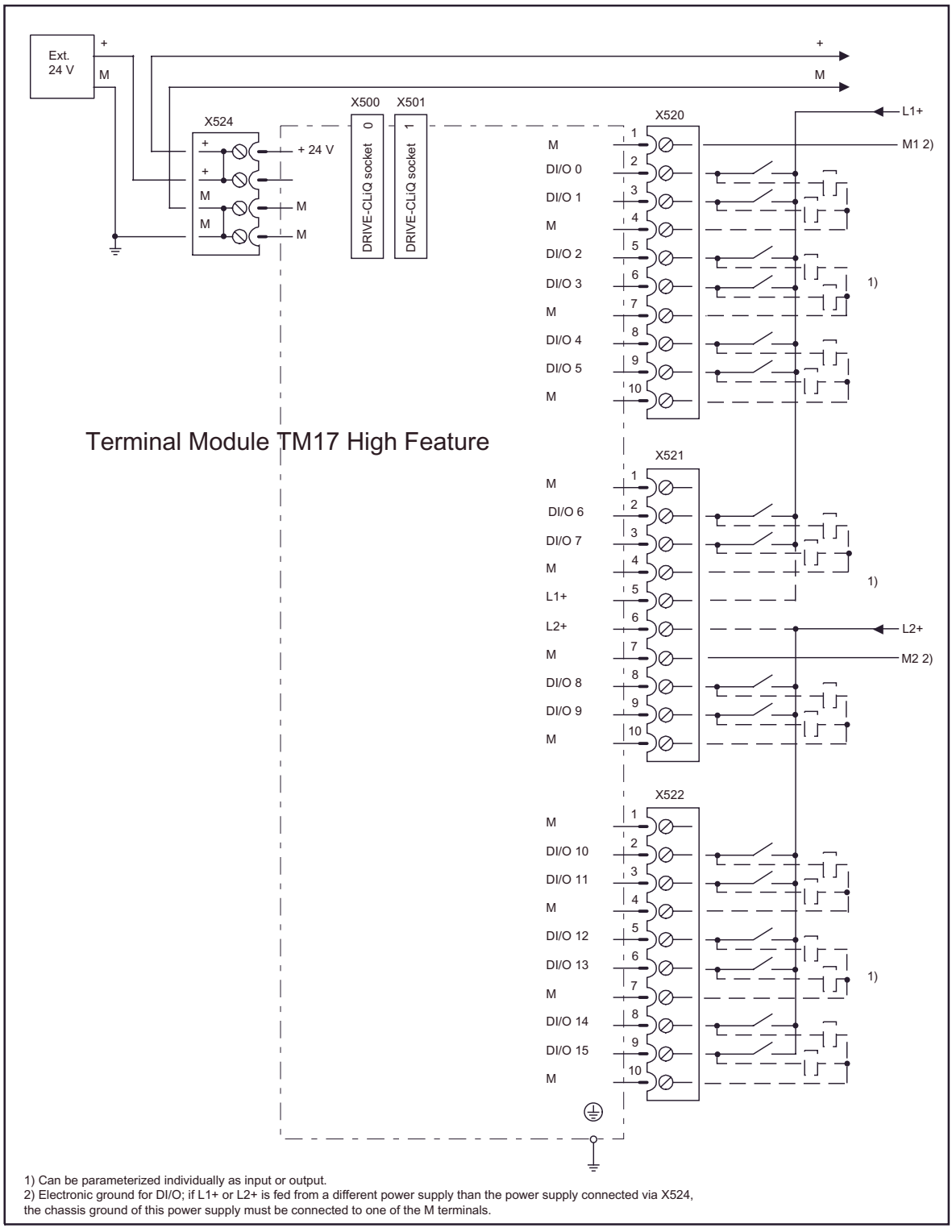
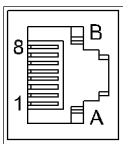


Figure 3-2 TM17 High Feature connection example

3.3.3 X500 and X501 DRIVE-CLiQ interface

Table 3-2 DRIVE-CLiQ interface X500 and X501

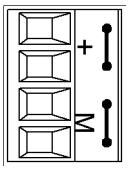
	Pin	Signal name	Technical specifications
	1	TXP	Transmit data +
	2	TXN	Transmit data -
	3	RXP	Receive data +
	4	Reserved, do not use	
	5	Reserved, do not use	
	6	RXN	Receive data -
	7	Reserved, do not use	
	8	Reserved, do not use	
	A	+ (24 V)	Power supply
	B	GND (0 V)	Electronic ground
Blanking plate for DRIVE-CLiQ interface: Yamaichi, order number: Y-ConAS-13			

3.3.4 X524 Electronic power supply

Caution

It is essential to ensure that the external 24 VDC power supply to the terminal module is not interrupted for longer than 3 ms. After an interruption of 3 ms, the command to reset the component is issued, causing all outputs to be reset.

Table 3-3 Terminals for the electronic power supply

	Terminal	Designation	Technical specifications
	+	Electronic power supply	Voltage: 24 VDC (20.4 V - 28.8 V) Current consumption: max. 0.2 A Max. current via jumper in connector: 20 A at 60 °C
	+	Electronic power supply	
	M	Electronic ground	
	M	Electronic ground	
Max. connectable cross-section: 2.5 mm² Type: Screw terminal 2 (see Appendix A)			

Note

The two "+" and "M" terminals are jumpered in the connector and not in the device. This ensures that the supply voltage is looped through.

The current consumption increases by the value for the DRIVE-CLiQ node. The digital outputs are supplied via terminals X520, X521, and X522.

Requirements for the power supply

Requirements for the power supply are as follows:

Table 3-4 Requirements for the electronic power supply

Parameter	Requirement
Current	200 mA[1] per module (TM17 High Feature)

[1] Does not include the current provided for the DI/O or for the DRIVE-CLiQ Interface.

The maximum supply current for TM17 High Feature is calculated from the sum of the 3 currents below:

- 200 mA, maximum, via X524 connection

  (module logic must always be taken into account)
- 450 mA, maximum, via X524

  (24 V supply via DRIVE-CLiQ; relevant only if a module connected downcircuit of the TM17 High Feature is supplied via DRIVE-CLiQ, e.g. encoder without a separate 24 V connection)
- 16 x 0.5 A, maximum, via X520/X521/X522

  (all channels are parameterized as DO and charged with 0.5 A)

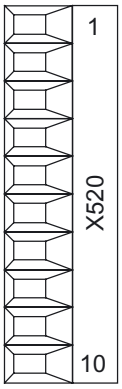
The terminal module monitors the electronic power supply for both overvoltage and undervoltage conditions.

Note

Avoid long cables. The 24 VDC power supply should be located as close as possible to the terminal modules. The total length of all power cables, when added together, must not exceed 10 meters.

3.3.5 X520 digital inputs/outputs

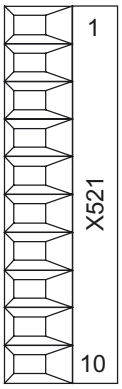
Table 3-5 Screw terminal X520

	Terminal	Designation[1]	Technical specifications
	1	M (GND)	See "Technical specifications"
	2	DI/O 0	
	3	DI/O 1	
	4	M (GND)	
	5	DI/O 2	
	6	DI/O 3	
	7	M (GND)	
	8	DI/O 4	
	9	DI/O 5	
	10	M (GND)	
Max. connectable cross-section: 1.5 mm^2 Type: Screw terminal 1 (see Appendix A)			

[1] M: Electronic ground for DI/O 0 to 15; if L1+ or L2+ is fed from a power supply other than the power supply connected via X524, the chassis ground of this power supply (L1+ or. L2+) must be connected to one of the M-terminals.
DI/O: Digital input/output

3.3.6 X521 digital inputs/outputs

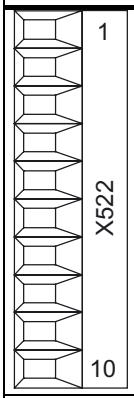
Table 3-6 Screw terminal X521

	Terminal	Designation[1]	Technical specifications
	1	M (GND)	See "Technical specifications"
	2	DI/O 6	
	3	DI/O 7	
	4	M (GND)	
	5	L1+	
	6	L2+	
	7	M (GND)	
	8	DI/O 8	
	9	DI/O 9	
	10	M (GND)	
Max. connectable cross-section: 1.5 mm^2 Type: Screw terminal 1 (see Appendix A)			

[1] L1+: A 24 VDC infeed for DI/O 0 to 7 (first voltage group) must always be connected when at least one DI/O of the voltage group is used as an output.
L2+: A 24 VDC infeed for DI/O 8 to 15 (second potential group) must always be connected when at least one DI/O of the potential group is used as an output.
M: Electronic ground for DI/O 0 to 15; if L1+ or L2+ is fed from a power supply other than the power supply connected via X524, the chassis ground of this power supply (L1+ or. L2+) must be connected to one of the M-terminals.
DI/O: Digital input/output

3.3.7 X522 digital inputs/outputs

Table 3-7 Screw terminal X522

	Terminal	Designation[1]	Technical specifications
	1	M (GND)	See "Technical specifications"
	2	DI/O 10	
	3	DI/O 11	
	4	M (GND)	
	5	DI/O 12	
	6	DI/O 13	
	7	M (GND)	
	8	DI/O 14	
	9	DI/O 15	
	10	M (GND)	
Max. connectable cross-section: 1.5 mm^2 Type: Screw terminal 1 (see Appendix A)			

[1] M: Electronic ground for DI/O 0 to 15; if L1+ or L2+ is fed from a power supply other than the power supply connected via X524, the chassis ground of this power supply (L1+ or. L2+) must be connected to one of the M-terminals.
DI/O: Digital input/output

3.3.8 Description of the LEDs on Terminal Module TM17 High Feature

Table 3-8 Description of the LED

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	Flashing 2 Hz	Component detected: no fault present
	Red/Orange	Flashing 2 Hz	Component detected: Fault(s) present

Cause and rectification of faults

The following reference contains information about the cause of faults and how they can be rectified:

- SIMOTION D4x5 Commissioning and Hardware Installation Manual
- TM15 / TM17 High Feature Commissioning Manual

3.4 Dimension drawing

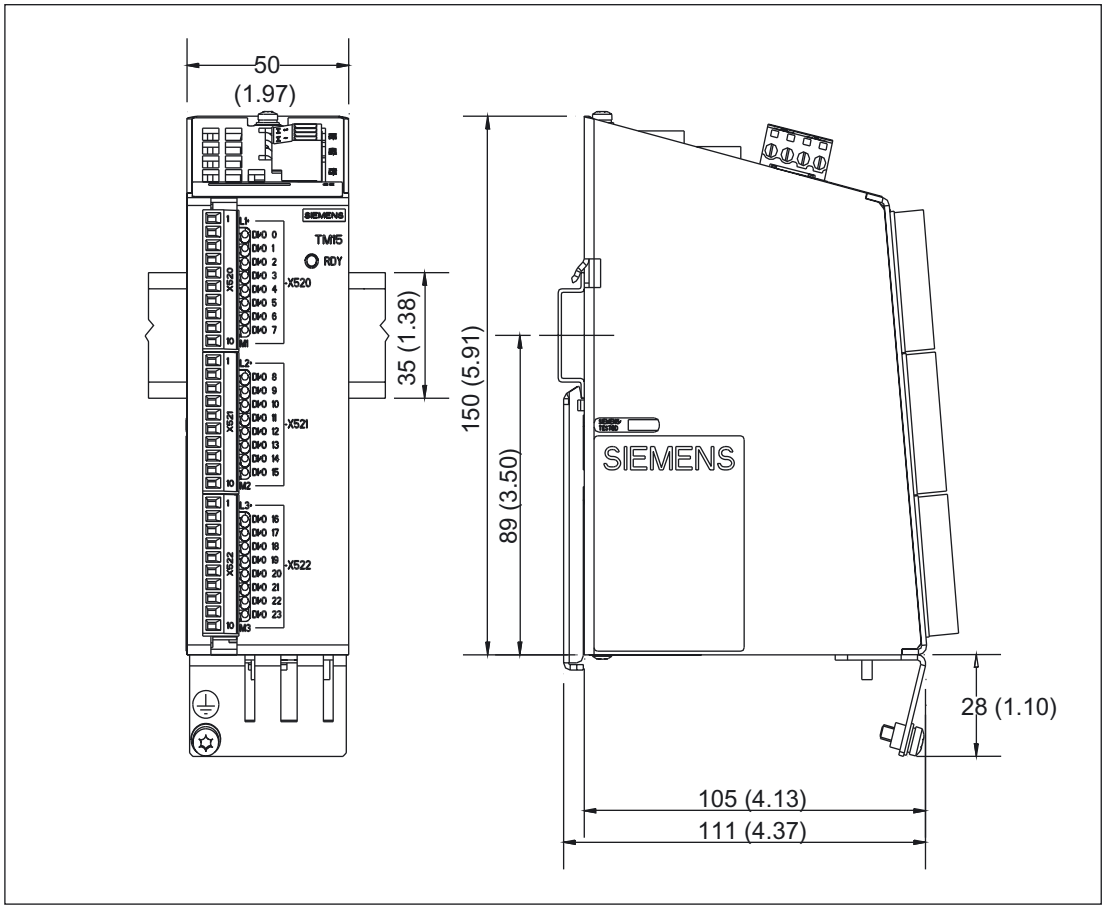


Figure 3-3 Dimension drawing of TM17 High Feature (like TM15)

3.5 Installation

Installation

1. Place the component on the DIN rail.
2. Snap the component on to the DIN rail. Make sure that the mounting slides at the rear latch into place.
3. You can now move the component on the DIN rail to the left or to the right to its final position.

Disassembly

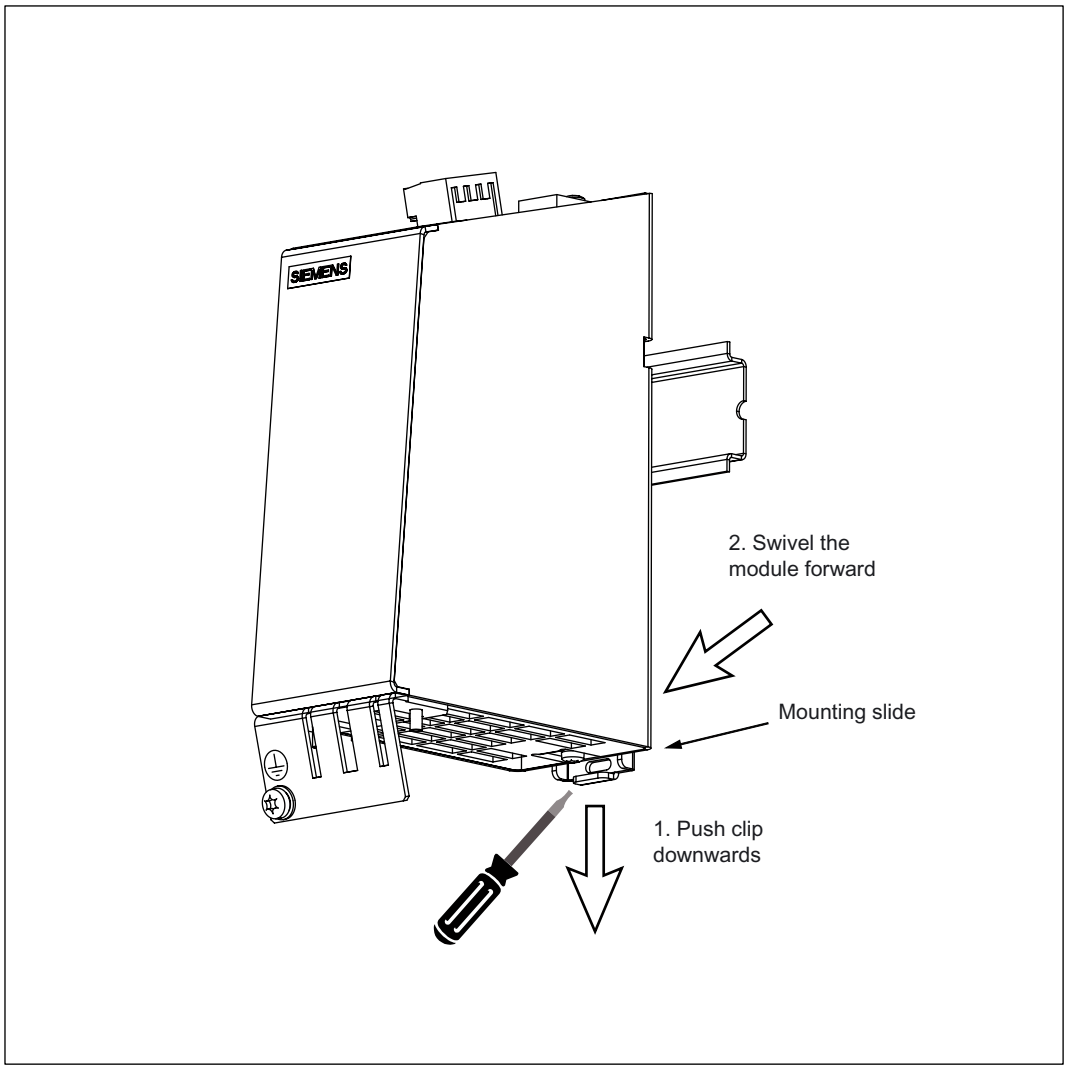


Figure 3-4 Releasing the component from a DIN rail

3.6 Electrical Connection

It is always advisable to shield the digital input/output wiring.

The following pictures show two typical shield connections from Weidmüller.

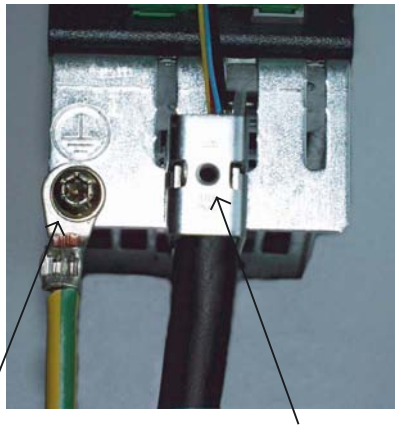


Figure 3-5 Shield connections

Company Internet addresses:

Weidmüller: http://www.weidmueller.com

Danger

If the shielding procedures described and the specified cable lengths are not observed, the machine may not operate properly.

The casing of the TM17 High Feature is connected to the chassis terminal of the module power supply (terminal X524). As long as the chassis is grounded, the housing is also grounded. Additional grounding via the M4 screw is required, in particular, when large equipotential bonding currents can flow (e.g. via the cable shield or the non-isolated I/O of the TM17 High Feature).

Connector coding

Siemens supplies a series of coding elements (coding sliders) with each Terminal Module TM17 High Feature. To code a connector, you must insert at least one coding slider and cut off at least one coding projection on the connector:

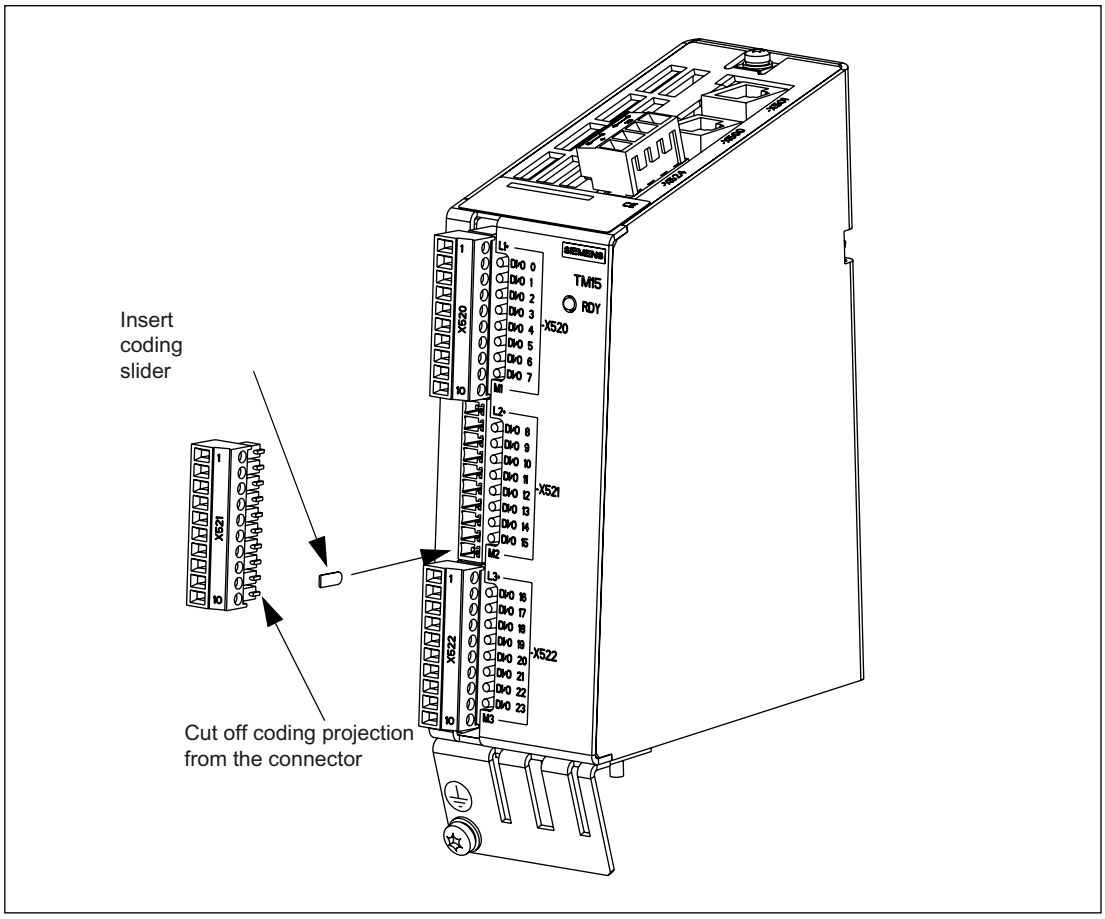


Figure 3-6 Connector coding - procedure (same as for TM 15)

To avoid incorrect wiring, unique connector coding schemes for the I/O connectors X520, X521, and X522 may be defined. Examples of possible patterns:

- Different coding between the 3 plugs of a component (i.e., X520, X521, and X522).
- Different components are coded differently.
- Identical components on the same machine are coded differently (e.g. several TM17 High Feature components).

3.7 Commissioning

Note

For information about commissioning , see the *SIMOTION Terminal Modules TM15 / TM17 High Feature* Commissioning Manual.

