Equipment Manual, 03/2007 Edition

SINAMICS S120
Control Units and additional system components

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S120
Control Units and additional system components

Manual

Foreword

System overview 1

Control Units 2

Additional system components 3

Encoder system connection 4

Information on electromagnetic compatibility (EMC) 5

Spring-Loaded Terminals/Screw Terminals A

List of Abbreviations B

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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

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Disclaimer of Liability

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

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Foreword

SINAMICS documentation

The SINAMICS documentation is sub-divided into 2 areas:

- General documentation / catalogs
- Manufacturer/service documentation

You will find an overview of the documentation, which is updated on a monthly basis, in the available languages in the Internet under:

http://www.siemens.com/motioncontrol

Following the menu items "Support" → "Technical Documentation" → "Overview of Publications".

The Internet edition of DOConCD, DOConWEB, are available under:

http://www.automation.siemens.com/doconweb

Information on the range of training courses and FAQs (frequently asked questions) are available in the Internet under:

http://www.siemens.com/motioncontrol and there under the menu item "Support"

Phases of use

Table 1 Table Preface-1: Phase of use and the available documents/tools

Phases of use	Tools
Orientation	SINAMICS S sales documentation
Planning/engineering	SIZER engineering tool
Select/order	SINAMICS S Catalogs
Configuring/installation	• SINAMICS S120 Equipment Manual for Control Units and Supplementary System Components • SINAMICS S120 Equipment Manual for Booksize Power Units • SINAMICS S120 Equipment Manual for Chassis Power Units • SINAMICS S150 Operating Instructions
Commissioning	• STARTER Parameterizing and Commissioning Tool • SINAMICS S120 Getting Started • SINAMICS S120 Commissioning Manual • SINAMICS S120 Commissioning Manual CANopen • SINAMICS S List Manual • SINAMICS S150 Operating Instructions

Phases of use	Tools
Using/operating	• SINAMICS S120 Commissioning Manual • SINAMICS S List Manual • SINAMICS S150 Operating Instructions
Maintenance/Service	• SINAMICS S120 Commissioning Manual • SINAMICS S List Manual • SINAMICS S150 Operating Instructions

Target group

This manual addresses planners, installation and design engineers.

Benefits

This manual provides information about the components and functions of the units and provides the target group with information so that they can safely mount/install, configure, check and operate the devices and also troubleshoot them.

Standard scope

The functionality of the standard scope is described in the following documentation. The machinery construction OEM documents supplements or changes that he makes (the machinery construction OEM).
Functions that are not explained in this documentation may be able to be executed in the drive system. However, no claim can be made regarding the availability of these functions when the equipment is first supplied or in the event of servicing.

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

Technical Support

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

	Europe/Africa	Asia/Australia	America
Telephone	+49 (0) 180 5050 - 222	+86 1064 719 990	+1 423 262 2522
Fax	+49 (0) 180 5050 - 223	+86 1064 747 474	+1 423 262 2289
Internet	http://www.siemens.com/automation/support-request		
E-mail	mailto:adsupport@siemens.com		

Note

You will find telephone numbers for other countries for technical support in the Internet: http://www.siemens.com/automation/service&support

Questions about the documentation

If you have any questions (suggestions, corrections) regarding this documentation, please fax or e-mail us at:

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

A fax form is available in the appendix of this document.

Internet address for SINAMICS

http://www.siemens.com/sinamics.

EC Declarations of Conformity

The EC Declaration of Conformity for the EMC Directive can be found/obtained:

- in the Internet:
  http://support.automation.siemens.com
  under the Product/Order No. 15257461
- For the responsible regional offices of the A&D MC business division of Siemens AG

The EC Declaration of Conformity for the EMC Directive can be found/obtained

- in the Internet:
  http://support.automation.siemens.com
  under the Product/Order No. 22383669

ESD notices

⚠ Caution

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

Regulations for handling ESD components:

When handling electronic components, you must ensure that the person carrying out the work, the work place, and packaging are properly grounded.

Personnel in ESD areas with conductive flooring may only handle electronic components if:

They are grounded with an ESD wrist band

They are wearing ESD shoes or ESD shoe grounding straps

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

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

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

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

Measurements must only be taken on boards when the measuring instrument is grounded (via protective conductors, for example) or the measuring probe is briefly discharged before measurements are taken with an isolated measuring device (for example, touching a bare metal housing).

Safety Information

⚠ Danger

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

Only appropriately qualified personnel may mount/install, commission and service SINAMICS S drive units.

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.

Operational electrical equipment and motors have parts and components which are at hazardous voltage levels, that when touched can result in severe bodily injury or death.

All work on the electrical system must be carried out when the system has been disconnected from the power supply.

⚠ Warning

Correct and safe operation of SINAMICS S equipment assumes correct transportation, storage, setup, and installation, as well as careful operation and maintenance.

The details in the catalogs and proposals also apply to the design of special equipment versions.

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

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

⚠ Danger

The use of protection against direct contact using SELV / DVC A is only permissible in areas with potential bonding and in dry indoor areas and rooms. If these conditions are not fulfilled, then other protective measures against electric shock must be used (e.g. protection using protective impedances or limited voltage or using protective classes I and II).

Caution

Operating the equipment in the immediate vicinity (< 1.5 m) of mobile telephones with a transmitter power of > 1 W and ≤ 5 W may lead to incorrect operation.

Explanation of the symbols

The symbols corresponds to IEC 617-2.

Table 2 Symbols

Symbol	Meaning
	Protective ground (PE)
	Ground (e.g. M 24 V)
	Functional ground (e.g. shield) Equipotential bonding

Residual risks of power drive systems

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

1. Unintentional movements of driven machine components during commissioning, operation, maintenance, and repairs caused by, for example:
   - Hardware defects and/or software errors in the sensors, controllers, actuators, and connection technology
   - Response times of the controller and drive
   - Operating and/or ambient conditions not within the scope of the specification
   - Parameterization, programming, cabling, and installation errors
   - Use of radio devices / cellular phones in the immediate vicinity of the controller
   - External influences / damage
2. Exceptional temperatures as well as emissions of light, noise, particles, or gas caused by, for example:
   - Component malfunctions
   - Software errors
   - Operating and/or ambient conditions not within the scope of the specification
   - External influences / damage
3. Hazardous shock voltages caused by, for example:
   - Component malfunctions
   - Influence of electrostatic charging
   - Induction of voltages in moving motors
   - Operating and/or ambient conditions not within the scope of the specification
   - Condensation / conductive contamination
   - External influences / damage
4. Electrical, magnetic, and electromagnetic fields that can pose a risk to people with a pacemaker and/or implants if they are too close.
5. Emission of pollutants if components or packaging are not disposed of properly.

An assessment of the residual risks of PDS components (see points 1 to 5 above) established that these risks do not exceed the specified limit values (risk priority number to EN 60812 RPZ ≤ 125).

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

Table of contents

Foreword 5

1 System overview 17

1.1 Field of application 17

1.2 Versions 18

1.3 Platform Concept and Totally Integrated Automation 18

1.4 Introduction 19

1.5 SINAMICS S120 Components 22

1.6 Power Sections 23

1.7 System data 24

2 Control Units 27

2.1 Introduction 27

2.2 Control Unit CU320 30
2.2.1 Description 30
2.2.2 Safety Information 30
2.2.3 Interface description 31
2.2.3.1 Overview 31
2.2.3.2 Connection example 32
2.2.3.3 X100 - X103 DRIVE-CLiQ interface 33
2.2.3.4 X122: Digital Inputs/Outputs 34
2.2.3.5 X132: Digital Inputs/Outputs 35
2.2.3.6 Electronics power supply X124 36
2.2.3.7 PROFIBUS X126 37
2.2.3.8 PROFIBUS address switches 38
2.2.3.9 Reference 38
2.2.3.10 Serial interface (RS232) X140 39
2.2.3.11 Measurement sockets T0, T1, and T2 39
2.2.3.12 Slot for the CompactFlash card 40
2.2.3.13 Description of the LEDs on the control unit 41
2.2.4 Dimension Drawing 42
2.2.5 Installation 43
2.2.6 Technical Specifications 47

3 Additional system components 49

3.1 Basic Operator Panel BOP20 49
3.1.1 Description 49
3.1.2 Interface description 49
3.1.3 Installation 52
3.1.4 Technical data 53

3.2 Option Board: Communication Board CBC10 53
3.2.1 Description 53
3.2.2 Safety Information 53

3.2.3 Interface description ... 54
3.2.3.1 Overview ... 54
3.2.3.2 CAN bus interface X451 ... 55
3.2.3.3 CAN bus interface X452 ... 56
3.2.3.4 2-pin SMD DIL switch ... 57
3.2.4 Installation/Mounting ... 58
3.2.5 Technical Specifications ... 58

3.3 Communication Board CBE20 ... 59
3.3.1 Description ... 59
3.3.2 Safety information ... 59
3.3.3 Interface description ... 60
3.3.3.1 Overview ... 60
3.3.3.2 X1400 Ethernet interface ... 61
3.3.3.3 Description of the LEDs on the CBE20 ... 61
3.3.4 Installation ... 63
3.3.5 Technical specifications ... 63

3.4 Option Board: Terminal Board TB30 ... 64
3.4.1 Description ... 64
3.4.2 Safety Information ... 64
3.4.3 Interface description ... 65
3.4.3.1 Overview ... 65
3.4.3.2 Connection example ... 66
3.4.3.3 X424 power supply, digital outputs ... 67
3.4.3.4 Digital inputs/outputs X481 ... 68
3.4.3.5 Analog inputs/outputs X482 ... 69
3.4.4 Installation/Mounting ... 70
3.4.5 Electrical Connection ... 71
3.4.6 Technical Specifications ... 71

3.5 Terminal Module TM15 ... 72
3.5.1 Description ... 72
3.5.2 Safety Information ... 72
3.5.3 Interface description ... 73
3.5.3.1 Overview ... 73
3.5.3.2 Connection example ... 74
3.5.3.3 X500 and X501 DRIVE-CLiQ interface ... 75
3.5.3.4 X524 Electronic power supply ... 75
3.5.3.5 X520 digital inputs/outputs ... 76
3.5.3.6 X521 digital inputs/outputs ... 77
3.5.3.7 X522 digital inputs/outputs ... 78
3.5.3.8 Description of the LEDs on the Terminal Module TM15 ... 79
3.5.4 Dimension Drawing ... 80
3.5.5 Installation ... 81
3.5.6 Electrical Connection ... 82
3.5.7 Technical specifications ... 83

3.6 Terminal Module TM31 ... 86
3.6.1 Description ... 86
3.6.2 Safety Information ... 86
3.6.3 Interface description ... 87
3.6.3.1 Overview ... 87
3.6.3.2 Connection example ... 88
3.6.3.3 X500 and X501 DRIVE-CLiQ interface ... 89
3.6.3.4 Electronics power supply X524 ... 89
3.6.3.5 Digital inputs X520 ... 90

3.6.3.6 Digital inputs X530 91
3.6.3.7 Auxiliary voltage for the digital inputs X540 92
3.6.3.8 Analog inputs X521 93
3.6.3.9 S5 current/voltage changeover switch for analog inputs 93
3.6.3.10 Analog outputs/temperature sensor connection X522 94
3.6.3.11 X541 bidirectional digital inputs/outputs 95
3.6.3.12 Relay outputs X542 96
3.6.3.13 Description of the LEDs on the Terminal Module TM31 96
3.6.4 Dimension drawing 97
3.6.5 Installation 98
3.6.6 Electrical connection 99
3.6.7 Technical Specifications 101

3.7 Terminal Module TM41 102
3.7.1 Description 102
3.7.2 Safety Information 102
3.7.3 Interface description 103
3.7.3.1 Overview 103
3.7.3.2 Connection example 104
3.7.3.3 X500 and X501 DRIVE-CLiQ interface 105
3.7.3.4 X514 and X524 Power Supply 105
3.7.3.5 Sensor interface X520 106
3.7.3.6 X521 bidirectional digital inputs/outputs 107
3.7.3.7 X522 digital inputs / floating (isolated) 108
3.7.3.8 Analog input X523 108
3.7.3.9 Description of the LEDs on the Terminal Module TM41 109
3.7.4 Dimension drawing 110
3.7.5 Installation 111
3.7.6 Electrical Connection 112
3.7.7 Technical Specifications 113

3.8 Terminal Module TM54F (from V2.5 SP1) 114
3.8.1 Description 114
3.8.2 Safety Information 114
3.8.3 Interface description 115
3.8.3.1 Overview 115
3.8.3.2 X500 and X501 DRIVE-CLiQ interface 117
3.8.3.3 X514 power supply for digital outputs and sensors 118
3.8.3.4 X520 sensor power supply 118
3.8.3.5 X521 digital inputs + power supply with forced dormant error detection 119
3.8.3.6 X522 digital inputs 120
3.8.3.7 X523 digital outputs 121
3.8.3.8 Electronics power supply X524 122
3.8.3.9 X525 digital outputs 123
3.8.3.10 X531 digital inputs + power supply with forced dormant error detection 124
3.8.3.11 X532 digital inputs 125
3.8.3.12 X533 digital outputs 126
3.8.3.13 X535 digital outputs 127
3.8.3.14 Description of the LEDs on the Terminal Module TM54F 128
3.8.4 Dimension drawing 129
3.8.5 Installation 130
3.8.6 Technical specifications 131

3.9 DRIVE-CLiQ Hub Module DMC20 132
3.9.1 Description 132
3.9.2 Safety Information 132
3.9.3 Interface description 133

3.9.3.1 Overview ... 133
3.9.3.2 Electronics power supply X524 ... 134
3.9.3.3 DRIVE-CLiQ interface ... 134
3.9.3.4 Significance of the LED on the DMC20 ... 135
3.9.4 Dimension drawing ... 136
3.9.5 Installation ... 137
3.9.6 Technical data ... 138

3.10 Voltage Sensing Module VSM10 ... 139
3.10.1 Description ... 139
3.10.2 Safety information ... 140
3.10.3 Interface description ... 141
3.10.3.1 Overview ... 141
3.10.3.2 Connection example ... 142
3.10.3.3 DRIVE-CLiQ interface X500 ... 143
3.10.3.4 Electronics power supply X524 ... 143
3.10.3.5 X520 analog inputs/temperature sensor connection ... 144
3.10.3.6 X521 three-phase line supply voltage sensing up to 100 V (phase-to-phase) ... 144
3.10.3.7 X522 three-phase line supply voltage sensing up to 690 V (phase-to-phase) ... 145
3.10.3.8 Significance of the LEDs for the Voltage Sensing Module VSM10 ... 146
3.10.4 Dimension drawing ... 147
3.10.5 Installation ... 148
3.10.6 Electrical Connection ... 149
3.10.7 Technical data ... 149

4 Encoder system connection ... 151

4.1 Introduction ... 151

4.2 Overview of Sensor Modules ... 152
4.2.1 Description ... 152
4.2.2 Sensor Connections ... 154

4.3 Sensor Module Cabinet-Mounted SMC10 ... 156
4.3.1 Description ... 156
4.3.2 Safety Information ... 158
4.3.3 Interface description ... 159
4.3.3.1 Overview ... 159
4.3.3.2 DRIVE-CLiQ interface X500 ... 160
4.3.3.3 X520 sensor system ... 161
4.3.3.4 Electronics power supply X524 ... 162
4.3.3.5 Description of the LEDs on the SMC10 ... 163
4.3.4 Dimension drawing ... 164
4.3.5 Installation ... 165
4.3.6 Technical data ... 166

4.4 Sensor Module Cabinet-Mounted SMC20 ... 167
4.4.1 Description ... 167
4.4.2 Safety information ... 167
4.4.3 Interface description ... 168
4.4.3.1 Overview ... 168
4.4.3.2 DRIVE-CLiQ interface X500 ... 169
4.4.3.3 X520 sensor system ... 170
4.4.3.4 Electronics power supply X524 ... 171
4.4.3.5 Description of the LEDs on the SMC20 ... 172
4.4.4 Dimension drawing ... 173
4.4.5 Installation ... 174
4.4.6 Technical Specifications ... 175

4.5 Sensor Module Cabinet-Mounted SMC30 176
4.5.1 Description 176
4.5.2 Safety information 178
4.5.3 Interface description 179
4.5.3.1 Overview 179
4.5.3.2 Connection examples 181
4.5.3.3 DRIVE-CLiQ interface X500 183
4.5.3.4 X520 measuring system 183
4.5.3.5 X521 / X531 alternative measuring system 184
4.5.3.6 Electronics power supply X524 185
4.5.3.7 Description of the LEDs on the SMC30 186
4.5.4 Dimension drawing 187
4.5.5 Installation 189
4.5.6 Electrical Connection 191
4.5.7 Technical Specifications 192

4.6 Sensor Module External SME20 195
4.6.1 Description 195
4.6.2 Safety Information 195
4.6.3 Interface description 195
4.6.3.1 Overview 195
4.6.3.2 DRIVE-CLiQ interface 196
4.6.3.3 Measuring system interface 196
4.6.4 Dimension drawing 197
4.6.5 Installation 197
4.6.6 Technical specifications 198

4.7 Sensor Module External SME25 199
4.7.1 Description 199
4.7.2 Safety information 199
4.7.3 Interface description 199
4.7.3.1 Overview 199
4.7.3.2 DRIVE-CLiQ interface 200
4.7.3.3 Measuring system interface 200
4.7.4 Dimension drawing 201
4.7.5 Installation 202
4.7.6 Technical specifications 202

4.8 Sensor Module External SME120 203
4.8.1 Description 203
4.8.2 Safety information 204
4.8.3 Interface description 205
4.8.3.1 Overview 205
4.8.3.2 Connection example 206
4.8.3.3 DRIVE-CLiQ interface 207
4.8.3.4 X100 measuring system interface 207
4.8.3.5 X200 Temperature sensor 208
4.8.3.6 X300 Hall sensor input 208
4.8.4 Dimension drawing 209
4.8.5 Mounting 209
4.8.6 Technical data 210

4.9 Sensor Module External SME125 211
4.9.1 Description 211
4.9.2 Safety information 212
4.9.3 Interface description 213
4.9.3.1 Overview 213

4.9.3.2 Connection example ... 214
4.9.3.3 DRIVE-CLiQ interface ... 215
4.9.3.4 X100 measuring system interface ... 216
4.9.3.5 X200 Temperature sensor ... 216
4.9.4 Dimension drawing ... 217
4.9.5 Mounting ... 217
4.9.6 Technical data ... 218

4.10 DRIVE-CLiQ encoder ... 219
4.10.1 Description ... 219
4.10.2 Safety information ... 219
4.10.3 Interface description ... 220
4.10.3.1 Overview ... 220
4.10.3.2 DRIVE-CLiQ interface ... 220
4.10.4 Dimension drawings ... 221
4.10.5 Installation ... 223
4.10.6 Technical specifications ... 225

5 Information on electromagnetic compatibility (EMC) ... 227

5.1 Cabinet design and EMC: booksize ... 227

A Spring-Loaded Terminals/Screw Terminals ... 229

A.1 Spring-Loaded Terminals/Screw Terminals ... 229

B List of Abbreviations ... 231

B.1 List of Abbreviations ... 231

Index ... 243

System overview

1

1.1 Field of application

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

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

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



Figure 1-1 SINAMICS applications

1.2 Versions

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/induction motors and fulfills stringent requirements regarding
  - Dynamics and accuracy,
  - Integration of extensive technological functions in the drive control system.

1.3 Platform Concept and Totally Integrated Automation

All SINAMICS versions are based on a platform concept. Joint hardware and software components, as well as standardized tools for design, configuration, and commissioning tasks ensure high-level integration across all components. SINAMICS handles a wide variety of drive tasks with no system gaps. The different SINAMICS versions can be easily combined with each other.

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

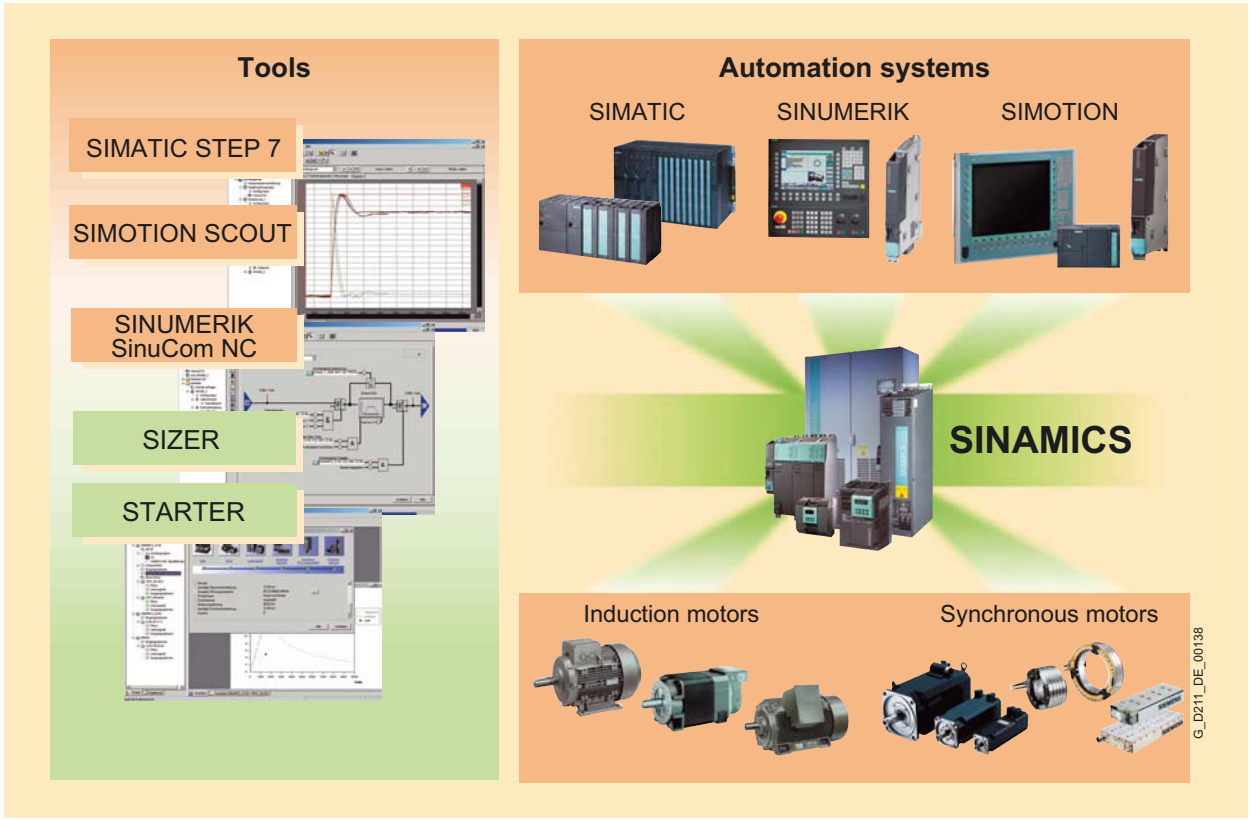


Figure 1-2 SINAMICS as part of the Siemens modular automation system

1.4 Introduction

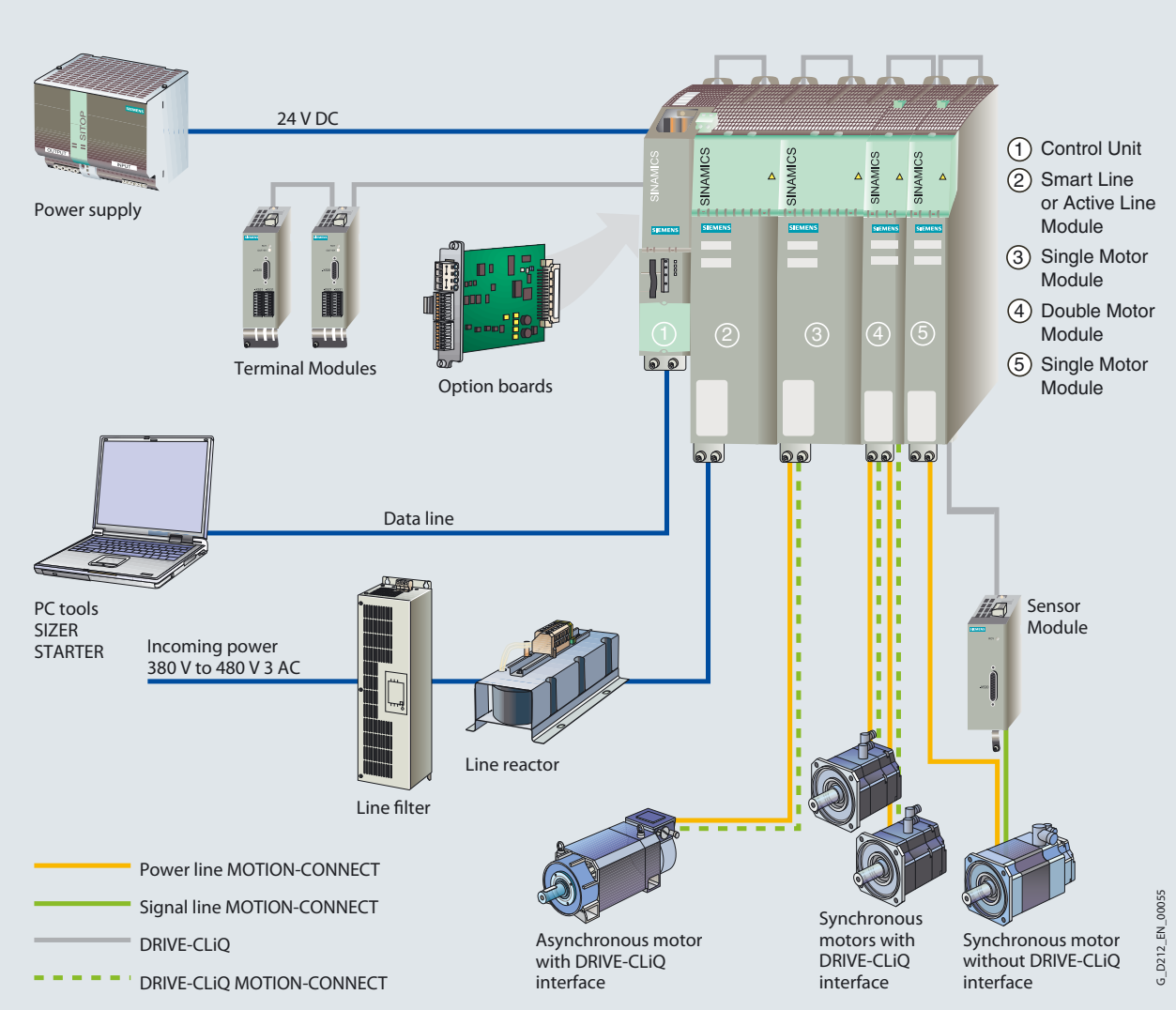


Figure 1-3 SINAMICS S120 system overview

Modular system for sophisticated drive tasks

SINAMICS S120 solves complex drive tasks for a wide range of industrial applications and is, therefore, designed as a modular system. Users can choose from many different harmonized components and functions to create a solution that best meets their requirements. SIZER, a high-performance engineering tool, makes it easier to choose and determine the optimum drive configuration.

SINAMICS S120 is supplemented by a wide range of motors. Whether torque, synchronous or induction motors, whether rotating or linear motors, all of these motors are optimally supported by SINAMICS S120.

Drive for multi-axis applications

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

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

New system architecture with a central Control Unit

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

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

DRIVE-CLiQ – the digital interface between SINAMICS components

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

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

Electronic type plates in all components

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

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

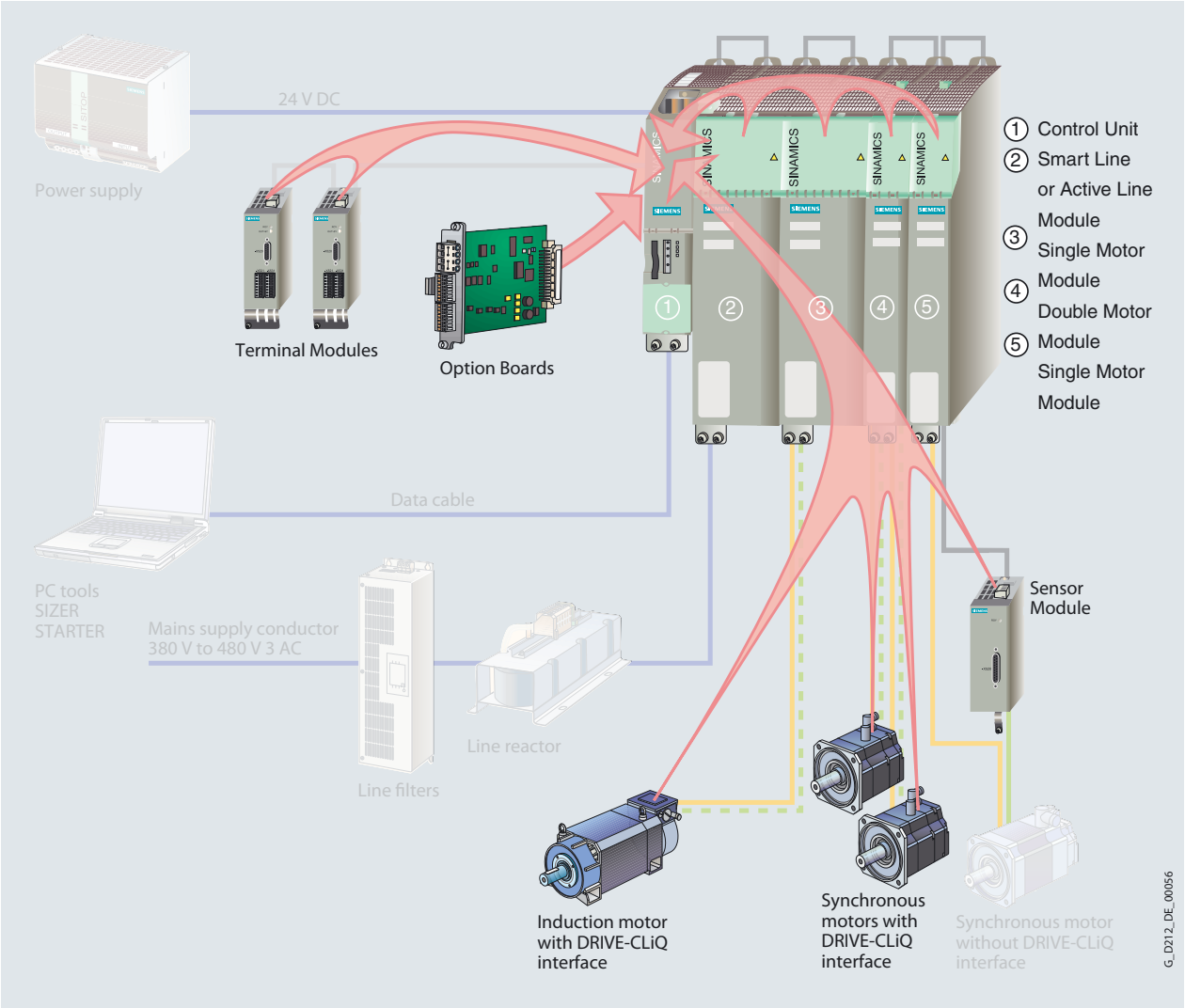


Figure 1-4 The electronic type plate for SINAMICS S120

1.5 SINAMICS S120 Components

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



Figure 1-5 SINAMICS S120 component overview

The following power components are available:

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

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

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

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

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

1.6 Power Sections

Line modules

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

- Smart line modules

  The smart line modules generate a non-stabilized DC link voltage and are capable of regenerative feedback.
- Active line modules

  The active line modules generate a stabilized DC link voltage and are capable of regenerative feedback.
- Basic Line Modules
  Basic Line Modules generate an unregulated DC link voltage and are not capable of regenerative feedback.