3.8 Technical data

Table 3-9 Technical specifications

Terminal Module TM17 High Feature	Unit	Value
Electronic power supply Voltage Current (without DRIVE-CLiQ or digital outputs) Power loss	 V_{DC} A_{DC} W	 24 VDC (20.4 – 28.8) 0.2 <4
Ambient temperature up to an altitude of 2000 m	°C	0 - 60
Storage temperature	°C	-40 to +85
Relative humidity	5% to 95%, no condensation	
I/O		
• Digital inputs/outputs	Each can be parameterized separately as DI or DO	
• Number of digital inputs/outputs	16	
• Isolation	No, 2 voltage groups	
• Max. cable length	m	30
Digital inputs		
• Voltage	V_{DC}	-30 to +30
• Low-level (an open digital input is interpreted as "low")	V_{DC}	-30 to +5
• High level	V_{DC}	15 to 30
• Input impedance	kΩ	2.8
• Current consumption (at 24 V DC)	mA	5 to 11
• Max. voltage in OFF state	V_{DC}	5
• Current in OFF state	mA	-11.0 to 2.0 (per channel)
• Input delay of digital inputs, typical	µs	(hardware filter that can be selected via the software) For "0" to "1" 1 or 125 ±15% [1] For "1" to "0" 1 or 125 ±15% [1]
• LEDs (per channel)	1 green at logic side	

Terminal Module TM17 High Feature	Unit	Value
Digital outputs (sustained short-circuit-proof)		
• Voltage	V_{DC}	24
• Max. load current per digital output	A_{DC}	0.5
• Output delay (ohmic load)		
typical	µs	For "0" to "1" 50 For "1" to "0" 75
maximum	µs	For "0" to "1" 100 For "1" to "0" 150
• Min. output pulse (100% amplitude, 0.5 A with resistive load)	µs	75 (typ.) 150 (max.)
• Max. switching frequency (100% amplitude, 50%/50% duty cycle, with 0.5 A and a resistive load)	kHz	1 (typ.)
• Voltage drop in ON state	V_{DC}	0.75 (max.) with all circuits fully loaded
• Leakage current in OFF state	µA	max. 10 per channel
• Output voltage drop (I/O power supply to the output)	V_{DC}	0.5
• Max. total current of the outputs (per group) to 60 °C to 50 °C to 40 °C	 A_{DC} A_{DC} A_{DC}	 2 3 4
IEC enclosure specification	IP20 degree of protection	
Protective-conductor connection	On the housing with M4/1.8 Nm screw	
Weight	kg	0.86
Approval	UL and cULus http://www.ul.com File: E164110, Vol. 2, Sec. 9	

[1] The shortest pulses can be detected using the 1 µs filter; however, the 125 µs filter will provide higher noise immunity.

Terminal Module TM31

4

4.1 Description

The Terminal Module TM31 is a terminal expansion module for snapping on to a DIN EN 60715 mounting rail. Terminal Module TM31 can be used to increase the number of available digital inputs/digital outputs and also the number of analog inputs/analog outputs within a drive system.

The TM31 contains the following terminals:

Table 4-1 Interface overview of the TM31

Type	Quantity
Digital inputs	8
Digital inputs/outputs	4
Analog inputs	2
Analog outputs	2
Relay outputs	2
Temperature sensor input	1

4.2 Safety Information

Caution

The cooling clearances of 50 mm above and below the components must be observed.

Caution

Connecting cables to temperature sensors must always be installed with shielding. The cable shield must be connected to the chassis potential at both ends over a large surface area. Temperature sensor cables that are routed together with the motor cable must be twisted in pairs and shielded separately.

4.3 Interface description

4.3.1 Overview

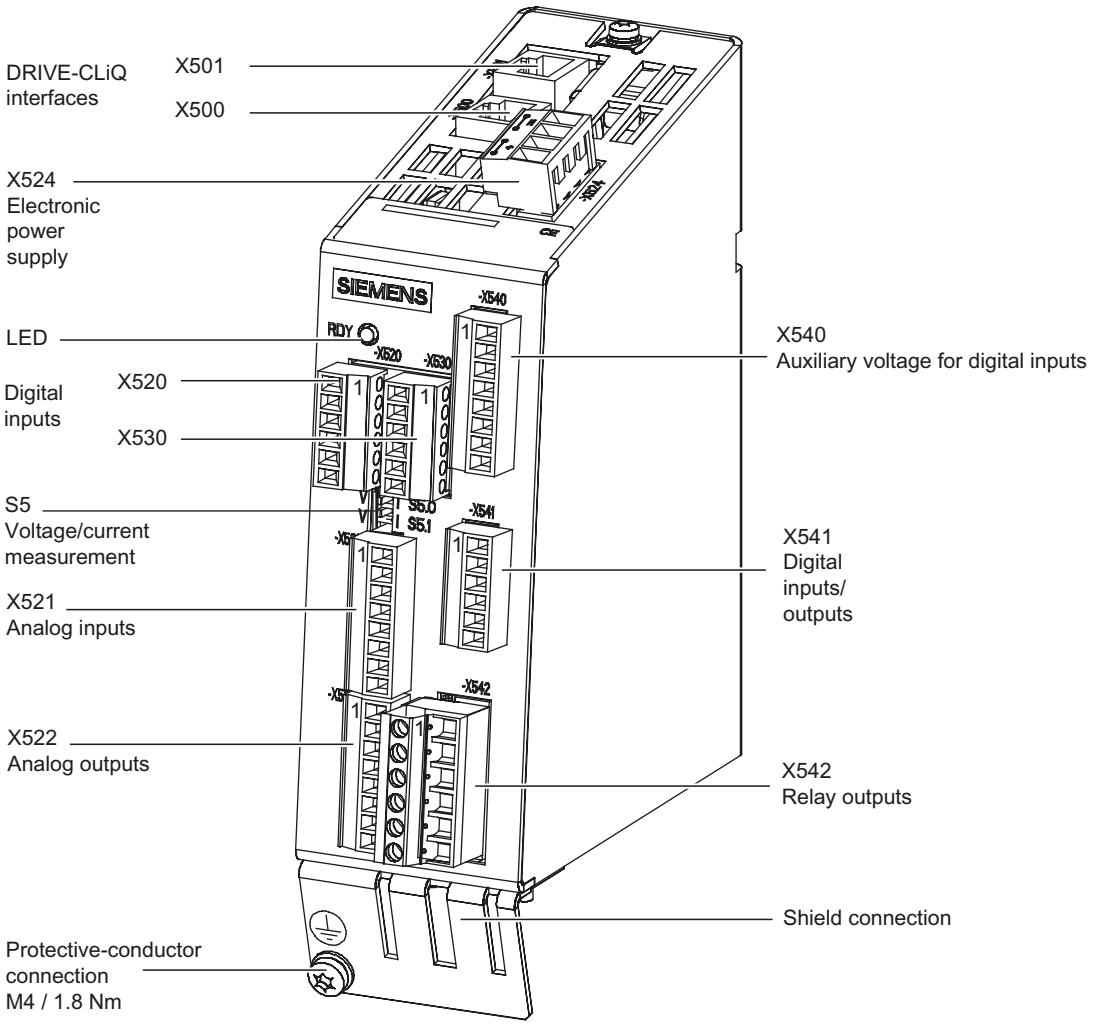


Figure 4-1 Interface description TM31

4.3.2 Connection example

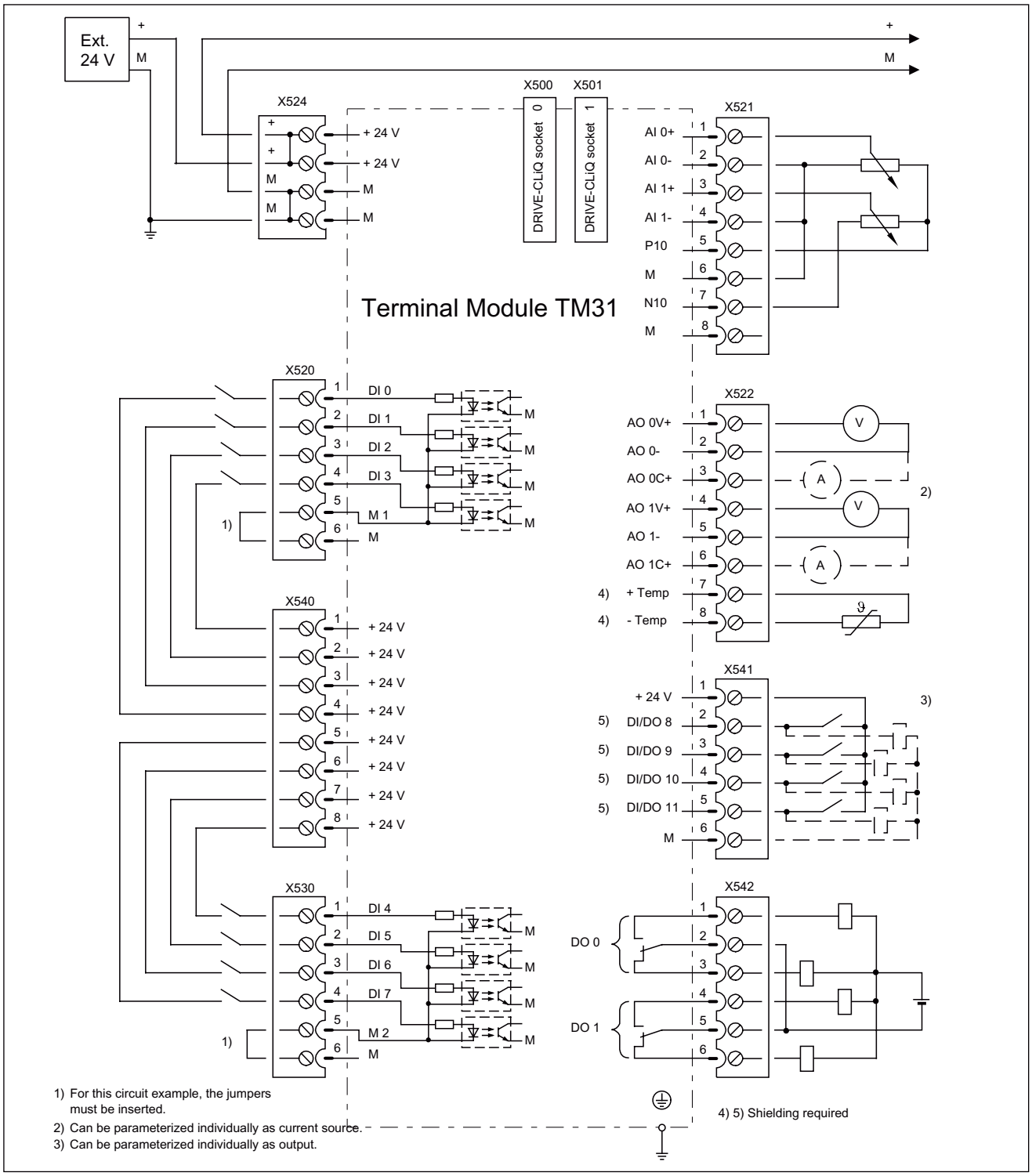
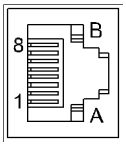


Figure 4-2 Example connection of TM31

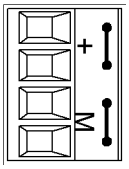
4.3.3 X500 and X501 DRIVE-CLiQ interface

Table 4-2 DRIVE-CLiQ interface X500 and X501

	Pin	Signal name	Technical specifications
	1	TXP	Transmit data +
	2	TXN	Transmit data -
	3	RXP	Receive data +
	4	Reserved, do not use	
	5	Reserved, do not use	
	6	RXN	Receive data -
	7	Reserved, do not use	
	8	Reserved, do not use	
	A	+ (24 V)	Power supply
	B	GND (0 V)	Electronic ground
Blanking plate for DRIVE-CLiQ interface: Yamaichi, order number: Y-ConAS-13			

4.3.4 Electronics power supply X524

Table 4-3 Terminals for the electronic power supply

	Terminal	Designation	Technical specifications
	+	Electronic power supply	Voltage: 24 V DC (20.4 V – 28.8 V) Current consumption: max. 1.1 A [1] Max. current via jumper in connector: 20 A at 55°C
	+	Electronic power supply	
	M	Electronic ground	
	M	Electronic ground	
Max. connectable cross-section: 2.5 mm² Type: Screw terminal 2 (see Appendix A)			

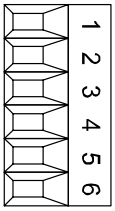
Note

The two "+" and "M" terminals are jumpered in the connector. This ensures that the supply voltage is looped through.

[1] Inclusive of current consumption for the DRIVE-CLiQ node.

4.3.5 Digital inputs X520

Table 4-4 Screw terminal X520

	Terminal	Designation[1)]	Technical specifications
	1	DI 0	Voltage: - 3 V to +30 V Typical current consumption: 10 mA at 24 V DC Isolation: The reference potential is terminal M1 Input delay: - For "0" to "1": 50 µs - For "1" to "0": 100 µs Level (incl. ripple) High level: 15 V to 30 V Low level: -3 V to 5 V
	2	DI 1	
	3	DI 2	
	4	DI 3	
	5	M1	
	6	M	
Max. connectable cross-section: 1.5 mm² Type: Screw terminal 1 (see Appendix A)			

1) DI: digital input; M: electronic ground M1: Ground reference

Notice

An open input is interpreted as "low".

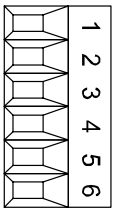
To enable the digital inputs to function, terminal M1 must be connected.
Options:

1. Use the provided ground reference of the digital inputs, or
2. Insert a jumper to terminal M

(Notice! this removes isolation for these digital inputs).

4.3.6 Digital inputs X530

Table 4-5 Screw terminal X530

	Terminal	Designation[1)]	Technical specifications
	1	DI 4	Voltage: -3 V to 30 V Typical current consumption: 10 mA at 24 V DC Input delay: - For "0" to "1": approx. 50 µs - For "1" to "0": approx. 100 µs Electrical isolation: The reference potential is terminal M2 Level (incl. ripple) High level: 15 V to 30 V Low level: -3 V to 5 V
	2	DI 5	
	3	DI 6	
	4	DI 7	
	5	M2	
	6	M	
Max. connectable cross-section: 1.5 mm² Type: Screw terminal 1 (see Appendix A)			

1) DI: digital input; M: electronic ground; M2: Ground reference

Notice

An open input is interpreted as "low".

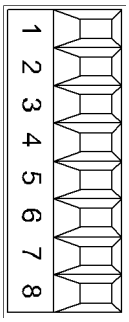
To enable the digital inputs to work, terminal M2 must be connected.
Options:

1. Use the provided ground reference of the digital inputs, or
2. Insert a jumper to terminal M

(Notice! this removes isolation for these digital inputs).

4.3.7 Auxiliary voltage for the digital inputs X540

Table 4-6 Screw terminal X540

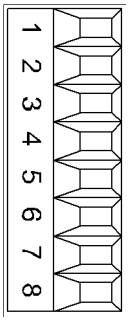
	Terminal	Designation	Technical specifications
	1	+24 V	Voltage: +24 V DC Max. total load current of +24 V auxiliary voltage of terminals X540 and X541 combined: 150 mA
	2	+24 V	
	3	+24 V	
	4	+24 V	
	5	+24 V	
	6	+24 V	
	7	+24 V	
	8	+24 V	
Max. connectable cross-section: 1.5 mm² Type: Screw terminal 1 (see Appendix A)			

Note

This voltage supply is only for powering the digital inputs.

4.3.8 Analog inputs X521

Table 4-7 Terminal block X521

	Terminal	Designation[1)]	Technical specifications
	1	AI 0+	The analog inputs can be switched between current input and voltage input using the S5.0 and S5.1 switches. Voltage: -10 V to 10 V; R_i = 100 kΩ Current 1: 4 mA to 20 mA; R_i = 250 Ω Current 2: -20 mA to 20 mA; R_i = 250 Ω Current 3: 0 mA to 20 mA; R_i = 250 Ω Resolution: 12 bits
	2	AI 0-	
	3	AI 1+	
	4	AI 1-	
	5	P10	Auxiliary voltage: P10 = 10 V N10 = -10 V Sustained short-circuit-proof
	6	M	
	7	N10	
	8	M	
Max. connectable cross-section: 1.5 mm² Type: Screw terminal 1 (see Appendix A)			

1) AI: analog inputs; P10/N10: auxiliary voltage; M or GND: Ground reference

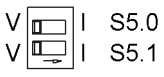
Caution

If more than 40 mA flows through the analog current input, then the component could be destroyed.

The common mode range may not be violated. This means that the analog differential voltage signals can have a maximum offset voltage of +/-30 V DC with respect to the ground potential. If the range is infringed, incorrect results may occur during analog/digital conversion.

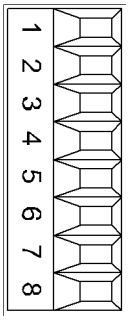
4.3.9 S5 current/voltage changeover switch for analog inputs

Table 4-8 Current/voltage selector S5

	Switch	Function
	S5.0	Selector voltage (V)/current (I) AI0
	S5.1	Selector voltage (V)/current (I) AI1

4.3.10 Analog outputs/temperature sensor connection X522

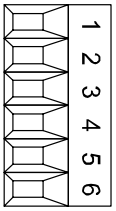
Table 4-9 Terminal block X522

	Terminal	Designation[1)]	Technical specifications
	1	AO 0V+	You can set the following output signals using parameters: Voltage: -10 V to 10 V (max. 3 mA) Current 1: 4 mA to 20 mA (max. load resistance ≤ 500 Ω) Current 2: -20 mA to 20 mA (max. load resistance ≤ 500 Ω) Current 3: 0 mA to 20 mA (max. load resistance ≤ 500 Ω) Resolution: 11 bits + sign Sustained short-circuit-proof
	2	AO 0-	
	3	AO 0C+	
	4	AO 1V+	
	5	AO 1-	
	6	AO 1C+	
	7	+Temp	Temperature sensor connection KTY84-1C130/PTC
	8	-Temp	
Max. connectable cross-section: 1.5 mm² Type: Screw terminal 1 (see Appendix A)			

1) AO xV: analog output voltage; AO xC: Analog output current

4.3.11 X541 bidirectional digital inputs/outputs

Table 4-10 Terminals for bidirectional digital inputs/outputs

	Terminal	Designation[1)]	Technical specifications
	1	+ 24 V	Auxiliary voltage: Voltage: +24 VDC Max. total load current of +24 V auxiliary voltage of terminals X540 and X541 combined: 150 mA As input: Voltage: -3 V to 30 V Typical current consumption: 10 mA at 24 VDC Input delay: - For "0" to "1": approx. 50 µs - For "1" to "0": approx. 100 µs As output: Voltage: 24 V DC Max. load current per output: 500 mA Max. total current of outputs: 100 mA / 1 A (assignable) Sustained short-circuit Output delay: - For "0" to "1": Typically 150 µs at 0.5 A ohmic load (500 µs maximum) - For "1" to "0": Typically 50 µs at 0.5 A ohmic load
	2	DI/DO 8	
	3	DI/DO 9	
	4	DI/DO 10	
	5	DI/DO 11	
	6	M	
Max. connectable cross-section: 1.5 mm² Type: Screw terminal 1 (see Appendix A)			

1) DI/DO: bidirectional digital input/output; M or GND: Electronic ground

Note

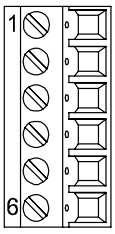
An open input is interpreted as "low".

Note

If a momentary interruption in the voltage occurs in the 24 V supply, the digital outputs will be deactivated until the interruption has been rectified.

4.3.12 Relay outputs X542

Table 4-11 Terminal block X542

	Terminal	Designation[1)]	Technical specifications
	1	DO 0.NC	Contact type: Two-way contact max. load current: 8 A Max. switching voltage: 250 V_{AC}, 30 V_{DC} Max. switching power at 250 V_{AC}: 2000 VA (cosϕ = 1) Max. switching power at 250 V_{AC}: 750 VA (cosϕ = 0.4) Max. switching power at 30 V_{DC}: 240 W (ohmic load) Required minimum current: 100 mA Overvoltage category: Class III to EN 60 664-1
	2	DO 0.COM	
	3	DO 0.NO	
	4	DO 1.NC	
	5	DO 1.COM	
	6	DO 1.NO	
Max. cross-section that can be connected 2.5 mm^2 Type: Screw terminal 3 (see Appendix A)			

1) DO: digital output, NO: normally-open contact, NC: normally-closed contact, COM: Mid-position contact

4.3.13 Description of the LEDs on the Terminal Module TM31

Table 4-12 Description of the LEDs on the TM31

LED	Color	State	Description
RDY	-	OFF	Electronics power supply is missing or 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. **Note:** LED is driven irrespective of the corresponding messages being reconfigured.
	Green/ Red	Flashing 2 Hz	Firmware is being downloaded.
	Green/Orange or Red/Orange	Flashing 2 Hz	Detection of the components via LED is activated (p0154). **Note:** Both options depend on the LED status when module recognition is activated via p0154 = 1.

Cause and rectification of faults

The following reference contains information about the cause of faults and how they can be rectified:

- SINAMICS S Commissioning Manual

4.4 Dimension drawing

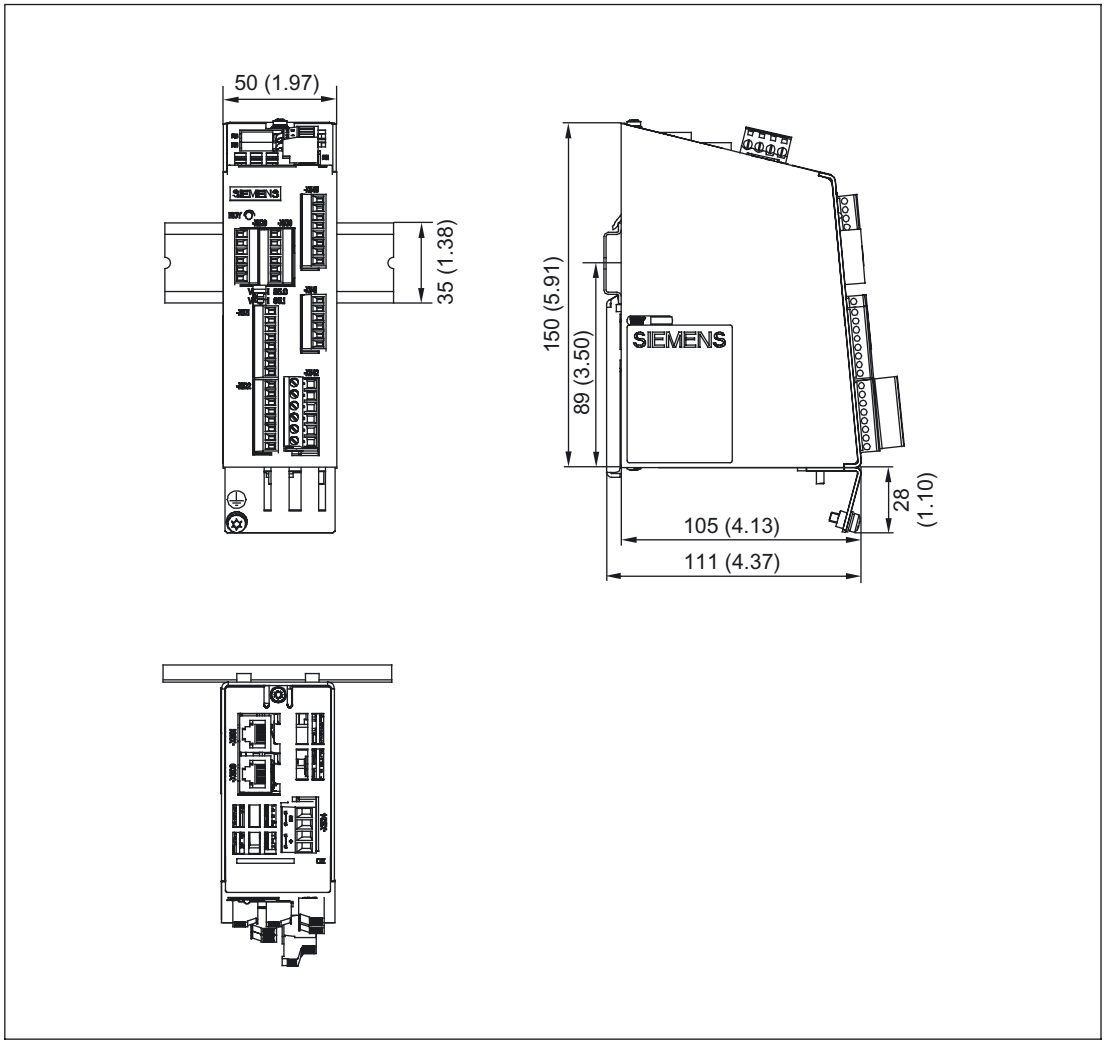


Figure 4-3 Dimension drawing of the TM31

4.5 Installation

Installation

1. Place the component on the DIN rail.
2. Snap the component on to the DIN rail. Make sure that the mounting slides at the rear latch into place.
3. You can now move the component on the DIN rail to the left or to the right to its final position.