Motor modules

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

1.7 System data

Technical specifications

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

Electrical specifications	
Electronics power supply	24 V DC -15/+20 %, safety extra-low voltage (DVC A)
Line supply voltage (only for TM31, VSM10)	3-ph. 380 V to 480 V AC ±10 % (-15 % < 1 min)
Line supply voltage (only for TM31, VSM10)	47 Hz to 63 Hz
Radio interference suppression acc. to EN 61800-3	Category C3 (standard) Category C2 (option) for system implementation, in conformance with the documentation
Overvoltage category	I acc. to EN 60664-1
Degree of contamination	2 acc. to EN 60664-1

Environmental conditions	
The Safety-Integrated safety function: The components must be protected against conductive pollution (e.g. by installing them in a cabinet with degree of protection IP54B acc. to EN 60529). Provided that conductive pollution can be prevented at the installation site, the degree of protection for the cabinet can be decreased accordingly.	
Degree of protection Degree of protection for SME20/25/120/125	IP20 or IPXXB acc. to EN 60529, open type acc. to UL 508 IP67, with mounted connectors
Protective class, line supply circuits Protective class, electronic circuits	I (with protective conductor connection) III (safety extra-low voltage) acc. to EN 61800-5-1
Permissible ambient temperature in the enclosure during operation	0 °C to +55 °C up to 2000 m above sea level. Above an altitude of 2000 m, the max. ambient temperature decreases by 3.5 K every 500 m. Installation altitude: max. 4000 m above sea level
Chemically active substances • Long-term storage in the transport packaging • Transport in the transport packaging • Operation	 Class 1C2 acc. to EN 60721-3-1 Class 2C2 acc. to EN 60721-3-2 Class 3C2 acc. to EN 60721-3-3
Biological environmental conditions • Long-term storage in the transport packaging • Transport in the transport packaging • Operation	 Class 1B1 acc. to EN 60721-3-1 Class 2B1 acc. to EN 60721-3-2 Class 3B1 acc. to EN 60721-3-3

Environmental conditions	
Vibratory load	
• Long-term storage in the transport packaging	Class 1M2 acc. to EN 60721-3-1
• Transport in the transport packaging	Class 2M3 acc. to EN 60721-3-2
• Operation (except SME20/25/120/125)	Test values: Frequency range: 10 Hz to 58 Hz With constant deflection = 0.075 mm Frequency range: 58 Hz to 200 Hz With constant acceleration 1 g
Test values for SME20/25/120/125	
• Operation	Frequency range: 10 Hz to 58 Hz With constant deflection = 0.37 mm Frequency range: 58 Hz to 200 Hz With constant acceleration 5 g
Shock stressing	
• Long-term storage in the transport packaging	Class 1M2 acc. to EN 60721-3-1
• Transport in the transport packaging	Class 2M3 acc. to EN 60721-3-2
• Operation (except SME20/25/120/125)	Test values: 15 g / 11 ms
Test values for SME20/25/120/125	
• Operation	Test values: 25 g / 6 ms
Climatic ambient conditions	
• Long-term storage in the transport packaging	Class 1K4 acc. to EN 60721-3-1 Temperature -25 °C to +55 °C
• Transport in the transport packaging	Class 2K4 acc. to EN 60721-3-2 Temperature -40 °C to +70 °C
• Operation	Class 3K3 acc. to EN 60721-3-3 Temperature +0 °C to +40 °C Relative / absolute air humidity 5 % to 90 % / ≤ 25 g/m^3 Oil mist, salt mist, formation of ice, moisture condensation, dripping, spray, splashing and water jets not permissible
SME20/25/120/125	
• Operation	Temperature +0 °C to +55 °C Air humidity: ≥ 5 % to ≤ 65 % annual average ≤ 85 % for max. 2 months / year moisture condensation and the formation of ice not permissible

Certificates	
Declarations of Conformity	CE (Low-Voltage and EMC Directives)
Approbation	cULus

Control Units

2

2.1 Introduction

Description

The Control Unit 320 (CU320) of the SINAMICS S system is designed for use with several drives.

The number of variable-speed drives depends on:

- The required performance
- The required special functions
- The required operating mode (servo, vector, or V/f).

The software and the parameters are stored on a plug-in CompactFlash card.

The option slot is used to expand the number of terminals or adapt to other communication interfaces (to the higher-level control).

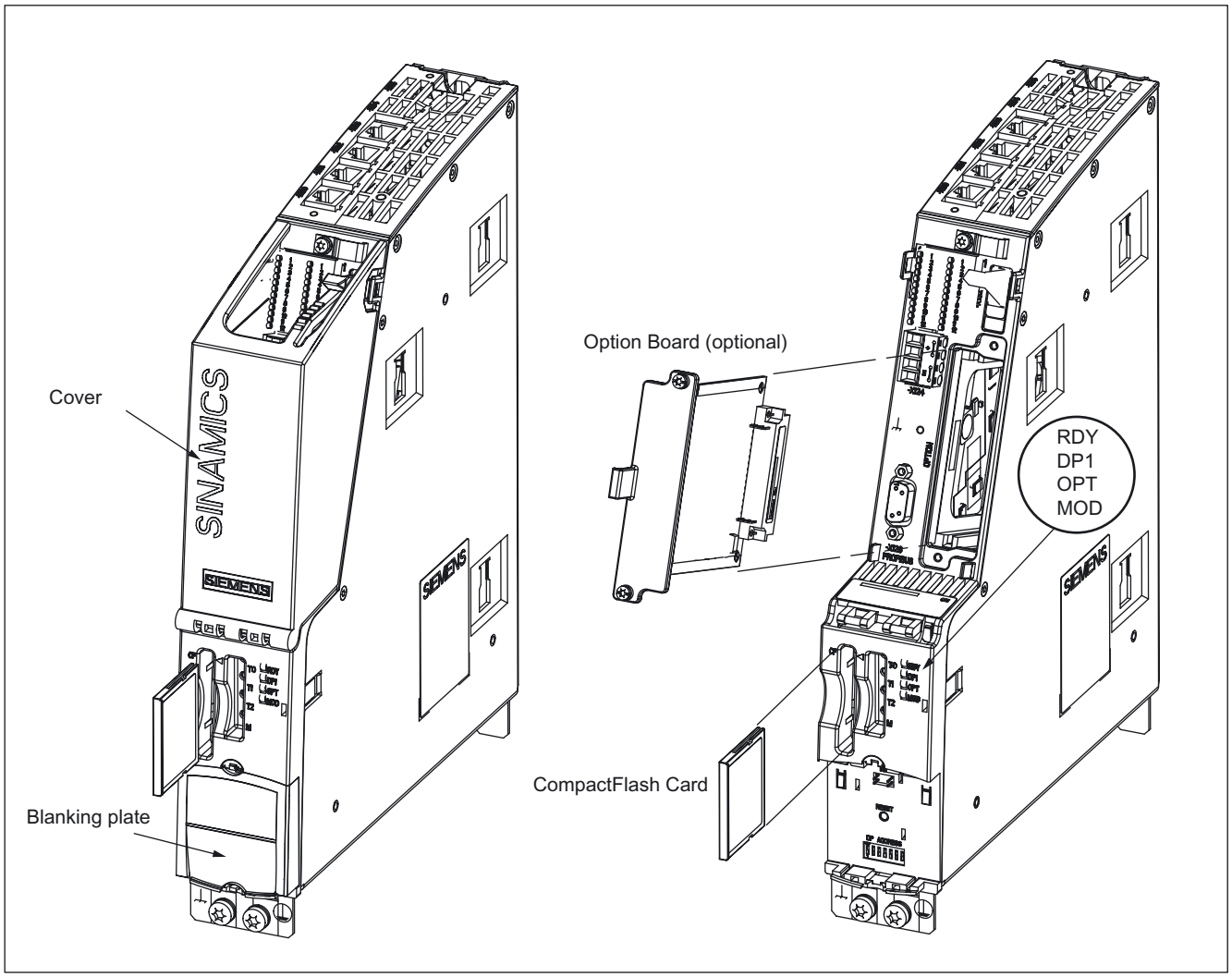


Figure 2-1 Overview Control Unit 320 (CU320)

Note

The Control Unit, the Option Board, and the CompactFlash card must be ordered separately.

If your application requires more than one Control Unit, the number can be increased accordingly. The Control Units are then interconnected via PROFIBUS, for example.

A Control Unit communicates with the associated components (Motor Modules, Line Modules, Sensor Modules, Terminal Modules, and so on) via the system-internal DRIVE-CLiQ interface.

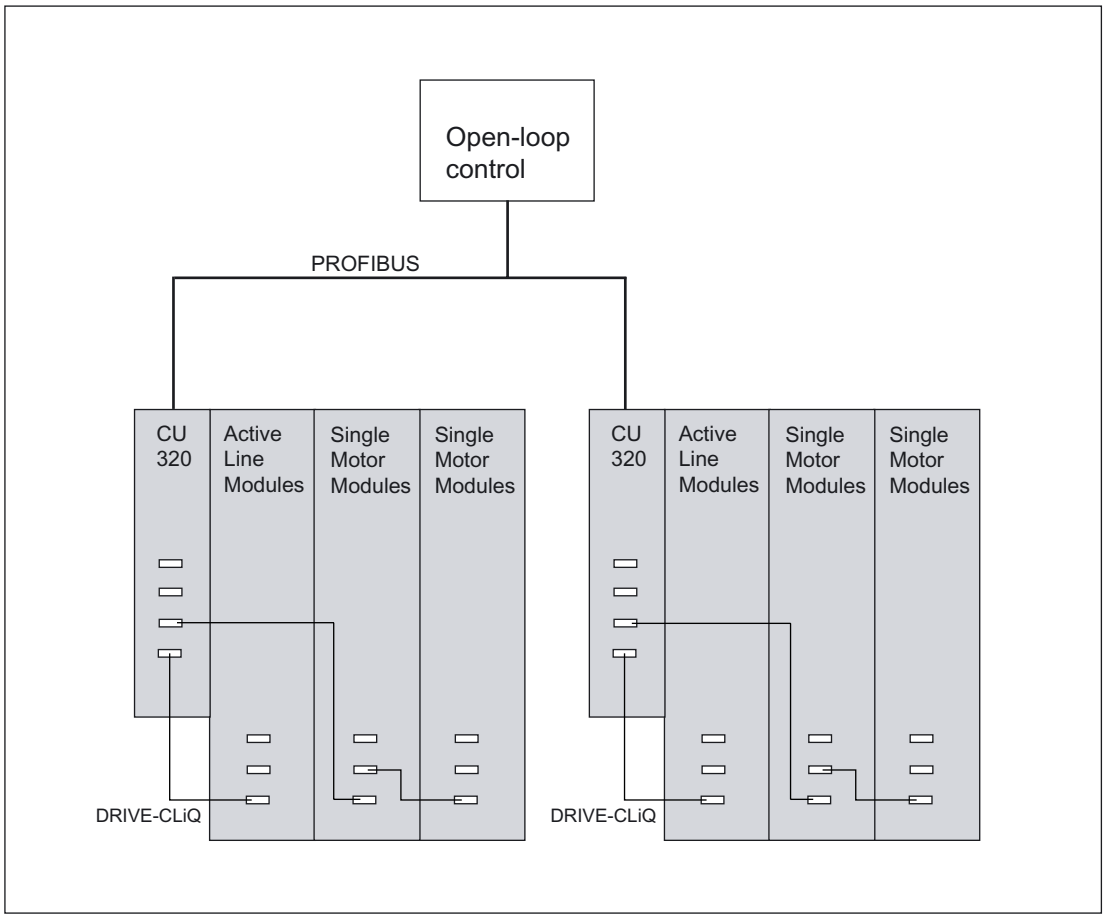


Figure 2-2 Sample configuration

2.2 Control Unit CU320

2.2.1 Description

The Control Unit 320 is a central control module in which the closed-loop and open-loop functions are implemented for one or more Line Modules and/or Motor Modules.

The CU320 contains the following interfaces:

Table 2-1 Overview of the CU320 interfaces

Type	Quantity
Digital inputs	8
Digital inputs/outputs	8
DRIVE-CLiQ interfaces	4
PROFIBUS interface	1
Serial interface (RS232)	1
Option slot	1

2.2.2 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.

⚠ Warning

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

Note

The CompactFlash card may only be inserted and removed when the Control Unit is disconnected from the power supply.

2.2.3 Interface description

2.2.3.1 Overview

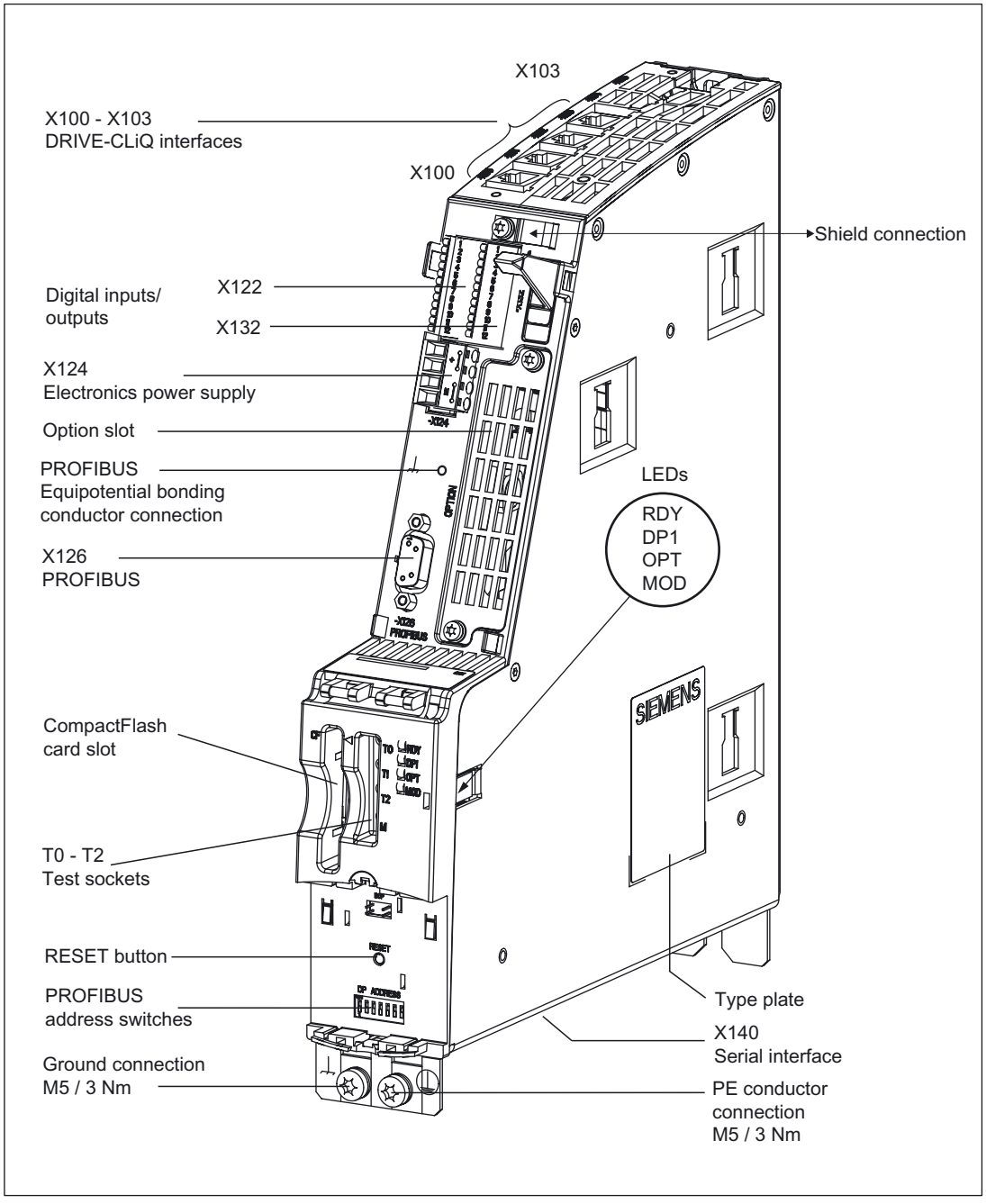


Figure 2-3 Interface description of the CU320 (covers removed)

2.2.3.2 Connection example

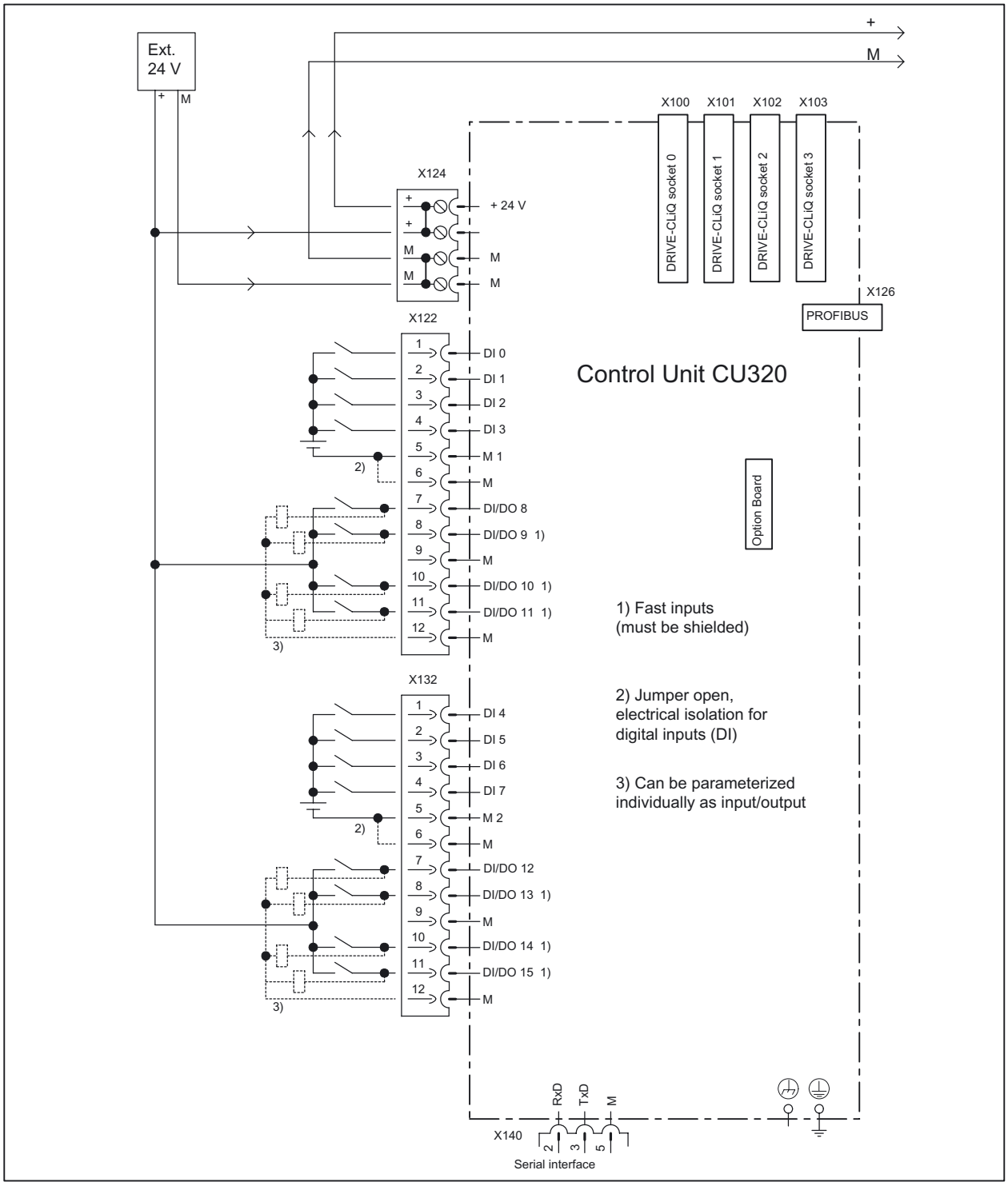
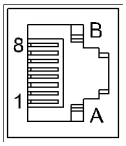


Figure 2-4 Example connection of CU320

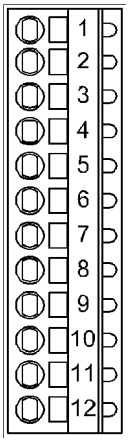
2.2.3.3 X100 - X103 DRIVE-CLiQ interface

Table 2-2 DRIVE-CLiQ interface

	Pin	Signal name	Technical data
	1	TXP	Transmit data +
	2	TXN	Transmit data -
	3	RXP	Receive data +
	4	Reserved, do not use	
	5	Reserved, do not use	
	6	RXN	Receive data -
	7	Reserved, do not use	
	8	Reserved, do not use	
	A	+ (24 V)	Power supply
	B	M (0 V)	Electronics ground
Blanking plate for DRIVE-CLiQ interface: Yamaichi company, Order No.: Y-ConAS-13 The maximum DRIVE-CLiQ cable length is 100 m.			

2.2.3.4 X122: Digital Inputs/Outputs

Table 2-3 Terminal block X122

	Terminal	Designation[1)]	Technical data
	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" → "1": approx. 50 µs for "1" → "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 "fast inputs" Input delay: for "0" → "1": approx. 50 µs / 5 µs for "1" → "0": approx. 100 µs/50 µs As output: Voltage: 24 V DC Max. load current per output: 500 mA continuous short-circuit proof output delay: for "0" → "1": approx. 400 µs for "1" → "0": approx. 100 µs
	8	DI/DO 9	
	9	M	
	10	DI/DO 10	
	11	DI/DO 11	
	12	M	
Max. connectable cross-section: 0.5 mm^2 Type: Spring-loaded terminal 1 (see Appendix A)			

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

Notice

An open input is interpreted as "low".

The "fast inputs" can be used in conjunction with a measuring system for position sensing.

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

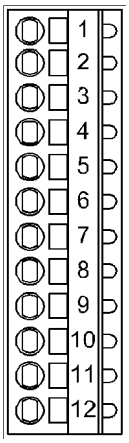
Connect the reference ground of the digital inputs, or a jumper to terminal M (Notice! This removes electrical isolation for these digital inputs).

Note

If a the 24 V power supply voltage is briefly interrupted, then the digital outputs are de-activated during this time.

2.2.3.5 X132: Digital Inputs/Outputs

Table 2-4 Terminal block X132

	Terminal	Designation[1)]	Technical data
	1	DI 4	Voltage: -3 V to 30 V Typical current consumption: 10 mA at 24 V DC Isolation: The reference potential is terminal M2 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 5	
	3	DI 6	
	4	DI 7	
	5	M2	
	6	M	
	7	DI/DO 12	As input: Voltage: -3 V to 30 V Typical current drain: 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 "fast inputs" Input delay: for "0" to "1": approx. 5 µs for "1" to "0": approx. 50 µs As output: Voltage: 24 V DC Max. load current per output: 500 mA continuous short-circuit proof output delay: for "0" to "1": 400 µs for "1" to "0": 100 µs
	8	DI/DO 13	
	9	M	
	10	DI/DO 14	
	11	DI/DO 15	
	12	M	
Max. connectable cross-section: 0.5 mm^2 Type: Spring-loaded terminal 1 (see Appendix A)			

1) DI: digital input; DI/DO: digital input/output; M: electronics ground; M2: ground reference

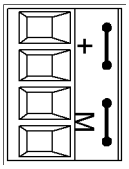
Notice
An open input is interpreted as "low". The "fast inputs" can be used for position sensing. To enable digital inputs (DI) 4 to 7 to function, terminal M2 must be connected. This can be done as follows: Connect the reference ground of the digital inputs, or a jumper to terminal M (Notice! This removes electrical isolation for these digital inputs).

Note

If a the 24 V power supply voltage is briefly interrupted, then the digital outputs are de-activated during this time.

2.2.3.6 Electronics power supply X124

Table 2-5 Terminal block X124

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

Note

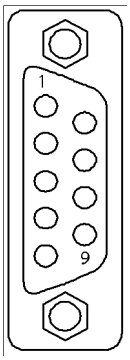
The two “+” and “M” terminals are jumpered in the connector. This ensures the supply voltage is looped through.

The current consumption increases by the value for the DRIVE-CLiQ node.

2.2.3.7 PROFIBUS X126

The PROFIBUS interface is a standard interface on every Control Unit.

Table 2-6 PROFIBUS interface X126

	Pin	Signal name	Meaning	Range
	1	-	Not assigned	
	2	M24_SERV	Power supply for teleservice, ground	0 V
	3	RxD/TxD–P	Receive/transmit data P (B)	RS485
	4	CNTR–P	Control signal	TTL
	5	DGND	PROFIBUS data reference potential	
	6	VP	Supply voltage plus	5 V + -10 %
	7	P24_SERV	Power supply for teleservice, + (24 V)	24 V (20.4 V – 28.8 V)
	8	RxD/TxD–N	Receive/transmit data N (A)	RS485
	9	-	Not assigned	
Type: 9-pin SUB-D female				

Note

A teleservice adapter can be connected to the PROFIBUS interface (X126) for remote diagnosis purposes.
The power supply for the teleservice terminals 2 and 7 can have a max. load of 150 mA.

⚠ Caution

No CAN cables must be connected to interface X126. If CAN cables are connected, the CU320 and other CAN bus nodes may be destroyed.

⚠ Caution

A potential bonding conductor with a minimum cross-section of 25 mm² must be used between parts of a plant or system that are separated from one another. If this is not carefully complied with, then significant discharge (leakage) currents can flow through the PROFIBUS cable that will destroy the Control Unit or other devices connecting to PROFIBUS.

PROFIBUS connectors

The first and last nodes in a bus must contain terminating resistors. Otherwise data transmission will not function correctly.

The terminating resistors are activated in the connector.

The cable shield must be connected at both ends over large-surface area contacts.

2.2.3.8 PROFIBUS address switches

Table 2-7 PROFIBUS address switches

Technical specifications	Switch	Significance
Significance: 2^0 2^1 2^2 2^3 2^4 2^5 2^6 = 1 2 4 8 16 32 64  S1 S2 S3 S4 S5 S6 S7 Example: 1 + 4 + 32 = 37 PROFIBUS address = 37	S1	$2^0 = 1$
	S2	$2^1 = 2$
	S3	$2^2 = 4$
	S4	$2^3 = 8$
	S5	$2^4 = 16$
	S6	$2^5 = 32$
	S7	$2^6 = 64$

Note

The PROFIBUS address switches are defaulted to 0 or 127. In these two settings, addresses are assigned via parameters.

The address switch is behind the blanking plate. The blanking plate is part of the scope of supply.

2.2.3.9 Reference

Setting the PROFIBUS address

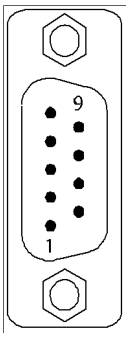
The following reference contains further information about setting the PROFIBUS address:

Reference: /IH1/ SINAMICS S120 Commissioning Manual

2.2.3.10 Serial interface (RS232) X140

An external display and operator device for operator control/parameterization can be connected via the serial interface. The interface is located on the underside of the CU.

Table 2-8 Serial interface (RS-232-C) X140

	Pin	Name	Technical Specifications
	2	RxD	Receive data
	3	TxD	Transmit data
	5	Ground	Ground reference

2.2.3.11 Measurement sockets T0, T1, and T2

Table 2-9 Measurement sockets T0, T1, and T2

Socket	Function	Technical specifications
T0	Measurement socket 0	Voltage: 0 V to 5 V Resolution: 8 bits Load current: max. 3 mA Continued-short-circuit-proof The reference potential is terminal M
T1	Measurement socket 1	
T2	Measurement socket 2	
M	Ground	
The measurement sockets are only suitable for bunch pin plugs with a diameter of 2 mm.		

2.2.3.12 Slot for the CompactFlash card

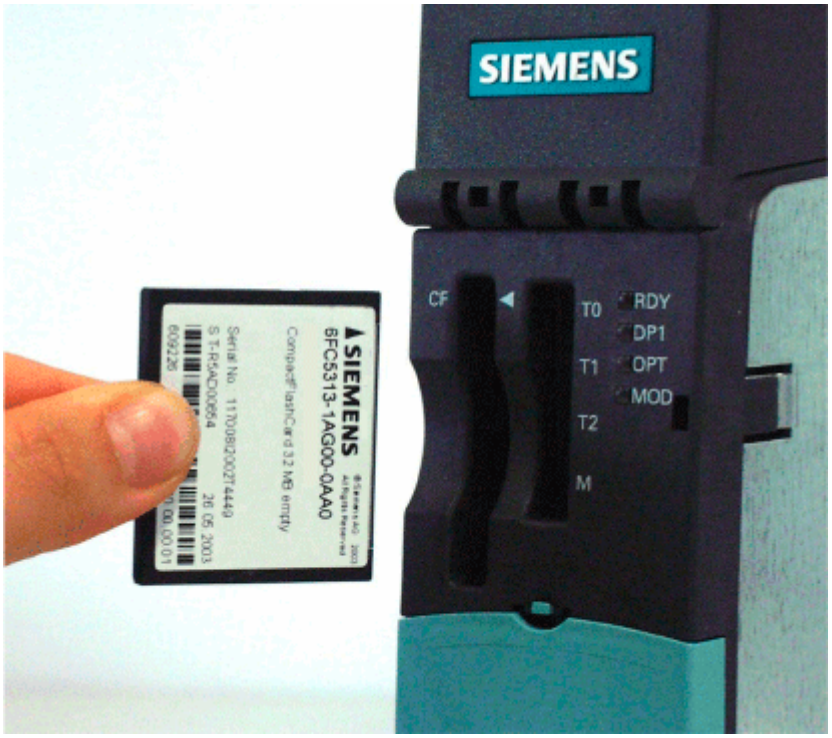


Figure 2-5 CompactFlash card slot

Caution
The CompactFlash card may only be inserted as shown in the figure (arrow top right). The CompactFlash card may only be inserted or removed when the Control Unit is disconnected from the power supply. When returning a defective Control Unit, remove the CompactFlash card and keep it for insertion in the replacement unit. This is important otherwise the data on the CompactFlash card (parameters, firmware, licenses, and so on) may be lost.

2.2.3.13 Description of the LEDs on the control unit

Table 2-10 Description of the LEDs on the Control Unit

LED	Color	Status	Description
RDY (READY)	-	Off	The electronics power supply is missing or lies outside permissible tolerance range.
	Green	Steady light	The component is ready for operation and cyclic DRIVE-CLiQ communication is taking place or the Control Unit must be commissioned for the first time.
		Flashing light 2 Hz	Writing to CompactFlash card
	Red	Steady light	This component has at least one fault.
		Flashing light 2 Hz	Boot error
	Green/ red	Flashing light 0.5 Hz	Control Unit 320 is ready for operation. However there are no software licenses.
	Orange	Flashing light 2 Hz	The component firmware has been updated, wait for POWER ON of the particular component
	Orange	Steady light	System boots and DRIVE-CLiQ communication is being established.
		Flashing light 0.5 Hz	Updating the firmware of the DRIVE-CLiQ components.
		Flashing light 2 Hz	Firmware checksum error, CRC error.
	Green/ orange or red/orange	Flashing light 1 Hz	Component recognition via LED is activated (p0124[0]). **Note:** Both options depend on the LED status when component recognition is activated via p0124[0] = 1.
DP1 (PROFIBUS cyclic operation)	-	Off	Cyclic communication is not (yet) running. Note: PROFIdrive is ready for communication when the Control Unit is ready for operation (see RDY LED).
	Green	Steady light	Cyclic communication is running.
		Flashing light 0.5 Hz	Cyclic communication is not yet running fully. Possible reasons: • The controller is not transmitting any setpoints. • During isochronous (clock synchronous) operation, no Global Control (GC) or a faulty Global Control (GC) is transferred by the controller.
	Red	Steady light	Cyclic communication has been interrupted.
	Orange	Flashing light 2 Hz	Firmware checksum error (CRC error).
OPT (OPTION)	–	Off	Electronics power supply is missing or outside permissible tolerance range. Component is not ready. Option Board not installed or no associated drive object has been created.
	Green	Steady light	Option Board is ready.
		0.5 Hz flashing light	Depends on the Option Board used
	Red	Steady light	At least one fault is pending in this component. The Option Board is not ready (e.g. after power ON).
MOD	-	Off	Reserved

Cause and rectification of faults

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

References: /IH1/ SINAMICS S120 Commissioning Manual.

RESET button

The RESET button is located behind the blanking plate.