Disassembly

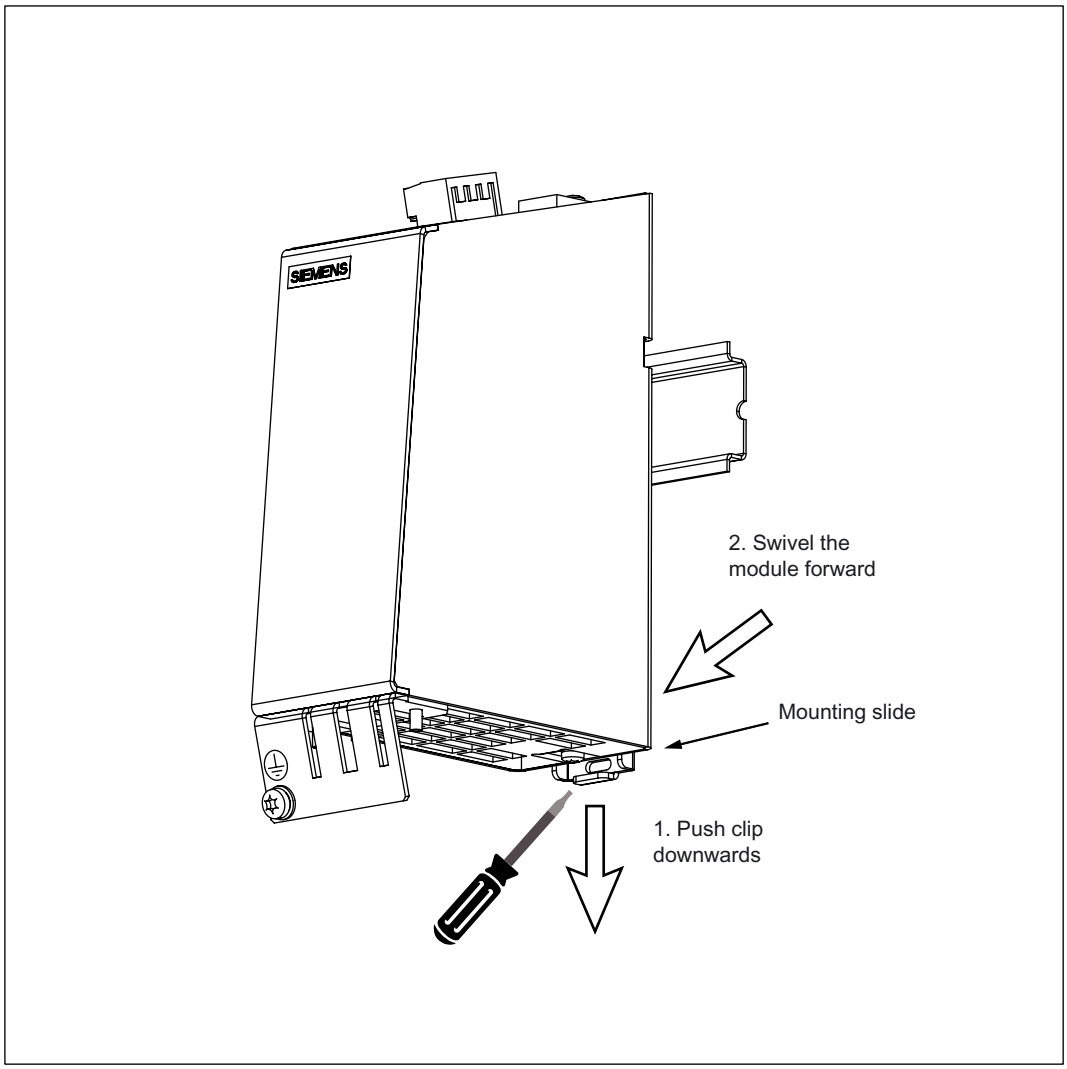


Figure 4-4 Releasing the component from a DIN rail

4.6 Electrical connection

It is always advisable to shield the digital input/output wiring.

The following pictures show two typical shield connections from Weidmüller.

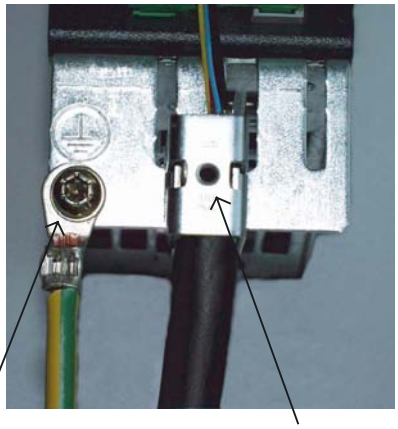


Figure 4-5 Shield connections

Internet address of the company:

Weidmüller: http://www.weidmueller.com

Danger

If the shielding procedures described and the specified cable lengths are not observed, the machine may not operate properly.

Connector coding

To ensure that identical connectors are assigned correctly on the TM31, the connecters are encoded as shown in the following diagram.

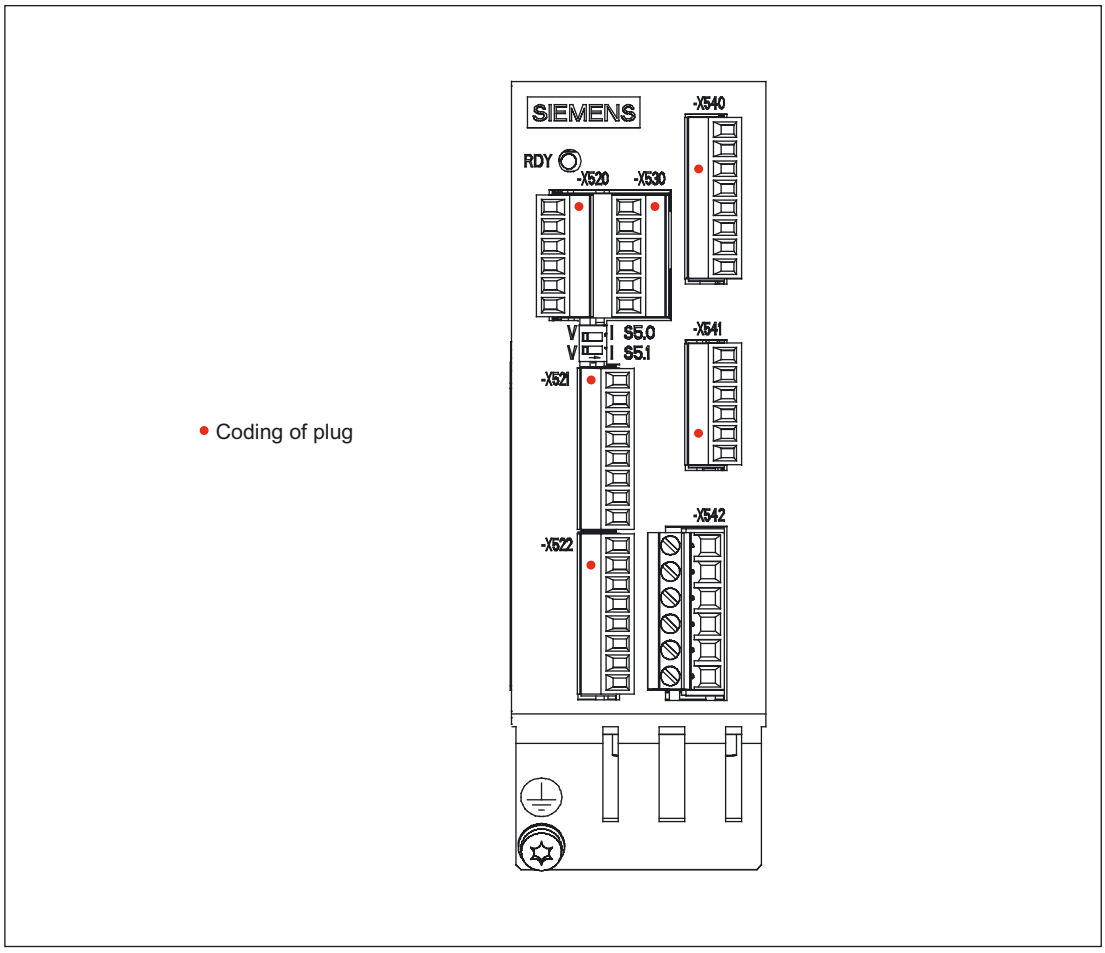


Figure 4-6 Connector coding of the TM31

The bending radii of the cables must be taken into account (see description of MOTION-CONNECT).

4.7 Commissioning

Note

Information about commissioning can be found in the *SIMOTION D4x5*Commissioning and Hardware Installation Manual and the SINAMICS documentation.

4.8 Technical Specifications

Table 4-13 Technical specifications

	Unit	Value
Electronic power supply		
Voltage	V_{DC}	24 DC (20.4 – 28.8)
Current (without DRIVE-CLiQ or digital outputs)	A_{DC}	0.5
Power loss	W	<10
PE/ground connection	On the housing with M4/1.8 Nm screw	
Response time	The response time for the digital inputs/outputs and the analog inputs/outputs consists of the following elements: • Response time on the component itself (approx. 1/2 DRIVE-CLiQ cycle). • Transmission time via the DRIVE-CLiQ connection (approx. 1 DRIVE-CLiQ cycle). • Evaluation on the control unit (see function diagram). **Reference:**SINAMICS S Parameter Manual – "Function diagrams" chapter	
Weight	kg	1

Terminal Module TM41

5

5.1 Description

The Terminal Module TM41 is an expansion module that is snapped onto a mounting rail (DIN EN 60715) in the cabinet.
An incremental encoder can be simulated using the encoder interface of the TM41. The TM41 can also be used to connect analog controls to SINAMICS.

TB41 is equipped with the following terminals:

Table 5-1 Interface overview of the TM41

Type	Quantity
Digital inputs, floating	4
Digital inputs/outputs	4
Analog inputs	1
TTL encoder output	1

The TM41 can be used starting from

- SINAMICS Firmware 2.4 and
- SIMOTION Version 4.0.

5.2 Safety Information

Danger

The 50 mm clearances above and below the components must be observed.

5.3 Interface description

5.3.1 Overview

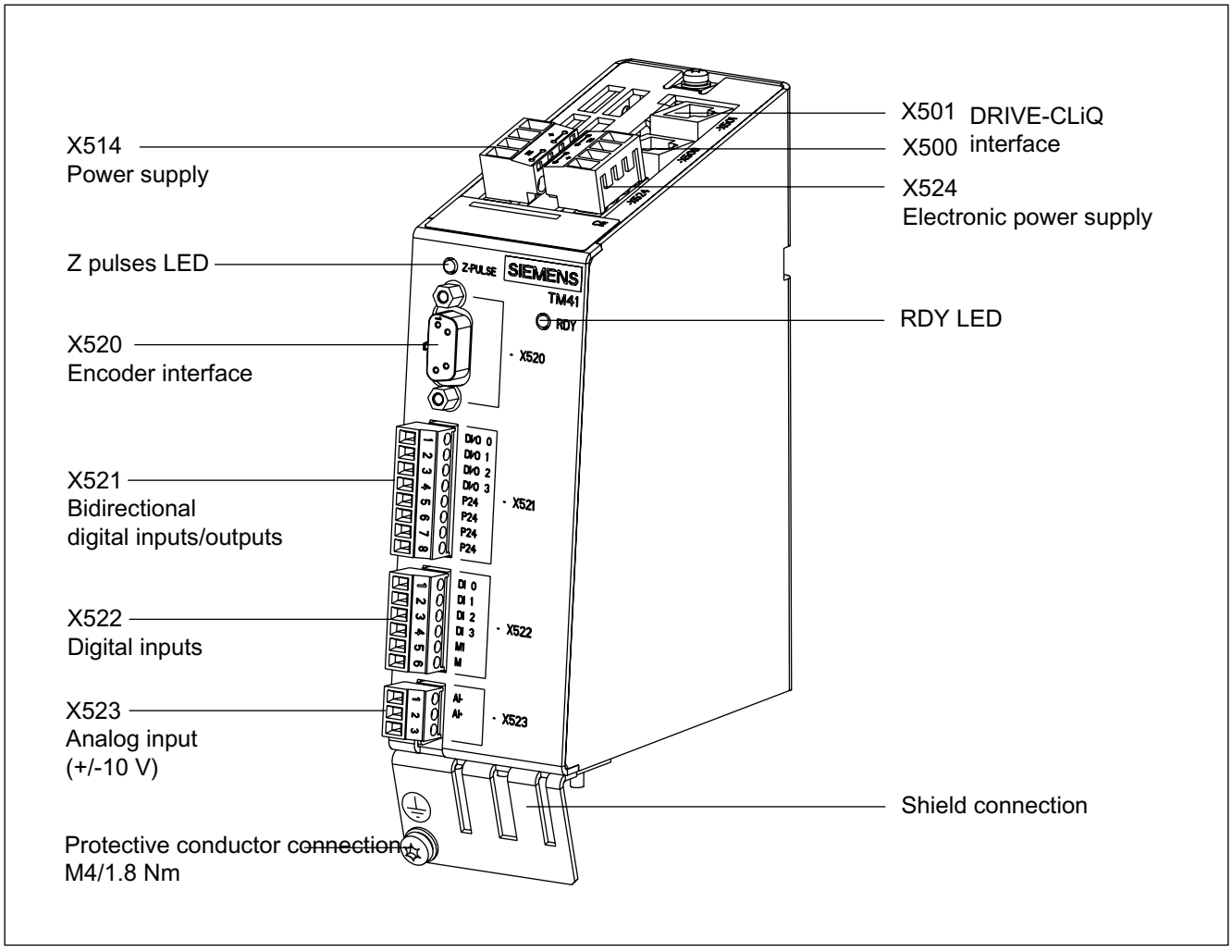


Figure 5-1 Interface description TM41

5.3.2 Connection example

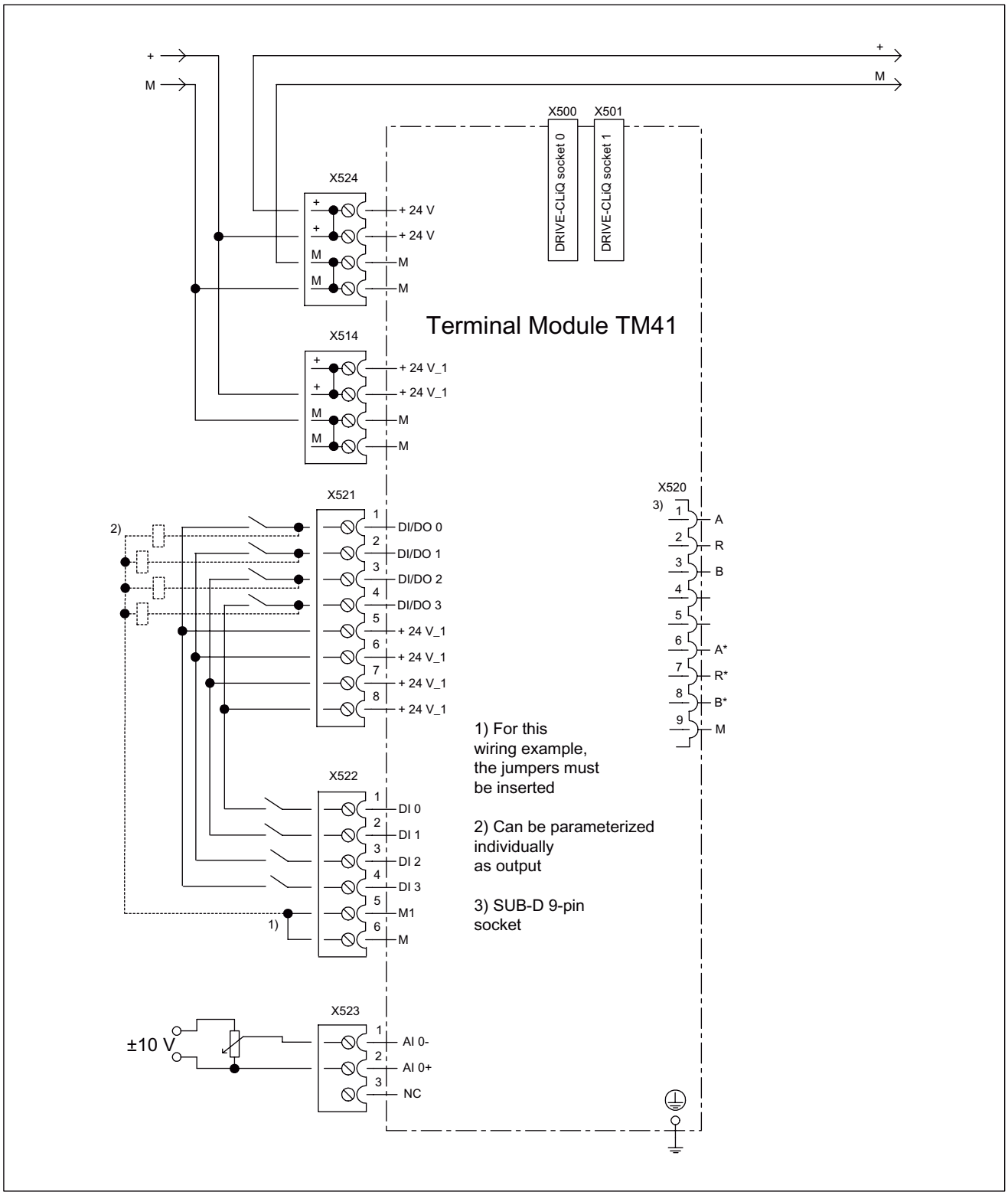
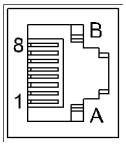


Figure 5-2 Sample connection of TM41

5.3.3 X500 and X501 DRIVE-CLiQ interface

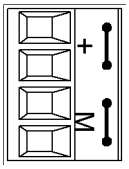
Table 5-2 DRIVE-CLiQ interface X500 and X501

	Pin	Signal name	Technical specifications
	1	TXP	Transmit data +
	2	TXN	Transmit data -
	3	RXP	Receive data +
	4	Reserved, do not use	
	5	Reserved, do not use	
	6	RXN	Receive data -
	7	Reserved, do not use	
	8	Reserved, do not use	
	A	+ (24 V)	Power supply
	B	GND (0 V)	Electronic ground
Blanking plate for DRIVE-CLiQ interface: Yamaichi, order number: Y-ConAS-13			

5.3.4 X514 and X524 Power Supply

The X514 interface supplies the X521 interface with current.
The X524 provides the electronic power supply.

Table 5-3 Power supply terminals X514 and X524

	Terminal	Designation	Technical specifications
	+	Power supply	Voltage: 24 VDC (20.4 V - 28.8 V) Current consumption: max. 0.5 A Max. current via jumper in connector: 20 A at 55 °C
	+	Power supply	
	M	Electronic ground	
	M	Electronic ground	
Max. connectable cross-section: 2.5 mm² Type: Screw terminal 2 (see Appendix A)			

Note

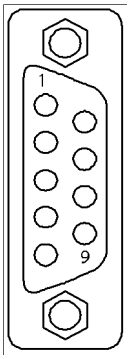
The two "+" and "M" terminals are jumpered in the connector. This ensures that the supply voltage is looped through.

The current drain of X524 increases by the value for the DRIVE-CLiQ node.

The current drain of X514 increases by the value for the digital outputs.

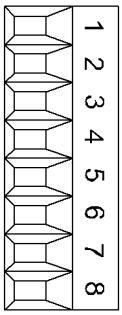
5.3.5 Sensor interface X520

Table 5-4 X520 interface

	Pin	Signal name	Technical specifications
	1	A	Incremental signal A
	2	R	Reference signal R
	3	B	Incremental signal B
	4	Reserved, do not use	
	5	Reserved, do not use	
	6	A*	Inverted incremental signal A
	7	R*	Inverted reference signal R
	8	B*	Inverted incremental signal B
	9	M	Ground
TTL encoder 100 m max. cable length Type: 9-pin SUB-D female			

5.3.6 X521 bidirectional digital inputs/outputs

Table 5-5 Screw terminal X521

	Terminal	Designation	Technical specifications
	1	DI/DO 0	As input: Voltage: -3 V to 30 V Typical current consumption: 10 mA at 24 V DC Level (including ripple) High level: 15 V to 30 V Low level: -3 V to 5 V Input delay: - For "0" to "1": approx. 50 µs - For "1" to "0": approx. 100 µs As output: Voltage: 24 VDC Max. load current per output: 0.5 mA Max. total current of outputs: 2 A Continued-short-circuit-proof Output delay: - For "0" to "1": typ. 150 µs at 0.5 A ohmic load (500 µs maximum) - For "1" to "0": typ. 150 µs at 0.5 A ohmic load
	2	DI/DO 1	
	3	DI/DO 2	
	4	DI/DO 3	
	5	+24 V	Voltage: +24 V DC Max. load current per terminal: 500 mA
	6	+24 V	
	7	+24 V	
	8	+24 V	
Max. connectable cross-section: 1.5 mm² Type: Screw terminal 1 (see Appendix A)			

Note

This voltage supply is only for powering the digital inputs.

Note

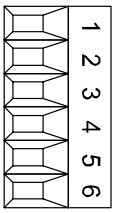
An open input is interpreted as "low".

Note

If a momentary interruption in the voltage occurs in the 24 V supply, the digital outputs will be deactivated until the interruption has been rectified.

5.3.7 X522 digital inputs / floating (isolated)

Table 5-6 Screw terminal X522

	Terminal	Designation[1)]	Technical specifications
	1	DI 0	Voltage: - 3 V to 30 V Typical current consumption: 6.5 mA at 24 V DC Isolation: The reference potential is terminal M1 Input delay: - For "0" to "1": approx. 50 µs - For "1" to "0": approx. 100 µs Level (incl. ripple) High level: 15 V to 30 V Low level: -3 V to 5 V
	2	DI 1	
	3	DI 2	
	4	DI 3	
	5	M1	
	6	M	
Max. connectable cross-section: 1.5 mm² Type: Screw terminal 1 (see Appendix A)			

1) DI: digital input; M: electronic ground M1: ground reference

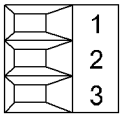
Notice

To enable the digital inputs to function, terminal M1 must be connected. This can be done as follows:

1) Connect the reference ground of the digital inputs, or
2) a jumper to terminal M
(Notice! this removes isolation for these digital inputs).

5.3.8 Analog input X523

Table 5-7 Terminal block X523

	Terminal	Designation[1)]	Technical specifications
	1	AI 0-	Voltage: -10 V to 10 V; R_i = 40 kΩ Resolution: 14 bits (13 bits + sign)
	2	AI 0+	
	3	Reserved, do not use	
Max. connectable cross-section: 1.5 mm² Type: Screw terminal 1 (see Appendix A)			

Caution

The common mode range may not be violated. This means that the analog differential voltage signals can have a maximum offset voltage of +/- 15 V with respect to the ground potential. If the range is infringed, incorrect results may occur during analog/digital conversion.

5.3.9 Description of the LEDs on the Terminal Module TM41

Table 5-8 Description of the LEDs on the TM41

LED	Color	Status	Description
READY	-	Off	Electronics power supply is missing or outside permissible tolerance range.
	Green	Continuous light	The component is ready for operation and cyclic DRIVE-CLiQ communication is taking place.
	Orange	Continuous light	DRIVE-CLiQ communication is being established.
	Red	Continuous light	This component has at least one fault. **Note:** LED is driven irrespective of the corresponding messages being reconfigured.
	Green/ Red	Flashing 2 Hz	Firmware is being downloaded.
	Green/ Orange or Red/ Orange	Flashing 2 Hz	Component recognition via LED is activated (p0154). **Note:** Both options depend on the LED status when component recognition is activated via p0154 = 1.
Z pulses	-	Off	Zero mark found, wait for zero mark output or component powered-down.
	Red	Continuous light	Zero mark not enabled or zero mark search.
	Green	Continuous light	Stopped at zero mark.
		Flashing	Flashes on each output zero mark.

Cause and rectification of faults

The following reference contains information about the cause of faults and how they can be rectified:

- SINAMICS S Commissioning Manual

5.4 Dimension drawing

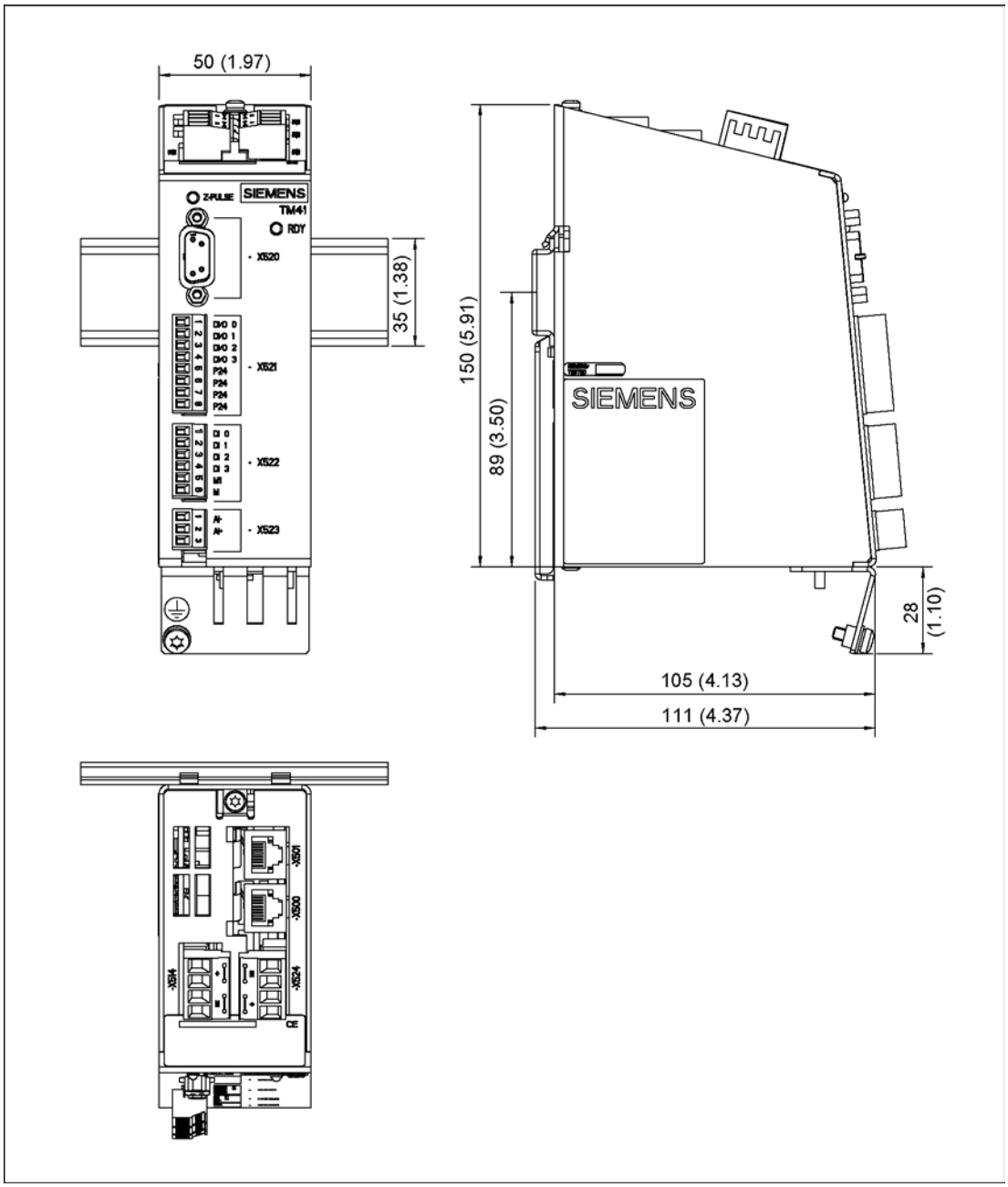


Figure 5-3 Dimension drawing of TM41

5.5 Installation

Installation

1. Place the component on the DIN rail.
2. Snap the component on to the DIN rail. Make sure that the mounting slides at the rear latch into place.
3. You can now move the component on the DIN rail to the left or to the right to its final position.

Disassembly

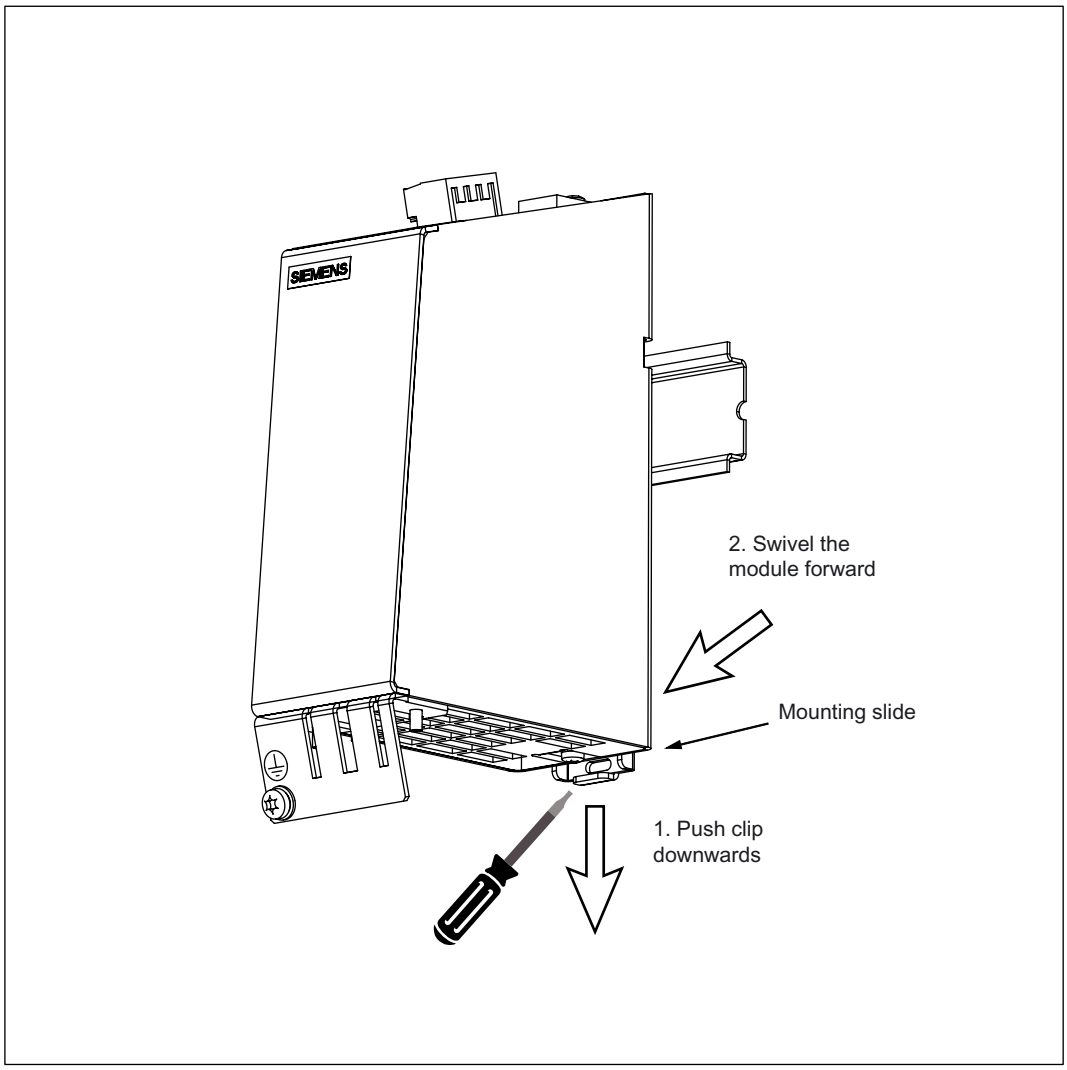


Figure 5-4 Releasing the component from a DIN rail

5.6 Electrical Connection

Shield contact for components from Weidmüller

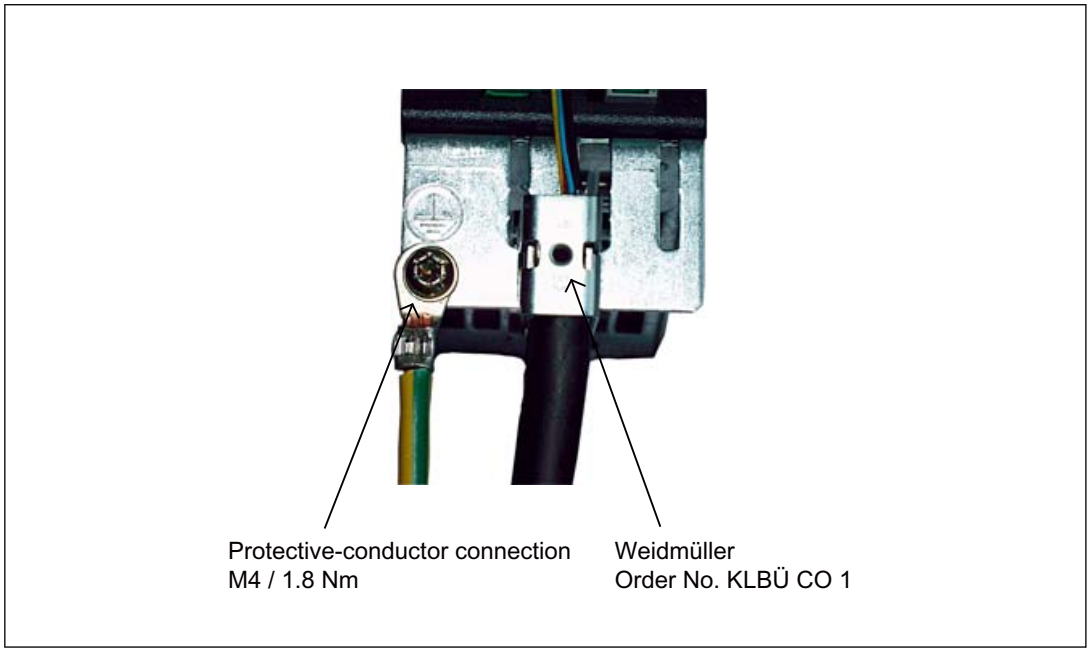


Figure 5-5 Shield contacts

Internet address of the company:

Weidmüller: http://www.weidmueller.com

The bending radii of the cables must be taken into account (see description of MOTION-CONNECT).

5.7 Commissioning

Note

For information about commissioning, refer to the following manuals:

SIMOTION D4x5 Commissioning and Hardware Installation Manual

SIMOTION Motion Control Technology Objects Axis Electric/Hydraulic, External Encoder Function Manual

SINAMICS documentation

5.8 Technical Specifications

Table 5-9 Technical specifications

	Unit	Value
Electronic power supply		
Voltage	V_{DC}	24 DC (20.4 – 28.8)
Current (without DRIVE-CLiQ or digital outputs)	A_{DC}	0.5
PE/chassis connection	On housing with M4/1.8 Nm screw	
Response time	The response time for the digital inputs/outputs and the analog input consists of the following elements: • Response time on the component itself (approx. 1/2 DRIVE-CLiQ cycle). • Transmission time via the DRIVE-CLiQ connection (approx. 1 DRIVE-CLiQ cycle). • Evaluation on the control unit (see function diagram). **References:** SINAMICS S Parameter Manual, "Function Diagrams" chapter.	
Weight	kg	0.85

Terminal Module TM54F

6

6.1 Description

The Terminal Module TM54F is a terminal expansion module for snapping on to a DIN EN 60715 mounting rail. The TM54F offers safe digital inputs and outputs for control of Safety Integrated functions of SINAMICS.

Each Control Unit can be assigned exactly one TM54F, which is connected via DRIVE-CLiQ. Additional stations (e.g., TMxx, SMxx, MMxx) can be connected to the same DRIVE-CLiQ line.

The following terminals are located on the TM54F:

Table 6-1 Interface overview of the TM54F

Type	Quantity
Fail-safe digital outputs (F-DO)	4
Fail-safe digital inputs (F-DI)	10
Sensor[1] power supplies, dynamically adjustable[2]	2
Sensor[1] power supply, not dynamically adjustable	1
Digital inputs for testing the F-DO with test stop	4

[1] Sensors: Fail-safe devices for commanding and detecting, such as emergency stop pushbuttons and safety locks as well as position switches and light arrays / light curtains.

[2]Dynamic adjustment: The sensor power supply is switched on and off during test stop for testing the sensors, the cable routing, and the evaluation electronics of TM54F.

The TM54F provides 4 fail-safe digital outputs and 10 fail-safe digital inputs. A fail-safe digital output consists of a P/M-switching output as well as a digital input for reading back the switching state. A fail-safe digital input is made up of two digital inputs.

6.2 Safety Information

Danger

The 50 mm clearances above and below the components must be observed.

6.3 Interface description

6.3.1 Overview

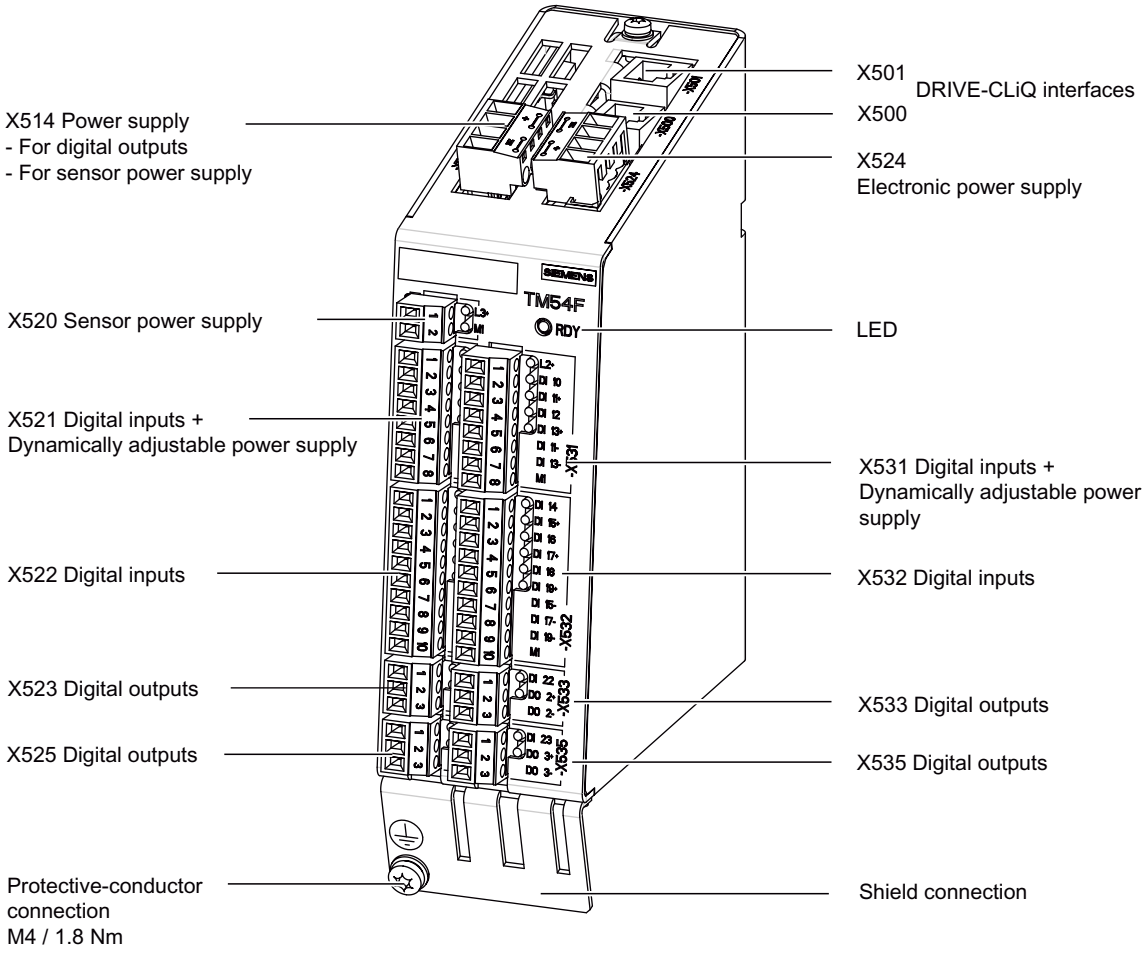


Figure 6-1 Interface Description - TM54F

6.3.2 Connection example

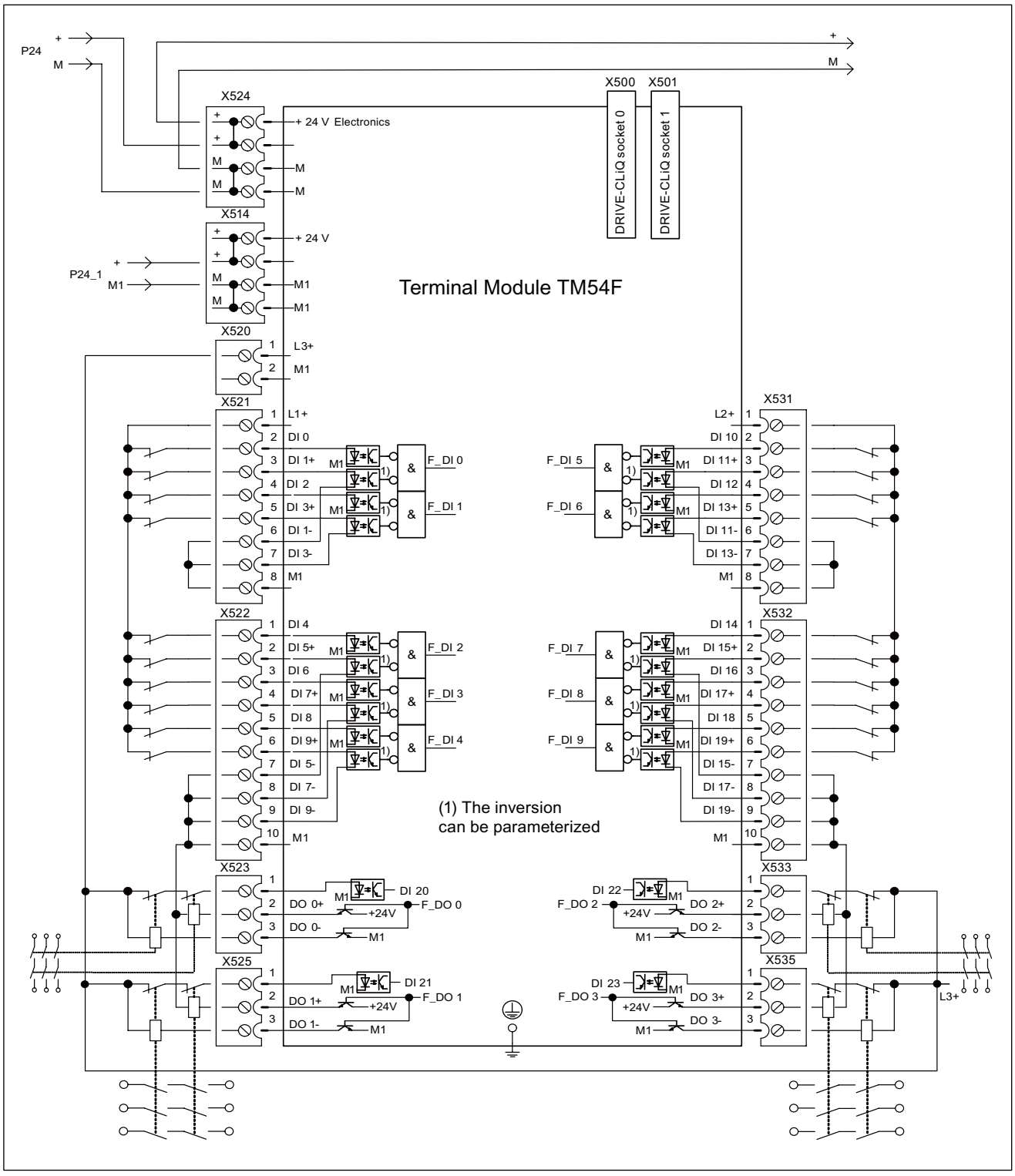
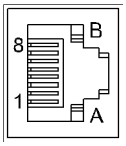


Figure 6-2 Connection example: TM54F

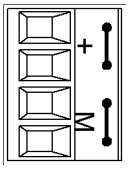
6.3.3 X500 and X501 DRIVE-CLiQ interface

Table 6-2 DRIVE-CLiQ interface X500 and X501

	Pin	Signal name	Technical specifications
	1	TXP	Transmit data +
	2	TXN	Transmit data -
	3	RXP	Receive data +
	4	Reserved, do not use	
	5	Reserved, do not use	
	6	RXN	Receive data -
	7	Reserved, do not use	
	8	Reserved, do not use	
	A	+ (24 V)	Power supply
	B	GND (0 V)	Electronic ground
Blanking plate for DRIVE-CLiQ interface: Yamaichi, order number: Y-ConAS-13			

6.3.4 X514 Power supply

Table 6-3 Terminals for power supply X514

	Terminal	Designation	Technical specifications
	+	Power supply	Voltage: 24 VDC (20.4 V - 28.8 V) Current consumption: max. 4 A[1] max. current via the bridges in the connector: 20 A at 55 °C
	+	Power supply	
	M1	Electronic ground	
	M1	Electronic ground	
Max. connectable cross-section: 2.5 mm² Type: Screw terminal 2 (see Appendix A)			

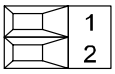
Note

The two "+" and "M" terminals are jumpered in the connector. This ensures that the supply voltage is looped through.