2.2.4 Dimension Drawing

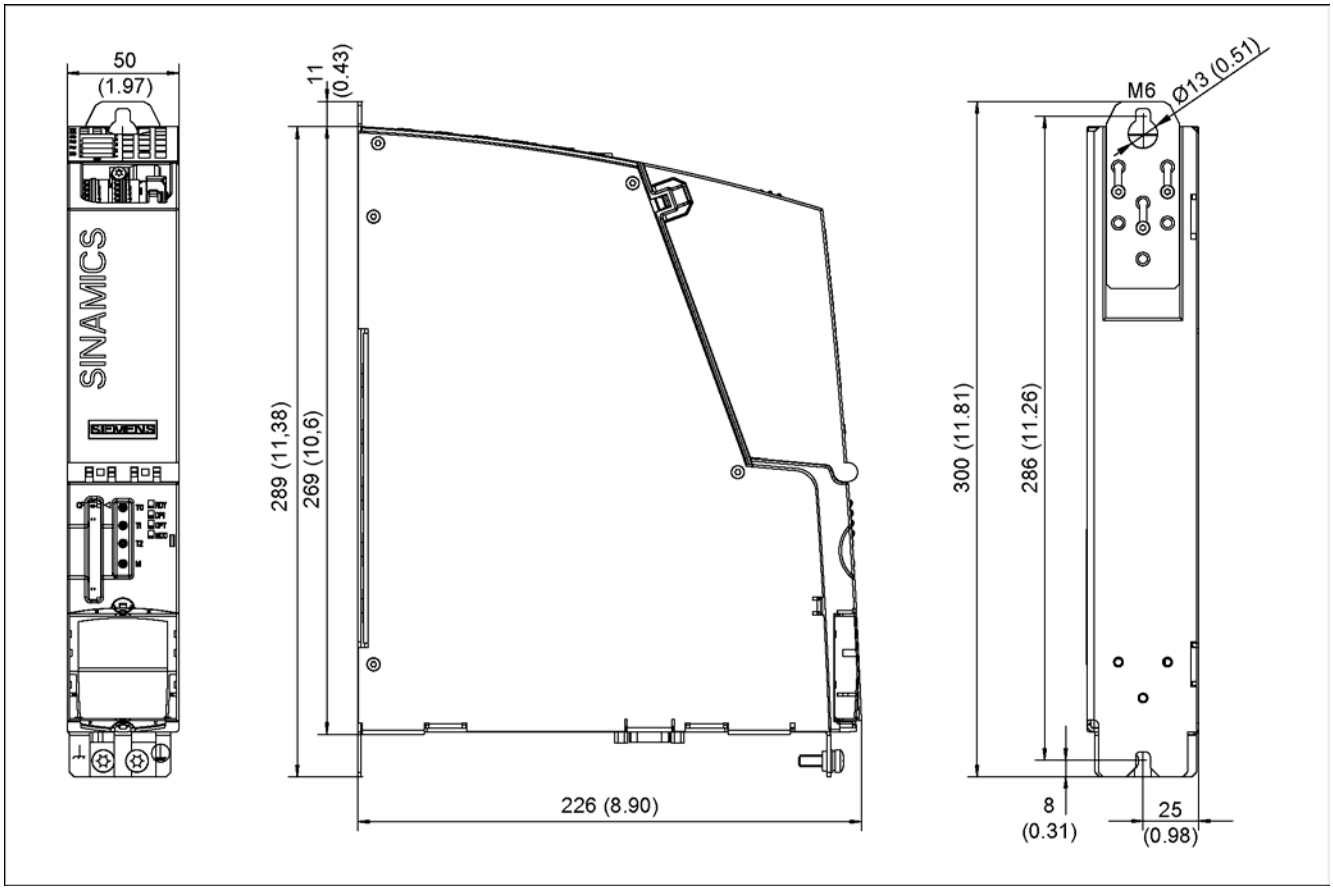


Figure 2-6 Dimension drawing: CU320

2.2.5 Installation

Mounting the CU320 directly on a Line Module booksize

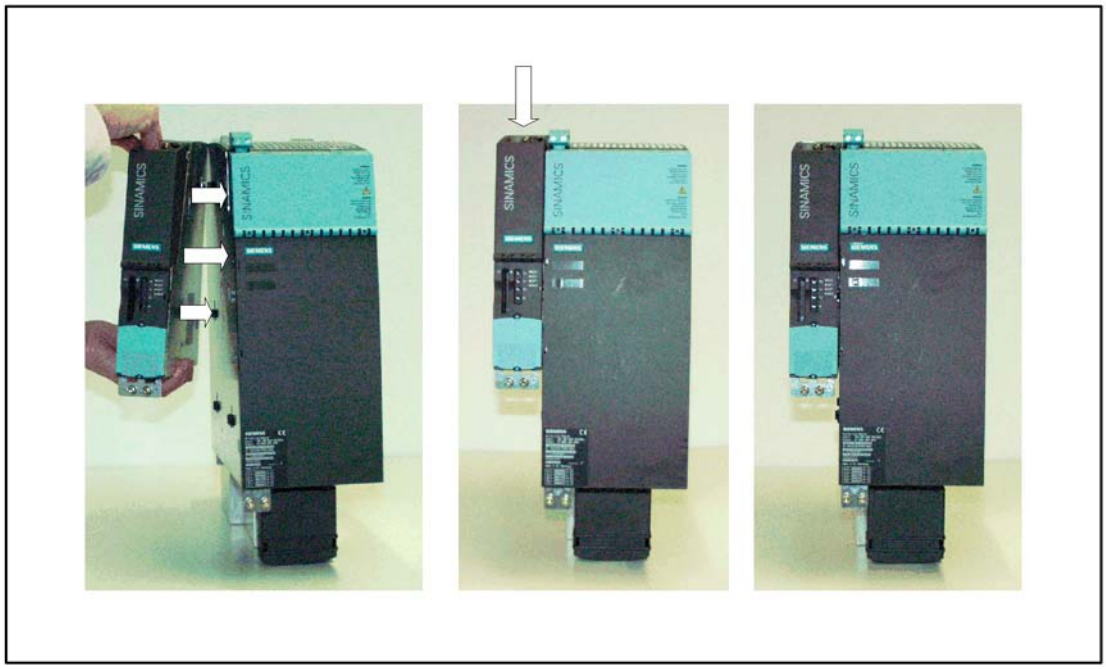


Figure 2-7 Mounting the CU320 directly on a Line Module in booksize format

Installing the CU320 directly on a mounting surface

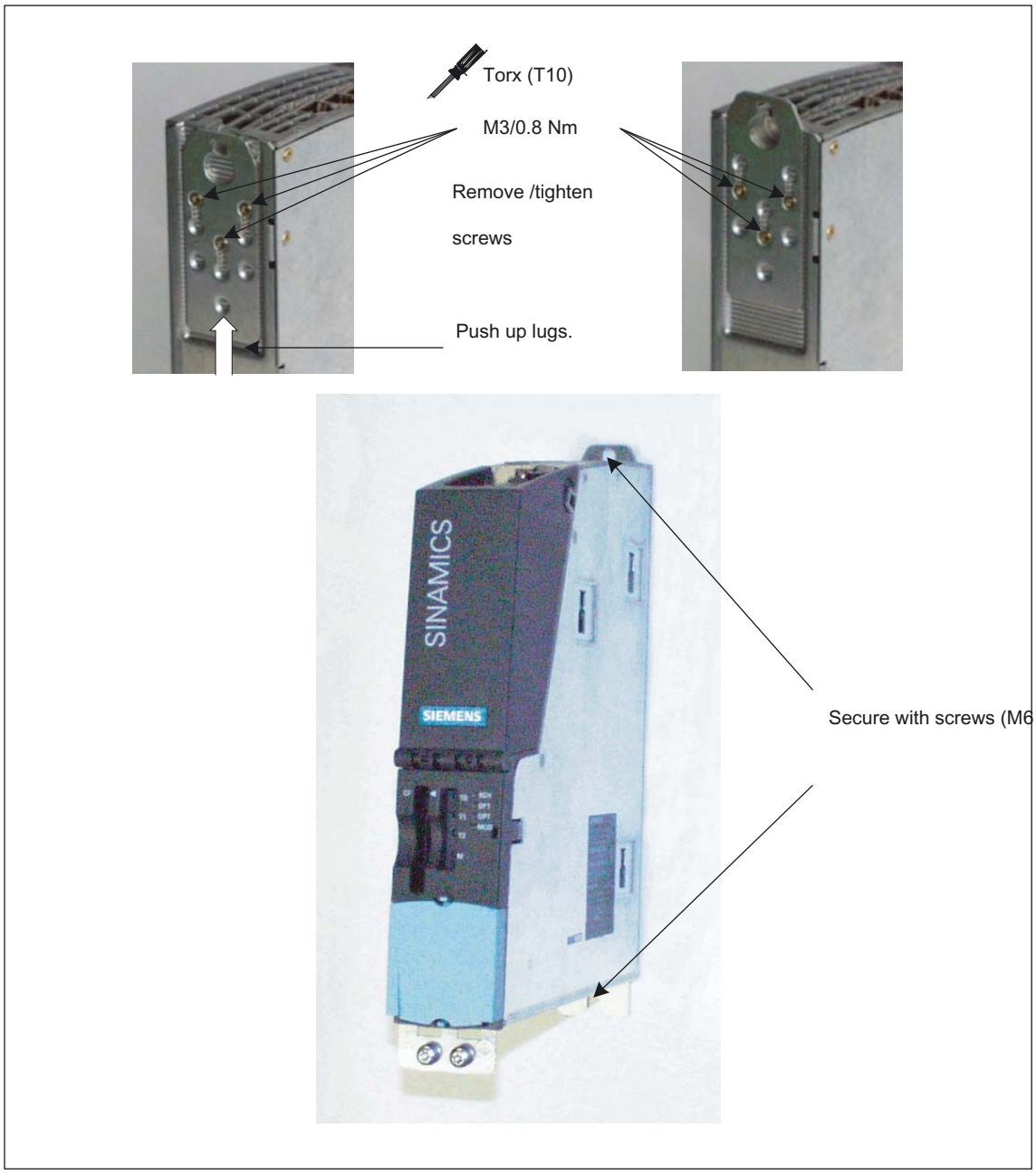


Figure 2-8 Installing the CU320 directly on a mounting surface

Installing the CU320 on a mounting surface using spacer elements

To provide the correct mounting depth for a booksize line-up with internal air cooling, you can use spacer elements (2 elements: 6SL3064-1BB00-0AA0) can be mounted.

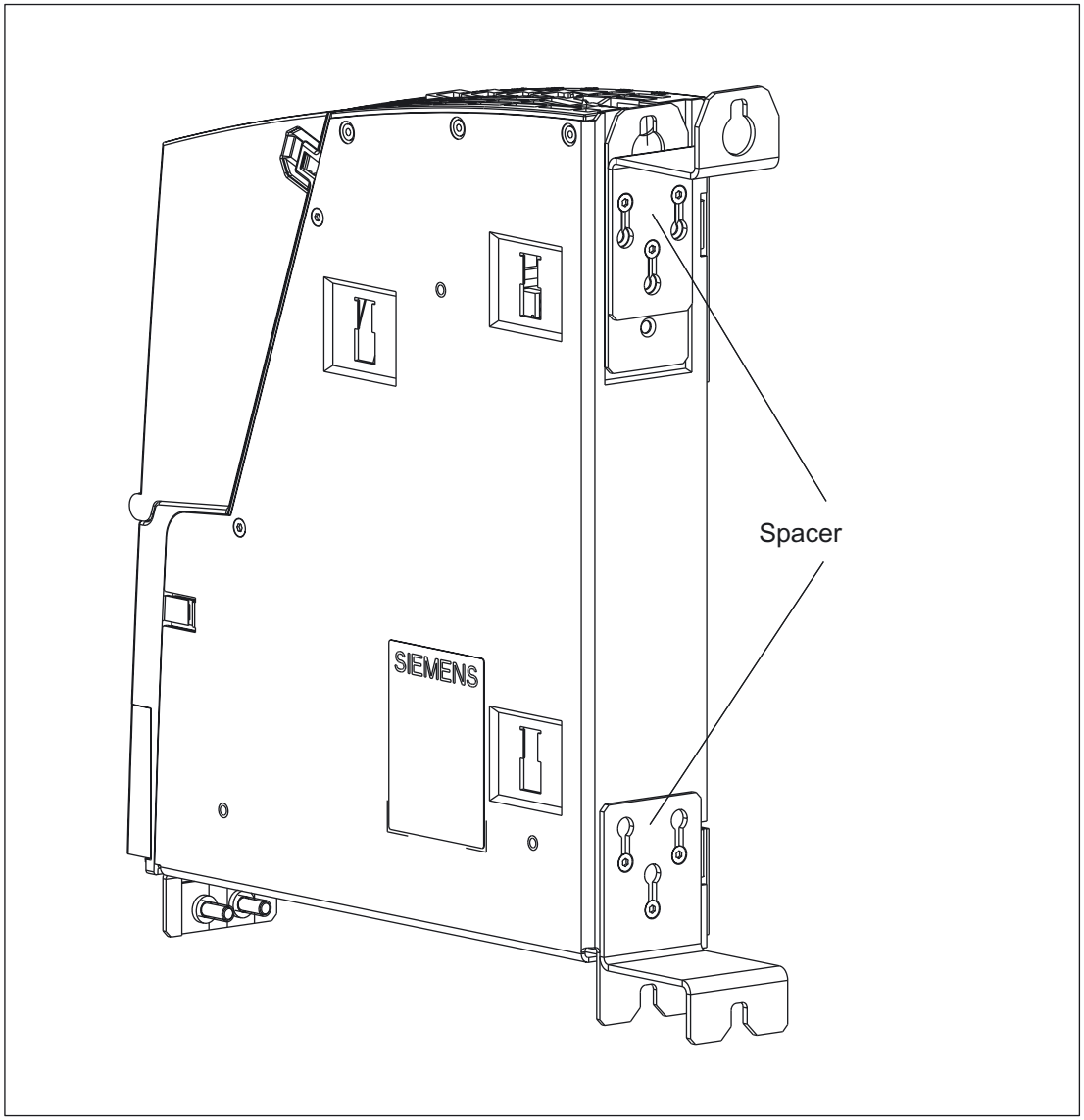


Figure 2-9 Installing the CU320 on a mounting surface using spacer elements

Removing/opening the cover of the CU320

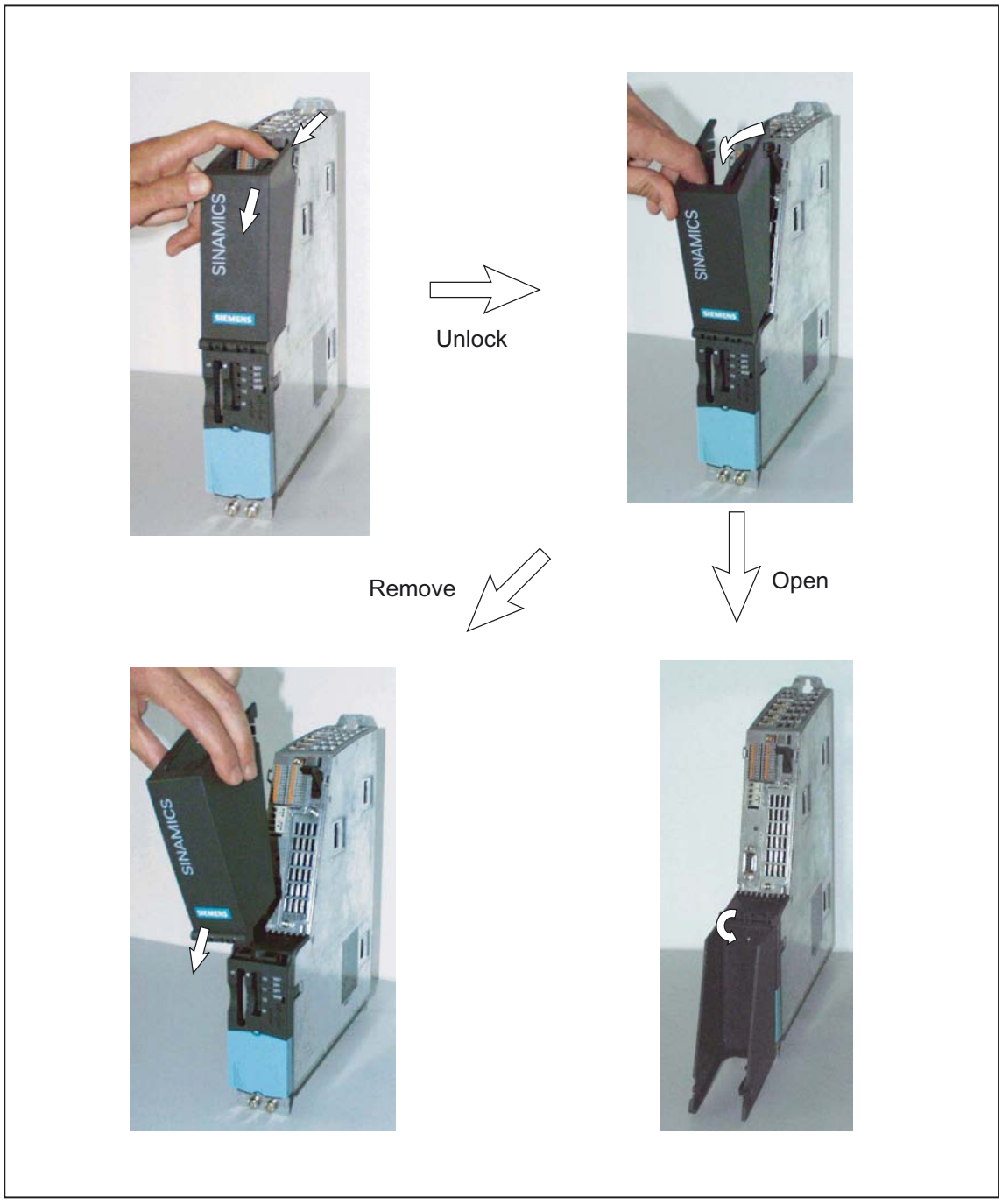


Figure 2-10 Removing/opening the cover of the CU320

2.2.6 Technical Specifications

Table 2-11 Technical data

	Unit	Value
Electronics power supply		
Voltage	V_{DC}	24 DC (20.4 – 28.8)
Current (without DRIVE-CLiQ or digital outputs)	A_{DC}	0,8
Power loss	W	20
PE/ground connection	On housing with M5/3 Nm screw	
Response time	The response time of digital inputs/outputs depends on the evaluation (refer to the function diagram). **References:** / LH1/ SINAMICS S List Manual, Chapter "Function diagrams".	
Weight	kg	1,5

Additional system components

3

3.1 Basic Operator Panel BOP20

3.1.1 Description

The Basic Operator Panel BOP20 contains six keys and a backlit display unit. The BOP20 can be plugged onto the SINAMICS Control Unit CU320 and operated. Operation is only possible from SINAMICS V2.4 onwards.

The following functions are possible with the BOP:

- Input of parameters and activation of functions
- Display of operating modes, parameters, alarms and faults

3.1.2 Interface description



Figure 3-1 Basic Operator Panel BOP20

Overview of displays and keys

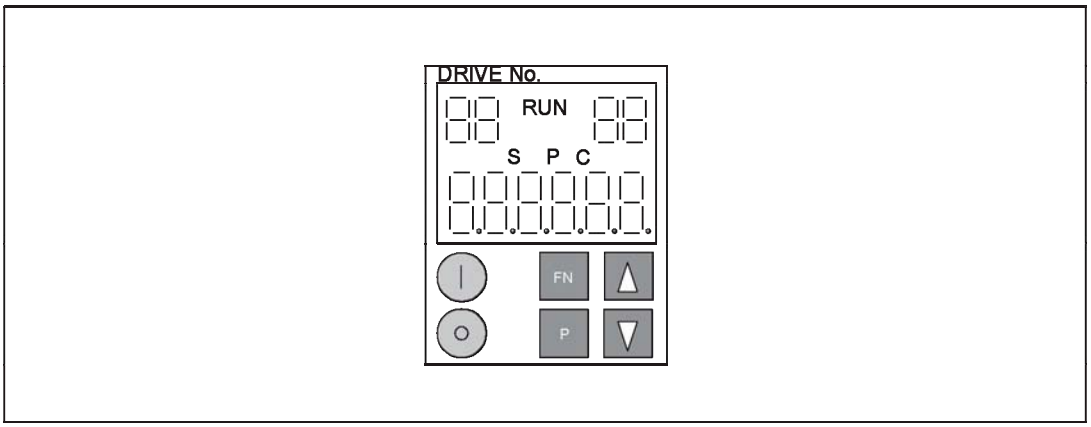


Figure 3-2 Overview of displays and keys

Table 3-1 Displays

Display	Meaning
top left 2 positions	The active drive object of the BOP is displayed here. The displays and key operations always refer to this drive object.
RUN	Is lit (bright) if the displayed drive is in the RUN state (in operation).
top right 2 positions	The following is displayed in this field: • More than 6 digits: Characters that are present but cannot be seen (e.g. "r2" —> 2 characters to the right are invisible, "L1" —> 1 character to the left is invisible) • Faults: Selects/displays other drives with faults • Designation of BICO inputs (bi, ci) • Designation of BICO outputs (bo, co) Source object of a BICO interconnection to a drive object different than the active one.
S	Is (bright) if at least one parameter was changed and the value was not transferred into the non-volatile memory.
P	Is lit (bright) if, for a parameter, the value only becomes effective after pressing the P key.
C	Is light (bright) if at least one parameter was changed and the calculation for consistent data management has still not been initiated.
Below, 6 position	Displays, e.g. parameters, indices, faults and alarms.

BOP20 keyboard

Table 3-2 Assignment of the BOP20 keyboard

Key	Name	Meaning
	ON	Powering-up the drives for which the command "ON/OFF1", "OFF2" or "OFF3" should come from the BOP.
	OFF	Powering-down the drives for which the commands "ON/OFF1", "OFF2" or "OFF3" should come from the BOP.
		Note: The effectiveness of these keys can be defined using the appropriate BICO parameterization (e.g. using these keys, it is possible to simultaneously control all of the axes that have been configured). The structure of the BOP control word corresponds to the structure of the PROFIBUS control word.
	Functions	The significance of these keys depends on the actual display. **Note:** The effectiveness of this key to acknowledge faults can be defined using the appropriate BiCo parameterization.
	Parameter	The significance of these keys depends on the actual display.
	Raise	The keys are dependent on the actual display and are used to raise or lower values.
	Lower	

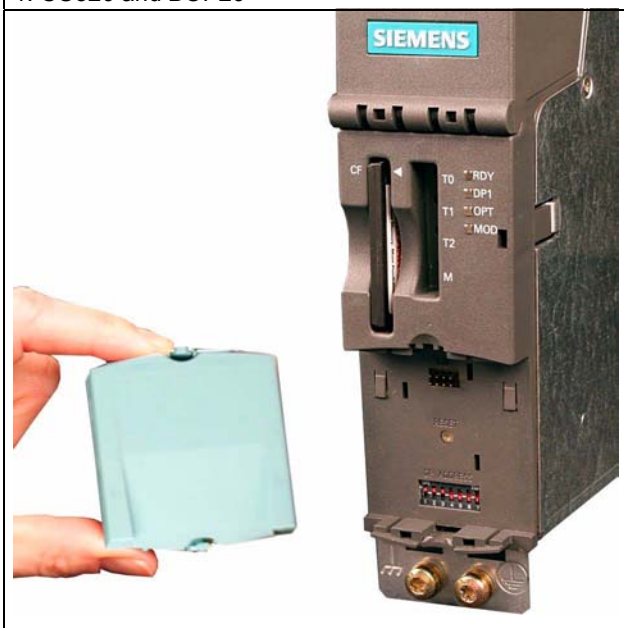
Displays and operating the BOP20

Information about the displays and using the BOP20 is provided in the following reference:

Reference: /IH1/ SINAMICS S120 Commissioning Manual

3.1.3 Installation

Table 3-3 Installation

	
1. CU320 and BOP20	2. Press the bars of the cover together
	
3. Remove the cover	4. Locate the BOP20

3.1.4 Technical data

Table 3-4 Technical specifications

Basic Operator Panel BOP20		
Weight, approx.	kg	0,02

3.2 Option Board: Communication Board CBC10

3.2.1 Description

The Communication Board CBC10 is a communication board for linking to CAN.

3.2.2 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 CBC10 must only be operated by qualified personnel. The ESC notices must be observed.

3.2.3 Interface description

3.2.3.1 Overview

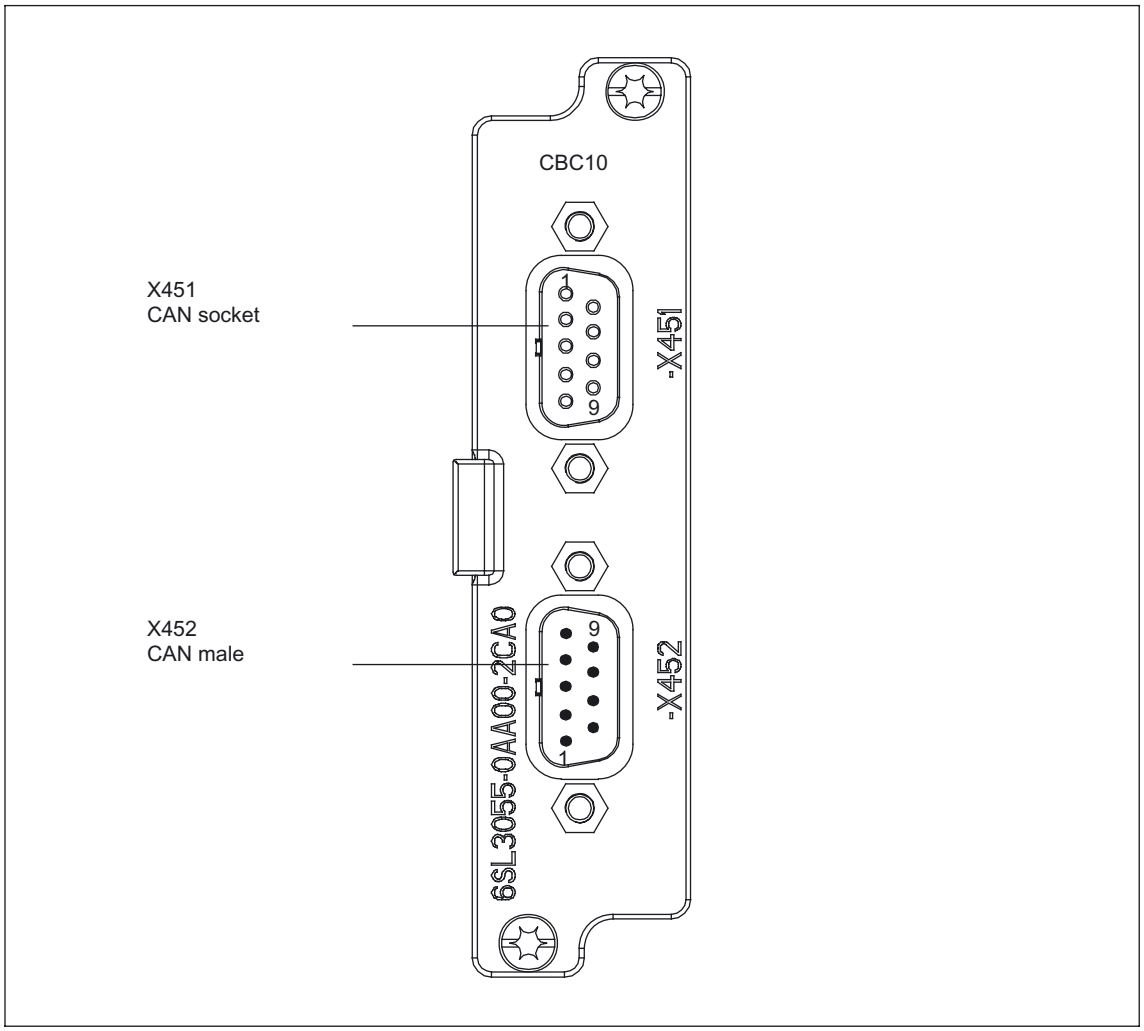
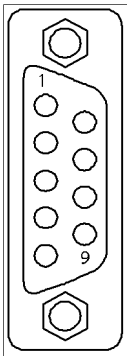


Figure 3-3 Interface description of the CBC10

3.2.3.2 CAN bus interface X451

Table 3-5 CAN bus interface X451

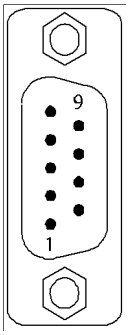
	Pin	Designation	Technical data
	1	Reserved, do not use	
	2	CAN_L	CAN signal (dominant low)
	3	CAN_GND	CAN ground
	4	Reserved, do not use	
	5	CAN_SHLD	Optional shield
	6	GND	CAN ground
	7	CAN_H	CAN signal
	8	Reserved, do not use	
	9	Reserved, do not use	
Type: 9-pin SUB-D female			

⚠ Caution

If the CAN bus interface is connected to the PROFIBUS connector, then this can destroy the CAN interface.

3.2.3.3 CAN bus interface X452

Table 3-6 CAN bus interface X452

	Pin	Name	Technical specifications
	1	Reserved, do not use	
	2	CAN_L	CAN signal (dominant low)
	3	CAN_GND	CAN ground
	4	Reserved, do not use	
	5	CAN_SHLD	Optional shield
	6	GND	CAN ground
	7	CAN_H	CAN signal
	8	Reserved, do not use	
	9	Reserved, do not use	
Type: 9-pin SUB-D male			

3.2.3.4 2-pin SMD DIL switch

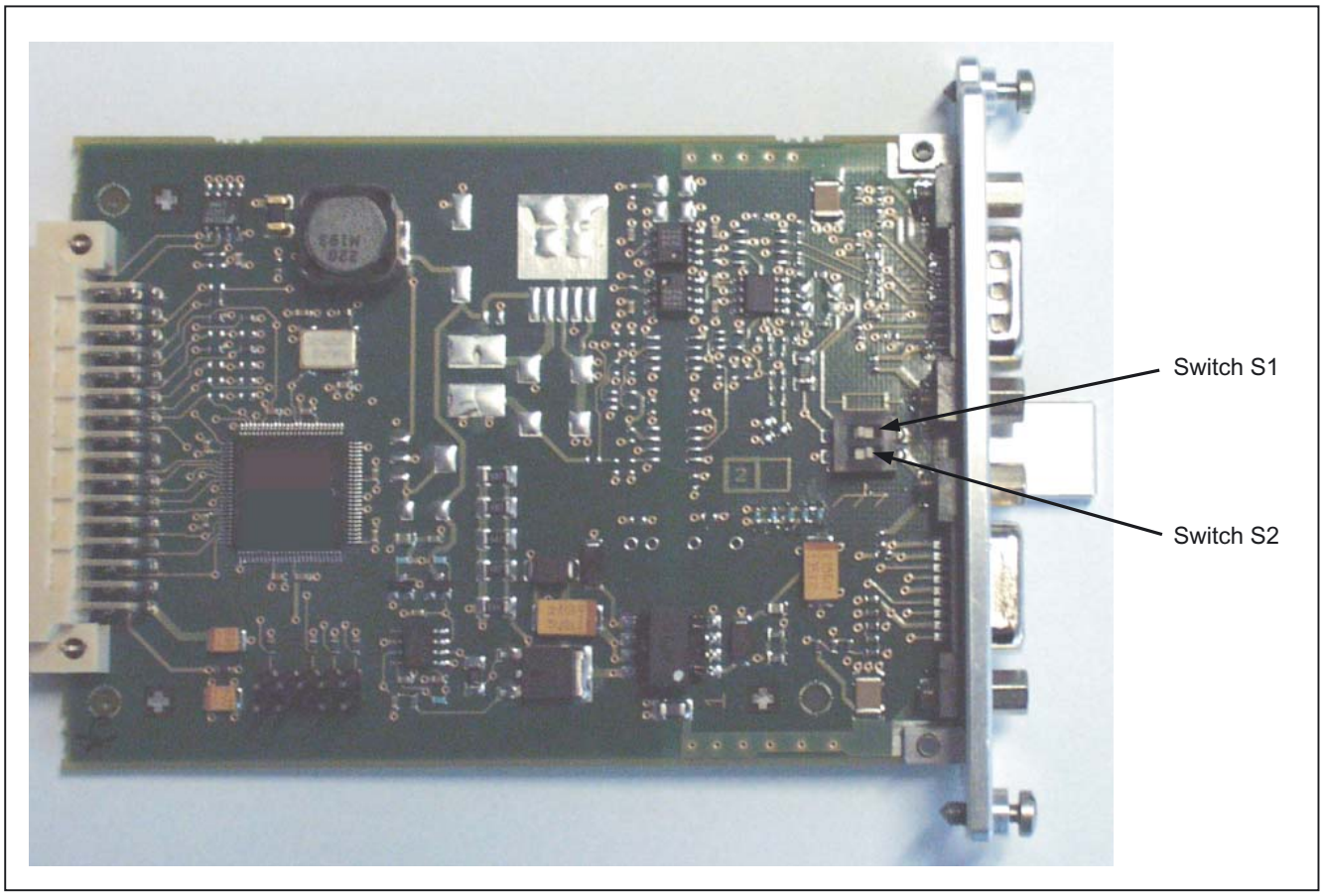
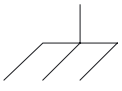


Figure 3-4 Switch S1/S2

Table 3-7 2-pin SMD DIL switch

ID on the component	Switch	Function	Switch position		Default
	S1	Bus terminating resistor 120 Ohm	OFF	Inactive	OFF
			ON	Active	
	S2	Operation with/without ground	OFF	Ground-free operation	OFF
			ON	Operation with ground	

3.2.4 Installation/Mounting

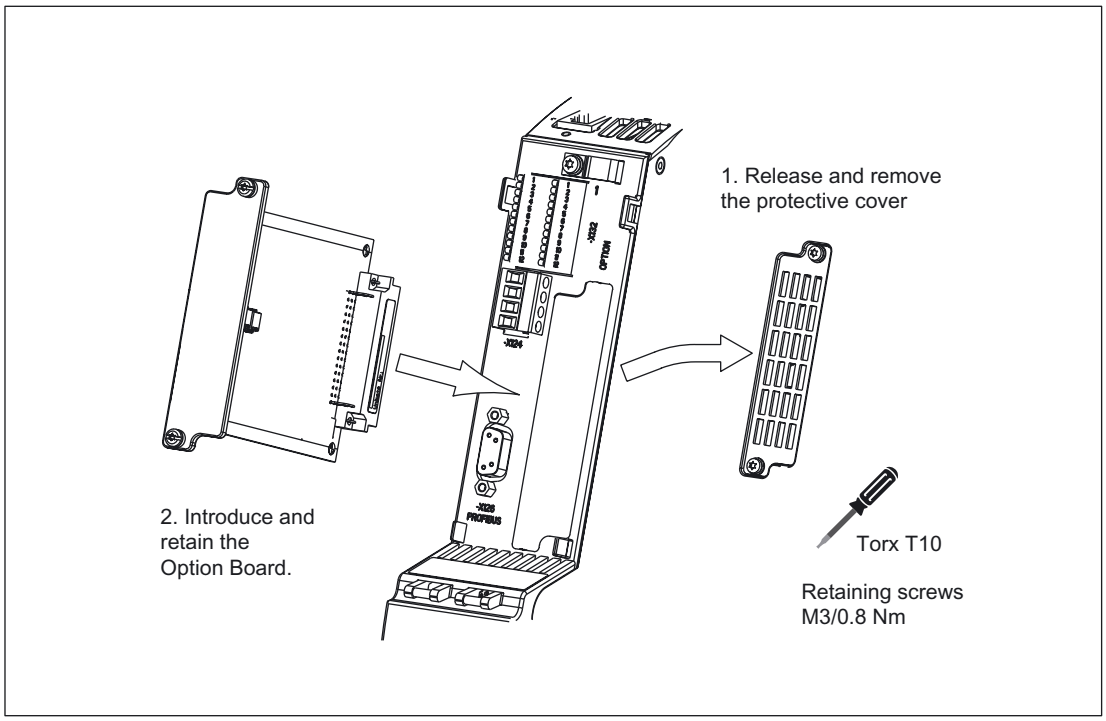


Figure 3-5 Installing the Option Board

3.2.5 Technical Specifications

Table 3-8 Technical specifications

Communication Board CBC10		
Max. current requirements (at 24 V DC)	A_{DC}	0,1
Power loss	W	<10
Weight, approx.	kg	0,1

3.3 Communication Board CBE20

3.3.1 Description

The SINAMICS S120 system can be connected to PROFINET using the Communication Board CBE20 interface board. The CBE20 permits PROFINET IO with IRT support and PROFINET IO with RT support. Mixed operation is not permissible! PROFINET CBA is not supported.