1)Inclusive of current consumption for digital outputs and the sensor infeed.

6.3.5 X520 Sensor power supply

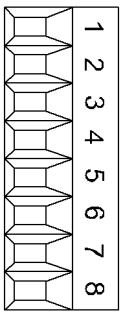
Table 6-4 Terminal X520

	Terminal	Designation	Technical specifications
	1	L3	500 mA, 24 V
	2	M1	

Not dynamically adjustable

6.3.6 X521 Digital inputs + dynamically adjustable power supply

Table 6-5 Screw terminal X521

	Terminal	Designation[1)]	Technical specifications
	1	L1	Voltage: +24 VDC max. total load current: 500 mA
	2	DI 0	Voltage: - 3 V to +30 V Typical current consumption: 3.2 mA at 24 VDC Isolation: Reference potential, see terminal 6, 7, 8 All digital inputs are isolated. Input delay:[2)] - For "0" to "1": approx. 30 µs (100 Hz) - For "1" to "0": approx. 60 µs (100 Hz) Level (incl. ripple) High level: 15 V to 30 V Low level: -3 V to 5 V
	3	DI 1+	
	4	DI 2	
	5	DI 3+	
	6	DI 1-	Reference potential for DI 1+
	7	DI 3-	Reference potential for DI 3+
	8	M1	Reference potential for DI 0, DI 2, L1+
An F-DI is made up of one digital input and a second digital input for which the cathode of the optocoupler is also connected to a terminal. F-DI 0 = terminal 2, 3, and 6 F-DI 1 = terminal 4, 5, and 7			
Max. connectable cross-section: 1.5 mm² Type: Screw terminal 1 (see Appendix A)			

1) DI: digital input; M1: Ground reference

2) Pure hardware delay

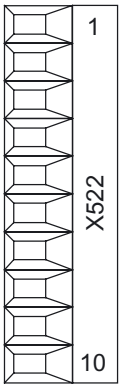
Notice

To enable digital inputs DI 0 to DI 2 to function, terminal M1 must be connected.
Options:

1) Use the provided ground reference of the digital inputs, or
2) Insert a jumper to terminal M1

6.3.7 X522 Digital inputs

Table 6-6 Screw terminal X522

	Terminal	Designation[1)]	Technical specifications
	1	DI 4	Voltage: - 3 V to +30 V Typical current consumption: 3.2 mA at 24 VDC Isolation: Reference potential, see terminal 7, 8, 9 All digital inputs are isolated. Input delay:[2)] - For "0" to "1": approx. 30 µs (100 Hz) - For "1" to "0": approx. 60 µs (100 Hz) Level (incl. ripple) High level: 15 V to 30 V Low level: -3 V to 5 V
	2	DI 5+	
	3	DI 6	
	4	DI 7+	
	5	DI 8	
	6	DI 9+	
	7	DI 5-	Reference potential for DI 5+
	8	DI 7-	Reference potential for DI 7+
	9	DI 9-	Reference potential for DI 9+
	10	M1	Reference potential for DI 4, DI 6, and DI 8
An F-DI is made up of one digital input and a second digital input for which the cathode of the optocoupler is also connected to a terminal. F-DI 2 = terminal 1, 2, and 7 F-DI 3 = terminal 3, 4, and 8 F-DI 4 = terminal 5, 6, and 9			
Max. connectable cross-section: 1.5 mm² Type: Screw terminal 1 (see Appendix A)			

1) DI: digital input; M1: Ground reference

2) Pure hardware delay

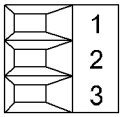
Notice

To enable digital inputs DI 4 , DI 6, and DI 8 to function, terminal M1 must be connected.
Options:

1) Use the provided ground reference of the digital inputs, or
2) Insert a jumper to terminal M1

6.3.8 X523 Digital outputs

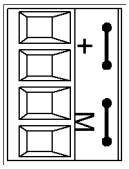
Table 6-7 Screw terminal X523

	Terminal	Designation	Technical specifications
	1	DI 20	Voltage: - 3 V to +30 V Typical current consumption: 3.2 mA at 24 VDC Isolation: Reference potential is terminal M1 The digital input is isolated. Input delay:[1)] - For "0" to "1": approx. 30 µs (100 Hz) - For "1" to "0": approx. 60 µs (100 Hz) Level (incl. ripple) High level: 15 V to 30 V Low level: -3 V to 5 V
	2	DO 0+	0.5 A Reference potential is terminal M1 0.5 A Reference potential is L1+, L2+, or L3+ Output delay:[1)] - For "0" to "1": approx. 300 µs - For "1" to "0": approx. 350 µs Total current consumption of all DOs: 2 A
	3	DO 0-	
An F-DO is made up of two digital outputs and one digital input for feedback F-DO 0 = terminal 1, 2, and 3			
Max. connectable cross-section: 1.5 mm² Type: Screw terminal 1 (see Appendix A)			

1) Pure hardware delay

6.3.9 Electronics power supply X524

Table 6-8 Terminals for the electronic power supply

	Terminal	Designation	Technical specifications
	+	Electronic power supply	Voltage: 24 V DC (20.4 V – 28.8 V) Current consumption: max. 1.1 A [1)] Max. current via jumper in connector: 20 A at 55°C
	+	Electronic power supply	
	M	Electronic ground	
	M	Electronic ground	
Max. connectable cross-section: 2.5 mm² Type: Screw terminal 2 (see Appendix A)			

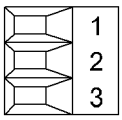
Note

The two "+" and "M" terminals are jumpered in the connector. This ensures that the supply voltage is looped through.

1) Inclusive of current consumption for the DRIVE-CLiQ node.

6.3.10 X525 Digital outputs

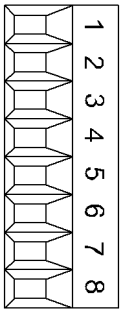
Table 6-9 Screw terminal X525

	Terminal	Designation	Technical specifications
	1	DI	Voltage: - 3 V to +30 V Typical current consumption: 3.2 mA at 24 VDC Isolation: Reference potential is terminal M1. The digital input is isolated. Input delay:1) - For "0" to "1": approx. 30 µs (100 Hz) - For "1" to "0": approx. 60 µs (100 Hz) Level (incl. ripple) High level: 15 V to 30 V Low level: -3 V to 5 V
	2	DO 1+	0.5 A Reference potential is terminal M1 0.5 A Reference potential is terminal L1+, L2+, or L3+ Output delay:1) - For "0" to "1": approx. 300 µs - For "1" to "0": approx. 350 µs Total current consumption of all DOs: 2 A
	3	DO 1-	
An F-DO is made up of two digital outputs and one digital input F-DO 1 = terminal 1, 2, and 3			
Max. connectable cross-section: 1.5 mm² Type: Screw terminal 1 (see Appendix A)			

1) Pure hardware delay

6.3.11 X531 Digital inputs + dynamically adjustable power supply

Table 6-10 Screw terminal X531

	Terminal	Designation[1)]	Technical specifications
	1	L 2+	Voltage: +24 VDC max. total load current: 150 mA
	2	DI 10	Voltage: - 3 V to +30 V Typical current consumption: 3.2 mA at 24 VDC Isolation: Reference potential, see terminal 6, 7, 8 All digital inputs are isolated. Input delay:[2)] - For "0" to "1": approx. 30 µs (100 Hz) - For "1" to "0": approx. 60 µs (100 Hz) Level (incl. ripple) High level: 15 V to 30 V Low level: -3 V to 5 V
	3	DI 11+	
	4	DI 12	
	5	DI 13+	
	6	DI 11-	Reference potential for DI 11+
	7	DI 13-	Reference potential for DI 13+
	8	M1	Reference potential for DI 10, DI 12, L2+
An F-DI is made up of one digital input and a second digital input for which the cathode of the optocoupler is also connected to a terminal. F-DI 5 = terminal 2, 3, and 6 F-DI 6 = terminal 4, 5, and 7			
Max. connectable cross-section: 1.5 mm² Type: Screw terminal 1 (see Appendix A)			

1) DI: digital input; M1: Ground reference

2) Pure hardware delay

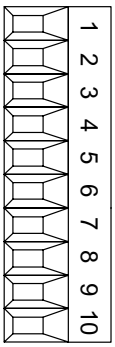
Note

To enable digital inputs DI 10 to DI 12 to function, terminal M1 must be connected.
Options:

1) Use the provided ground reference of the digital inputs, or
2) Insert a jumper to terminal M1

6.3.12 X532 Digital inputs

Table 6-11 Screw terminal X532

	Terminal	Designation[1]	Technical specifications
	1	DI 14	Voltage: - 3 V to +30 V Typical current consumption: 3.2 mA at 24 VDC Isolation: Reference potential is terminal M1. All digital inputs are isolated. Input delay:[2)] - For "0" to "1": approx. 30 µs (100 Hz) - For "1" to "0": approx. 60 µs (100 Hz) Level (incl. ripple) High level: 15 V to 30 V Low level: -3 V to 5 V
	2	DI 15+	
	3	DI 16	
	4	DI 17+	
	5	DI 18	
	6	DI 19+	
	7	DI 15-	Reference potential for 15+
	8	DI 17-	Reference potential for 17+
	9	DI 19-	Reference potential for 19+
	10	M1	Reference potential for 14, 16, 18
An F-DI is made up of one digital input and a second digital input for which the cathode of the optocoupler is also connected to a terminal. F-DI 7 = terminal 1, 2, and 7 F-DI 8 = terminal 3, 4, and 8 F-DI 9 = terminal 5, 6, and 9			
Max. connectable cross-section: 1.5 mm² Type: Screw terminal 1 (see Appendix A)			

1) DI: digital input; M1: Ground reference

2) Pure hardware delay

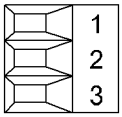
Note

To enable digital inputs DI 14 , DI 16, and DI 18 to function, terminal M1 must be connected. Options:

1) Use the provided ground reference of the digital inputs, or
2) Insert a jumper to terminal M1

6.3.13 X533 Digital outputs

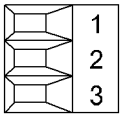
Table 6-12 Screw terminal X533

	Terminal	Designation	Technical specifications
	1	DI 22	Voltage: - 3 V to +30 V Typical current consumption: 3.2 mA at 24 VDC Isolation: Reference potential is terminal M1. The digital input is isolated. Input delay:[1)] - For "0" to "1": approx. 30 µs (100 Hz) - For "1" to "0": approx. 60 µs (100 Hz) Level (incl. ripple) High level: 15 V to 30 V Low level: -3 V to 5 V
	2	DO+	0.5 A Reference potential is terminal M1 0.5 A Reference potential is terminal L1+, L2+, or L3+ Output delay:[1)] - For "0" to "1": approx. 300 µs - For "1" to "0": approx. 350 µs Total current consumption of all DOs: 2 A
	3	DO-	
An F-DO is made up of two digital outputs and one digital input for feedback F-DO 2 = terminal 1, 2, and 3			
Max. connectable cross-section: 1.5 mm² Type: Screw terminal 1 (see Appendix A)			

1) Pure hardware delay

6.3.14 X535 Digital outputs

Table 6-13 X535 Digital inputs/outputs

	Terminal	Designation	Technical specifications
	1	DI 23	Voltage: - 3 V to +30 V Typical current consumption: 3.2 mA at 24 VDC Isolation: Reference potential is terminal M1. The digital input is isolated. Input delay:[1)] - For "0" to "1": approx. 30 µs (100 Hz) - For "1" to "0": approx. 60 µs (100 Hz) Level (incl. ripple) High level: 15 V to 30 V Low level: -3 V to 5 V
	2	DO 3+	0.5 A Reference potential is terminal M1 0.5 A Reference potential is terminal L1+, L2+, or L3+ Output delay:[1)] - For "0" to "1": approx. 300 µs - For "1" to "0": approx. 350 µs Total current consumption of all DOs: 2 A
	3	DO 3-	
An F-DO is made up of two digital outputs and one digital input for feedback F-DO 3 = terminal 1, 2, and 3			
Max. connectable cross-section: 1.5 mm² Type: Screw terminal 1 (see Appendix A)			

1) Pure hardware delay

6.3.15 Description of the LEDs on the Terminal Module TM54F

Table 6-14 Description of the LEDs on the Terminal Module TM54F

LED	Color	Status	Description
READY	-	Off	Electronics power supply is missing or outside permissible tolerance range.
	Green	Continuous light	The component is ready for operation and cyclic DRIVE-CLiQ communication is taking place.
	Orange	Continuous light	DRIVE-CLiQ communication is being established.
	Red	Continuous light	At least one fault is present in this component. **Note:** The LED is activated regardless of whether the corresponding messages have been reconfigured.
	Green/Red	Flashing 0.5 Hz	Firmware is being downloaded.
		Flashing 2 Hz	Firmware download is complete. Waiting for POWER ON
	Green / Orange or Red / Orange	Flashing	Detection of component via LED is activated (p0154). **Note:** Both options depend on the LED status when module recognition is activated via p0154 = 1.

6.3.16 Cause and rectification of faults

Cause and rectification of faults

The following reference contains information about the cause of faults and how they can be rectified:

- SINAMICS S Commissioning Manual

6.4 Dimensional diagram

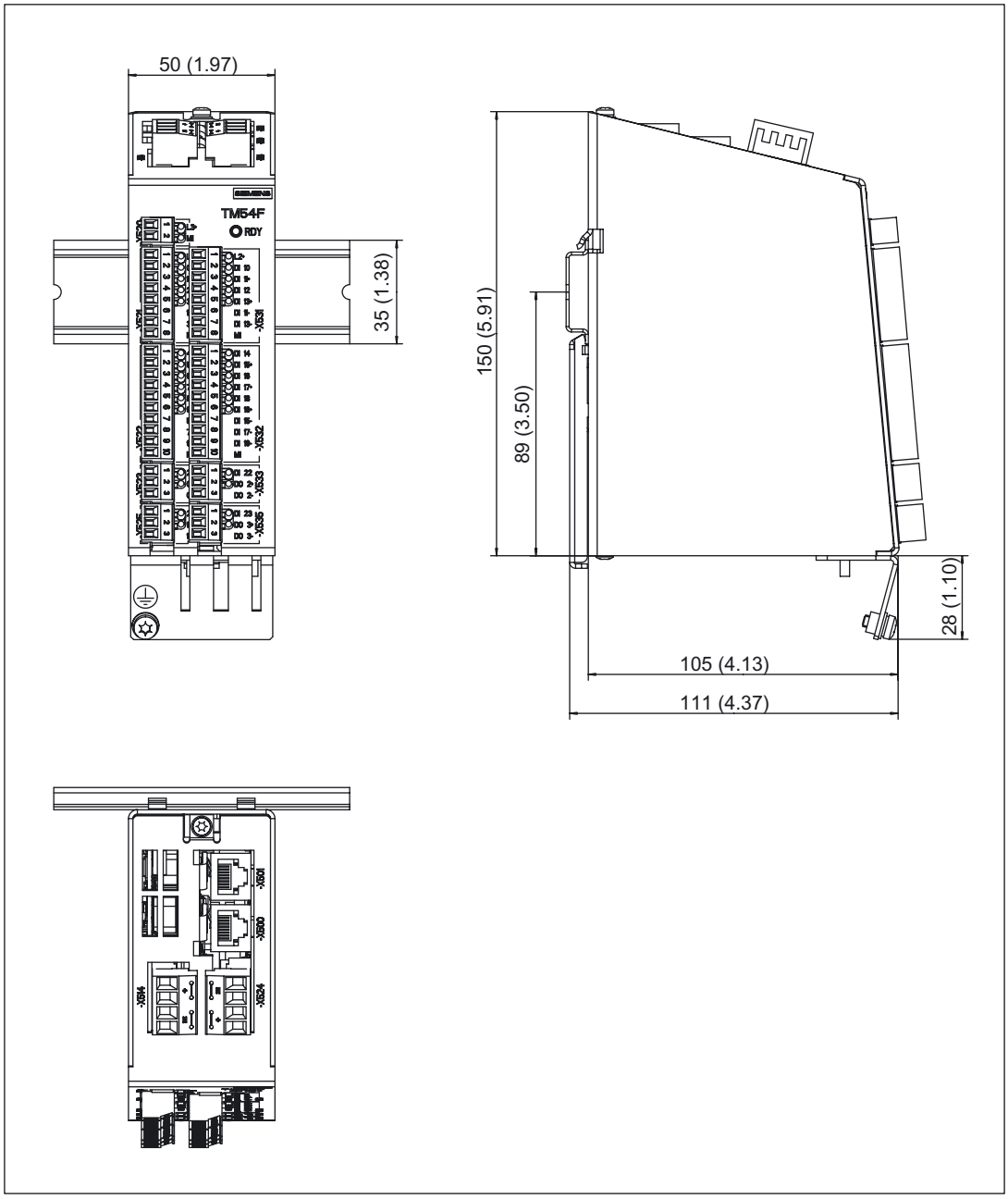


Figure 6-3 Dimension drawing of the TM54F

6.5 Installation

Installation

1. Place the component on the DIN rail.
2. Snap the component on to the DIN rail. Make sure that the mounting slides at the rear latch into place.
3. You can now move the component on the DIN rail to the left or to the right to its final position.

Disassembly

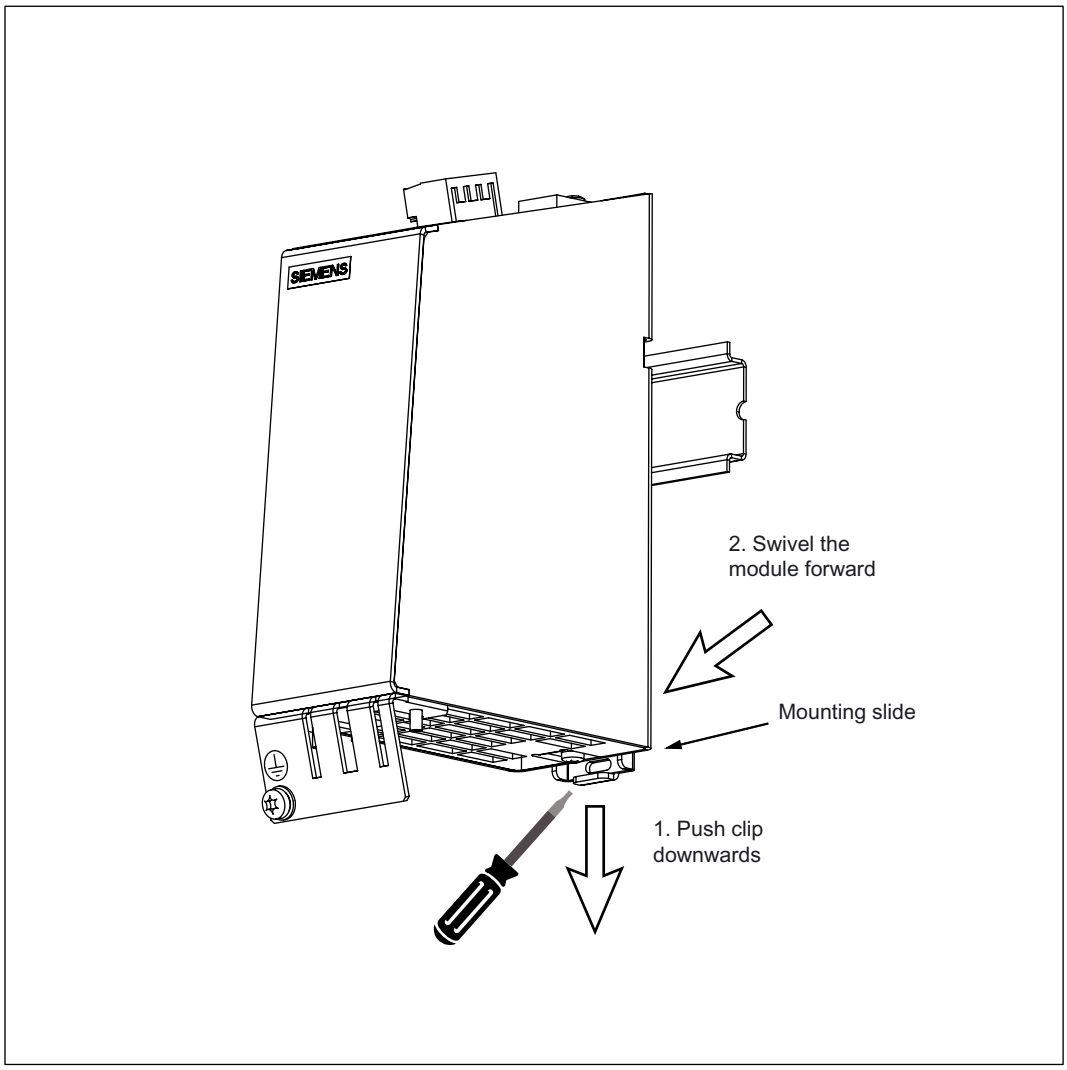


Figure 6-4 Releasing the component from a DIN rail

6.6 Commissioning

Note

Information about commissioning can be found in the *SINAMICS Safety Integrated* Function Manual (available with V2.5 SP1 and higher).

6.7 Technical specifications

Table 6-15 Technical specifications

	Unit	Value
Current demand (X524 at 24 VDC) without DRIVE-CLiQ supply	mA	160
Current demand (X514 at 24 VDC) without digital outputs	mA	35
- Cable length for 24 V infeed: - For longer cable lengths, the "Weidmüller Type No. PU DS 24 16A" surge protector must be used.	m	< 30
• Fail-safe digital inputs (F-DI) (with isolation) • Fail-safe digital outputs (F-DO) (with isolation) • Standard digital inputs (with isolation)		10 4 4
Fail-safe digital inputs (F-DI) and standard digital inputs		
• Voltage	V	0 - 30
• Low-level (an open digital input is interpreted as "low")	V	- 3 - + 5
• High level	V	15 - 30
• Current consumption (at 24 V DC)	mA	approx. 3
• Input delay[1)]		
– For "0" to "1"	µs	approx. 30 (100 Hz)
– For "1" to "0"	µs	approx. 60 (100 Hz)
Fail-safe digital outputs (F-DO), sustained short-circuit-proof		
• Voltage	V	24
• Max. load current per digital output	A	0.5
• Output delay[1)]		
– For "0" to "1"	µs	300
– For "1" to "0"	µs	350
Power loss	W	4.5 at 24 V
PE/chassis connection		On housing with M4 screw
Weight	kg	approx. 0.9

1) Pure hardware delay

Communication Board CBE30

7

7.1 Description

The system is connected to PROFINET IO using the Communication Board Ethernet CBE30 interface module for SIMOTION D4x5. The module supports PROFINET IO with isochronous Realtime Ethernet (IRT), PROFINET IO with RT, and standard TCP/IP communication. The Option Board has an X1400 interface with four ports and integrated switch functionality.