3.3.2 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 CBE20 must only be operated by qualified personnel. The ESC notices must be observed.

3.3.3 Interface description

3.3.3.1 Overview

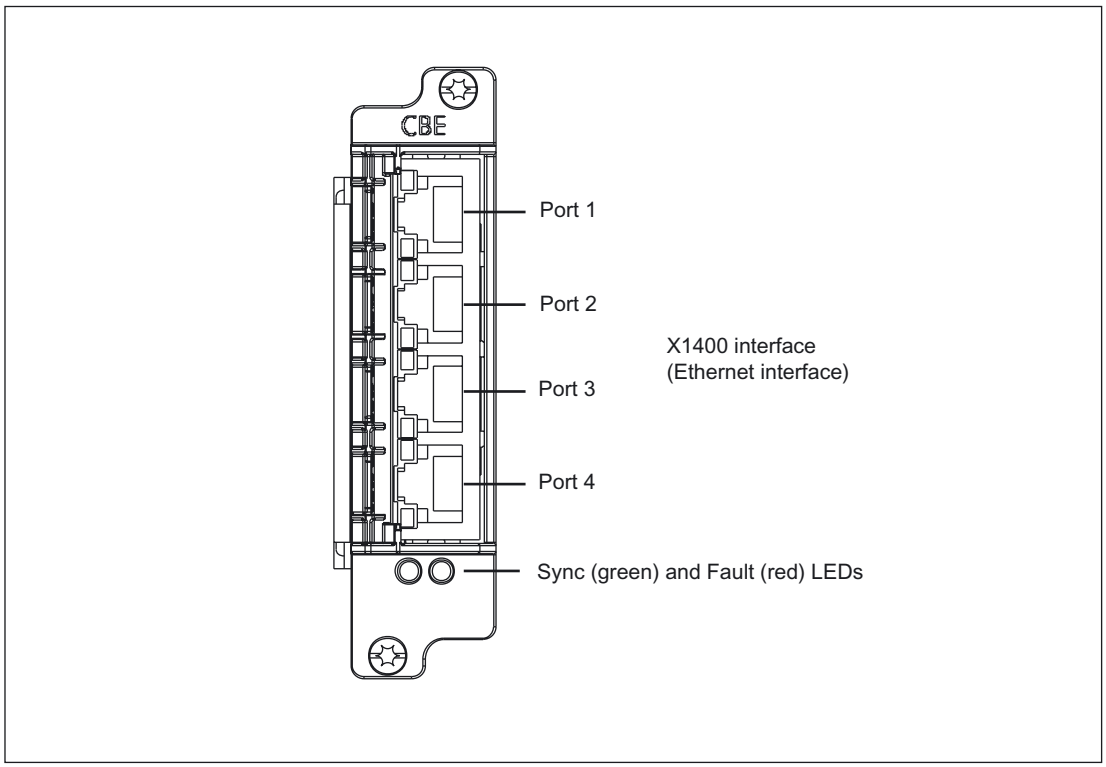


Figure 3-6 Interface description CBE20

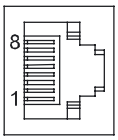
MAC address

The MAC address of the Ethernet interface is indicated on the upper side of the board.

The label is only visible when the Option Board has been removed.

3.3.3.2 X1400 Ethernet interface

Table 3-9 X1400 Port 1-4

	Pin	Signal name	Technical specifications
	1	RX+	Receive data +
	2	RX-	Receive data -
	3	TX+	Transmit data +
	4	---	Reserved, do not use
	5	---	Reserved, do not use
	6	TX-	Transmit data -
	7	---	Reserved, do not use
	8	---	Reserved, do not use
	Screened backshell	M_EXT	Screen, permanently connected

PROFINET

Cable and connector types

Information on PROFINET cables and connectors can be found in the following catalog:

Catalog IKPI, edition 2005

Industrial Communication for Automation and Drives

Order No. E86060-K6710-A101-B4

3.3.3.3 Description of the LEDs on the CBE20

The Ethernet interfaces are equipped with LEDs for indicating the statuses Link and Activity. The front panel of the board is fitted with two LEDs (Fault and Sync) which indicate the bus status.

Table 3-10 Description of the LEDs on the CBE20

LED	Color	State	Description
Link Port (4x)	-	Off	Electronic power supply is missing or outside permissible tolerance range.
	Green	Steady light	A different device is connected to port x and a physical connection exists.
Activity Port (4x)	-	Off	Electronic power supply is missing or outside permissible tolerance range.
	Yellow	Steady light	Component active (DC link discharge via braking resistor in progress).

LED	Color	State	Description
Fault	-	Off	If the Link Port LED is green: The CBE20 is operating normally, data is being exchanged with the configured IO Controller.
	Red	Flashing light	• The response monitoring time has expired. • Communications is interrupted. • The IP address is incorrect. • Incorrect or no configuration. • Incorrect parameter settings. • Incorrect or missing device name. • IO Controller not connected/switched off, although an Ethernet connection has been established. • After being powered-up, the LED flashes with 2 Hz until the CBE20 exchanges data with its IO controller.
		Steady light	CBE20 bus error • No physical connection to a subnet/switch. • Incorrect transmission rate. • Full duplex transmission is not activated.
Sync	-	Off	CBE20 is not synchronized to the IRT clock cycle.
	Green	Flashing light	The Control Unit task system has synchronized with the IRT clock cycle and data is being exchanged.
		Steady light	CBE20 is synchronized to the IRT clock cycle.
OPT (on the CU320)	-	Off	The state appears if the CBe20 is not detected, because • it is defect, • or because its electronics power supply is not OK.
	Green	Steady light	CBE20 is ready and cyclic communications has been established via PROFINET.
		Flashing light 0.5 Hz	CBE20 is ready but cyclic communications have not been established via PROFINET. Possible causes: • There is at least one SINAMICS fault, that prevents cyclic communications being established (LED "RDY" is in the red/steady light state) • SINAMICS is still not in clock synchronism
	Orange	Flashing light 2,5 Hz	Firmware download into the CBE20 running.
	Red	Steady light	Still no cyclic communications via PROFINET. However, non-cyclic communications are possible. SINAMICS waits for a parameterizing/configuring telegram.
		Flashing light 0.5 Hz	The firmware download into the CBE20 has been completed with an error. Possible causes: • CBE20 is defective • CF is defective In this state, CBE20 cannot be used.
		Flashing light 2.5 Hz	Communications error between SINAMICS and CBE20. Possible causes: • Board was withdrawn after booting • or a fatal exceptional error has occurred on the board

Cause and rectification of faults

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

References: /IH1/ SINAMICS S120 Commissioning Manual

3.3.4 Installation

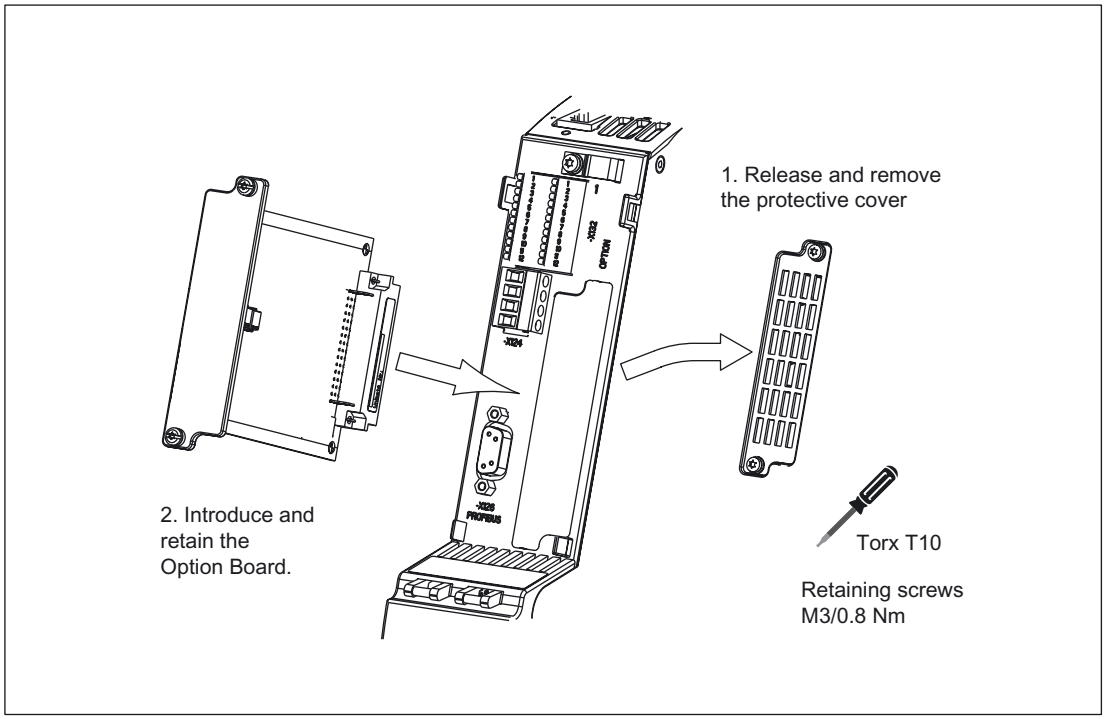


Figure 3-7 Installing the CBE20

3.3.5 Technical specifications

Table 3-11 Technical specifications

Communication Board CBE20 6SL3055-0AA00-2EBx	Unit	Value
Max. current requirements (at 24 V DC)	A_{DC}	0,1
Power loss	W	3
Weight	kg	<0,1

3.4 Option Board: Terminal Board TB30

3.4.1 Description

The Terminal Board TB30 is a terminal expansion board for plugging onto the Control Unit.

The TB30 contains the following terminals:

Table 3-12 Interface overview of the TB30

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

3.4.2 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.

3.4.3 Interface description

3.4.3.1 Overview

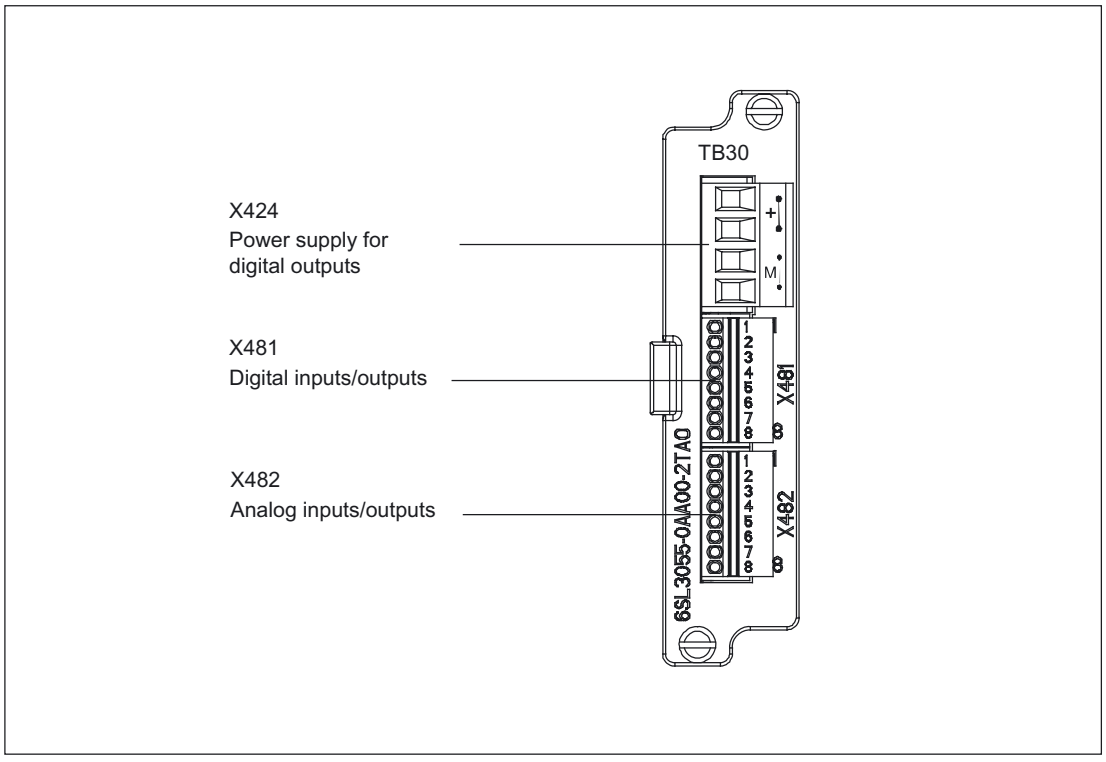


Figure 3-8 Interface description of the TB30

3.4.3.2 Connection example

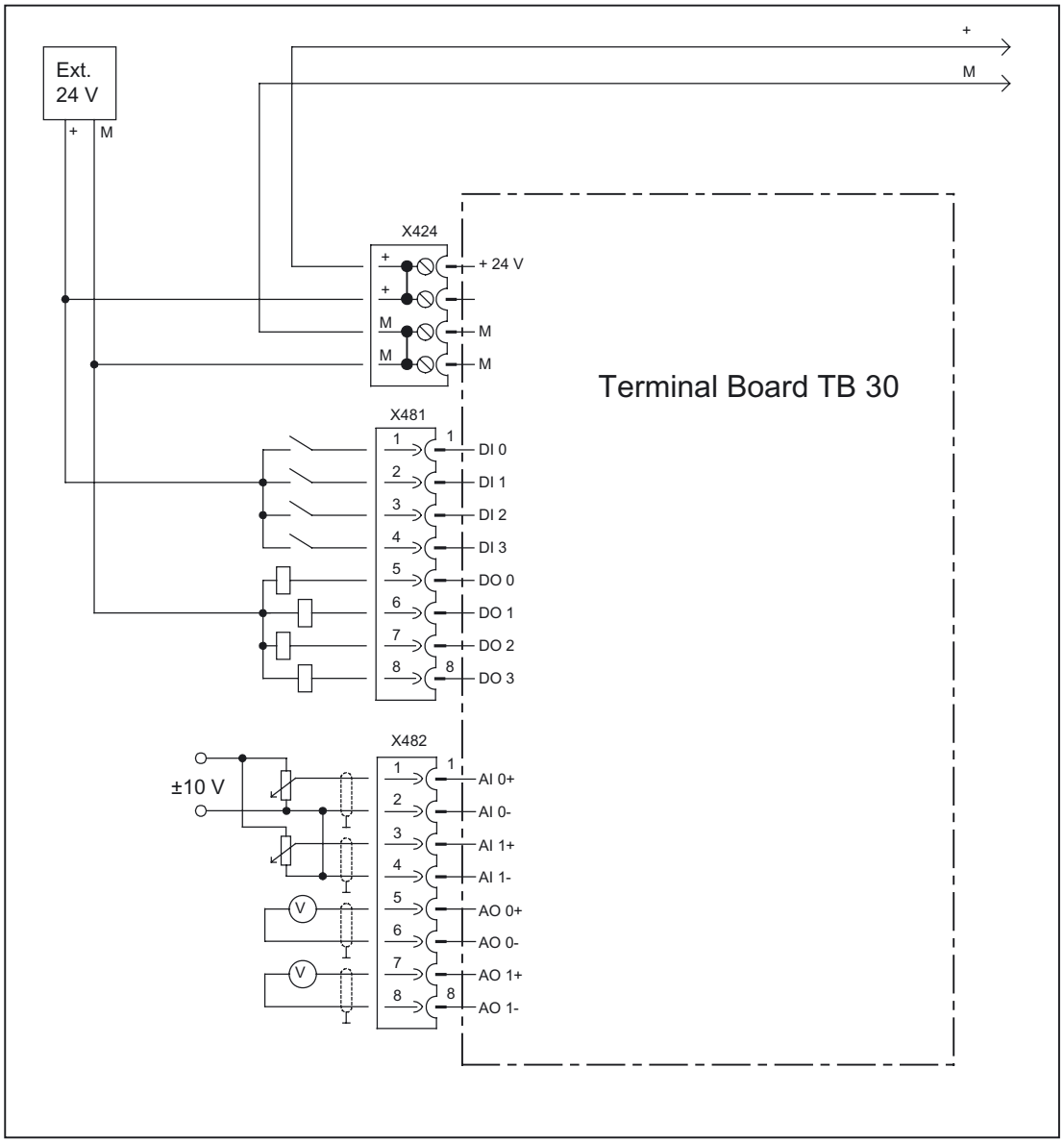
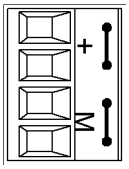


Figure 3-9 Example connection of TB30

3.4.3.3 X424 power supply, digital outputs

Table 3-13 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 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

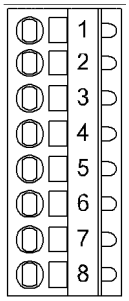
The power supply of the digital outputs and the electronics power supply of the Control Unit are isolated.

Note

If a the 24 V power supply voltage is briefly interrupted, then the digital outputs are de-activated during this time.

3.4.3.4 Digital inputs/outputs X481

Table 3-14 Terminal block X481

	Terminal	Designation[1)]	Technical data
	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": 20 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	DO 0	Voltage: 24 V DC Max. load current per output: 500 mA Reference ground: 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".

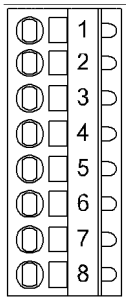
The power supply and the digital inputs/outputs are isolated from the Control Unit.

Note

If a the 24 V power supply voltage is briefly interrupted, then the digital outputs are de-activated during this time.

3.4.3.5 Analog inputs/outputs X482

Table 3-15 Terminal block X482

	Terminal	Designation[1)]	Technical data
	1	AI 0+	Analog inputs (AI) Voltage: -10 V to +10 V Internal resistance: 65 kΩ Resolution: 13 bits + sign
	2	AI 0-	
	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 Continuously 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 (refer to Chapter "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.

Handling analog inputs

The following reference contains more information about analog inputs:

References: /IH1/ SINAMICS S120 Commissioning Manual

3.4.4 Installation/Mounting

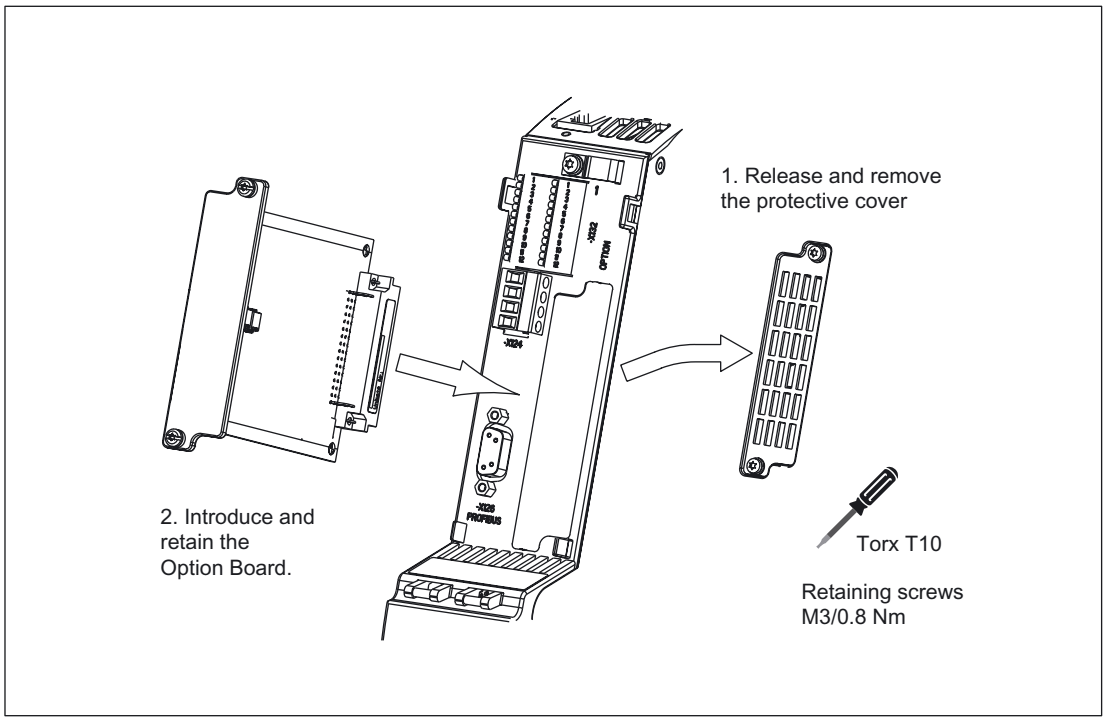


Figure 3-10 Installing the Option Board

3.4.5 Electrical Connection

Shield connection of the TB30 on the Control Unit

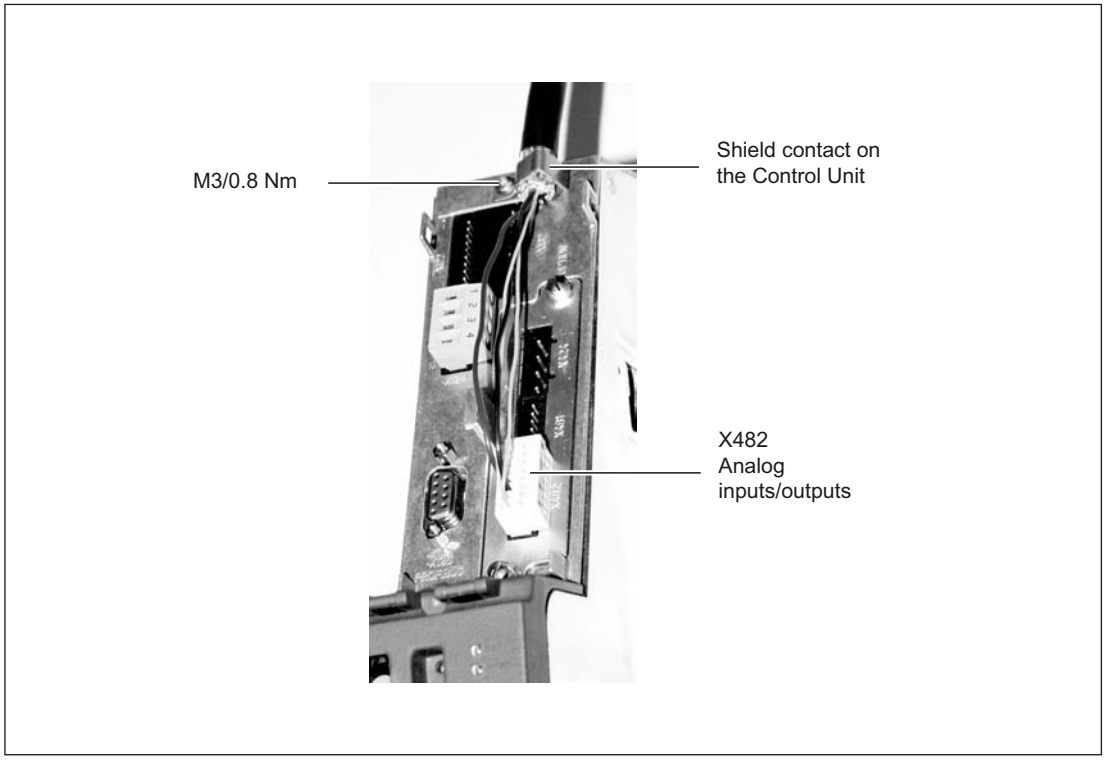


Figure 3-11 Shield contact for the TB30

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

3.4.6 Technical Specifications

Table 3-16 Technical specifications

	Unit	Value
Electronics 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 List Manual – "Function diagrams" chapter	
Weight	kg	0,1

3.5 Terminal Module TM15

3.5.1 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 3-17 Interface overview of the TM15

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

3.5.2 Safety Information

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

3.5.3 Interface description

3.5.3.1 Overview

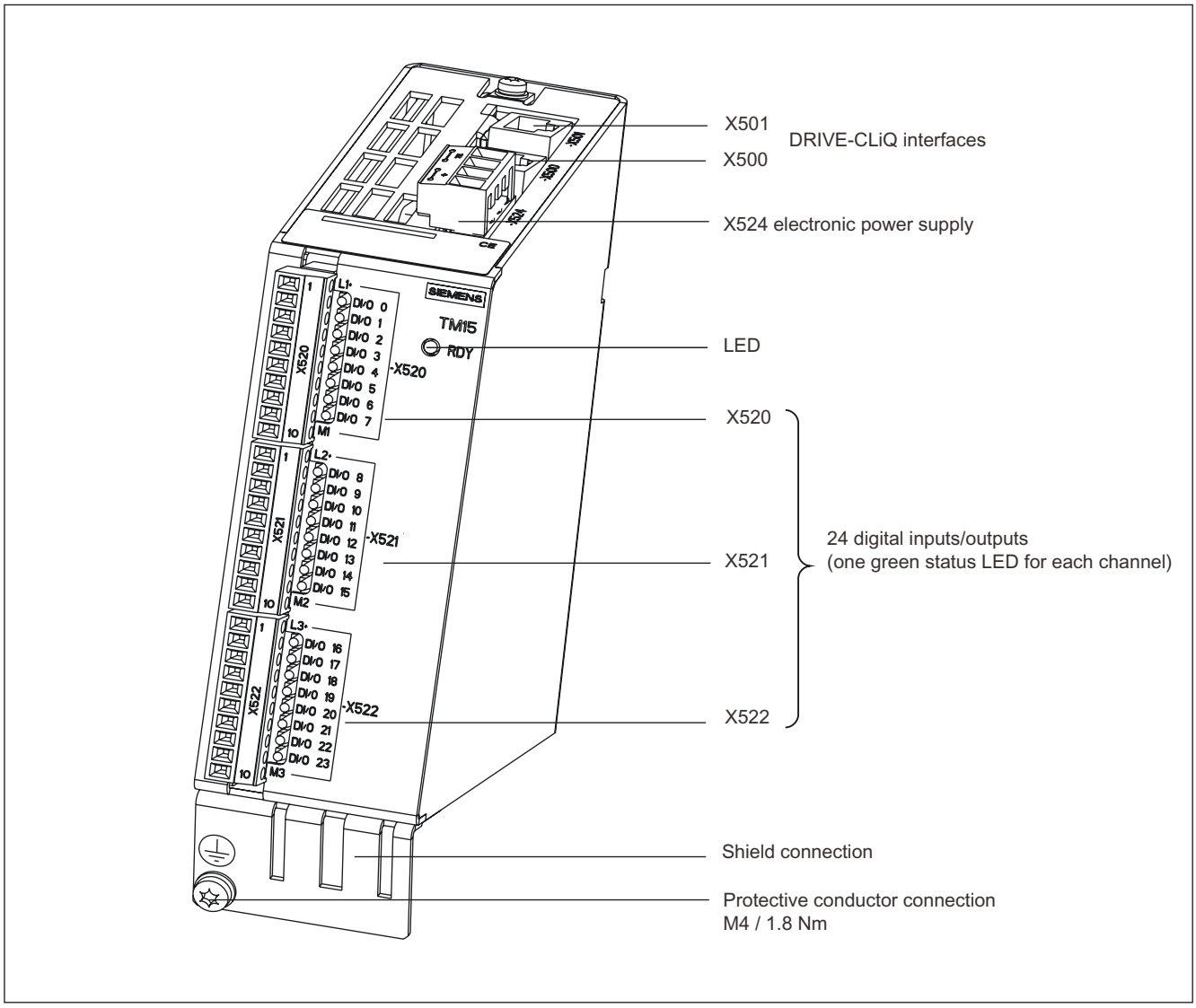


Figure 3-12 Interface description TM15

3.5.3.2 Connection example

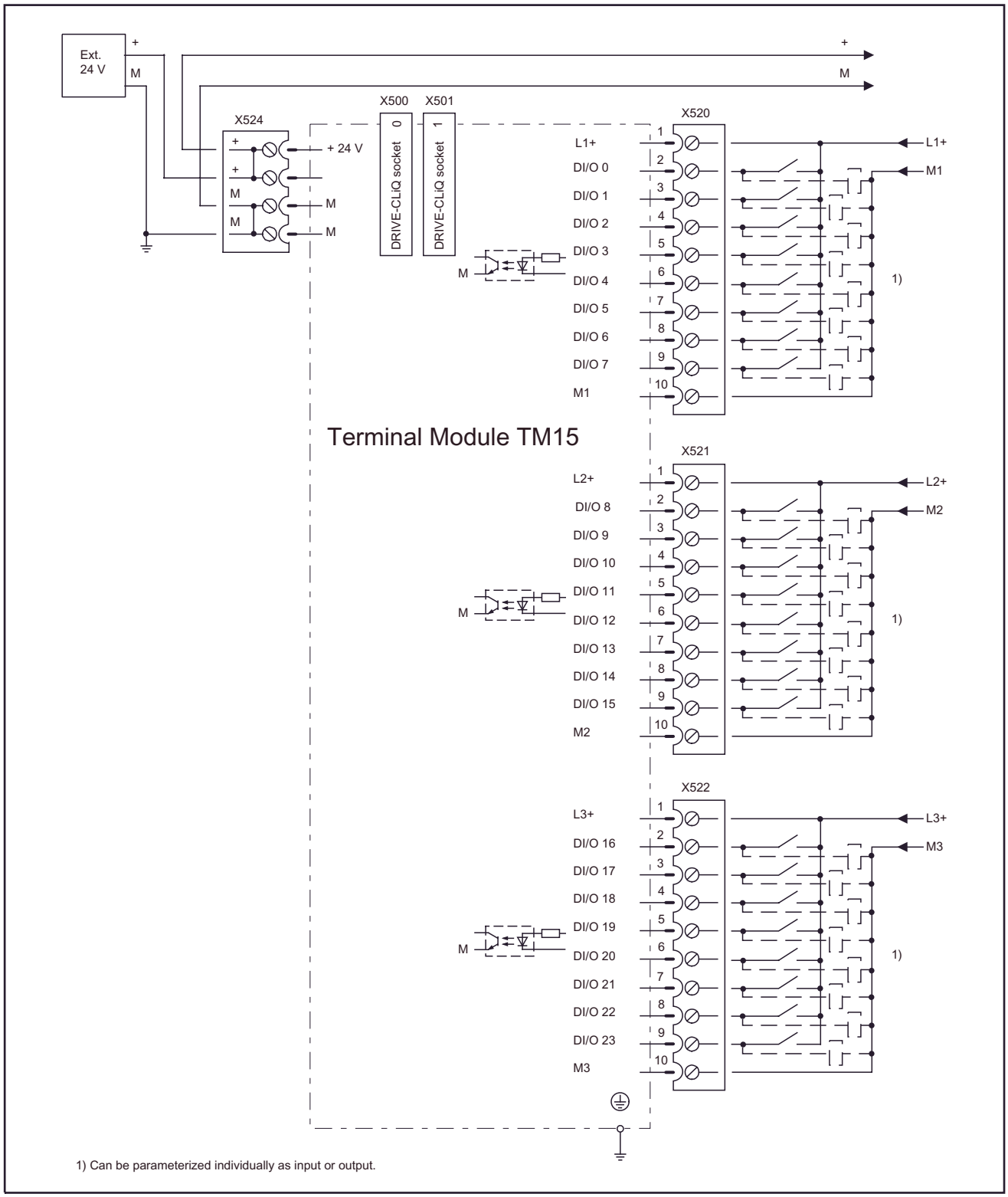
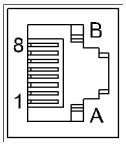


Figure 3-13 Example connection of TM15

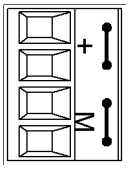
3.5.3.3 X500 and X501 DRIVE-CLiQ interface

Table 3-18 DRIVE-CLiQ interfaces X500 and X501

	Pin	Signal name	Technical data
	1	TXP	Transmit data +
	2	TXN	Transmit data -
	3	RXP	Receive data +
	4	Reserved, do not use	
	5	Reserved, do not use	
	6	RXN	Receive data -
	7	Reserved, do not use	
	8	Reserved, do not use	
	A	+ (24 V)	Power supply
	B	M (0 V)	Electronics ground
Blanking plate for DRIVE-CLiQ interface: Yamaichi company, Order No.: Y-ConAS-13			

3.5.3.4 X524 Electronic power supply

Table 3-19 Terminals for the electronics power supply

	Terminal	Name	Technical specifications
	+	Electronics 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
	+	Electronics power supply	
	M	Electronic ground	
	M	Electronic ground	
Max. connectable cross-section: 2.5 mm² Type: Screw terminal 2 (see Appendix A)			

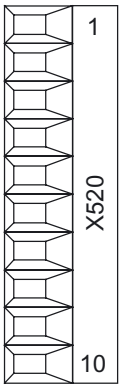
Note

The two “+” and “M” terminals are jumpered in the connector. This ensures 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.