A PROFINET IO cycle is divided into 2 channels: The IRT channel, which contains only IRT message frames, and a standard channel, which is shared by RT and IT message frames.

Further advantages of PROFINET IO with IRT are described in the relevant publications/documentation.

CBE30 description

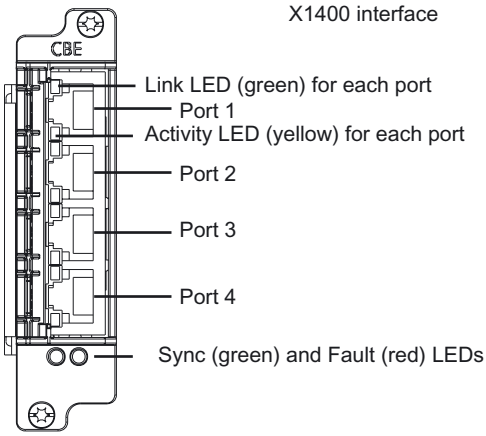


Figure 7-1 Communication Board Ethernet CBE30

7.2 Nameplates

Nameplate

The following figure shows you all the information included on the nameplate.

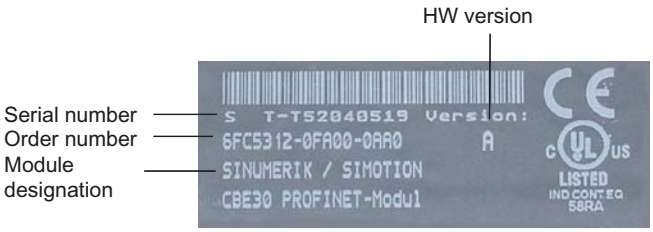


Figure 7-2 CBE30 nameplate

You might need to access the information provided on the nameplate after the CBE30 has been mounted. Because the nameplate is mounted on the underside of the Option Board, we recommend that you note the serial number before mounting the CBE30.

Note

The information contained in each field of the nameplate on your actual Option Board may differ from the information presented in this manual (for example, a higher product version, approvals and marks that have not yet been earned, etc., may be shown).

MAC address

A second plate for the MAC address of the Ethernet interfaces (up to 5 MAC addresses) is attached to the top side of the board:

Figure 7-3 CBE30 MAC address

The plate is only visible when the Option Board has been removed. You need the MAC address to assign an IP address.

Note

The MAC address is affixed to the top side of the board, behind the R45 sockets.

7.3 Safety Information

Caution

The option board may only be inserted and removed when the control unit and option board are disconnected from the power supply.

Caution

The CBE30 must only be operated by qualified personnel. The ESD notices must be observed.

7.4 Interface description

7.4.1 X1400 Ethernet interfaces

Characteristics

The X1400 interface has full-duplex 10/100-Mbit Ethernet ports. The module has an integrated 4-port switch.

Interface features

Table 7-1 X1400

Features	Type
Connector type	RJ45 socket connector
Cable type	Industrial Ethernet cable
Maximum cable length	100 m

Pin assignment

Table 7-2 X1400 interface

Pin	Signal name	Signal type	Meaning
1	TXP	Output	Ethernet transmit differential signal
2	TXN	Output	Ethernet transmit differential signal
3	RXP	Input	Ethernet receive differential signal
4	--		4 together with 5 via 75 ohm at the 1 nF capacitor to the shield ground
5	--		4 together with 5 via 75 ohm at the 1 nF capacitor to the shield ground
6	RXN	Input	Ethernet receive differential signal
7	--		7 together with 8 via 75 ohm at the 1 nF capacitor to the shield ground
8	--		7 together with 8 via 75 ohm at the 1 nF capacitor to the shield ground
Screened backshell	M_EXT		Screen, permanently connected

Position of the ports

The interface is located on the front side of the option board.

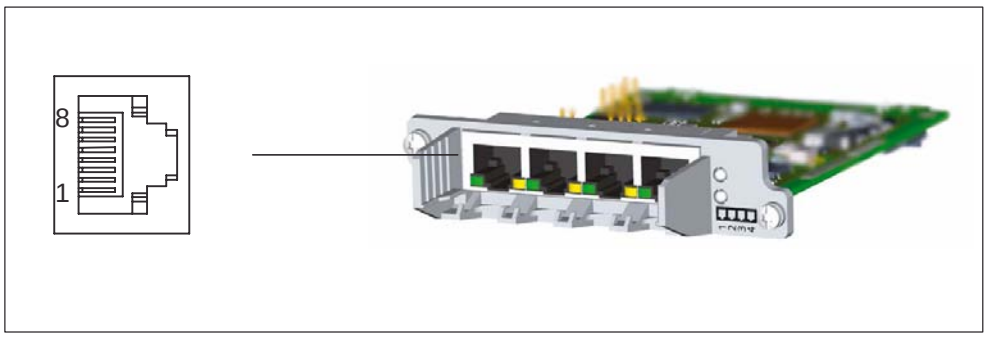


Figure 7-4 CBE30 interface

7.4.2 PROFINET cables

Cable and connector types

Note

For connecting PROFINET IO to CBE30 it is recommended using a connector with a 145° cable outlet (IE FC RJ45 plug 145).

Figure 7-5 RJ45 PN connector with a 145°cable outlet

Table 7-3 Connector types for PROFINET

Connectors	Designation	Order No.
IE FC RJ-45 Plug 145	RJ45 PN connector with angled exit	6GK1 901-1BB30-0AA0/ 6GK1 901-1BB30-0AB0

Table 7-4 Cable types for PROFINET

Cable	Designation	Order No.
IE FC Cable GP 2 (Type A)	4-wire, shielded TP installation cable for IE FC RJ45	6XV1 840-2AH10
IE FC Flexible Cable GP 2 (Type A)	4-wire, shielded flexible TP installation cable for IE FC RJ45	6XV1 870-2B
IE FC Trailing Cable GP 2x2 (Type C)	4-wire TP installation cable for ground cable use	6XV1 870-2D
IE FC Trailing Cable 2x2 (Type C)	4-wire shielded TP installation cable for connection to FC OUTLET RJ 45, for ground cable use	6XV1 840-3AH10
IE FC Marine Cable 2x2	4-wire shielded marine-certified TP installation cable for connection to FC OUTLET RJ45	6XV1 840-4AH10

Note

For a description of how to attach the connector to the cable, refer to the information about the respective connector in the "Industrial Communication for Automation and Drives" Catalog" (**IK PI** Catalog). You can also order cables and connectors there.

7.4.3 LED displays

LED displays

The X1400 interface with the four ports provides integrated LEDs for displaying the link and the activity. The front panel of the board is also fitted with two LEDs (Fault and Sync), which indicate the bus status.

Table 7-5 LED displays

Name	Color	Status	Meaning
Link port	Green	Green	A different device is connected to port x and a physical connection exists.
Activity port	Yellow	Yellow	Data are being received or sent at port x.
Fault	Red	Off	CBE30 runs correctly; the data exchange to all configured IO devices runs.
		Red	CBE30 bus error • No physical connection to a subnet/switch. • Incorrect transmission rate. • Full duplex transmission is not activated.
		Flashing red (2 Hz)	• Failure of a connected I/O device. • At least one of the assigned IO devices cannot be addressed. • Incorrect or no configuration.
Sync[1)]	Green	Off	SIMOTION D4xx task system is not synchronized to the send cycle of PROFINET IO IRT. An internal substitute cycle of the same length as the send cycle will be generated.
		Green	The SIMOTION D4xx task system has synchronized to the cycle for PROFINET IO IRT, and the data exchange is running. SINAMICS integrated and ext. DP interfaces are synchronized with the PROFINET IO IRT cycle.
		Flashing green (0.5 Hz)	The SIMOTION D4xx task system has synchronized to the cycle for PROFINET IO IRT, and the cyclic data exchange is running. SINAMICS integrated and ext. DP interfaces are not yet synchronized with the PROFINET IO IRT cycle.

1) If no IRT has been configured, then generally no synchronization will be made to the send cycle. LED is off.

7.5 Dimension drawing

CBE30 description

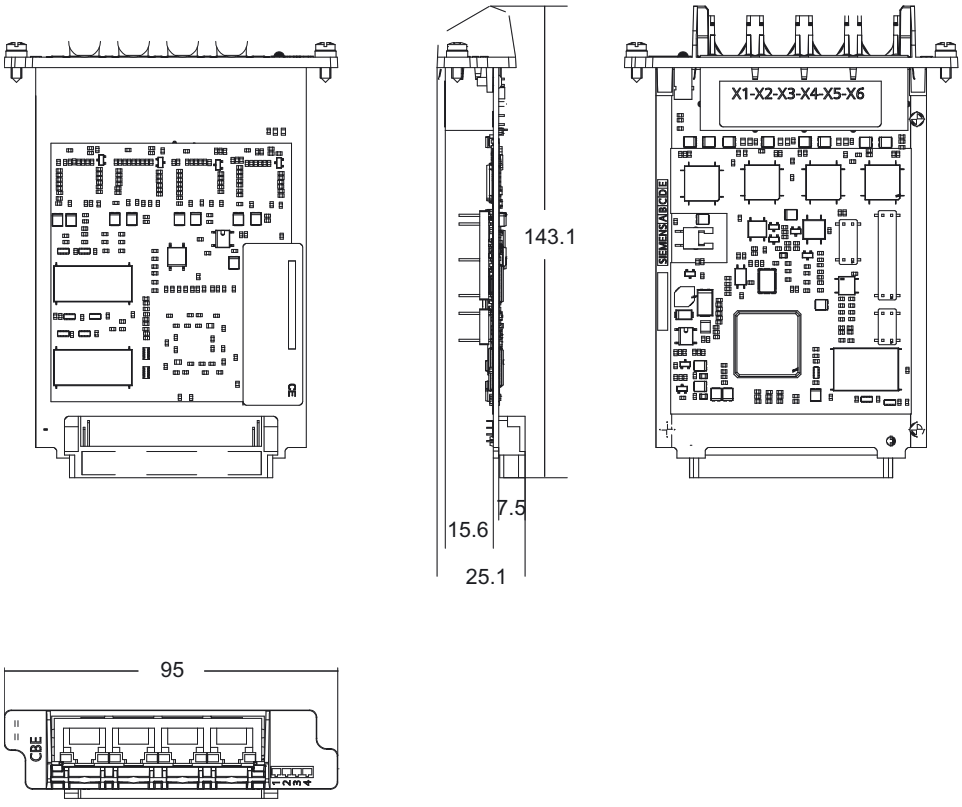


Figure 7-6 CBE30 dimension drawing

7.6 Installation/Mounting

Installing CBE30

A CBE30 is installed in the option slot of the control unit.

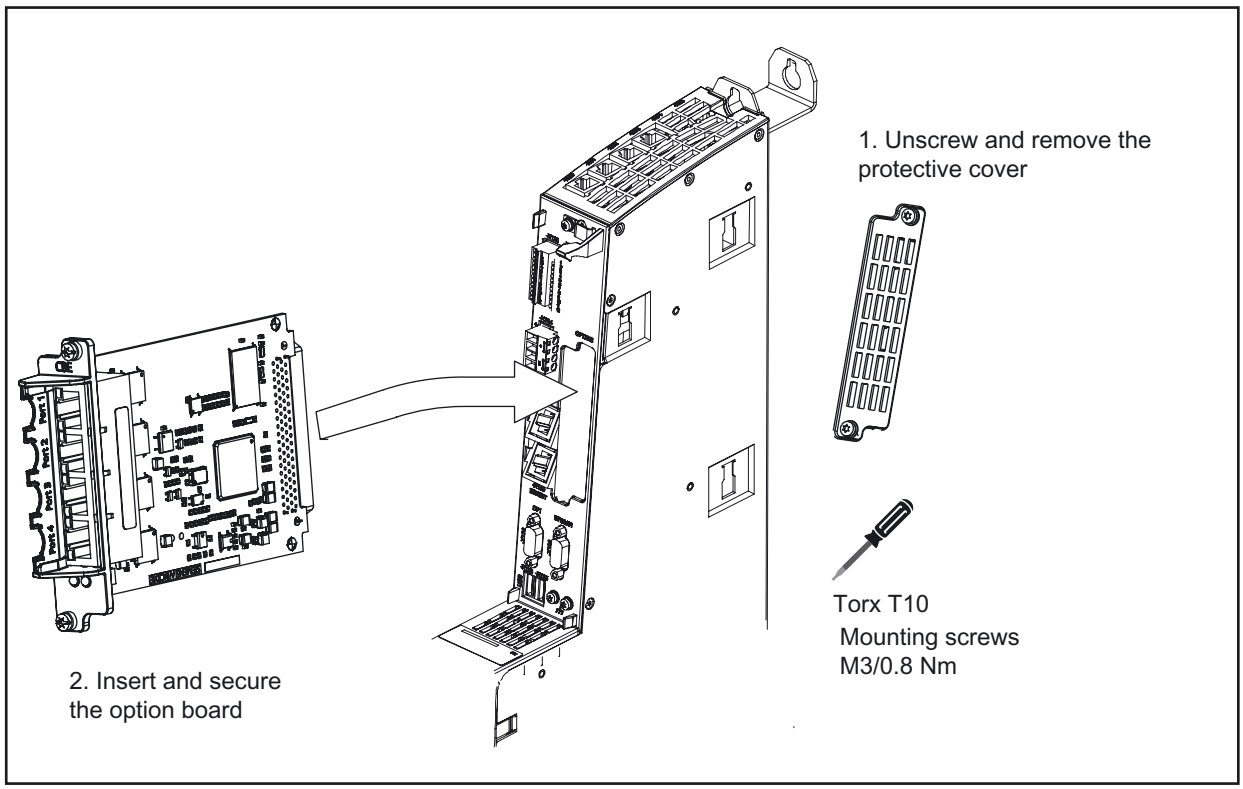


Figure 7-7 Installing CBE30

7.7 Commissioning

Note

Information about commissioning can be found in the *SIMOTION D4x5*Commissioning and Hardware Installation Manual.

7.8 Technical data

CBE30 technical data

Table 7-6 Technical data

Communication Board Extension (CBE30)		
Power supply from host:		
P3V3	3.3 V ±100 mV	
P5	P5 = 5.1 V ±100 mV	
P3V3 current consumption	max. 900 mA	
P5 current consumption	max. 560 mA	

Storage and operation

Table 7-7 Environmental conditions for CBE30

	Range	Standard
Storage	- 40 °C to +70 °C	
Operation	0 °C to +55 °C	
Relative humidity	> 5% to 95%	DIN EN 60721-3-3, Class 3K5
Degree of protection		IP00 acc. to DIN EN 60529
Vibratory load		DIN EN 60721-3-3, Class 3M6
Shock load		DIN EN 60721-3-3, 3 M4
Free fall		DIN EN 60721-3-2, 2M1 and 2M2
Toppling		DIN EN 60721-3-2, Class 2M1

Dimensions

Table 7-8 Length x width

	in [mm]
Length	113
integer	77

Controller Extension CX32

8

8.1 Description

The Controller Extension CX32 permits the drive-side computer performance to be scaled within the SIMOTION D product series.

8.2 Safety Information

Notice

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

8.3 Interface description

8.3.1 Overview

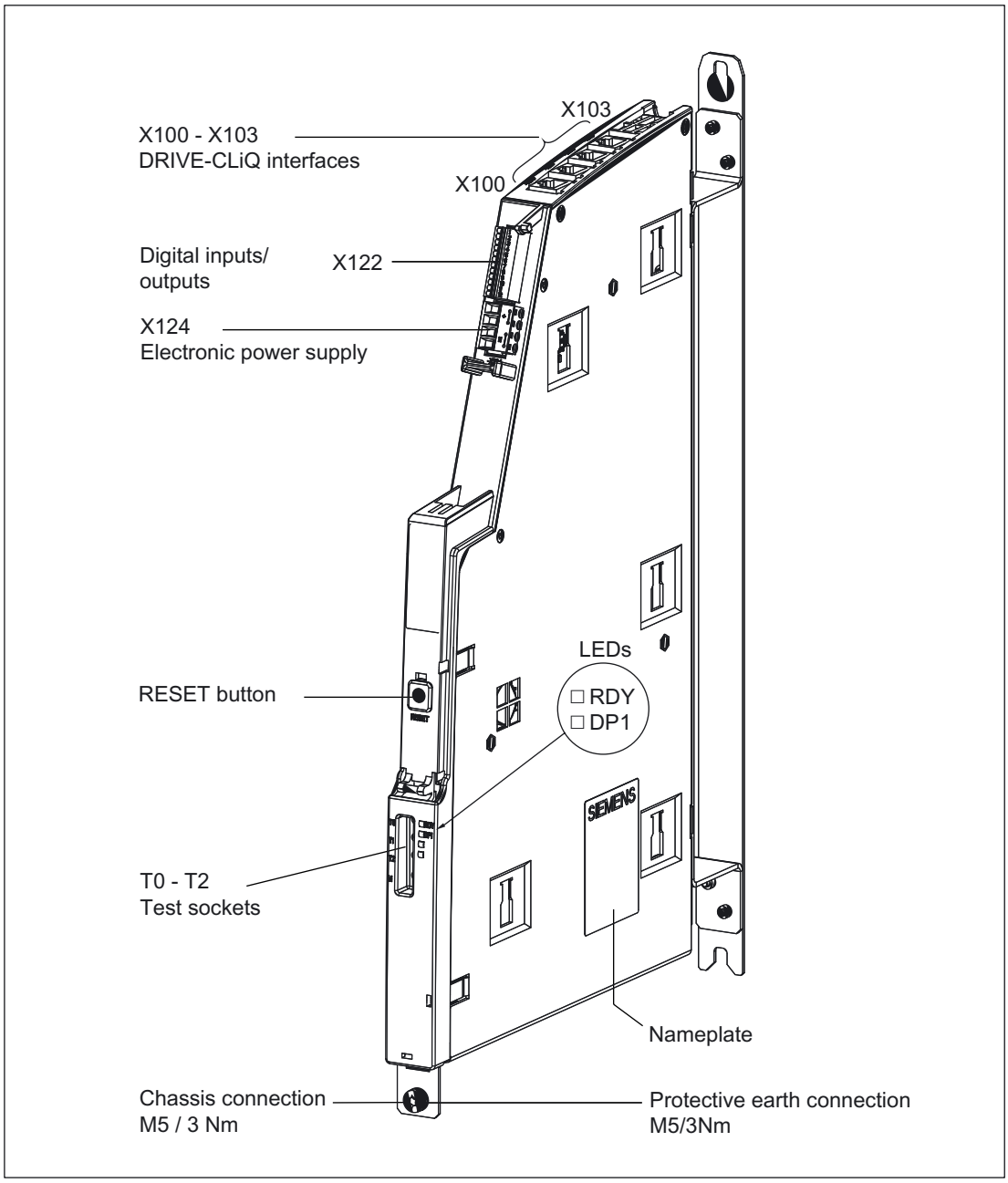


Figure 8-1 Interface description of the CX32 (covers removed)

8.3.2 Connection example

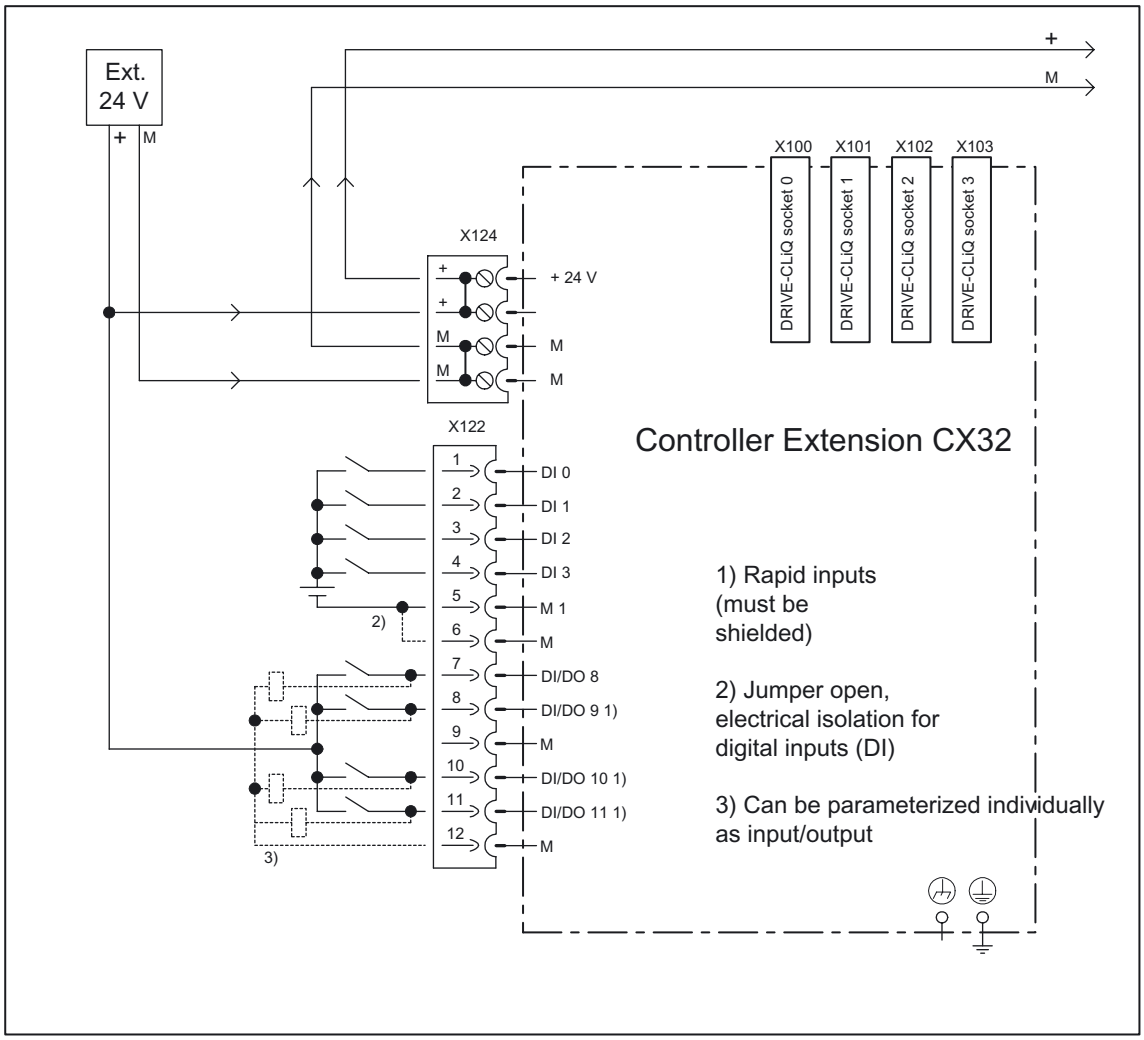
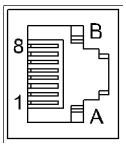


Figure 8-2 CX32 connection example

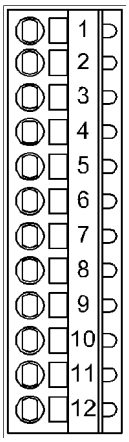
8.3.3 DRIVE-CLiQ interface X100 - X103

Table 8-1 DRIVE-CLiQ interface X100-X103

	Pin	Signal name	Technical specifications
	1	TXP	Transmit data +
	2	TXN	Transmit data -
	3	RXP	Receive data +
	4	Reserved, do not use	
	5	Reserved, do not use	
	6	RXN	Receive data -
	7	Reserved, do not use	
	8	Reserved, do not use	
	A	+ (24 V)	Power supply
	B	M (0 V)	Electronic ground
Blanking plate for DRIVE-CLiQ interface: Tyco, order no.: 969556-5			

8.3.4 X122: Digital Inputs/Outputs

Table 8-2 Terminal block X122

	Terminal	Designation[1)]	Technical specifications
	1	DI 0	Voltage: -3 V to 30 V Typical current consumption: 10 mA at 24 V DC Isolation: The reference potential is terminal M1 Level (incl. ripple) High level: 15 V to 30 V Low level: -3 V to 5 V Input delay: - For "0" to "1": approx. 50 µs - For "1" to "0": approx. 100 µs
	2	DI 1	
	3	DI 2	
	4	DI 3	
	5	M1	
	6	M	
	7	DI/DO 8	As input: 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 Terminal numbers 8, 10, and 11 are "rapid inputs" Input delay "rapid inputs": - For "0" to "1": approx. 50 µs/5 µs - For "1" to "0": approx. 100 µs/50 µs As output: Voltage: 24 VDC Max. load current per output: 500 mA Continued-short-circuit-proof Output delay: - For "0" to "1": approx. 400 µs - For "1" to "0": approx. 100 µs
	8	DI/DO 9	
	9	M	
	10	DI/DO 10	
	11	DI/DO 11	
	12	M	
Max. connectable cross-section: 0.5mm^2 Type: Spring-loaded terminal 1 (see Appendix A)			

1) DI: digital input; DI/DO: bidirectional digital input/output; M: electronic ground M1: ground reference

Note

An open input is interpreted as "low".