3.5.3.5 X520 digital inputs/outputs

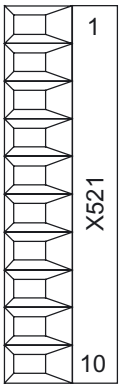
Table 3-20 Screw terminal X520

	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

3.5.3.6 X521 digital inputs/outputs

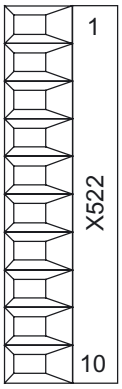
Table 3-21 Screw terminal X521

	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 V DC power supply 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 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

3.5.3.7 X522 digital inputs/outputs

Table 3-22 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

3.5.3.8 Description of the LEDs on the Terminal Module TM15

Table 3-23 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:

Reference: /IH1/ SINAMICS S, Commissioning Manual

3.5.4 Dimension Drawing

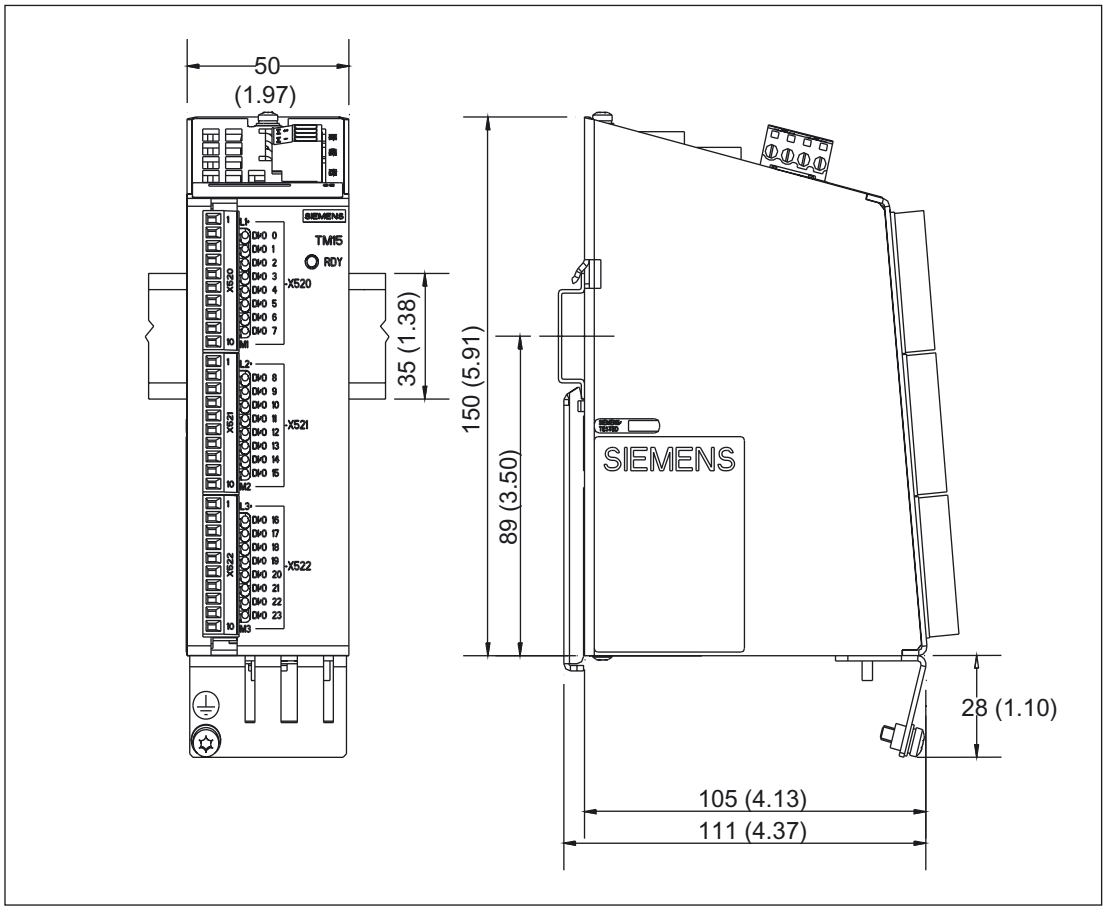


Figure 3-14 Dimension drawing of the TM15

3.5.5 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.

Removal

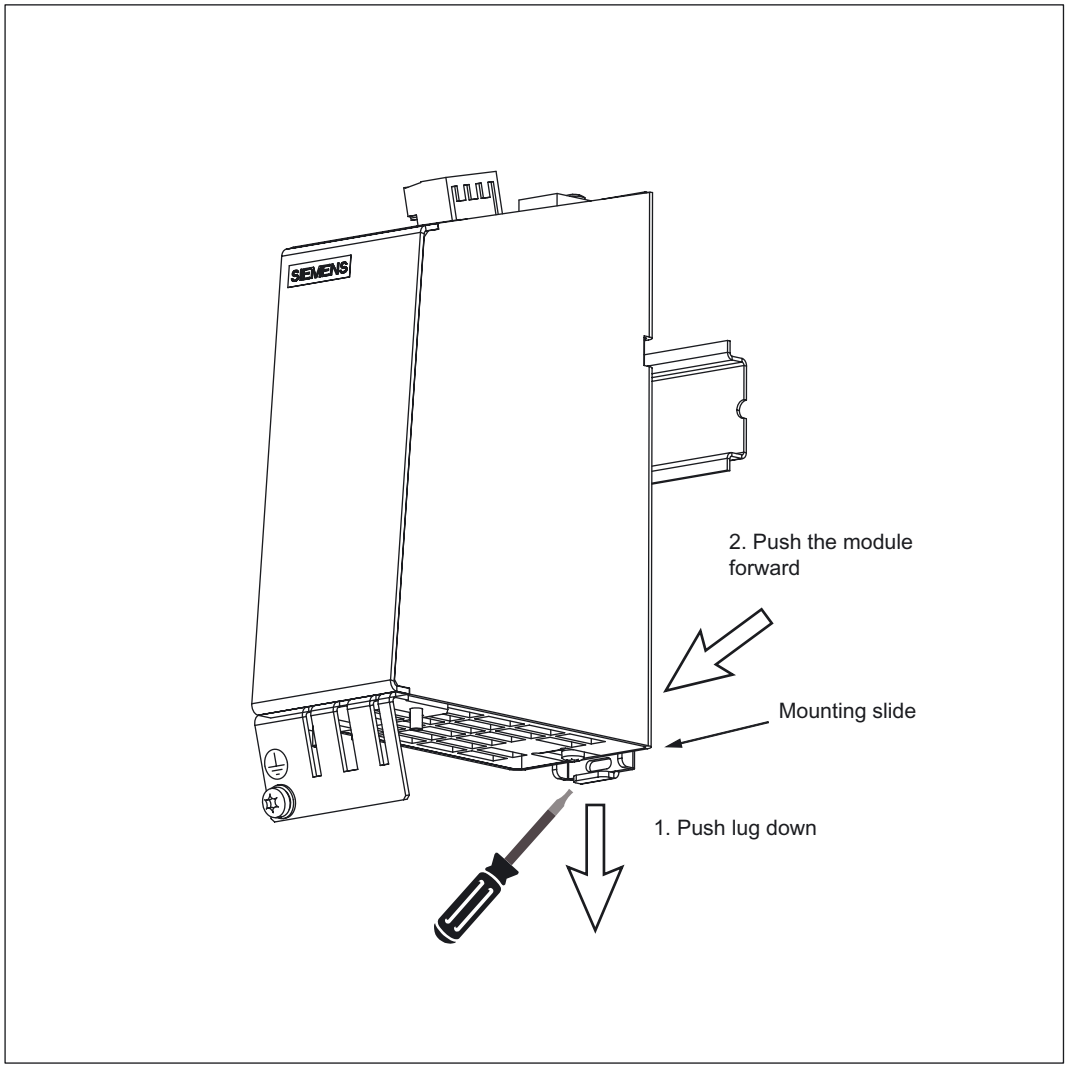


Figure 3-15 Releasing the component from a DIN rail

3.5.6 Electrical Connection

It is always advisable to shield the digital I/O wiring.

The following pictures show two typical shield contacts from Weidmüller.

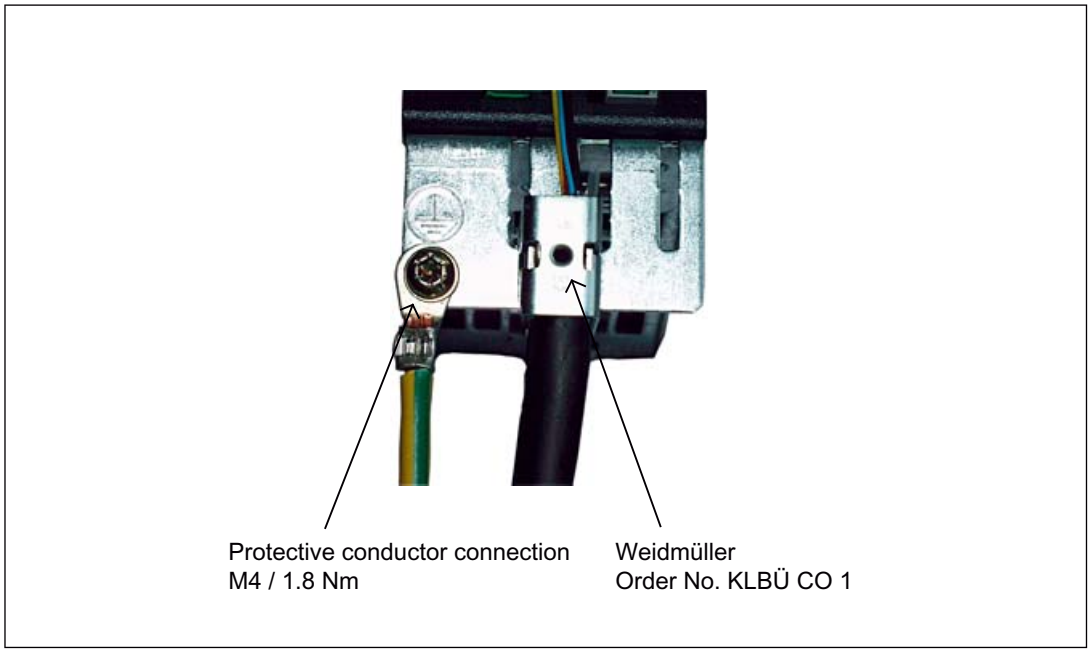


Figure 3-16 Shield contacts

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.

Notice
Only screws with a permissible screw-in depth of 4 - 6 mm may be used.

The TM15 housing is connected to the ground terminal of the module supply (terminal X524). If the ground terminal is actually grounded, then 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 codes

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

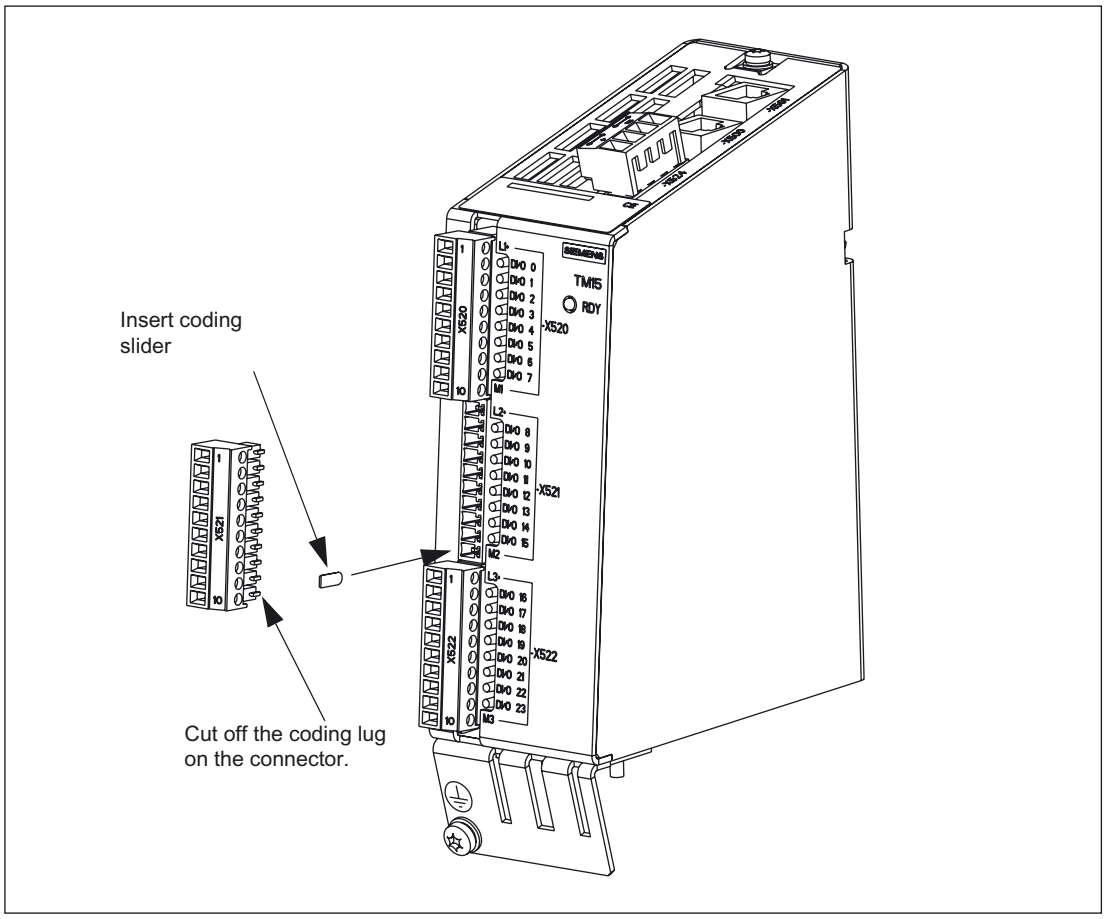


Figure 3-17 Procedure for encoding a connector

To avoid wiring errors, unique coding patterns can be defined for the connectors X520, X521 and X522. Examples of possible patterns:

- 3 connectors on one component are encoded differently (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).

3.5.7 Technical specifications

Table 3-24 Technical specifications

Terminal Module TM15 **6SL3055-0AA00-3FAx**	**Unit**	**Value**
Electronics 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

Terminal Module TM15 **6SL3055-0AA00-3FAx**	**Unit**	**Value**
Ambient temperature up to an altitude of 2000 m	°C	0 - 60
Storage temperature	°C	-40 to +85
Relative humidity	5 % to 95 %, no moisture condensation	
I/O		
• Digital inputs/outputs	Can either be parameterized 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 VDC)	mA	11
• Max. voltage in OFF state	V_{DC}	5
• Current in OFF state	mA	0.0 to 1.0 (per channel)
• Typical input delay of the digital inputs	µs	L → H: 50 H → L: 100
Digital outputs (continued-short-circuit-proof)		
• Voltage	V_{DC}	24
• Max. load current per digital output	A_{DC}	0,5
• Output delay (ohmic load)		
• typical	µs	L → H: 50 H → L: 150
• maximum	µs	L → H: 100 H → L: 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.) for maximum load in all circuits
• Leakage current in OFF state	µA	max. 10 per channel
• Voltage drop, output (I/O power supply to the output)	V_{DC}	0,5

Terminal Module TM15 **6SL3055-0AA00-3FAx**	**Unit**	**Value**
• Max. total current of outputs (per group) up to 60 °C up to 50 °C up to 40 °C	 A_{DC} A_{DC} A_{DC}	 2 3 4
IEC enclosure specification	IP20 degree of protection	
Protective ground conductor	On 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). • Response transmit time via the DRIVE-CLiQ connection (approx. 1 DRIVE-CLiQ cycle). • Evaluation on the Control Unit (see function diagram) **References:** SINAMICS S List Manual – "Function diagrams" chapter.	
Weight	kg	0,86
Approbation	UL and cULus http://www.ul.com File: E164110, Vol. 2, Sec. 9	

3.6 Terminal Module TM31

3.6.1 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 3-25 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

3.6.2 Safety Information

⚠ Warning

The 50 mm clearances 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.

3.6.3 Interface description

3.6.3.1 Overview

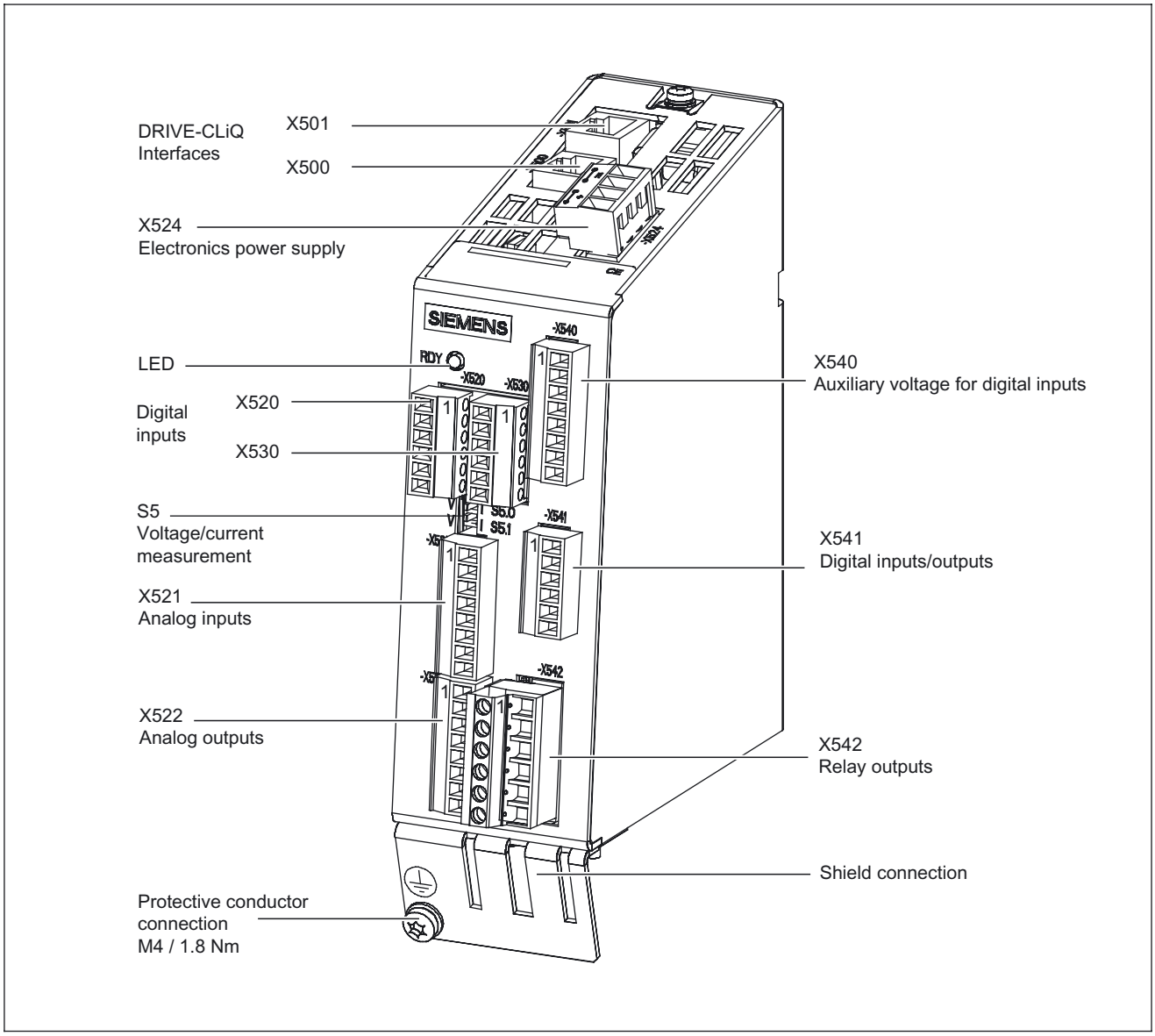


Figure 3-18 Interface description TM31

3.6.3.2 Connection example

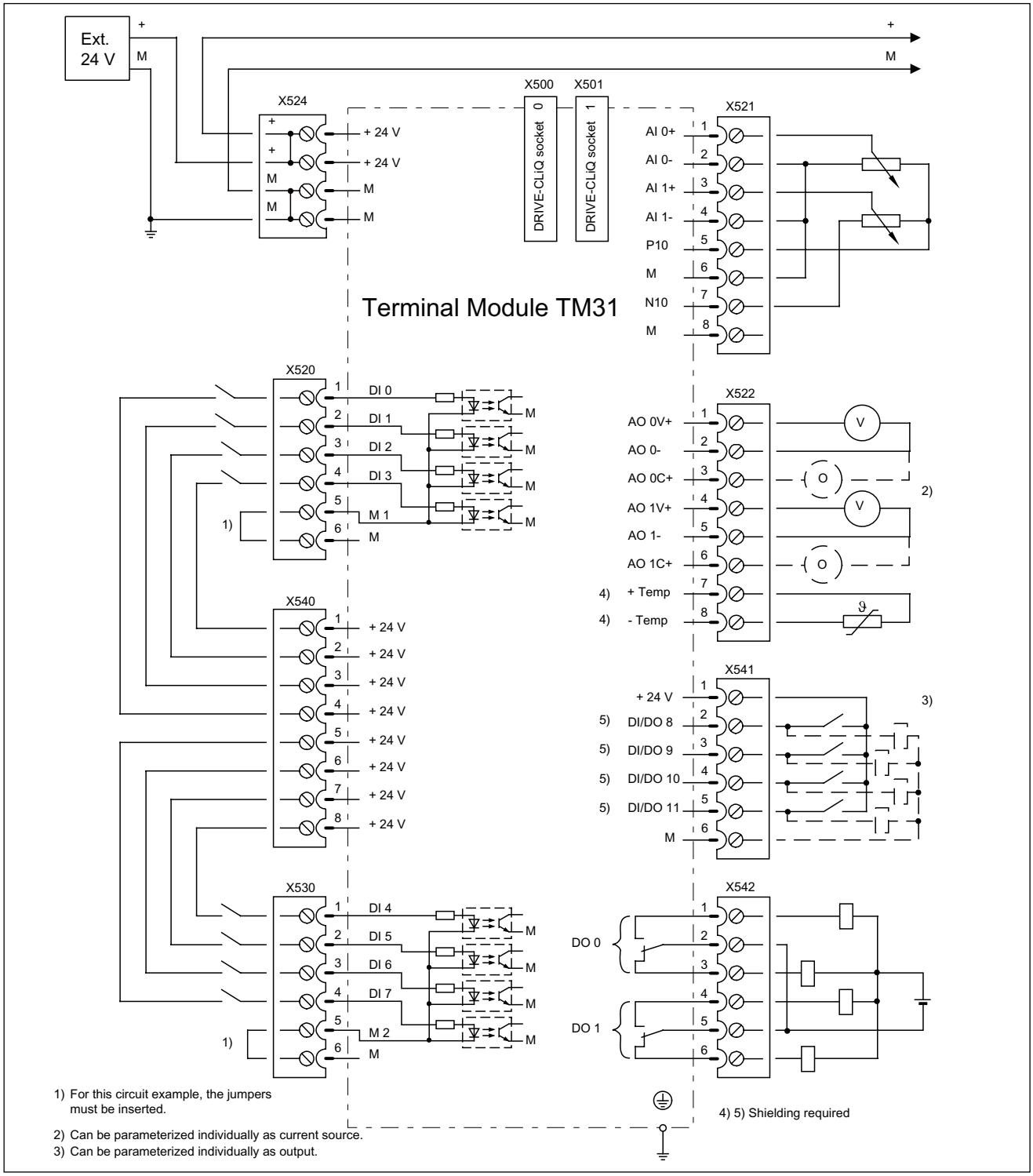
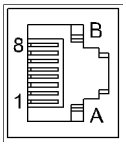


Figure 3-19 Example connection of TM31

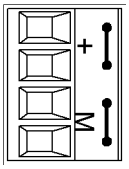
3.6.3.3 X500 and X501 DRIVE-CLiQ interface

Table 3-26 DRIVE-CLiQ interfaces X500 and X501

	Pin	Signal name	Technical data
	1	TXP	Transmit data +
	2	TXN	Transmit data -
	3	RXP	Receive data +
	4	Reserved, do not use	
	5	Reserved, do not use	
	6	RXN	Receive data -
	7	Reserved, do not use	
	8	Reserved, do not use	
	A	+ (24 V)	Power supply
	B	M (0 V)	Electronics ground
Blanking plate for DRIVE-CLiQ interface: Yamaichi company, Order No.: Y-ConAS-13			

3.6.3.4 Electronics power supply X524

Table 3-27 Terminals for the electronics power supply

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

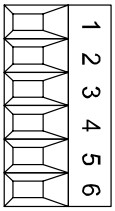
Note

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

The current consumption increases by the value for the DRIVE-CLiQ node and digital outputs.

3.6.3.5 Digital inputs X520

Table 3-28 Screw terminal X520

	Terminal	Designation[1)]	Technical data
	1	DI 0	Voltage: - 3 V to +30 V Typical current consumption: 10 mA at 24 V DC Input delay: - for "0" to "1": 50 µs - for "1" to "0": 100 µs Electrical isolation: Reference potential is Terminal M1 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: electronics ground M1: ground reference

Notice

An open input is interpreted as "low".

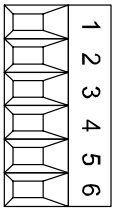
To enable the digital inputs to function, terminal M1 must be connected.
This can be done as follows:

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

(Notice! This removes electrical isolation for these digital inputs).

3.6.3.6 Digital inputs X530

Table 3-29 Screw terminal X530

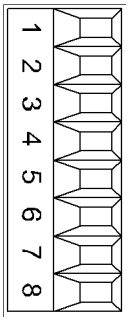
	Terminal	Designation[1)]	Technical data
	1	DI 4	Voltage: -3 V to 30 V Typical current consumption: 10 mA at 24 V DC Input delay: - for "0" to "1": 50 µs - for "1" to "0": 100 µs Electrical isolation: Reference potential is Terminal M2 Level (incl. ripple) High level: 15 V to 30 V Low level: -3 V to 5 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: electronics ground; M2: Ground reference

Notice
An open input is interpreted as "low". To enable the digital inputs to work, terminal M2 must be connected. This can be done as follows: 1. The ground reference provided of the digital inputs, or 2. a jumper to terminal M (Notice! This removes electrical isolation for these digital inputs).

3.6.3.7 Auxiliary voltage for the digital inputs X540

Table 3-30 Screw terminal X540

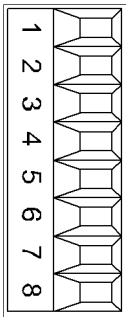
	Terminal	Designation	Technical data
	1	+24 V	Voltage: +24 V DC Max. total load current of +24 V auxiliary voltage of terminals X540 and X541 combined: 150 mA
	2	+24 V	
	3	+24 V	
	4	+24 V	
	5	+24 V	
	6	+24 V	
	7	+24 V	
	8	+24 V	
Max. connectable cross-section: 1.5 mm² Type: Screw terminal 1 (see Appendix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

Note

This voltage supply is only for powering the digital inputs.

3.6.3.8 Analog inputs X521

Table 3-31 Terminal block X521

	Terminal	Designation[1)]	Technical data
	1	AI 0+	The analog inputs can be toggled between current and voltage input using switches S5.0 and S5.1. 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 Continued-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.

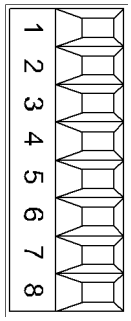
3.6.3.9 S5 current/voltage changeover switch for analog inputs

Table 3-32 Current/voltage selector S5

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

3.6.3.10 Analog outputs/temperature sensor connection X522

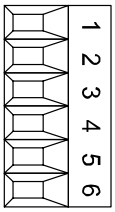
Table 3-33 Terminal block X522

	Terminal	Name[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 Continued-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

3.6.3.11 X541 bidirectional digital inputs/outputs

Table 3-34 Terminals for bidirectional digital inputs/outputs

	Terminal	Designation[1)]	Technical data
	1	+24 V	Auxiliary voltage: Voltage: +24 V DC 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 V DC Input delay: - for "0" to "1" 50 µs - for "1" to "0" 100 µs As output: Voltage: 24 V DC Max. load current per output: 500 mA Max. total current of outputs: 100 mA / 1 A (can be parameterized) 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: Electronics ground

Note

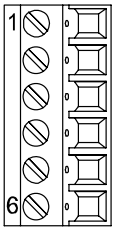
An open input is interpreted as "low".

Note

If a the 24 V power supply voltage is briefly interrupted, then the digital outputs are de-activated during this time.

3.6.3.12 Relay outputs X542

Table 3-35 Terminal block X542

	Terminal	Name[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. connectable cross-section. 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

3.6.3.13 Description of the LEDs on the Terminal Module TM31

Table 3-36 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:

Reference: /IH1/ SINAMICS S, Commissioning Manual

3.6.4 Dimension drawing

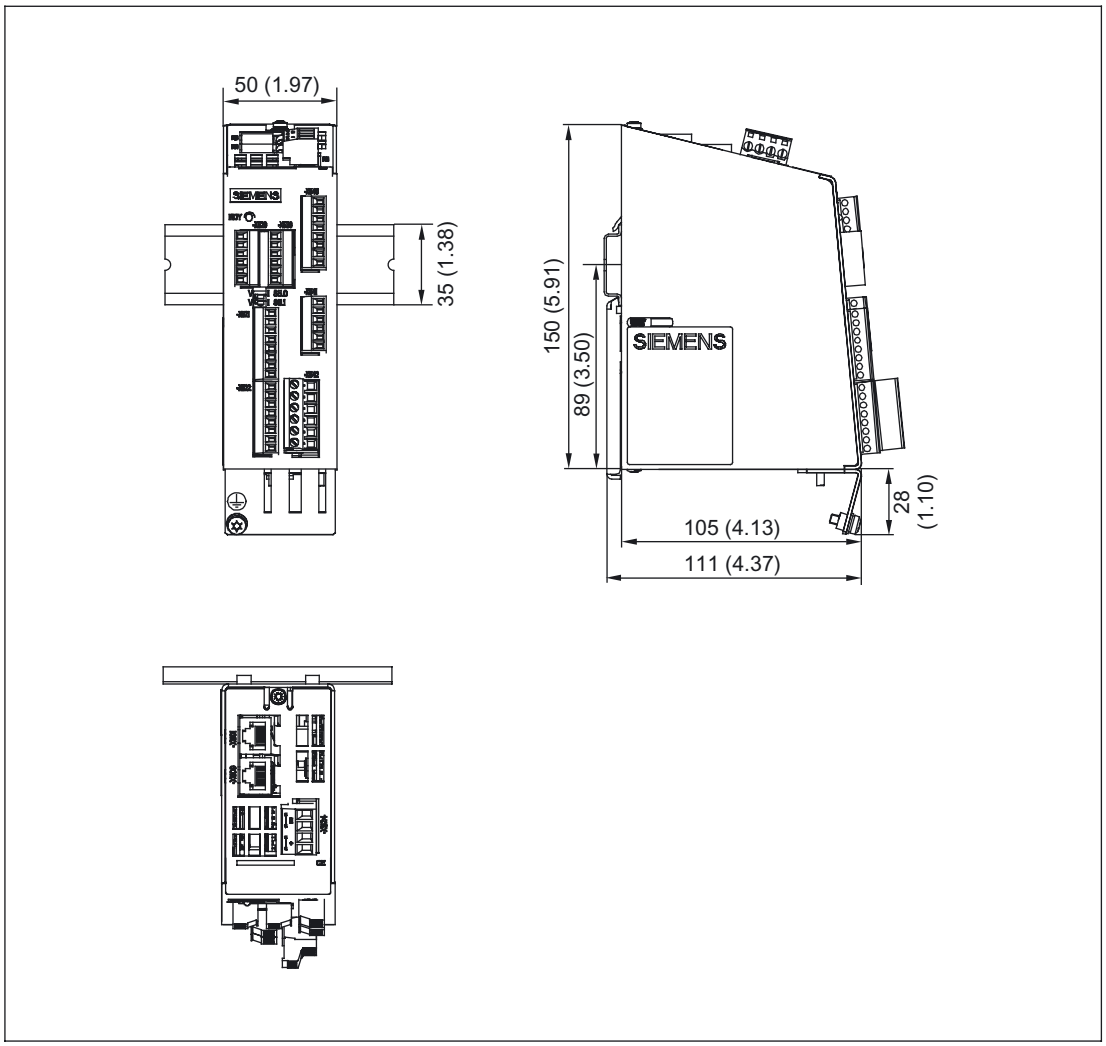


Figure 3-20 Dimension drawing of the TM31

3.6.5 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.