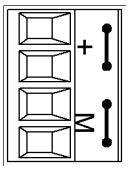
The "rapid inputs" can be used for positioning measurement.

To enable digital inputs (DI) 0 to 3 to function, terminal M1 must be connected. This can be done as follows:

Connect the included reference ground of the digital inputs, or a jumper to terminal M **(Notice! this removes isolation for these digital inputs).**

8.3.5 Electronics power supply X124

Table 8-3 Terminal block X124

	Terminal	Function	Technical specifications
	+	Electronic power supply	Voltage: 24 V DC (20.4 V - 28.8 V) Current consumption: max. 0.8 A (without load) Max. current via jumper in connector: 20 A at 55 °C
	+	NC	
	M	Electronic ground	
	M	Electronic ground	
Max. connectable cross-section: 2.5 mm^2 Type: Screw terminal 2 (see Appendix A)			

Note

The two "+" and "M" terminals are jumpered in the connector. This ensures that the supply voltage is looped through.

The total current consumption is the sum of the no-load current consumption plus DRIVE-CLiQ and the digital output current requirements.

8.3.6 Description of the LEDs on the CX32

Table 8-4 Description of the LEDs on the CX32

LED	Color	State	Description
READY	OFF		Electronics power supply outside permissible tolerance range
	Green	Continuous	CX32 is ready for operation
		Flashing 2 Hz	Writing to CompactFlash card
	Red	Continuous	At least one fault is pending (e.g. RESET, watchdog monitoring, basic system error). CX32 is being started up
		Flashing 0.5 Hz	Boot error (e.g. firmware cannot be loaded into the RAM)
	Yellow	Continuous	Firmware loading into RAM
		Flashing 0.5 Hz	Unable to load firmware into RAM
		Flashing 2 Hz	Firmware CRC error
CU_LINK	OFF		Electronics power supply outside the permissible tolerance range. CX32 is not ready for operation.
	Green	Continuous	CU_LINK is ready for communication and cyclic communication is running
		Flashing 0.5 Hz	CU_LINK is ready for communication, but no cyclic communication
	Red	Continuous	At least one CU_LINK fault is present. CU_LINK not ready for operation (e.g. after power ON)

Cause and rectification of faults

The following reference contains information about the cause of faults and how they can be rectified:

- SIMOTION D4x5 Commissioning and Hardware Installation Manual

RESET button

The RESET button is on the front of the device under the cover.

Function of the RESET button

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

- SIMOTION D4x5 Commissioning and Hardware Installation Manual

8.4 Installation

Mounting the CX32 directly on a line module booksize

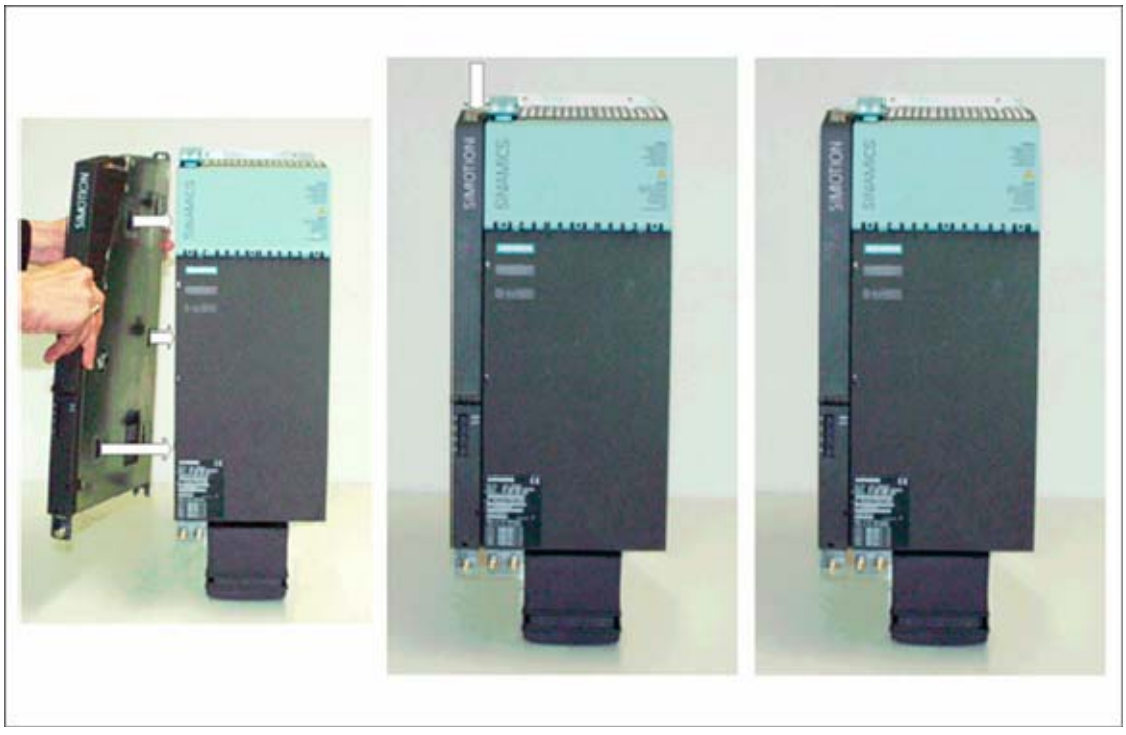
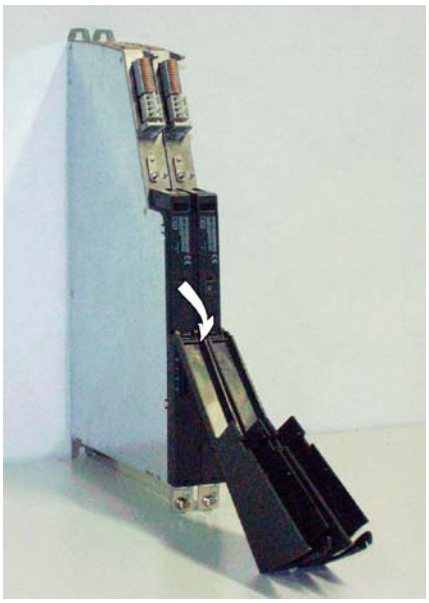
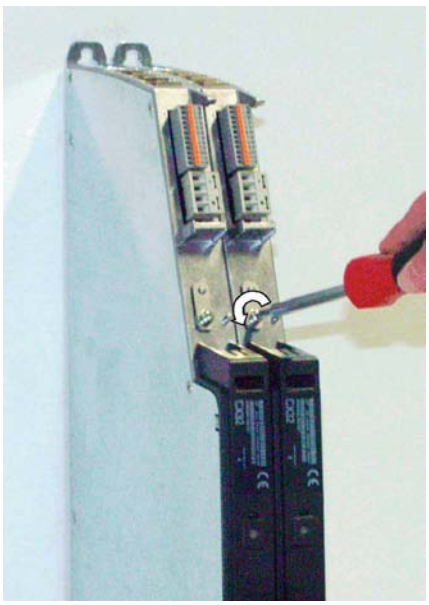
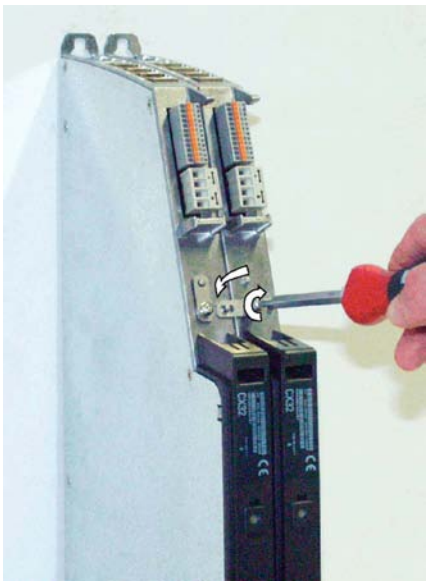
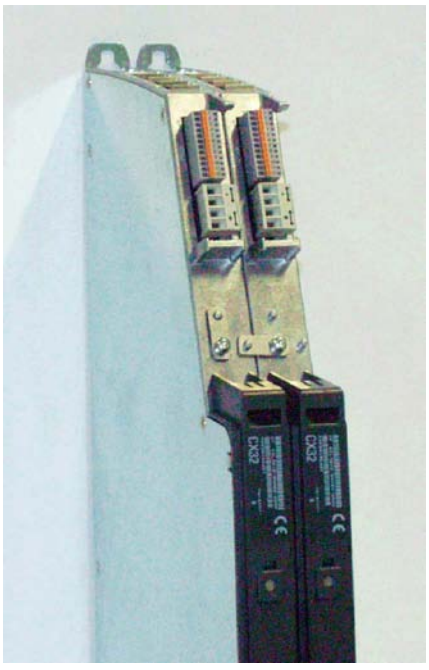


Figure 8-3 Mounting the CX32 directly on a line module booksize

Mounting the CX32 on an additional CX32

Table 8-5 Mounting the CX32 on an additional CX32

		
Opening the cover.	Unscrewing the screw.	The bracket must be moved so that the pin is in the opening of the bracket. Tighten the screw.
		
Mounted bracket.	Closing the cover.	

Mounting the CX32 directly on a mounting surface

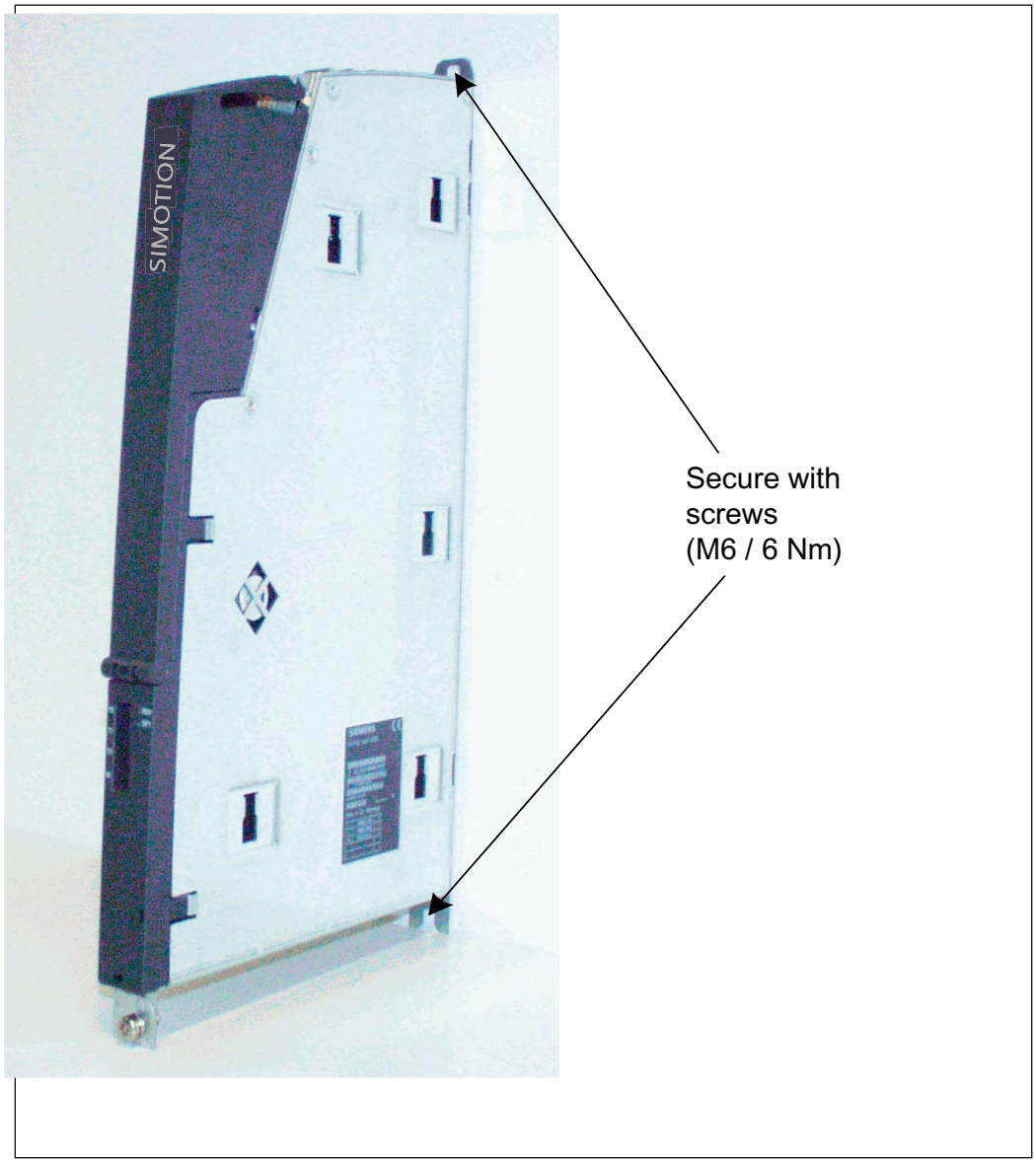


Figure 8-4 Mounting the CX32 directly on a mounting surface

Mounting the CX32 on a mounting surface using spacer elements

To provide the correct mounting depth for a booksize line-up with internal air cooling, a spacer element is pre-assembled on the CX32.

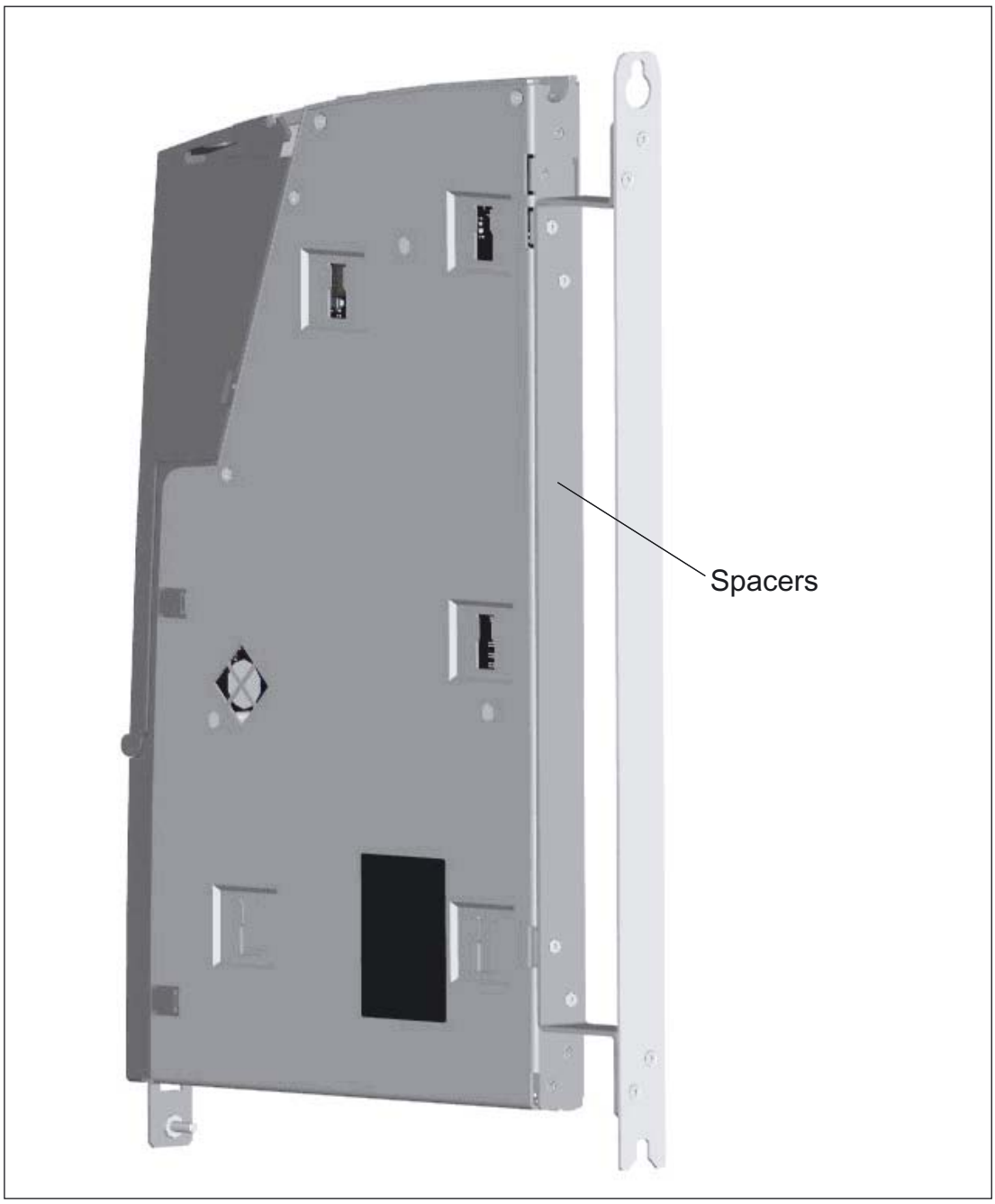


Figure 8-5 Mounting the CX32 on a mounting surface using spacer elements

Removing/opening the cover of the CX32

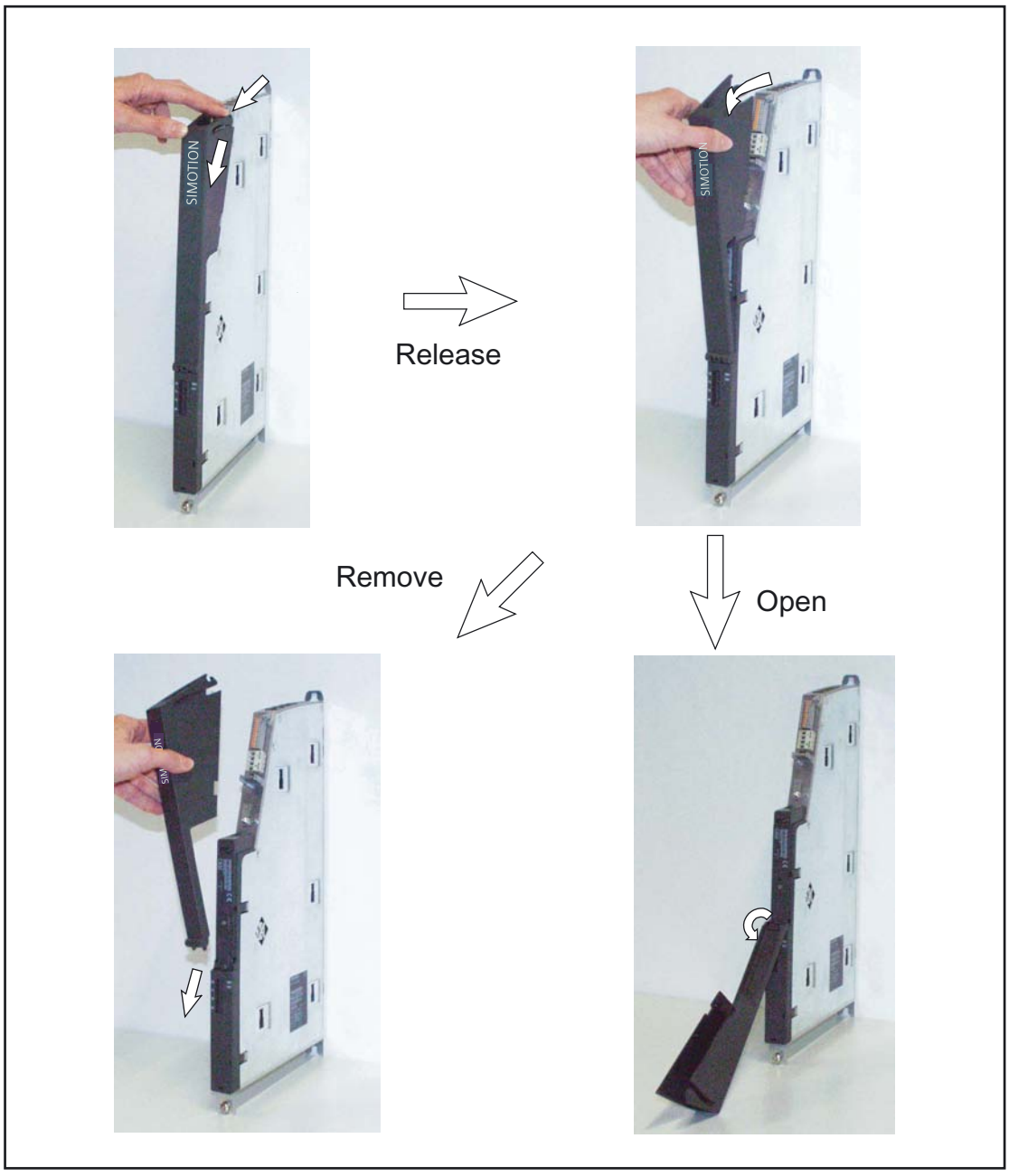


Figure 8-6 Removing/opening the cover of the CX32

8.5 Commissioning

Note

Information about commissioning can be found in the *SIMOTION D4x5* Commissioning and Hardware Installation Manual and the SINAMICS documentation.