Removal

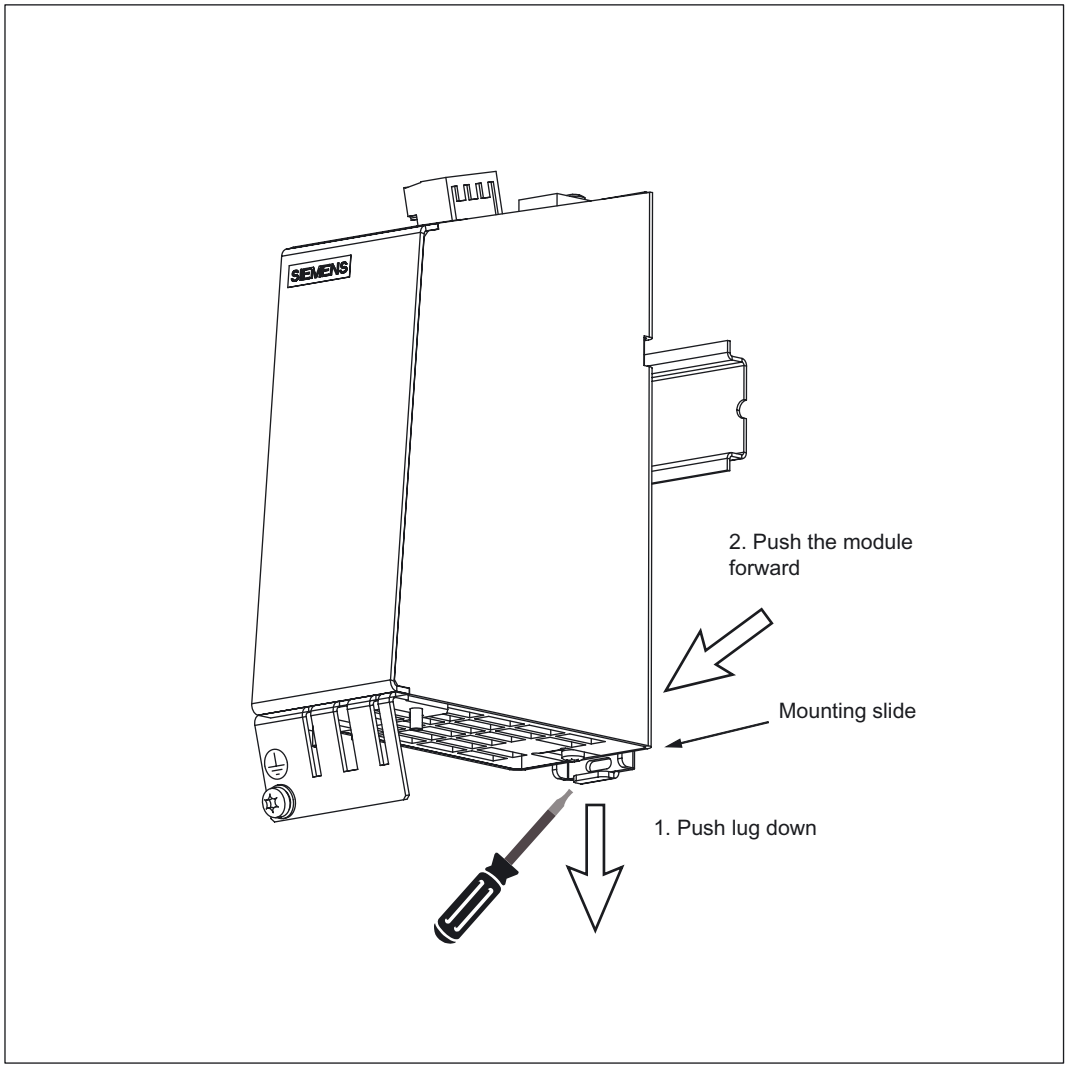


Figure 3-21 Releasing the component from a DIN rail

3.6.6 Electrical connection

It is always advisable to shield the digital I/O wiring.

The following pictures show two typical shield contacts from Weidmüller.

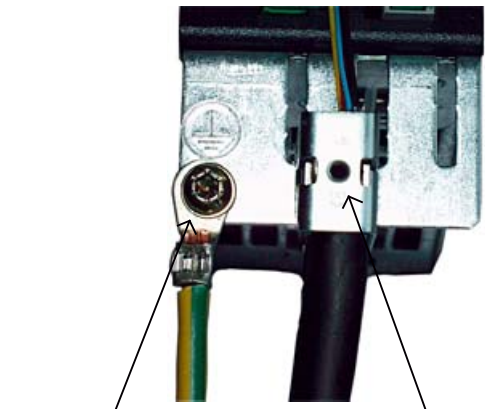


Figure 3-22 Shield contacts

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.

Notice
Only screws with a permissible screw-in depth of 4 - 6 mm may be used.

Connector codes

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

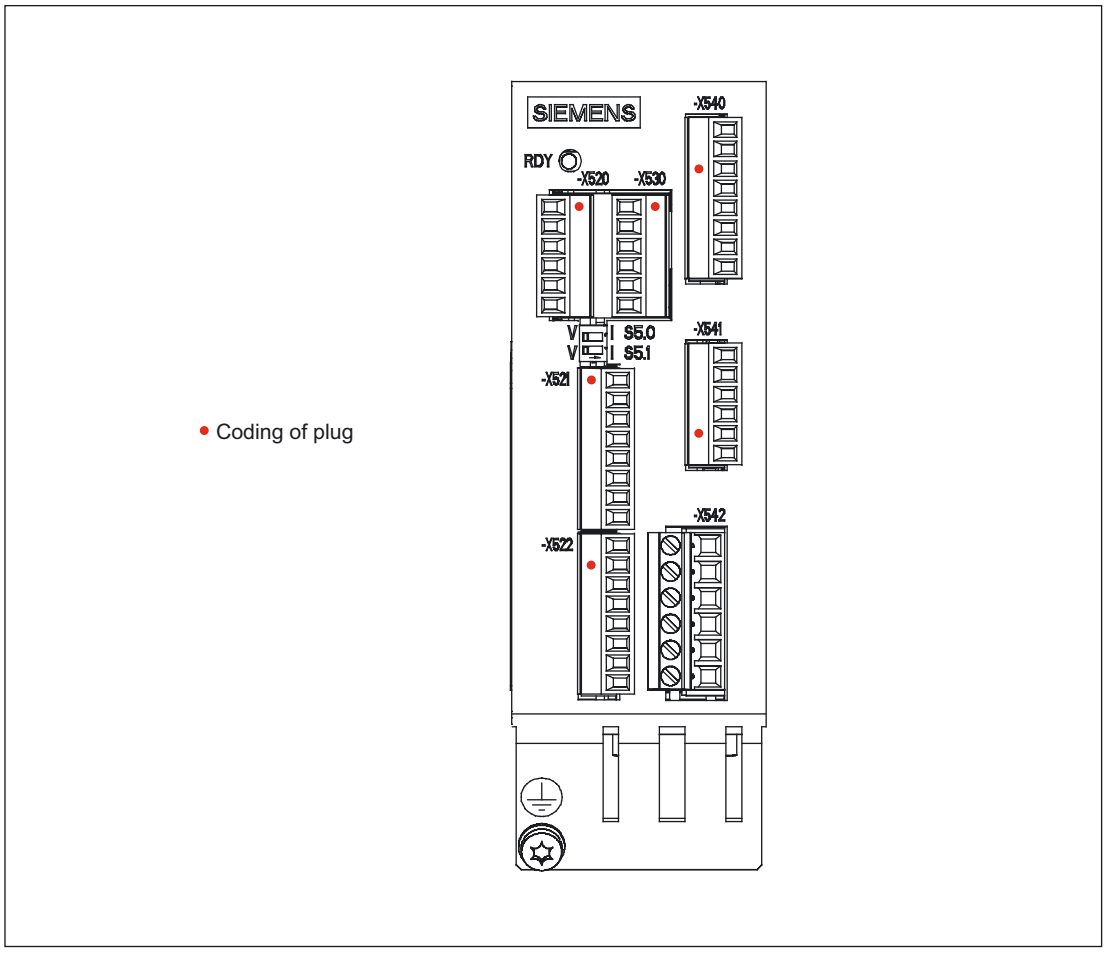


Figure 3-23 Connector codes of the TM31

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

3.6.7 Technical Specifications

Table 3-37 Technical specifications

	Unit	Value
Electronics 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	At 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). • Response transmit time via the DRIVE-CLiQ connection (approx. 1 DRIVE-CLiQ cycle). • Evaluation on the Control Unit (see function diagram). **References:**SINAMICS S List Manual – "Function diagrams" chapter	
Weight	kg	1

3.7 Terminal Module TM41

3.7.1 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 emulated 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 3-38 Interface overview of the TM41

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

TM41 can be used from firmware 2.4 onwards

3.7.2 Safety Information

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

3.7.3 Interface description

3.7.3.1 Overview

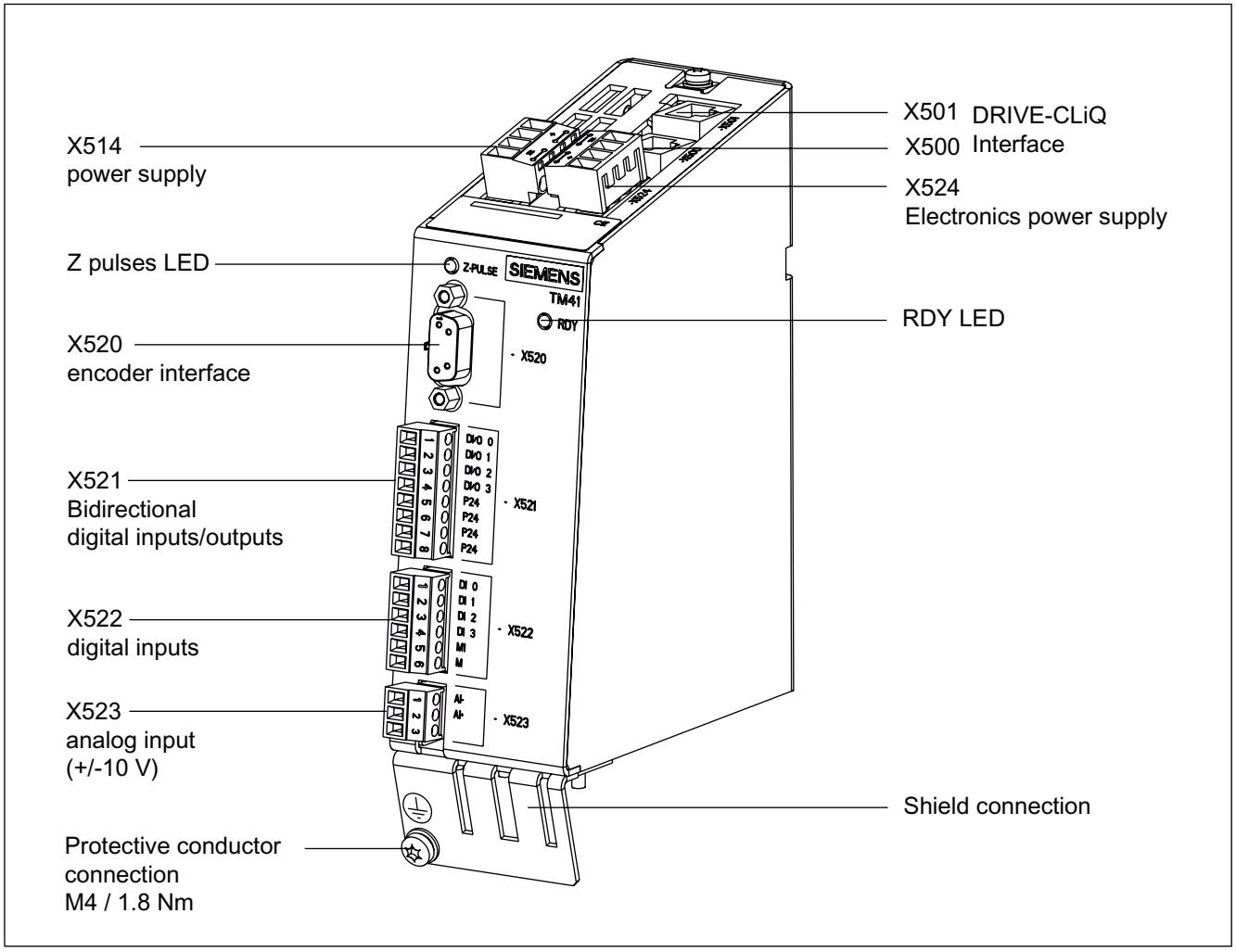


Figure 3-24 Interface description TM41

3.7.3.2 Connection example

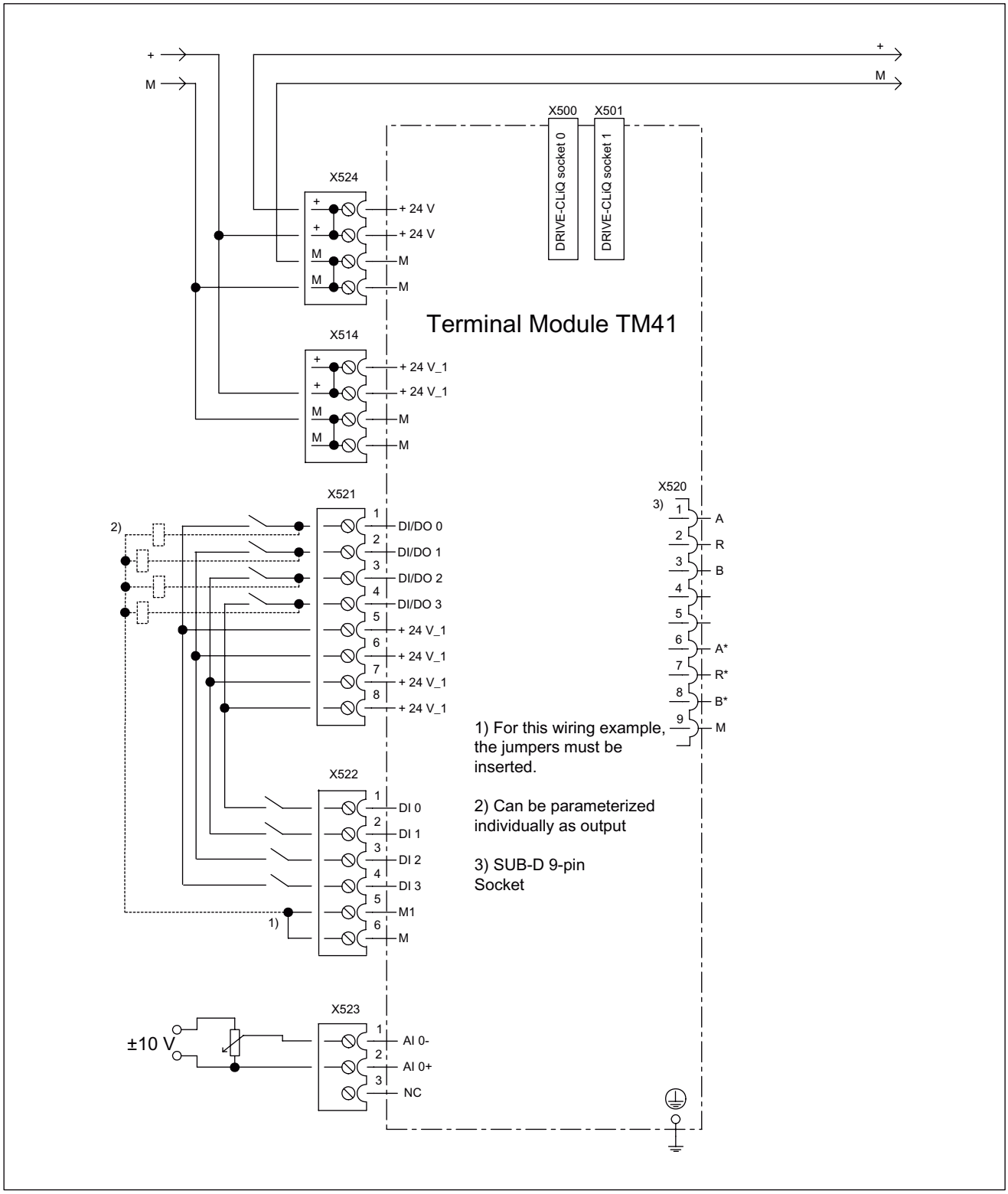
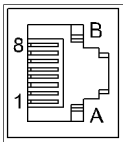


Figure 3-25 Sample connection of TM41

3.7.3.3 X500 and X501 DRIVE-CLiQ interface

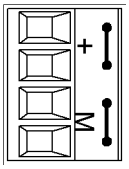
Table 3-39 DRIVE-CLiQ interfaces X500 and X501

	Pin	Signal name	Technical data
	1	TXP	Transmit data +
	2	TXN	Transmit data -
	3	RXP	Receive data +
	4	Reserved, do not use	
	5	Reserved, do not use	
	6	RXN	Receive data -
	7	Reserved, do not use	
	8	Reserved, do not use	
	A	+ (24 V)	Power supply
	B	M (0 V)	Electronics ground
Blanking plate for DRIVE-CLiQ interface: Yamaichi company, Order No.: Y-ConAS-13			

3.7.3.4 X514 and X524 Power Supply

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

Table 3-40 Power supply terminals X514 and X524

	Terminal	Name	Technical specifications
	+	Power supply	Voltage: 24 V DC (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

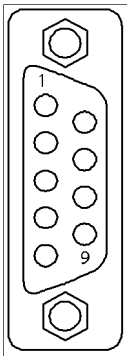
The two “+” and “M” terminals are jumpered in the connector. This ensures the supply voltage is looped through.

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.

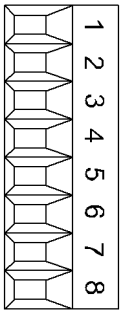
3.7.3.5 Sensor interface X520

Table 3-41 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			

3.7.3.6 X521 bidirectional digital inputs/outputs

Table 3-42 Screw terminal X521

	Terminal	Designation	Technical data
	1	DI/DO 0	As input: Voltage: -3 V to 30 V Typical power 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": 50 µs - for "1" to "0": 100 µs As output: Voltage: 24 V DC 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": Typically 150 µs at 0.5 A ohmic load (500 µs maximum) - for "1" to "0": Typically 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

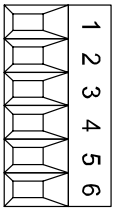
An open input is interpreted as "low".

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.

3.7.3.7 X522 digital inputs / floating (isolated)

Table 3-43 Screw terminal X522

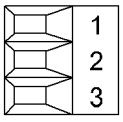
	Terminal	Designation[1)]	Technical data
	1	DI 0	Voltage: - 3 V to 30 V Typical current consumption: 6.5 mA at 24 V DC Input delay: - for "0" to "1": 50 µs - for "1" to "0": 100 µs Electrical isolation: Reference potential is Terminal M1 Level (incl. ripple) High level: 15 V to 30 V Low level: -3 V to 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: Electronics 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 ground reference of the digital inputs, or 2) a jumper to terminal M (Notice: This removes electrical isolation for these digital inputs).

3.7.3.8 Analog input X523

Table 3-44 Terminal block X523

	Terminal	Name[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.

3.7.3.9 Description of the LEDs on the Terminal Module TM41

Table 3-45 Description of the LEDs on the TM41

LED	Color	State	Description
READY	-	Off	Electronics power supply is missing or outside permissible tolerance range.
	Green	Steady light	The component is ready for operation and cyclic DRIVE-CLiQ communication is taking place.
	Orange	Steady light	DRIVE-CLiQ communication is being established.
	Red	Steady light	This component has at least one fault. **Note:** LED is driven irrespective of the corresponding messages being reconfigured.
	Green/Red	Flashing light 2 Hz	Firmware is being downloaded.
	Green/Orange or Red/Orange	Flashing light 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	Steady light	Zero mark not enabled or zero mark search.
	Green	Steady light	Stopped at zero mark.
		Flashing light	Flashes for each zero mark that is output.

Cause and rectification of faults

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

Reference: /IH1/ SINAMICS S, Commissioning Manual

3.7.4 Dimension drawing

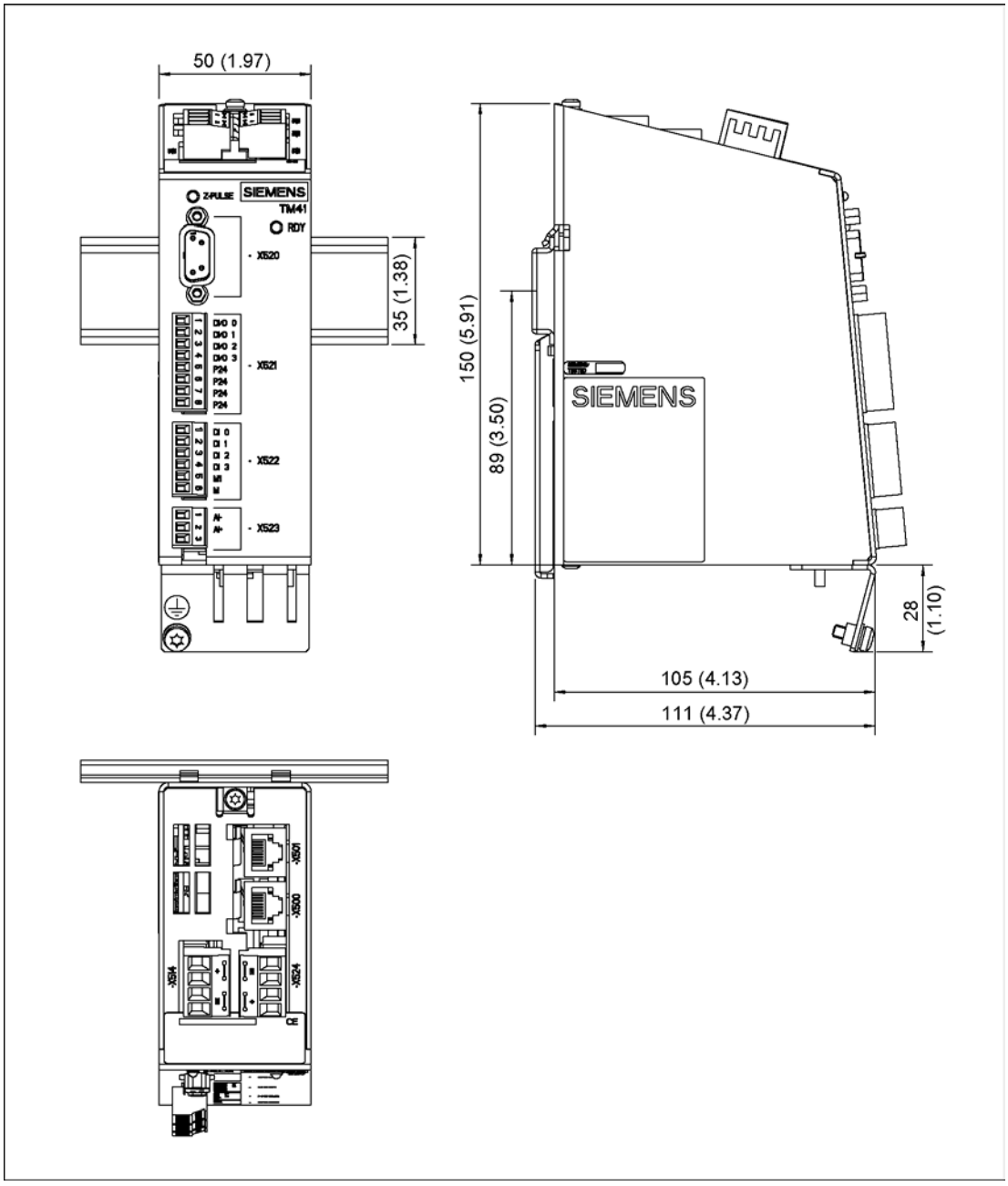


Figure 3-26 Dimension drawing of TM41

3.7.5 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.

Removal

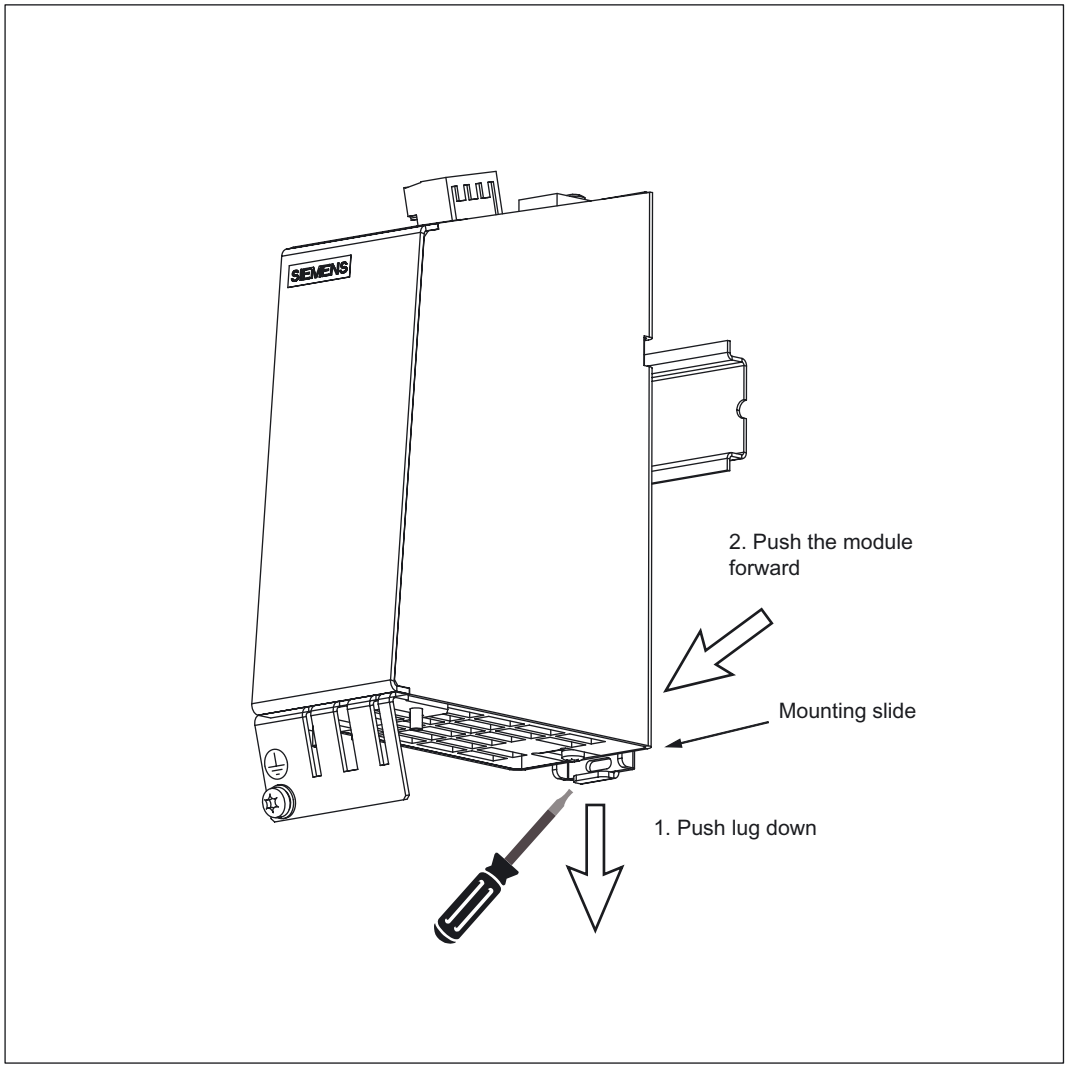


Figure 3-27 Releasing the component from a DIN rail

3.7.6 Electrical Connection

Shield contact for components from Weidmüller

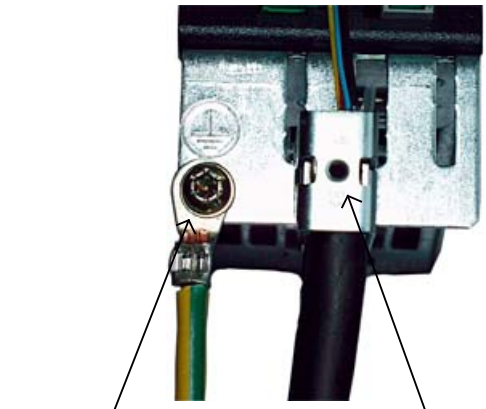


Figure 3-28 Shield contacts

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).

Notice
Only screws with a permissible screw-in depth of 4 - 6 mm may be used.

3.7.7 Technical Specifications

Table 3-46 Technical specifications

	Unit	Value
Electronics power supply		
Voltage	V_{DC}	24 DC (20.4 – 28.8)
Current (without DRIVE-CLiQ or digital outputs)	A_{DC}	0,5
PE/ground 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). • Response transmit time via the DRIVE-CLiQ connection (approx. 1 DRIVE-CLiQ cycle). • Evaluation on the Control Unit (see function diagram). **References:** SINAMICS S List Manual – "Function diagrams" chapter.	
Weight	kg	0,85

3.8 Terminal Module TM54F (from V2.5 SP1)

3.8.1 Description

The Terminal Module TM54F is a terminal expansion module that is snapped on to a mounting rail according to DIN EN 60715. The TM54F provides safety digital inputs and outputs to control Safety Integrated functions of SINAMICS.

Precisely one TM54F is assigned to each Control Unit that is connected via DRIVE-CLiQ. Additional devices (e.g. TMxx, SMxx, MMxx) can be connected to the same DRIVE-CLiQ line.

The TM54F has the following terminals:

Table 3-47 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, with forced dormant error detection[2]	2
Sensor[1] power supply, without forced dormant error detection	1
Digital inputs to check F_DO for a test stop	4

[1] Sensors: Fail-safe devices to issue commands and sense - for example emergency stop pushbuttons and safety locks as well as position switches and light grids / light curtains.

[2] Dynamization: For the test stop to check the sensors, cable routing and evaluation electronics of the TM54, the sensor power supply is switched-in and switched-out.

The TM54F has 4 fail-safe digital outputs and 10 fail-safe digital inputs. A fail-safe digital output comprises a P/M switching output as well as a digital input to read back the switching state. A fail-safe digital input comprises two digital inputs.

3.8.2 Safety Information

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

3.8.3 Interface description

3.8.3.1 Overview

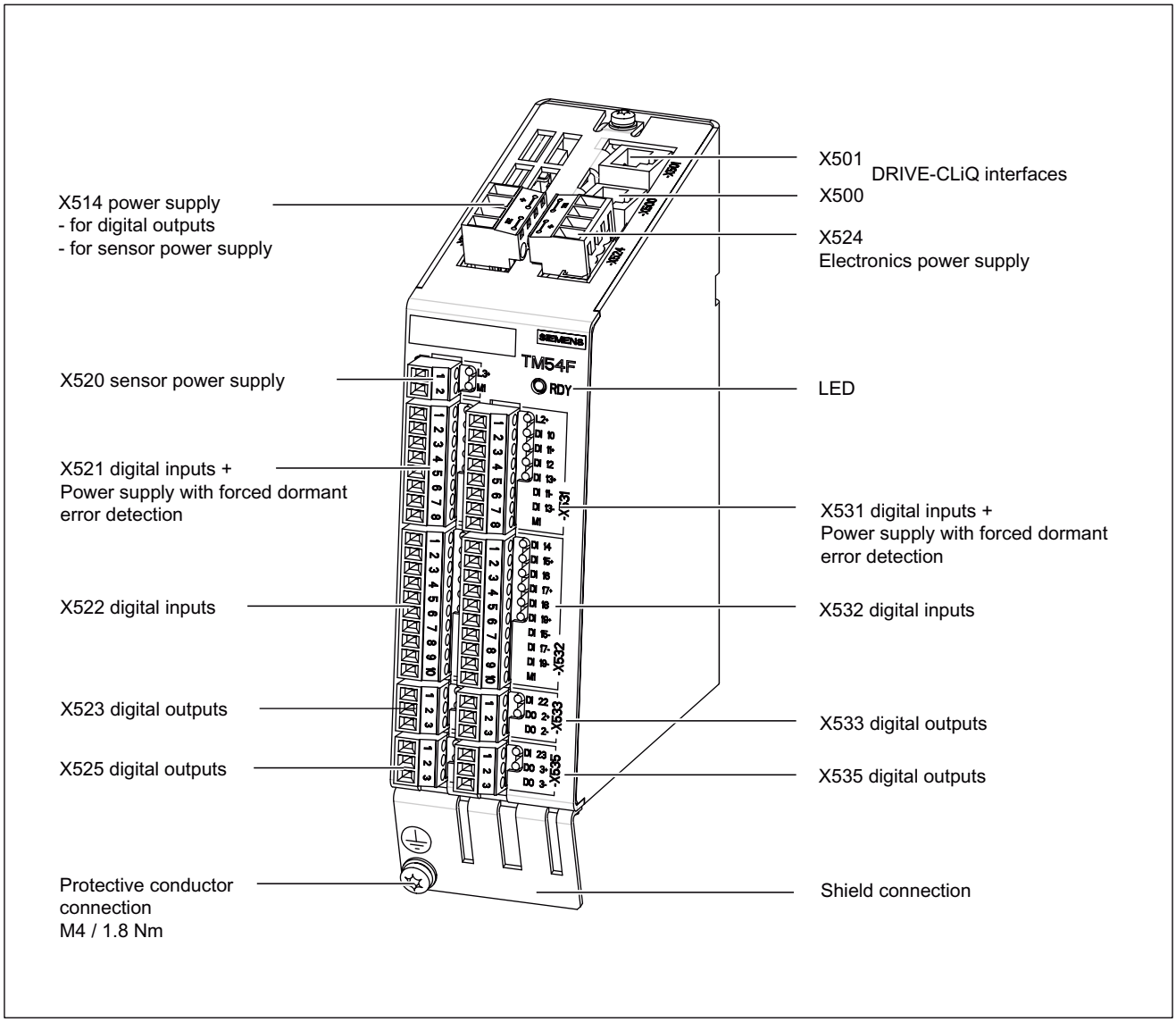


Figure 3-29 Interface description of the TM54F

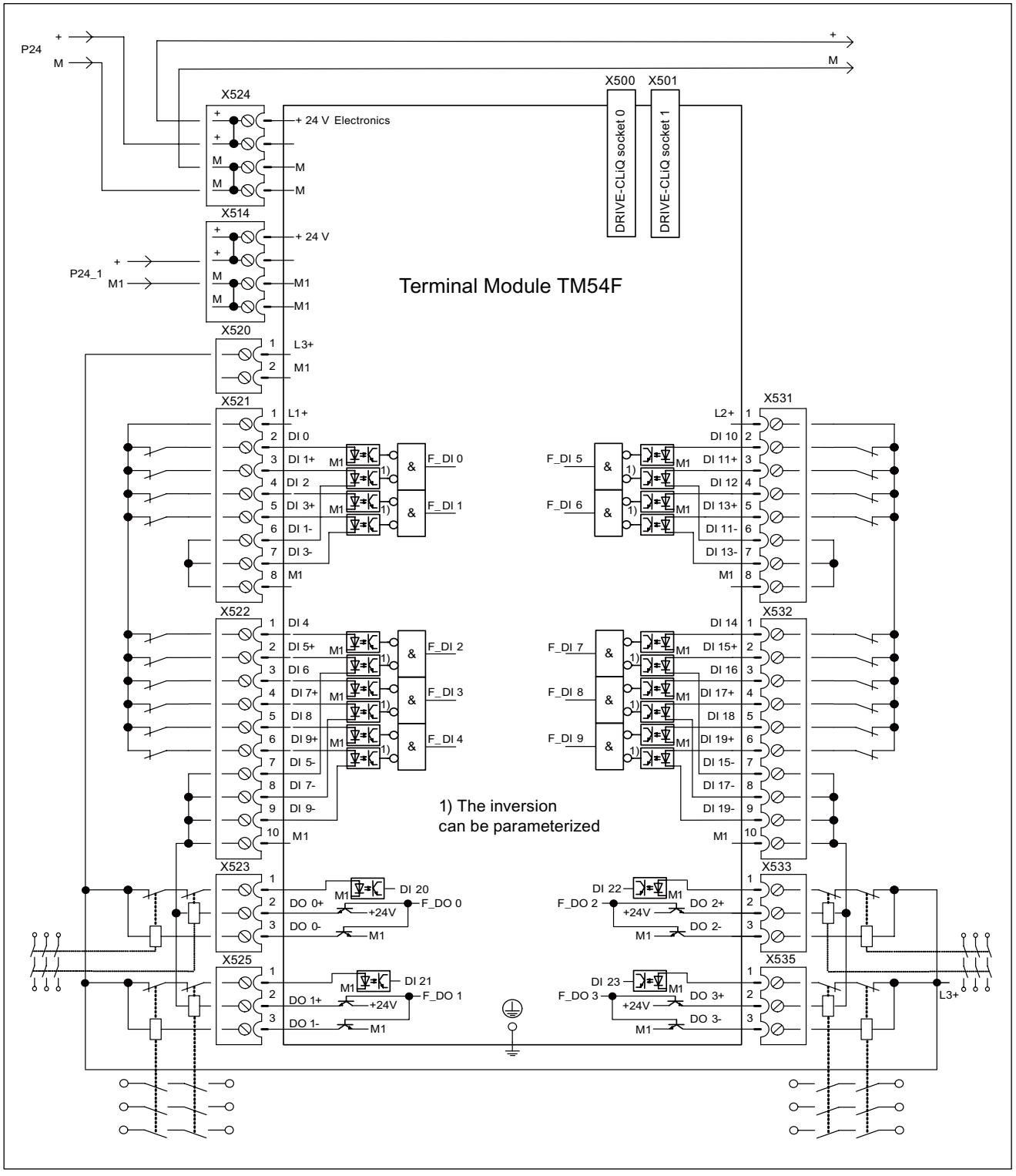


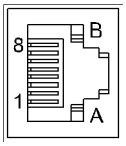
Figure 3-30 Connection example: TM54F

Additional circuit examples are included in:

- SINAMICS S120 Function Manual Safety Integrated, Order No.: 6SL3097-2AR00-0AP0
- System Manual: The safety program for world industry, Order No.: 6ZB5000-0AA01-0BA1, 5 Edition, Supplement: 6ZB5000-0AB01-0BA0

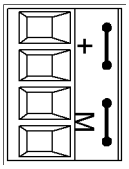
3.8.3.2 X500 and X501 DRIVE-CLiQ interface

Table 3-48 DRIVE-CLiQ interfaces X500 and X501

	Pin	Signal name	Technical data
	1	TXP	Transmit data +
	2	TXN	Transmit data -
	3	RXP	Receive data +
	4	Reserved, do not use	
	5	Reserved, do not use	
	6	RXN	Receive data -
	7	Reserved, do not use	
	8	Reserved, do not use	
	A	+ (24 V)	Power supply
	B	M (0 V)	Electronics ground
Blanking plate for DRIVE-CLiQ interface: Yamaichi company, Order No.: Y-ConAS-13			

3.8.3.3 X514 power supply for digital outputs and sensors

Table 3-49 Terminals for the power supply X514

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

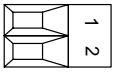
Note

The two "+" and "M1" terminals are jumpered in the connector. This ensures the supply voltage is looped through.