8.6 Technical Specifications

Table 8-6 Technical Specifications

	Unit	Value
Electronics power supply Voltage Current (without DRIVE-CLiQ or digital outputs)	 V_{DC} A_{DC}	 24 DC (20.4 – 28.8) 0,8
Ambient temperature up to an altitude of 2000 m	°C	0 ... 55
Storage temperature	°C	-40 ... +70
Relative humidity	5% to 95%, no condensation	
PE/chassis connection	On housing with M5/3Nm screw	
Response time	The response time of digital inputs/outputs depends on the evaluation (see function diagram). **Reference:** /LH1/ SINAMICS S List Manual, "Function diagrams" chapter.	
Weight	kg	1,5

Terminal Board TB30

9

9.1 Description

The Terminal Board TB30 is a terminal expansion board for plugging into the control unit.

The TB30 contains the following terminals:

Table 9-1 Interface overview of the TB30

Type	Quantity
Digital inputs	4
Digital outputs	4
Analog inputs	2
Analog outputs	2

9.2 Safety Information

Caution

The option board may only be inserted and removed when the control unit and option board are disconnected from the power supply.

Caution

The TB30 must only be operated by qualified personnel. The ESC notices must be observed.

9.3 Interface description

9.3.1 Overview

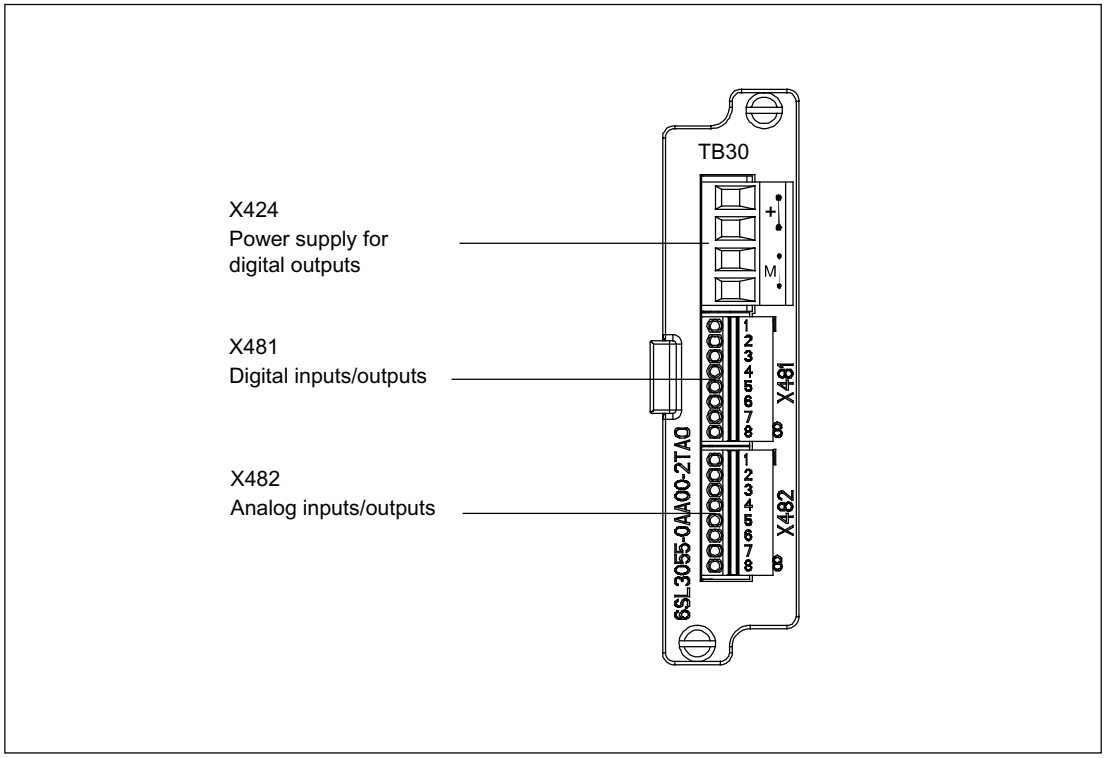


Figure 9-1 Interface description of the TB30

9.3.2 Connection example

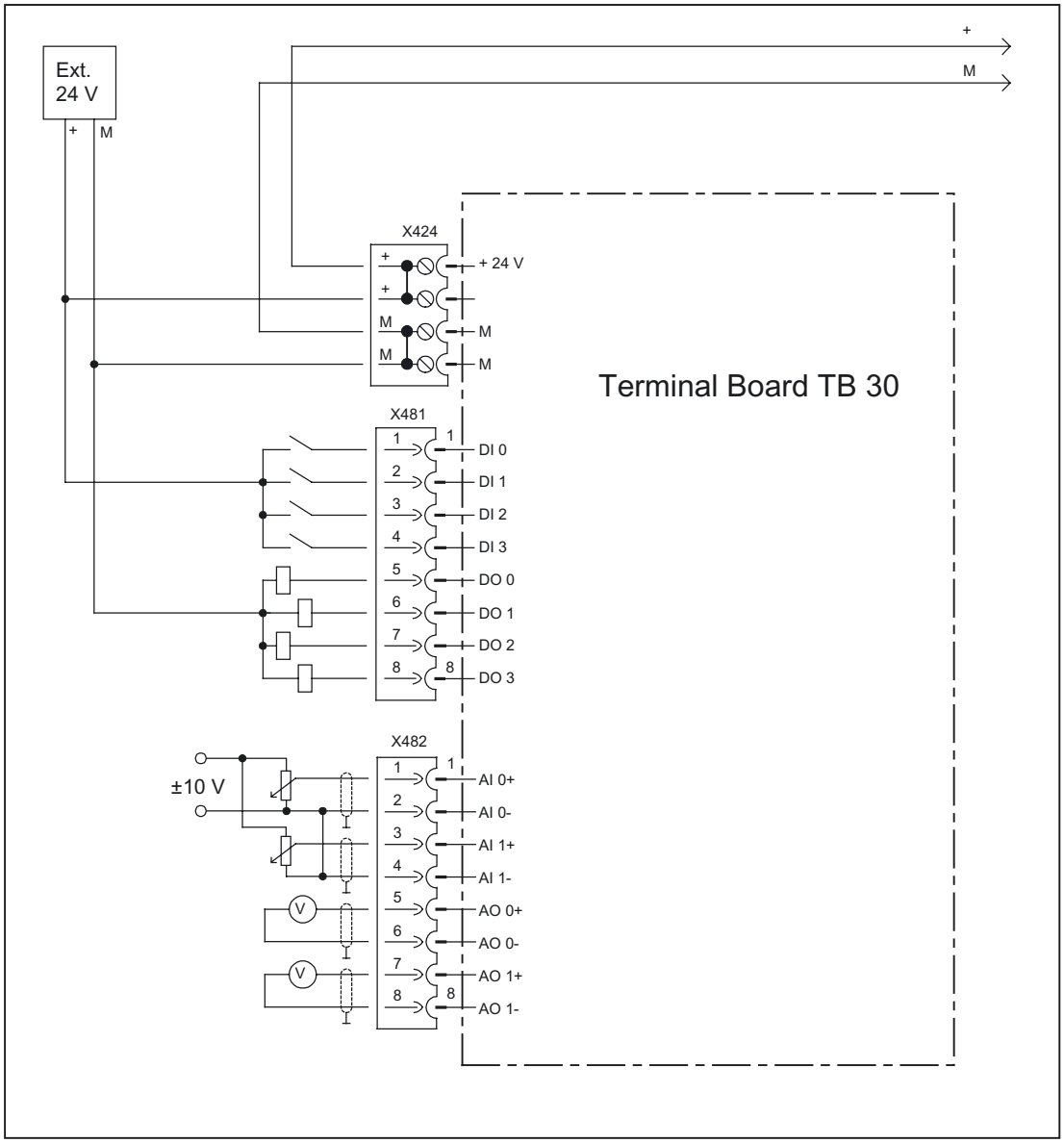
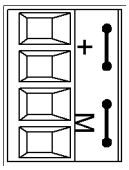


Figure 9-2 Example connection of TB30

9.3.3 X424 power supply, digital outputs

Table 9-2 Terminal block X424

	Terminal	Function	Technical specifications
	+	Power supply	Voltage: 24 V DC (20.4 V – 28.8 V) Current consumption: max. 4 A (per digital output max. 0.5 A) Max. current via jumper in connector: 20 A at 55 °C
	+	Power supply	
	M	Ground	
	M	Ground	
Max. connectable cross-section: 2.5 mm^2 Type: Screw terminal 2 (see Appendix A)			

Note

The two "+" and "M" terminals are jumpered in the connector. This ensures that the supply voltage is looped through.

This power supply is required for the digital outputs only. The electronics power supply and the power supply for the analog inputs/outputs are drawn via the option slot of the Control Unit.

Note

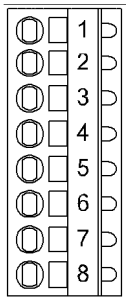
The power supply of the digital outputs and the electronics power supply of the Control Unit are isolated.

Note

If a momentary interruption in the voltage occurs in the 24 V supply, the digital outputs will be deactivated until the interruption has been rectified.

9.3.4 Digital inputs/outputs X481

Table 9-3 Terminal block X481

	Terminal	Designation[1)]	Technical specifications
	1	DI 0	Voltage: -3 V to 30 V Typical current consumption: 10 mA at 24 V DC Ground reference: X424. M Input delay: - For "0" to "1": approx. 20 µs - For "1" to "0": approx. 100 µs Level (incl. ripple) High level: 15 V to 30 V Low level: -3 V to 5 V
	2	DI 1	
	3	DI 2	
	4	DI 3	
	5	DO 0	Voltage: 24 VDC Max. load current per output: 500 mA Ground reference: X424.M Sustained short-circuit-proof Output delay: - For "0" to "1": Typically 150 µs at 0.5 A ohmic load (500 µs maximum) - For "1" to "0": Typically 50 µs at 0.5 A ohmic load
	6	DO 1	
	7	DO 2	
	8	DO 3	
Max. connectable cross-section: 0.5 mm^2 Type: Spring-loaded terminal 1 (see Appendix A)			

1) DI: digital input, DO: Digital output

Note

An open input is interpreted as "low".

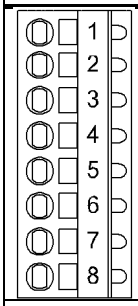
The power supply and the digital inputs/outputs are isolated from the Control Unit.

Note

If a momentary interruption in the voltage occurs in the 24 V supply, the digital outputs will be deactivated until the interruption has been rectified.

9.3.5 X482 analog inputs/outputs

Table 9-4 Terminal block X482

	Terminal	Designation[1)]	Technical specifications
	2	AI 0-	Analog inputs (AI) Voltage: -10 V to +10 V Internal resistance: 65 kΩ Resolution: 13 bits + sign
	3	AI 1+	
	4	AI 1-	
	5	AO 0+	Analog outputs (AO) Voltage range: -10 V to +10 V Load current: max. -3 mA to +3 mA Resolution: 11 bit + sign Sustained short-circuit proof
	6	AO 0-	
	7	AO 1+	
	8	AO 1-	
Max. connectable cross-section: 0.5 mm^2 Type: Spring-loaded terminal 1 (see Appendix A)			

1) AI: analog input, AO: Analog output

Note

An open input is interpreted as approximately "0 V".

The power supply of the analog inputs/outputs is drawn via the option slot of the control unit and not via X424.

The shield is connected to the control unit (see section "Electrical connection").

Caution

The common-mode range must not be infringed.
The analog differential voltage signals can have a maximum offset voltage of +/-30 V with respect to the ground potential. If the range is infringed, incorrect results may occur during analog/digital conversion.

9.3.6 Working with analog inputs

Working with analog inputs

The following reference contains more information about analog inputs:

- SINAMICS S120 Commissioning Manual

9.4 Installation/Mounting

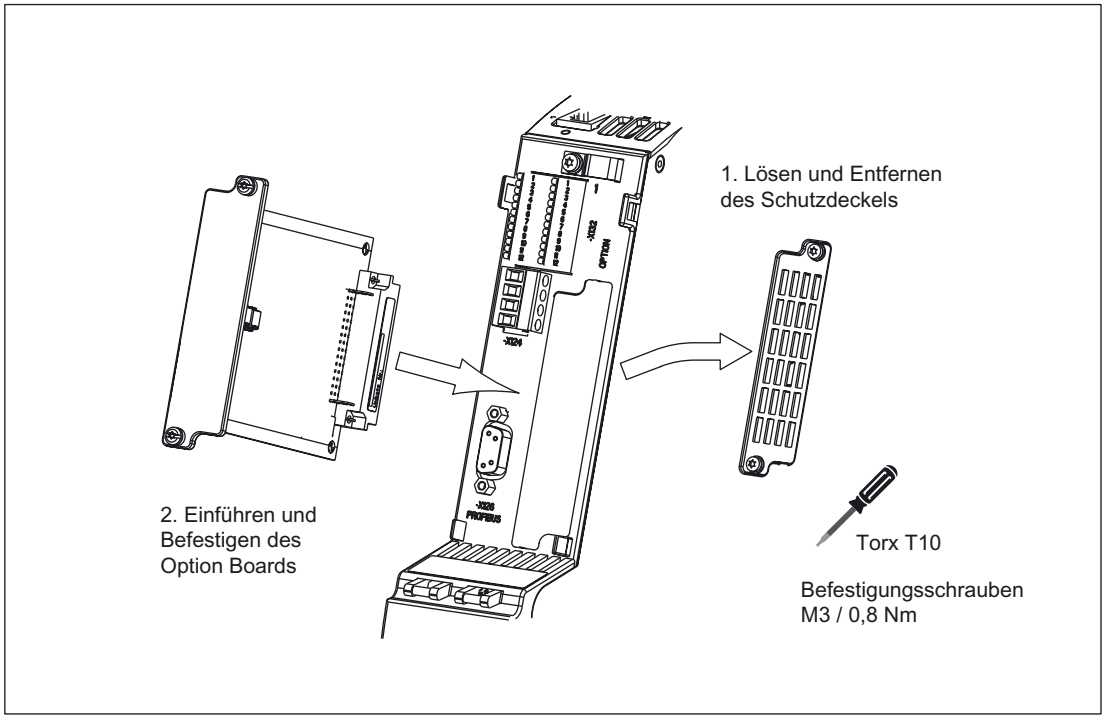


Figure 9-3 Installing the Option Board

9.5 Electrical Connection

Shield connection of the TB30 on the control unit

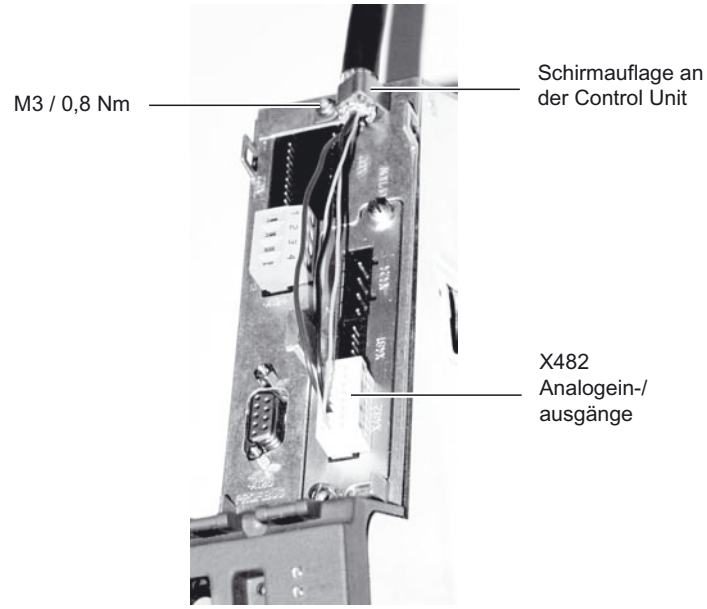


Figure 9-4 Shield contact for the TB30

The permissible bending radii for the cables must not be exceeded when the cables are being installed.

9.6 Commissioning

Note

Information about commissioning can be found in the *SIMOTION D4x5* Commissioning and Hardware Installation Manual and the SINAMICS documentation.

9.7 Technical Specifications

Table 9-5 Technical specifications

	Unit	Value
Electronic power supply		
Voltage	V_{DC}	24 DC (20.4 – 28.8)
Current via the option slot of the CU (without digital outputs)	A_{DC}	0.05
Power loss	W	<3
Response time	The response time of digital inputs/outputs and analog inputs/outputs depends on the evaluation on the control unit (see function diagram). **References:** SINAMICS S Parameter Manual – "Function diagrams" chapter.	
Weight	kg	0.1

Appendix A

A

A.1 Spring-Loaded Terminals/Screw Terminals

Connectable conductor cross-sections of spring-loaded terminals

Table A-1 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 A-2 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	

Screw terminal type			
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	

A.2 EC Declaration of Conformity

The Declaration of Conformity can be found on the following website:

http://support.automation.siemens.com/WW/view/de/15257461

Appendix B

B

B.1 Drive computer performance

If you are using Terminal Modules (TMs), TB30, and CX32, note that these utilize drive computer performance and, thus, can reduce the available axis quantity structures. The following table provides an overview of the approximate drive computer performance required with reference to a servo axis with a current- and speed-controller cycle of 125 µs.

To calculate the required drive computer performance more precisely, use the SIZER drive configuration tool. SIZER assists you when configuring the components needed for a drive task and guides you through all configuration steps starting from the supply system through the motors up to the drive components and controls, including Terminal Modules, TB30, and CX32.

Utilized component	Sampling time		
	High	Medium	Low
Almost negligible:			
TM31		1 ms	4 ms
TB30		1 ms	4 ms
TM15 DI/DO		1 ms	4 ms
Must be taken into account as approx. 1/4 axis per module:			
TM31	250 µs		
TB30	250 µs		
TM15 DI/DO	250 µs		
TM41 (XSet simulation (P4400 == 1))		125 µs [1] 4 ms [2]	250 µs [1] 4 ms [2]
Must be taken into account as approx. 1/2 axis per module:			
TM15	125 µs		
TM17 High Feature	125 µs		
TM41 (XSet simulation (P4400 == 0))	125 µs [1] 2 ms [2]	125 µs [1] 4 ms [2]	250 µs [1] 4 ms [2]
TM41 (XSet simulation (P4400 == 1))	125 µs [1] 2 ms [2]		
TM54F	Detailed specifications not available at the editorial deadline. One TM54F can be accommodated per Control Unit/SIMOTION control.		

1) Sampling time of encoder simulation (P4099[3])

2) Sampling time of digital and analog I/O (P4099[0,1])

The SIMOTION CX32 can be operated on the SIMOTION D435 and D445. When one or more CX32 are used, these combine to form the drive computer performance of an axis.

ESD guidelines

C

C.1 Electrostatically sensitive modules

Definition

All electronic modules are equipped with highly integrated modules or components. Because of the technology used, these electronic components are very sensitive to overvoltages and thus to discharge of static electricity.

The acronym **ESD** has become the established designation for such **E**lectrostatically **S**ensitive **D**evices. The **ESD** designation is used internationally to refer to **e**lectrostatically **s**ensitive **d**evices.

Electrostatically sensitive devices are identified by this symbol:

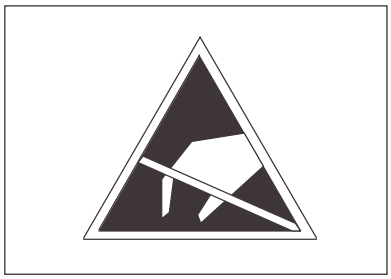


Figure C-1 Electrostatically sensitive modules

Caution

Electrostatically sensitive devices can be irreparably damaged by voltages that are far lower than anything a person can perceive. These voltages occur if you touch a component or the electrical connection of a module without having previously discharged any static from your body. Any damage that occurs to a module as a result of overvoltage is generally not recognized immediately and only comes to light after the equipment has been operating for some time.

C.2 Electrostatic discharge from persons

Accumulating an electrostatic charge

Anyone who is not conductively connected to the electrical potential of their environment can accumulate an electrostatic charge.

The figure below shows the maximum electrostatic voltages that can accumulate on a person who is operating equipment when he/she comes into contact with the materials indicated. These values comply with the specifications in IEC 801-2.

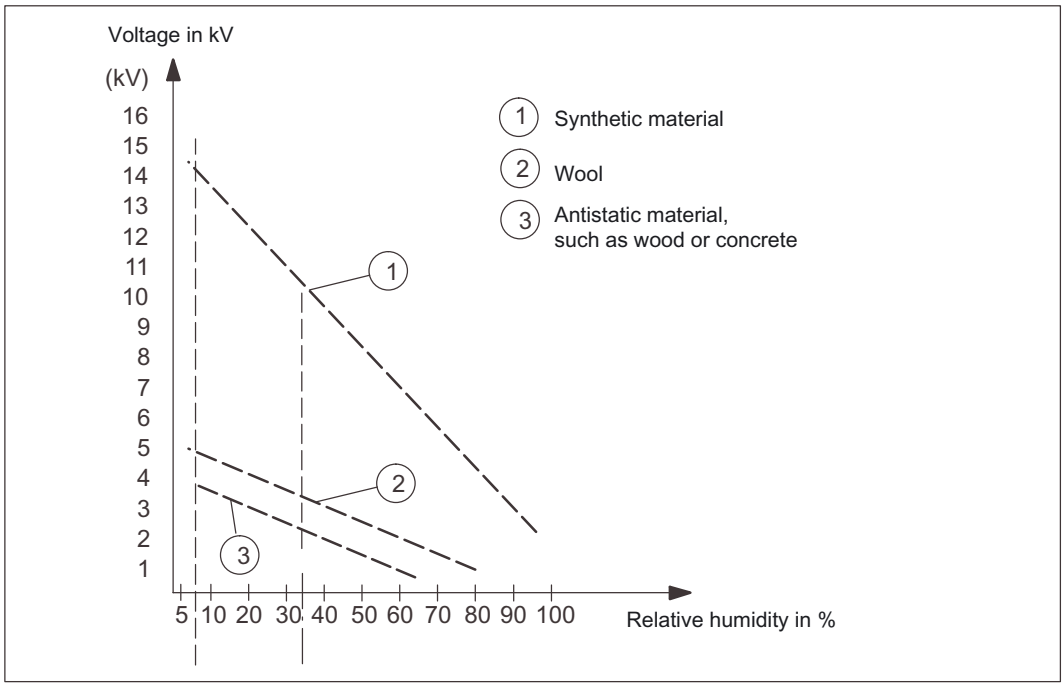


Figure C-2 Electrostatic voltage that can accumulate in operating personnel

C.3 Basic measures for protection against discharge of static electricity

Make sure the grounding is good

When working with electrostatically sensitive devices, make sure that the person, the workstation and the packaging are properly grounded. This is how you can avoid the accumulation of static electricity.

Avoid direct contact

Never touch electrostatically sensitive devices if this can be avoided (for example, during maintenance work). When you touch modules, make sure that you do not touch either the pins on the modules or the printed conductors. If you follow these instructions, electrostatic discharge cannot reach or damage sensitive components.

If you have to take measurements on a module, make sure that you first discharge any static that may have accumulated in your body. To do this, touch a grounded metal object. Only use grounded measuring instruments.

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