[1] including the current drain for the digital outputs and to supply the sensor.

3.8.3.4 X520 sensor power supply

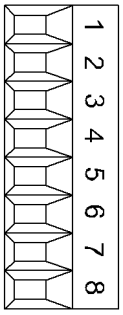
Table 3-50 Terminal X520

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

Without forced dormant error detection

3.8.3.5 X521 digital inputs + power supply with forced dormant error detection

Table 3-51 Screw terminal X521

	Terminal	Designation[1]	Technical data
	1	L1+	Voltage: +24 V DC max. total load current: 500 mA
	2	DI 0	Voltage: - 3 V to +30 V Typical current consumption: 3.2 mA at 24 V DC Electrical isolation: Reference potential, refer to terminals 6, 7, 8 All digital inputs are electrically isolated. Input delay:[2] - for "0" to "1": 30 µs (100 Hz) - for "1" to "0": 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 comprises a digital input and a 2nd digital input where, in addition, the cathode of the optocoupler is fed-out. F-DI 0 = terminals 2, 3 and 6 F-DI 1 = terminals 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

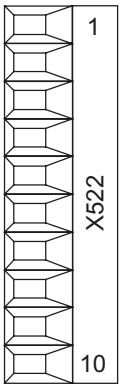
Notice

In order that digital inputs DI 0 to DI 2 can function, terminal M1 must be connected.
This can be done as follows:

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

3.8.3.6 X522 digital inputs

Table 3-52 Screw terminal X522

	Terminal	Designation[1)]	Technical data
	1	DI 4	Voltage: - 3 V to +30 V Typical current consumption: 3.2 mA at 24 V DC Electrical isolation: Reference potential, refer to terminals 7, 8, 9 All digital inputs are electrically isolated. Input delay:[2)] - for "0" to "1": 30 µs (100 Hz) - for "1" to "0": 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 comprises a digital input and a 2nd digital input where, in addition, the cathode of the optocoupler is fed-out. F-DI 2 = terminals 1, 2 and 7 F-DI 3 = terminals 3, 4 and 8 F-DI 4 = terminals 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

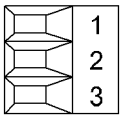
Notice

In order that digital inputs DI 4, DI 6 and DI 8 can function, terminal M1 must be connected. This can be done as follows:

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

3.8.3.7 X523 digital outputs

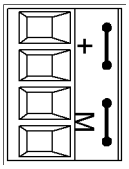
Table 3-53 Screw terminal X523

	Terminal	Designation	Technical data
	1	DI 20	Voltage: - 3 V to +30 V Typical current consumption: 3.2 mA at 24 V DC Electrical isolation: Reference potential is Terminal M1 The digital input is electrically isolated. Input delay:[1)] - for "0" to "1": 30 µs (100 Hz) - for "1" to "0": 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
	3	DO 0-	0.5 A Reference potential is L1+, L2+ or L3+ Output delay:[1)] - for "0" to "1": 300 µs - for "1" to "0": 350 µs Total current drain of all DOs: 2 A
An F-DO comprises two digital outputs and a digital input to feed back the signal F-DO 0 = terminals 1, 2 and 3 Max. connectable cross-section: 1.5 mm² Type: Screw terminal 1 (see Appendix A)			

1) Pure hardware delay

3.8.3.8 Electronics power supply X524

Table 3-54 Terminals for the electronics power supply

	Terminal	Designation	Technical data
	+	Electronics 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
	+	Electronics power supply	
	M	Electronics ground	
	M	Electronics ground	
Max. connectable cross-section: 2.5 mm² Type: Screw terminal 2 (see Appendix A)			

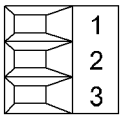
Note

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

[1)] including the current drain for the DRIVE-CLiQ devices.

3.8.3.9 X525 digital outputs

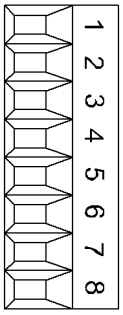
Table 3-55 Screw terminal X525

	Terminal	Designation	Technical data
	1	DI	Voltage: - 3 V to +30 V Typical current consumption: 3.2 mA at 24 V DC Electrical isolation: Reference potential is terminal M1 The digital input is electrically isolated. Input delay:[1)] - for "0" to "1": 30 µs (100 Hz) - for "1" to "0": 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
	3	DO 1-	0.5 A Reference potential is terminal L1+, L2+ or L3+ Output delay:[1)] - for "0" to "1": 300 µs - for "1" to "0": 350 µs Total current drain of all DOs: 2 A
An F-DO comprises two digital outputs and a digital input F-DO 1 = terminals 1, 2 and 3:			
Max. connectable cross-section: 1.5 mm² Type: Screw terminal 1 (see Appendix A)			

1) Pure hardware delay

3.8.3.10 X531 digital inputs + power supply with forced dormant error detection

Table 3-56 Screw terminal X531

	Terminal	Designation[1)]	Technical data
	1	L 2+	Voltage: +24 V DC max. total load current: 150 mA
	2	DI 10	Voltage: - 3 V to +30 V Typical current consumption: 3.2 mA at 24 V DC Electrical isolation: Reference potential, refer to terminals 6, 7, 8 All digital inputs are electrically isolated. Input delay:[2)] - for "0" to "1": 30 µs (100 Hz) - for "1" to "0": 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 to DI 11+
	7	DI 13-	Reference potential to DI 13+
	8	M1	Reference potential to DI 10, DI 12, L2+
An F-DI comprises a digital input and a 2nd digital input where, in addition, the cathode of the optocoupler is fed-out. F-DI 5 = terminals 2, 3 and 6 F-DI 6 = terminals 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

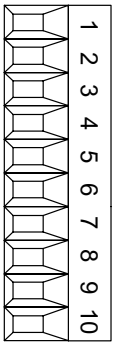
Notice

In order that digital inputs DI 10 to DI 12 can function, terminal M1 must be connected. This can be done as follows:

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

3.8.3.11 X532 digital inputs

Table 3-57 Screw terminal X532

	Terminal	Designation[1)]	Technical data
	1	DI 14	Voltage: - 3 V to +30 V Typical current consumption: 3.2 mA at 24 V DC Electrical isolation: Reference potential is terminal M1 All digital inputs are electrically isolated. Input delay:[2)] - for "0" to "1": 30 µs (100 Hz) - for "1" to "0": 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 to DI 15+
	8	DI 17-	Reference potential to DI 17+
	9	DI 19-	Reference potential to DI19+
	10	M1	Reference potential to DI14, DI16, DI18
An F-DI comprises a digital input and a 2nd digital input where, in addition, the cathode of the optocoupler is fed-out. F-DI 7 = terminals 1, 2 and 7 F-DI 8 = terminals 3, 4 and 8 F-DI 9 = terminals 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

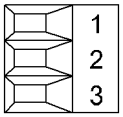
Notice

In order that digital inputs DI 14, DI 16 and DI 18 can function, terminal M1 must be connected.
This can be done as follows:

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

3.8.3.12 X533 digital outputs

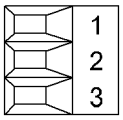
Table 3-58 Screw terminal X533

	Terminal	Designation	Technical data
	1	DI 22	Voltage: - 3 V to +30 V Typical current consumption: 3.2 mA at 24 V DC Electrical isolation: Reference potential is terminal M1 The digital input is electrically isolated. Input delay:[1)] - for "0" to "1": 30 µs (100 Hz) - for "1" to "0": 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": 300 µs - for "1" to "0": 350 µs Total current drain of all DOs: 2 A
	3	DO-	
An F-DO comprises two digital outputs and a digital input for the feedback signal F-DO 2 = terminals 1, 2 and 3 Max. connectable cross-section: 1.5 mm² Type: Screw terminal 1 (see Appendix A)			

1) Pure hardware delay

3.8.3.13 X535 digital outputs

Table 3-59 X535 digital inputs/outputs

	Terminal	Designation	Technical data
	1	DI 23	Voltage: - 3 V to +30 V Typical current consumption: 3.2 mA at 24 V DC Electrical isolation: Reference potential is terminal M1 The digital input is electrically isolated. Input delay:[1)] - for "0" to "1": 30 µs (100 Hz) - for "1" to "0": 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": 300 µs - for "1" to "0": 350 µs Total current drain of all DOs: 2 A
	3	DO 3-	
An F-DO comprises two digital outputs and a digital input for the feedback signal F-DO 3 = terminals 1, 2 and 3 Max. connectable cross-section: 1.5 mm² Type: Screw terminal 1 (see Appendix A)			

1) Pure hardware delay

3.8.3.14 Description of the LEDs on the Terminal Module TM54F

Table 3-60 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	Steady light	The component is ready for operation and cyclic DRIVE-CLiQ communication is taking place.
	Orange	Steady light	DRIVE-CLiQ communication is being established.
	Red	Steady 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	0.5 Hz flashing light	Firmware is being downloaded.
		2 Hz flashing light	Firmware download is complete. Waiting for POWER ON
	Green/orange or Red/orange	Flashing light	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.

3.8.4 Dimension drawing

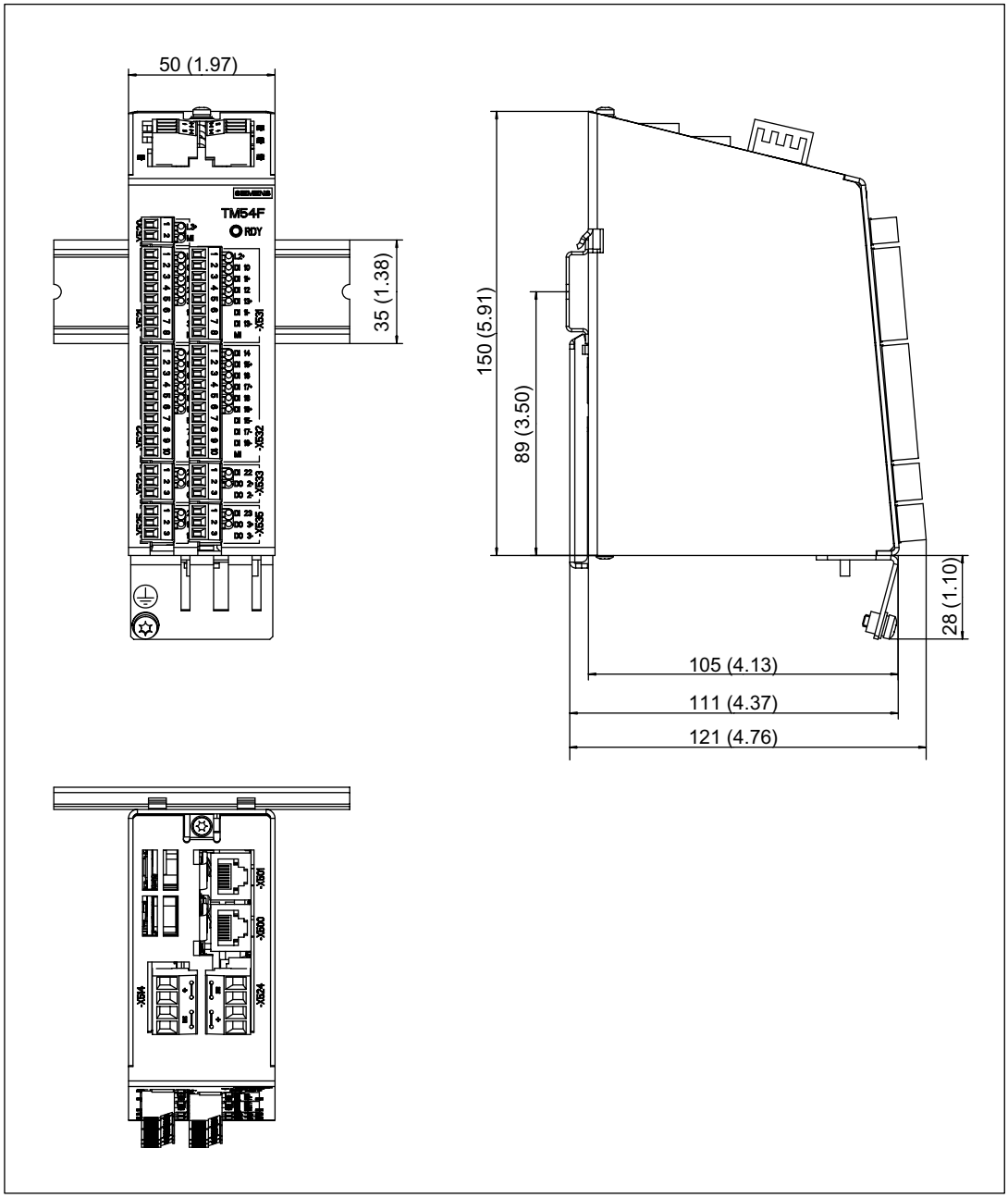


Figure 3-31 Dimension drawing of TM54F

3.8.5 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.

Removal

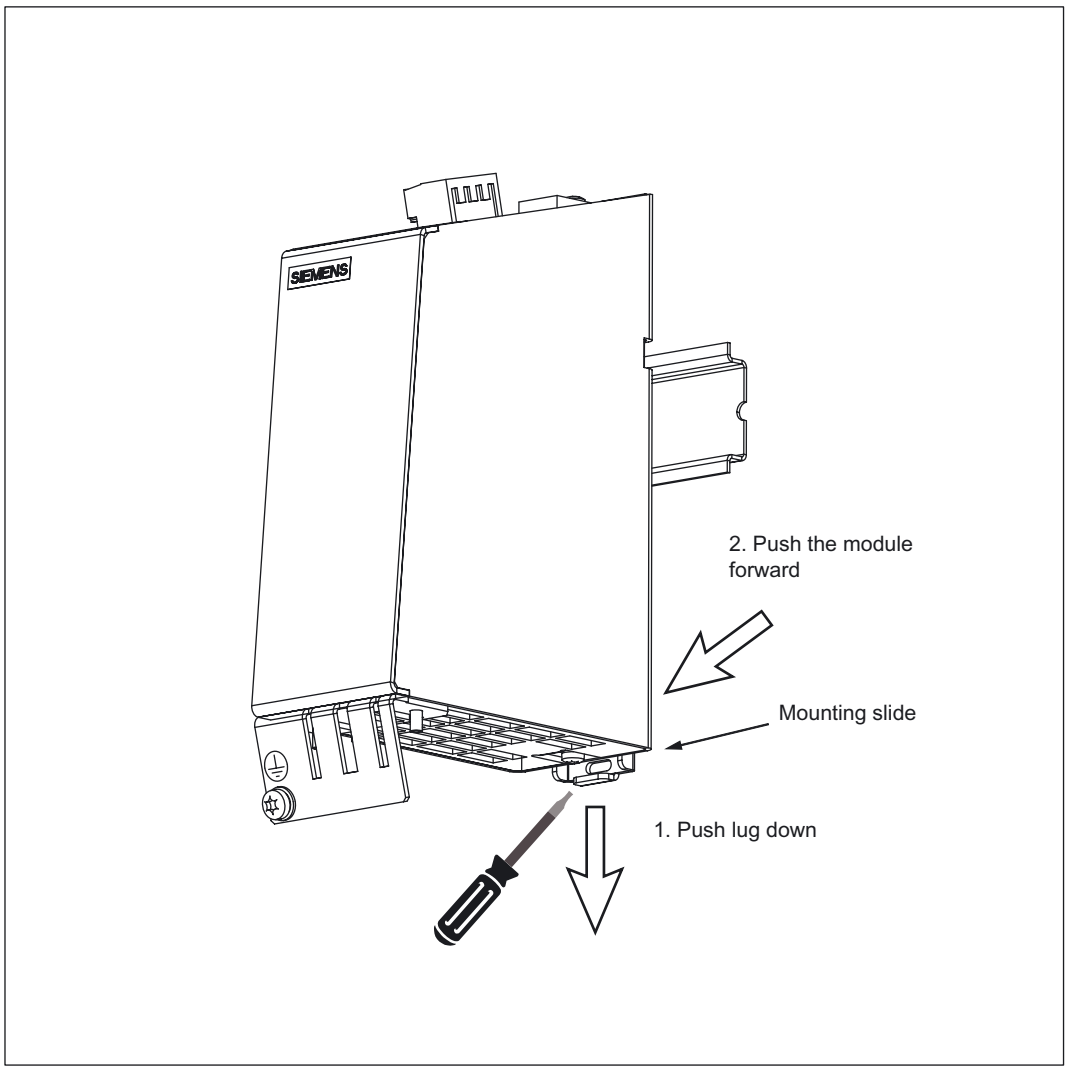


Figure 3-32 Releasing the component from a DIN rail

3.8.6 Technical specifications

Table 3-61 Technical specifications

	Unit	Value
Current requirement (X524 at 24 V DC) without DRIVE-CLiQ supply	mA	160
Current requirement (X514 at 24 V DC) without digital outputs	mA	35
- cable length for the 24 V power supply: - 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 electrical isolation) • Fail-safe digital outputs (F-DO) (with electrical isolation) • Standard digital inputs (with electrical isolation)		10 4 4
Fail-safe digital inputs (F-DI) and standard digital inputs • Voltage • Low-level (an open digital input is interpreted as "low") • High level • Current consumption (at 24 V DC) • Input delay[1)] – for "0" to "1" – for "1" to "0"	 V V V mA µs µs	 0 – 30 - 3 - + 5 15 – 30 ca. 3 approx. 30 (100 Hz) approx. 60 (100 Hz)
Fail-safe digital outputs (F-DO), continuous short-circuit proof • Voltage • Max. load current per digital output • Output delay[1)] – for "0" to "1" – for "1" to "0"	 V A µs µs	 24 0,5 300 350
Power loss	W	4.5 at 24 V
PE/ground connection		On housing with M4 screw
Weight	kg	approx. 0.9

1) Pure hardware delay

3.9 DRIVE-CLiQ Hub Module DMC20

3.9.1 Description

The DRIVE-CLiQ DMC20 Hub Module is used to implement star-shaped distribution of a DRIVE-CLiQ line. With the DMC20, an axis grouping can be expanded with 4 DRIVE-CLiQ sockets for additional subgroups.

The component is especially suitable for applications which require DRIVE-CLiQ nodes to be removed in groups, without interrupting the DRIVE-CLiQ line and therefore the data exchange.

3.9.2 Safety Information

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

3.9.3 Interface description

3.9.3.1 Overview

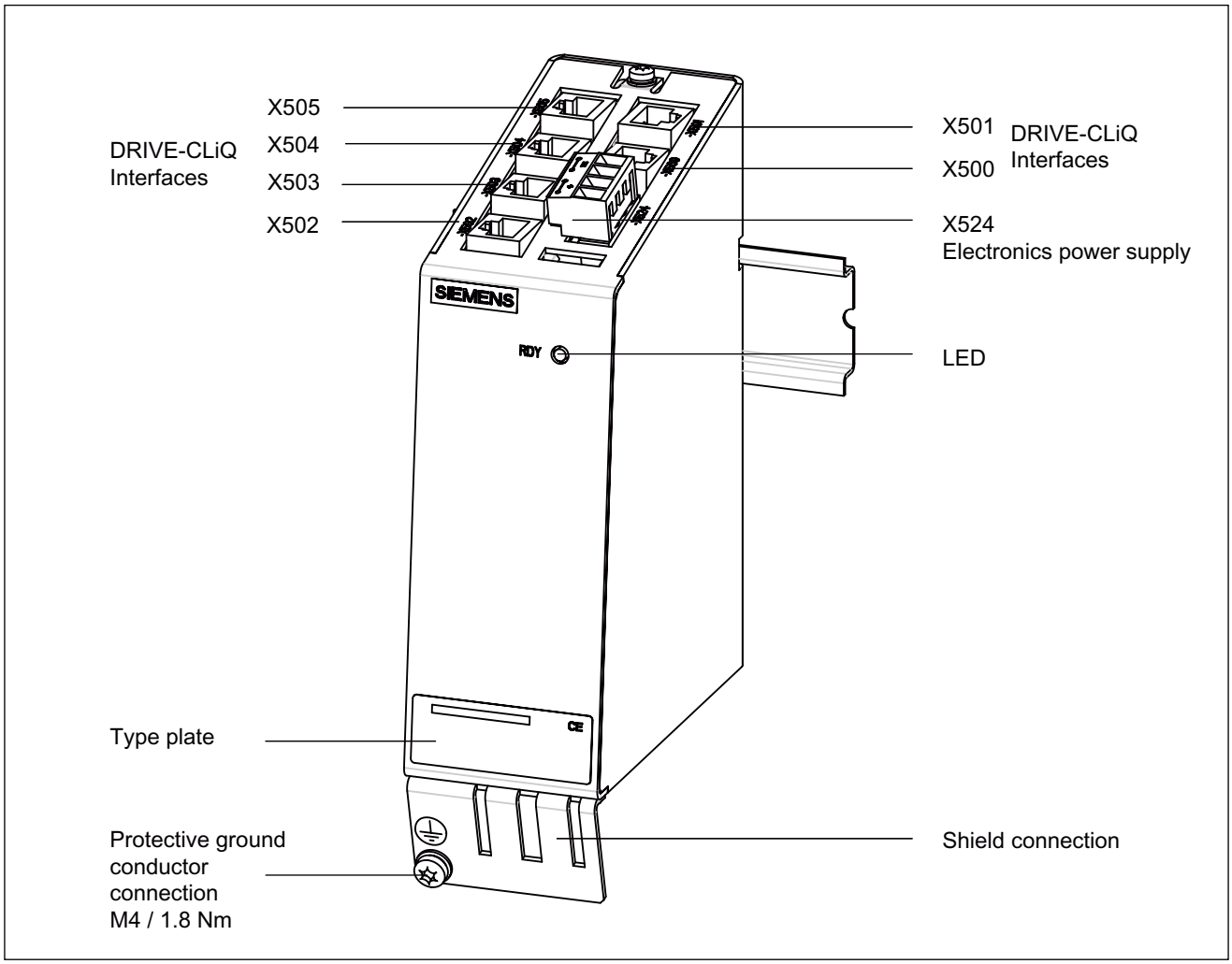
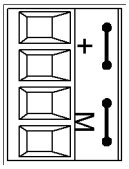


Figure 3-33 Interface description of the DMC20

3.9.3.2 Electronics power supply X524

Table 3-62 X524 terminals for the electronics power supply

	Terminal	Designation	Technical specifications
	+	Electronic power supply	24 DC (20.4 – 28.8)
	+	N. c.	
	M	Electronic ground	
	M	Electronic ground	
Max. connectable cross-section: 2,5 mm^2 Type: Screw terminal type 2 (see Appendix A)			

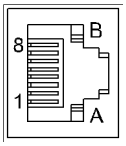
Note

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

The current consumption increases by the value for the DRIVE-CLiQ node and digital outputs.

3.9.3.3 DRIVE-CLiQ interface

Table 3-63 DRIVE-CLiQ interface X500, X501, X502, X503, X504, X505
Type: RJ45plus socket

	Pin	Signal name	Technical data
	1	TXP	Transmit data +
	2	TXN	Transmit data -
	3	RXP	Receive data +
	4	Reserved, do not use	
	5	Reserved, do not use	
	6	RXN	Receive data -
	7	Reserved, do not use	
	8	Reserved, do not use	
	A	+ (24 V)	Power supply
	B	M (0 V)	Electronics ground
Blanking plate for DRIVE-CLiQ interface: Yamaichi company, Order No.: Y-ConAS-13			

3.9.3.4 Significance of the LED on the DMC20

Table 3-64 Significance of the LED on the DMC20

LED	Color	Status	Description
READY	-	Off	Electronics power supply outside permissible tolerance range.
	Green	Steady light	The component is ready for operation and cyclic DRIVE-CLiQ communication is taking place.
	Orange	Steady light	DRIVE-CLiQ communication is being established.
	Red	Steady light	At least one fault is present in this component.
	Green Red	Flashing 2 Hz	The firmware is being downloaded. Component recognition via LED is activated (po154).

3.9.4 Dimension drawing

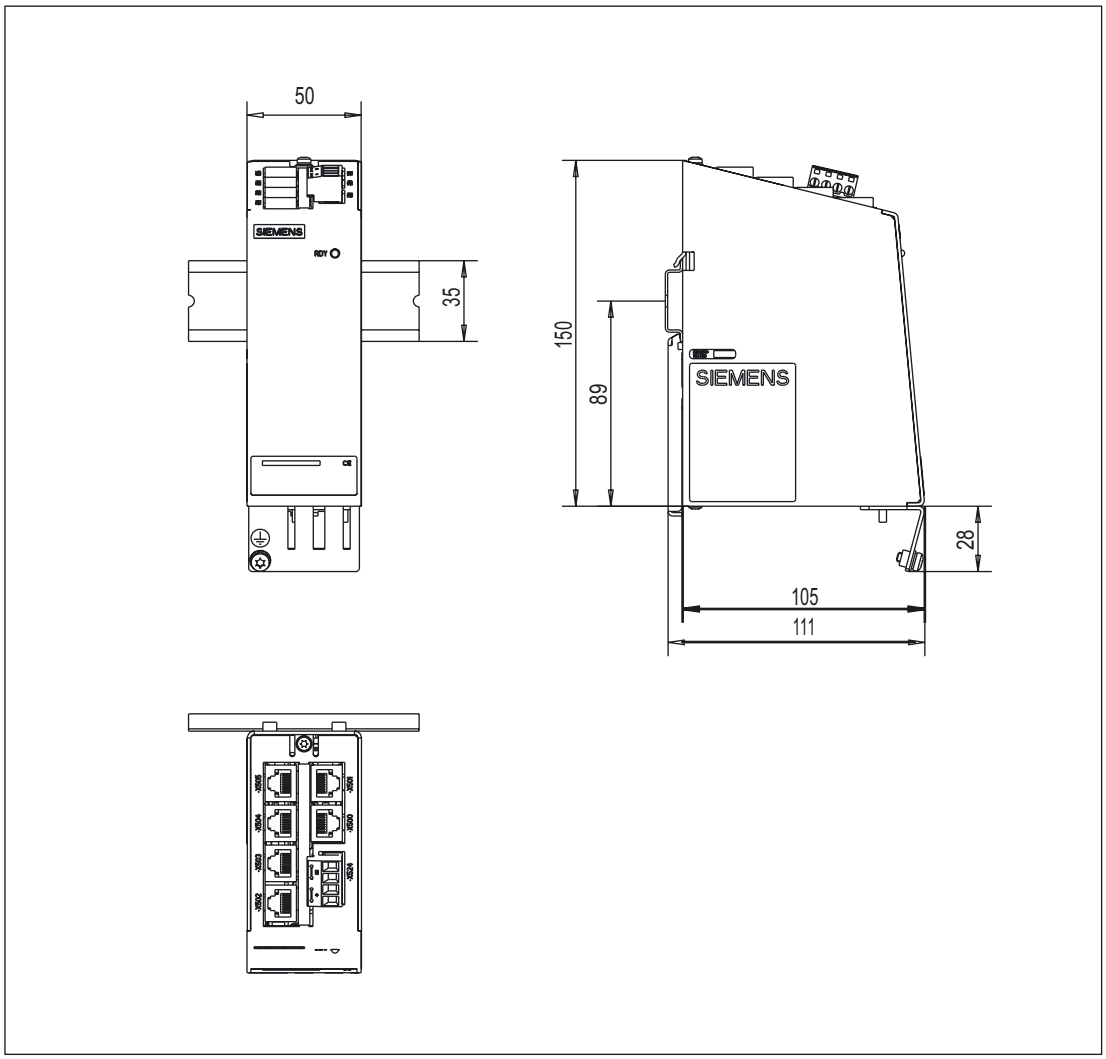


Figure 3-34 Dimension drawing of the DMC20

3.9.5 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.

Removal

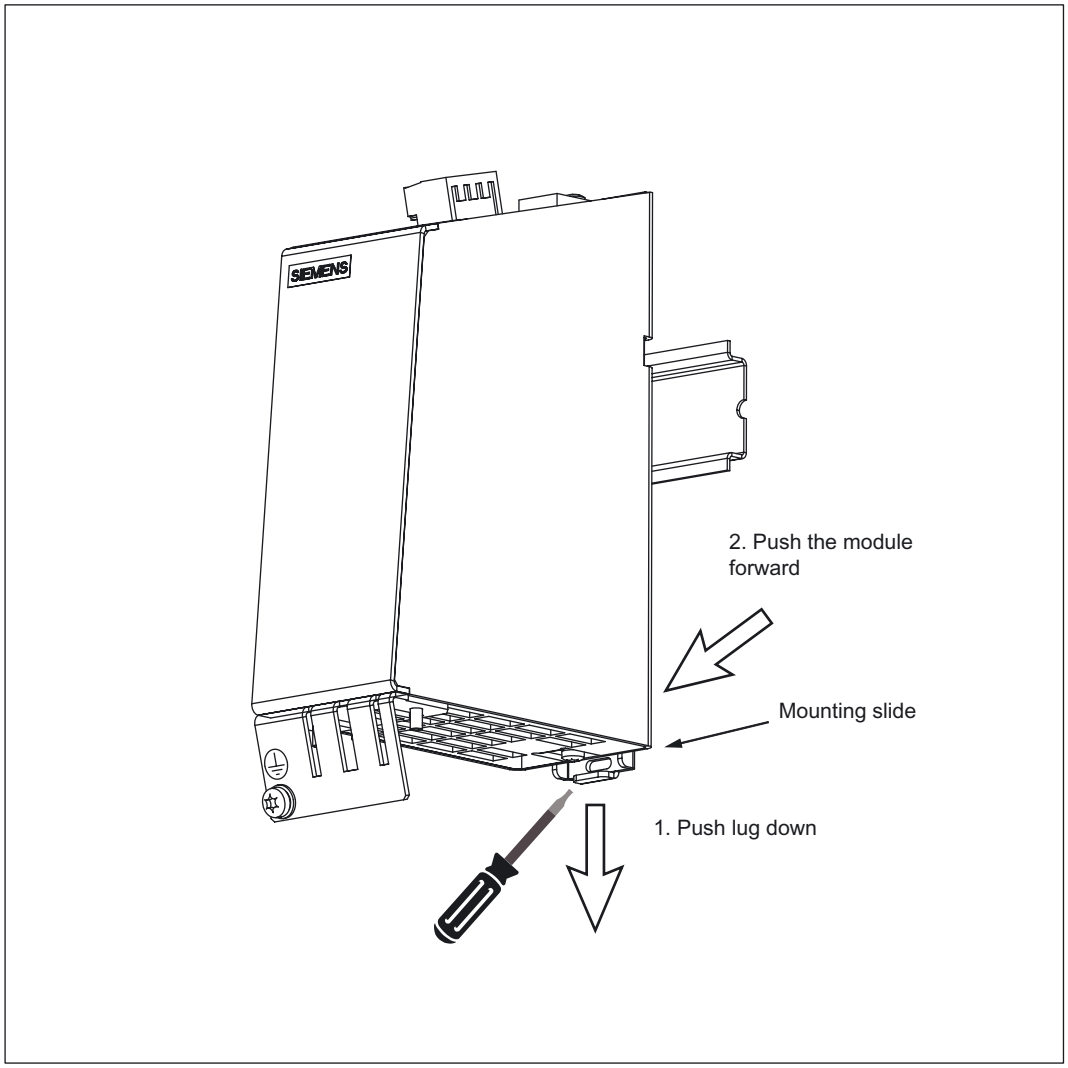


Figure 3-35 Releasing the component from a DIN rail

3.9.6 Technical data

Table 3-65 Technical specifications of the DMC20

	Unit	Value
Electronics power supply		
Voltage	V_{DC}	24 DC (20.4 – 28.8)
Current (without DRIVE-CLiQ or digital outputs)	A_{DC}	0,5
PE/ground connection	At the housing with M4/1.8 Nm stud	
Weight	kg	0,8

3.10 Voltage Sensing Module VSM10

3.10.1 Description

The Voltage Sensing Module VSM10 is a voltage sensing module that is used to sense the actual value for Active Line Modules and Smart Line Modules from 16 kW and upwards. The Voltage Sensing Module is used to sense the three-phase line supply voltage in front of the line reactor which is then provided to the infeed closed-loop control[1].

For booksize units, these components can be optionally used to increase the degree of ruggedness against irregularities in the line supply.

In addition to the voltage sensing, a temperature sensor can be connector to the VSM10 to thermally monitor the line reactor. Further, the functionality of the line filter can checked using two analog inputs.

The VSM10 from firmware 2.4 onwards can be used.

Table 3-66 Interface overview of the VSM10

Type	Quantity
Analog inputs	2
Line supply voltage connections (690 V)	3
Line supply voltage connections (100 V)	3
Temperature sensor input	1

[1]The infeed control is a firmware function that is required for the open-loop and closed-loop control, monitoring and communication of an infeed.

3.10.2 Safety information

⚠ Warning

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

Notice

The VSM10 has two terminal strips to sense the three-phase line supply voltage (X521 and X522). The voltage strength of terminal X521 is a maximum of 100 V (phase-to-phase) and is used for voltage sensing via a potential transformer. A maximum voltage to be sensed of up to to 690 V (phase-to-phase) can be directly connected to terminal X522. Only one of the two terminals X521 and X522 may be used. Nothing may be connected to the unused terminal.

Caution

Verbindungsleitungen zu Temperatursensoren müssen grundsätzlich geschirmt verlegt werden. The cable shield must be connected to the chassis potential at both ends through a large surface area. Temperature sensor cables that are routed together with the motor cable must be twisted in pairs and shielded separately.

3.10.3 Interface description

3.10.3.1 Overview

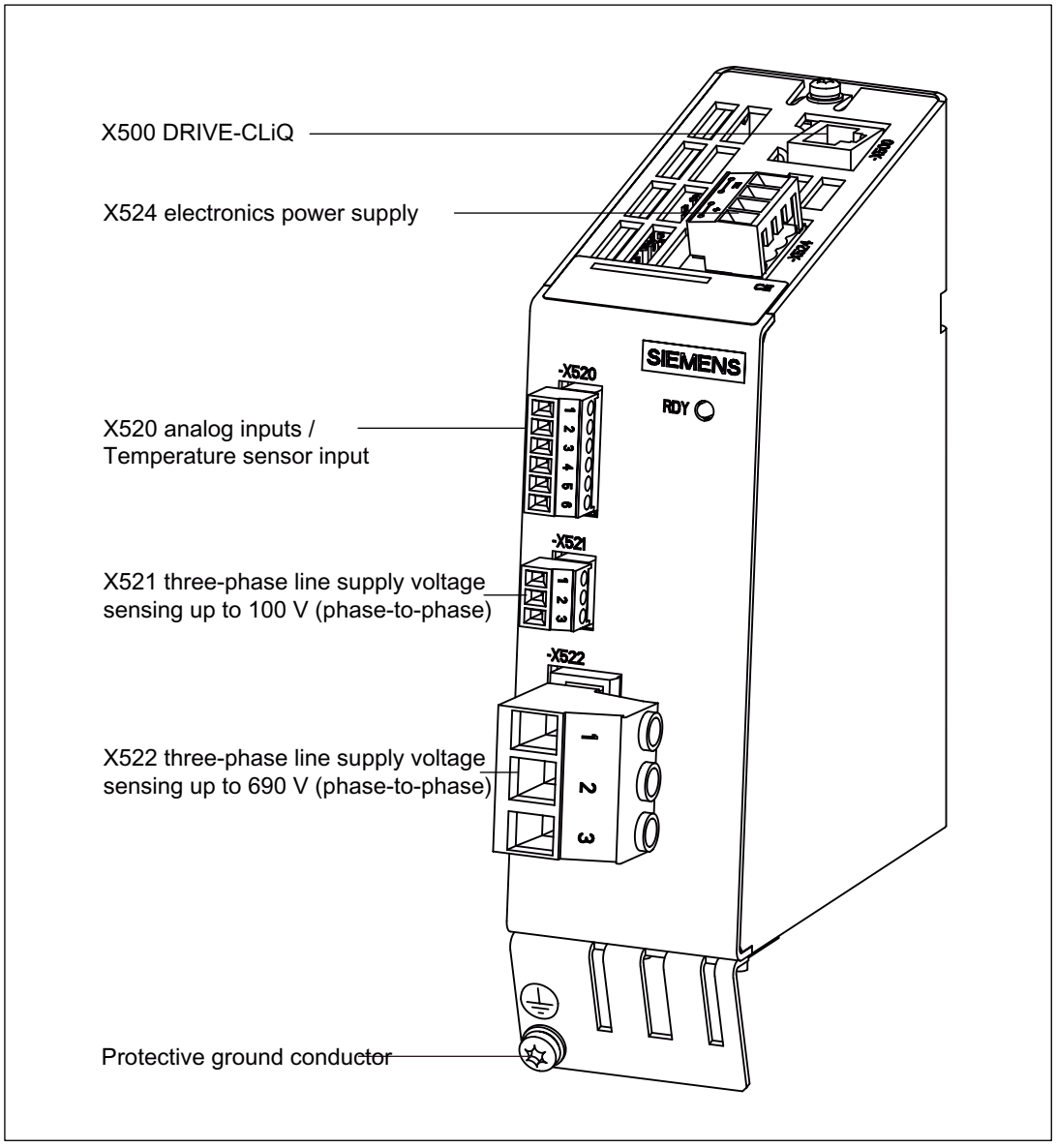


Figure 3-36 Voltage Sensing Module VSM10

3.10.3.2 Connection example

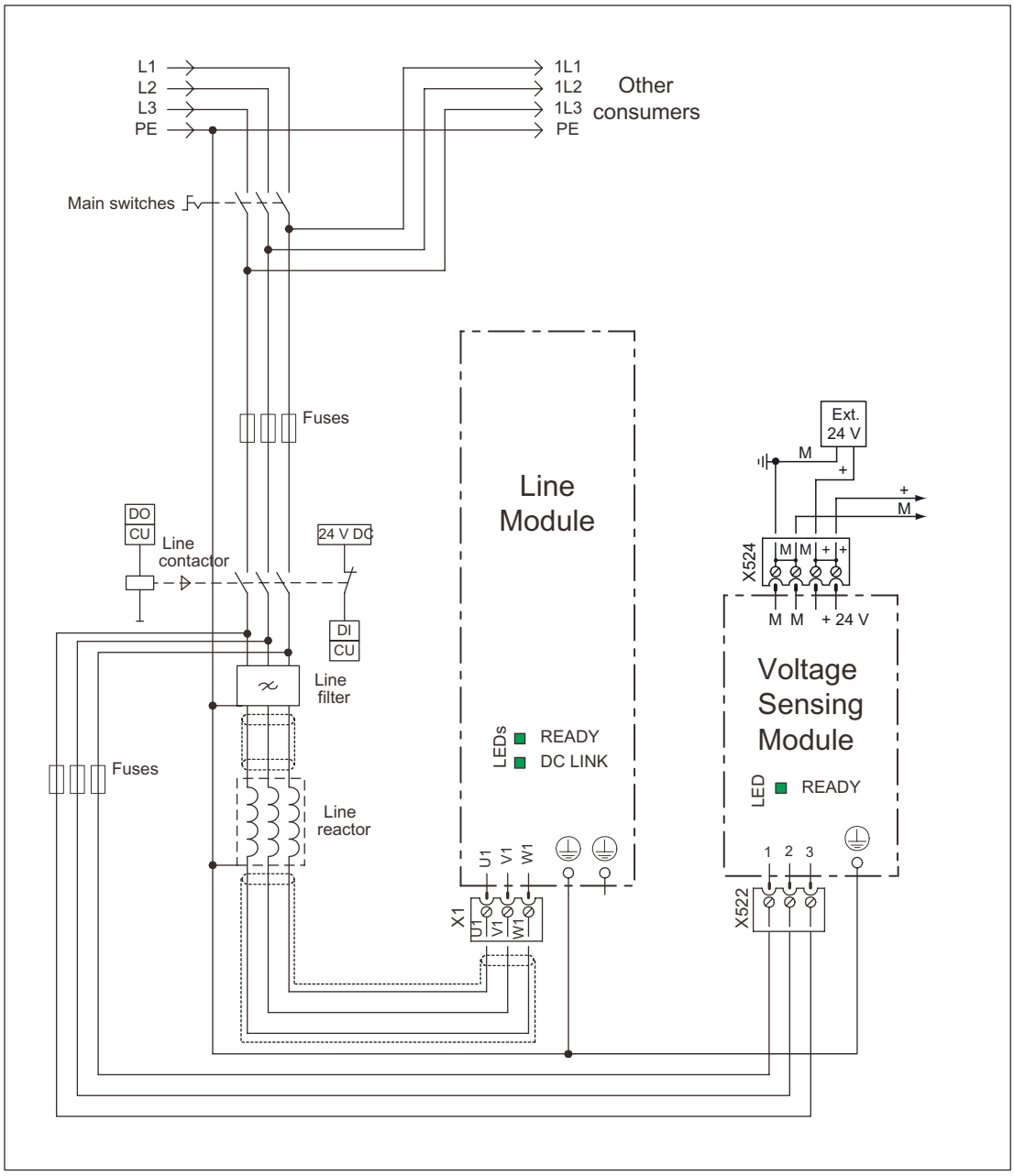
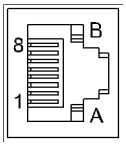


Figure 3-37 Connection example, VSM10

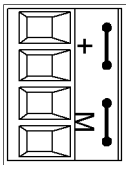
3.10.3.3 DRIVE-CLiQ interface X500

Table 3-67 DRIVE-CLiQ interface X500

	Pin	Signal name	Technical data
	1	TXP	Transmit data +
	2	TXN	Transmit data -
	3	RXP	Receive data +
	4	Reserved, do not use	
	5	Reserved, do not use	
	6	RXN	Receive data -
	7	Reserved, do not use	
	8	Reserved, do not use	
	A	+ (24 V)	Power supply
	B	M (0 V)	Electronics ground
Blanking plate for DRIVE-CLiQ interface: Yamaichi company, Order No.: Y-ConAS-13 The maximum cable length that can be connected is 50 m.			

3.10.3.4 Electronics power supply X524

Table 3-68 Terminals for the electronics power supply

	Terminal	Designation	Technical data
	+	Electronics power supply	Voltage: 24 V DC (20.4 V – 28.8 V) Current consumption: max. 0,2 A Max. current via jumper in connector: 20 A at 55 °C
	+	Electronics power supply	
	M	Electronics ground	
	M	Electronics ground	
Max. connectable cross-section: 2.5 mm² Type: Screw terminal 2 (see Appendix A) The maximum cable length that can be connected is 10 m.			

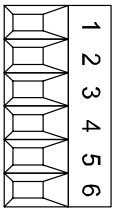
Note

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.

3.10.3.5 X520 analog inputs/temperature sensor connection

Table 3-69 Terminal block X520

	Terminal	Designation	Technical specifications
	1	AI 0+	2 analog differential inputs +/- 10V to monitor the line filter resonance Resolution: 12 bits
	2	AI 0-	
	3	AI 1+	
	4	AI 1-	
	5	+Temp	Temperature sensor connection KTY84-1C130/PTC
	6	-Temp	
Max. connectable cross-section: 1.5 mm² Type: Screw terminal 1 (see Appendix A)			

Note

In order to minimize noise emission, shielded cables should be used.

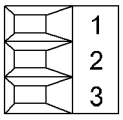
Caution
The common mode range may not be violated. This means that the analog differential voltage signals can have a maximum offset voltage of +/-30 V with respect to the ground potential. If the range is infringed, incorrect results may occur during analog/digital conversion.

3.10.3.6 X521 three-phase line supply voltage sensing up to 100 V (phase-to-phase)

This interface is not relevant for booksize units.

3.10.3.7 X522 three-phase line supply voltage sensing up to 690 V (phase-to-phase)

Table 3-70 Terminal block X522

	Terminal	Designation	Technical specifications
	1	Phase voltage U	Directly connected to sense the line supply voltage
	2	Phase voltage V	
	3	Phase voltage W	
Max. connectable cross-section: 6 mm² Type: Screw terminal 1 (see Appendix A)			

Notice

Only one of the two terminals X521 and X522 may be used. Nothing may be connected to the unused terminal.

Notice

The line phases must be connected to the VSM10 with the same sequence as that of the Line Module. If this is not observed, when the Line Module is enabled, overcurrents can occur.

Notice

If the configuration has a line filter, then the phase voltages for the VSM (X522) must be taken from in front of the line filter. If the configuration does not have a line filter, then X522 must be connected to the line side of the line reactor (voltages are taken from in front of the line reactor).

3.10.3.8 Significance of the LEDs for the Voltage Sensing Module VSM10

Table 3-71 Significance of the LEDs on the VSM10

LED	Color	Status	Description
RDY	---	Off	The electronics power supply is missing or lies outside permissible tolerance range.
	Green	Steady light	The component is ready for operation and cyclic DRIVE-CLiQ communication is taking place.
	Orange	Steady light	DRIVE-CLiQ communication is being established.
	Red	Steady light	At least one fault is present in this component.
	Green/red	2 Hz flashing light	Firmware is being downloaded.
	Green orange or red orange	2 Hz flashing light	Detection of the components via LED is activated (p0144). Note: Both options depend on the LED status when module recognition is activated via p0144 = 1.

3.10.4 Dimension drawing

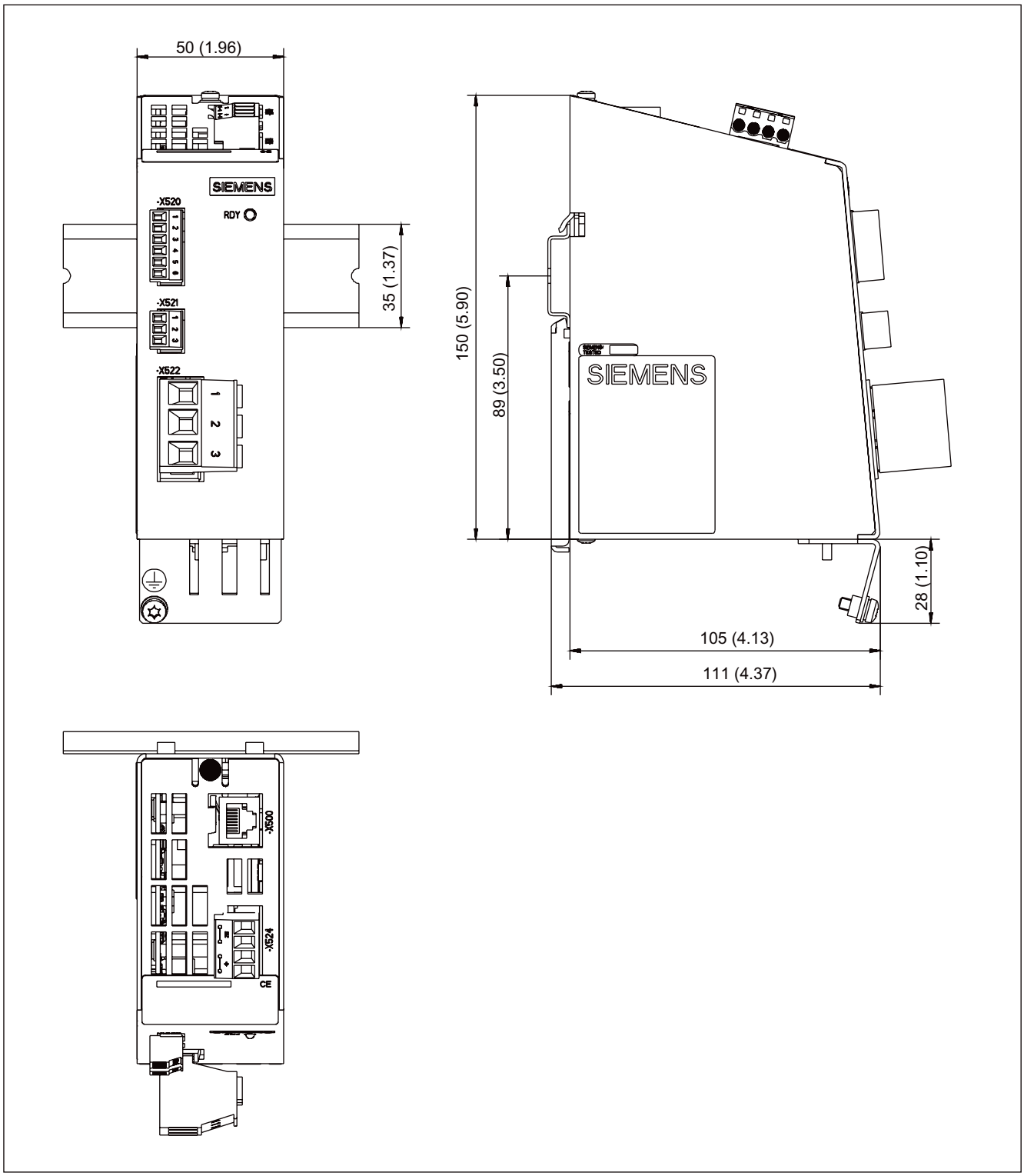


Figure 3-38 Dimension drawing: Voltage Sensing Module

3.10.5 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.

Removal

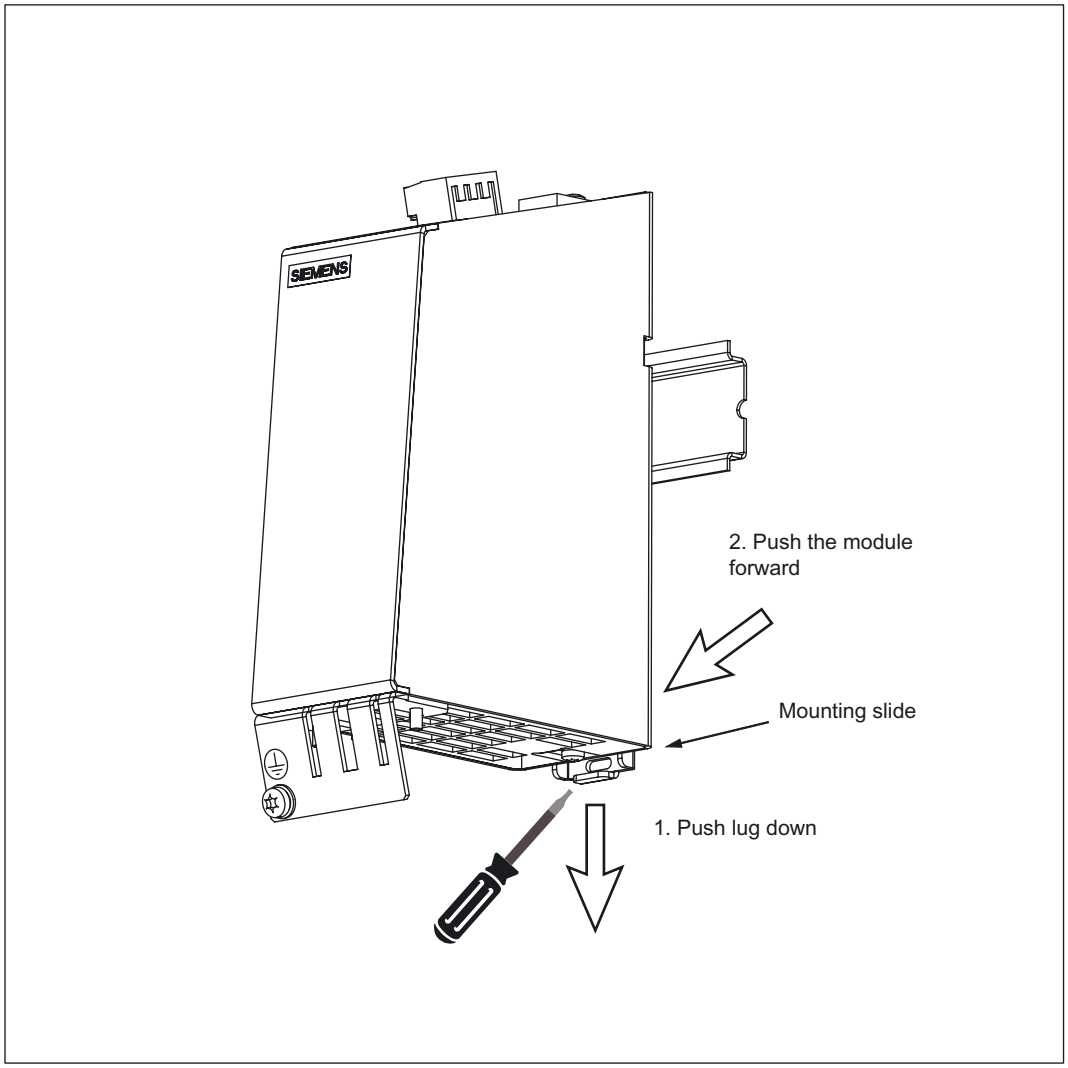


Figure 3-39 Releasing the component from a DIN rail

3.10.6 Electrical Connection

Shield contact for components from Weidmüller

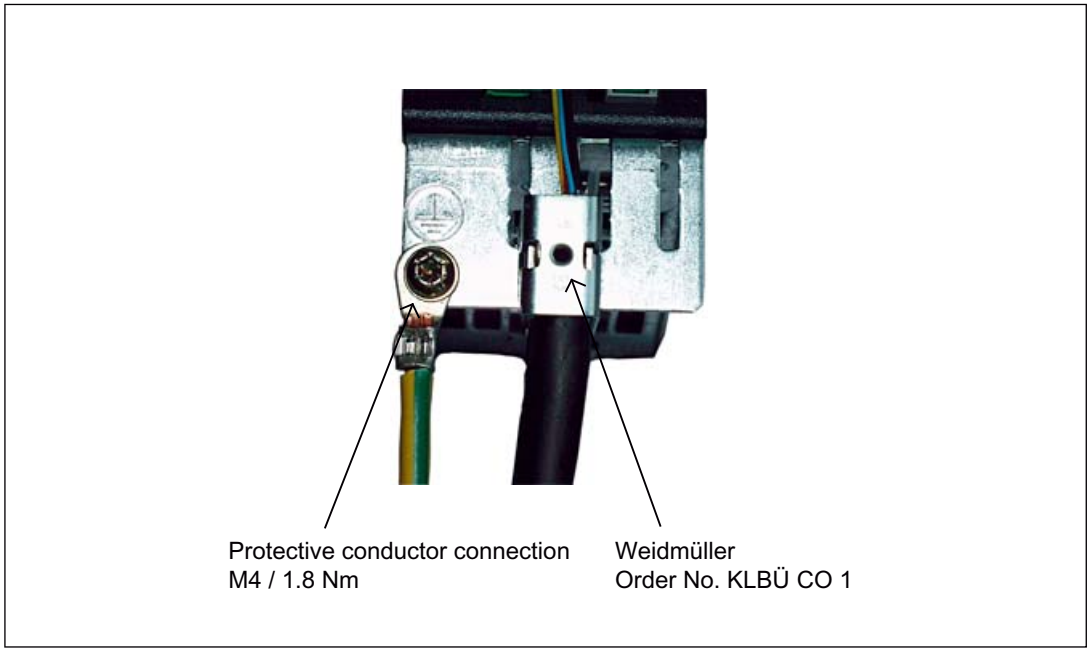


Figure 3-40 Shield contacts

Internet address of the company:

Weidmüller: http://www.weidmueller.com

Notice
Only screws with a permissible screw-in depth of 4 - 6 mm may be used.

3.10.7 Technical data

Table 3-72 Technical specifications

	Unit	Value
Electronics power supply		
Voltage	V_{DC}	24 DC (20.4 – 28.8)
Current (without DRIVE-CLiQ or digital outputs)	A_{DC}	0,3
Power loss	W	<10
PE/ground connection	On the housing with M4, 1.8 Nm screw	
Weight	kg	1

Encoder system connection 4

4.1 Introduction

The sensor system should be connected to SINAMICS S120 via DRIVE-CLiQ.

Motors with DRIVE-CLiQ interfaces (e.g. synchronous motors 1FK7 and 1FT6, and induction motors 1PH7) are designed for this purpose.

These motors with DRIVE-CLiQ interfaces can be connected to the associated Motor Module via the available MOTION-CONNECT DRIVE-CLiQ cables. In this way, the motor sensor and temperature signals as well as the electronic type plate data, such as the unique identification number, rated data (voltage, current and torque) are transferred directly to the Control Unit. These motors simplify commissioning and diagnosis because the motor and sensor type are identified automatically.

Motors without DRIVE-CLiQ interfaces

The sensor and temperature signals from motors without DRIVE-CLiQ interfaces, as well as external sensors must be connected via Sensor Modules. Presently, Sensor Modules Cabinet-Mounted (SMC) are available, which can be directly mounted in the control cabinets and Sensor Modules External (SME) for mounting outside the control cabinets.

Only one encoder system can be connected to each Sensor Module.

Motors with DRIVE-CLiQ interfaces

The encoder systems can be connected to SINAMICS S120 via DRIVE-CLiQ. Motors with DRIVE-CLiQ interface are available for this purposes, e.g. 1FK7 synchronous motor.

Motors with DRIVE-CLiQ interfaces can be directly connected to the associated Motor Module via the available MOTION-CONNECT DRIVE-CLiQ cables. The connection of the MOTION-CONNECT DRIVE-CLiQ cable at the motor has degree of protection IP67.

The DRIVE-CLiQ interface supplies the motor encoder via the integrated 24 V DC supply and transfers the motor encoder and temperature signals and the electronic rating plate data, e.g. a unique identification number, rated data (voltage, current, torque) directly to the Control Unit. This means that for the various encoder types - e.g. resolver or absolute value encoder - different encoder cables are no longer required; just one MOTION-CONNECT DRIVE-CLiQ cable can be used for all types.

Further information

Motor sensors and temperature signals should preferably be connected to the associated Motor Module, while external sensors should be connected to the Control Unit.

4.2 Overview of Sensor Modules

4.2.1 Description

Sensor Modules Cabinet-Mounted (SMC)

Sensor Modules Cabinet-Mounted can be ordered and configured separately. They are used when a motor with a DRIVE-CLiQ interface is not available and when external sensors in addition to the motor sensor are required. Only one encoder system can be connected to each Sensor Module Cabinet-Mounted. Only sensor systems in which the power supply for the sensor system is not grounded may be connected.

Note

The SMC supplies the power to the sensor; the SMC, however, must be provided separately with 24 VDC power.

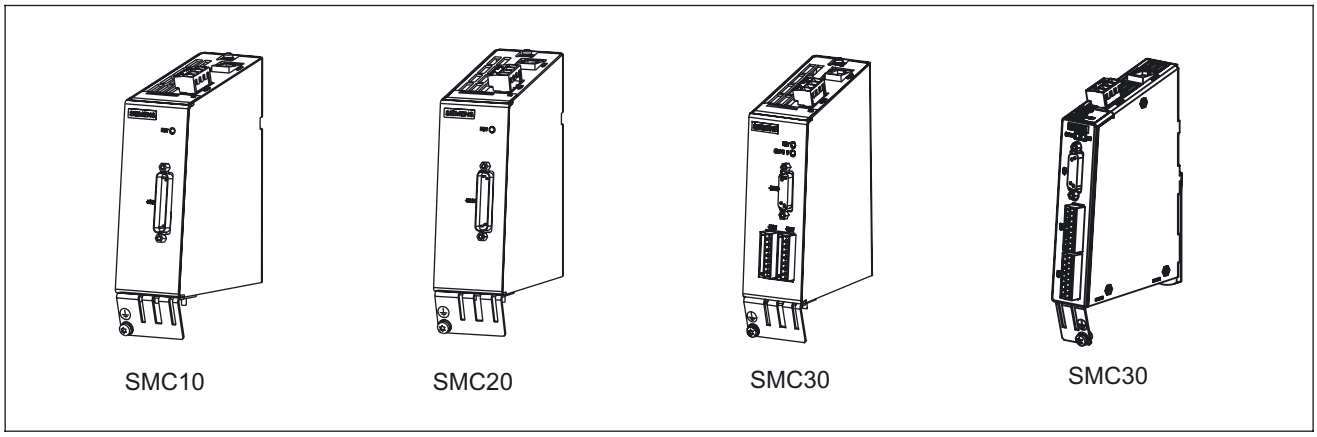


Figure 4-1 Sensor Modules Cabinet-Mounted (SMC)

Sensor Modules External (SME)

Direct measuring systems outside the cabinet can be connected to the Sensor Module External. The SME evaluates these measuring systems and converts the calculated values to DRIVE-CLiQ. No motor or sensor data is stored in the SME.

Note

The SME provides the encoder power supply. The power supply for the SME is provided from the connected DRIVE-CLiQ cable. This must be taken into consideration when the DRIVE-CLiQ cable is selected.

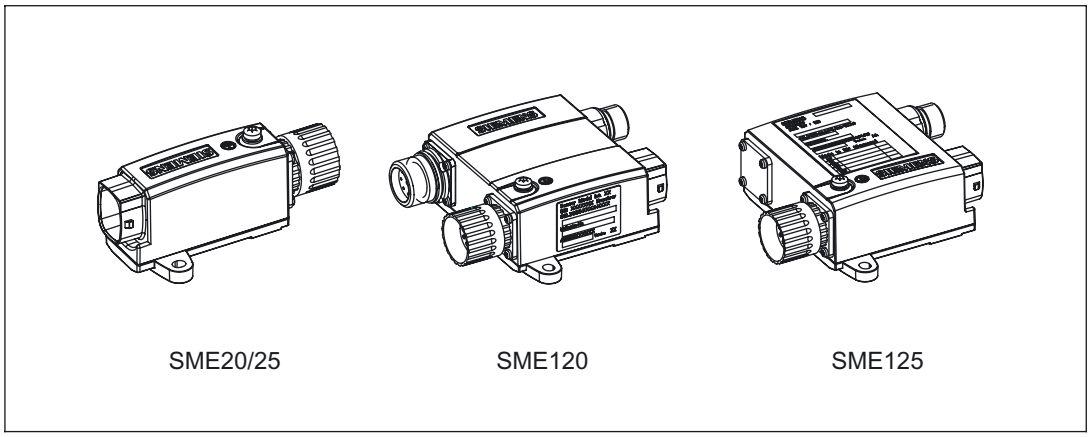


Figure 4-2 Sensor Modules External (SME)

Connectable sensor systems

Table 4-1 Connectable sensor systems

	SMC				SME			
Measuring systems	**SMC10**	**SMC20**	**SMC30 50 mm**	**SMC30 30 mm**	**SME20**	**SME25**	**SME120**	**SME125**
Resolver	Yes	-	-	-	-	-	-	-
Incremental encoder sin / cos (1 Vpp) with/without reference signal	-	Yes	-	-	Yes	-	Yes	-
Absolute encoder EnDat	-	Yes	-	-	-	Yes	-	Yes
Incremental encoder TTL / HTL	-	-	Yes	Yes	-	-	-	-
Absolute value encoder SSI	-	Yes[1)]	Yes[2)]	Yes[2)]	-	Yes[1)]	-	Yes[1)]
Temperature evaluation	Yes	Yes	Yes	Yes	-	-	Yes (electrically isolated)	Yes (electrically isolated)

[1)] Only possible from firmware 2.4 (only SSI encoders with 5-V supply possible)

[2)] Only from Order No. 6SL3055-0AA00-5CA1 and Firmware 2.4 (SSI encoders with 5-V or 24 V supply possible)

4.2.2 Sensor Connections

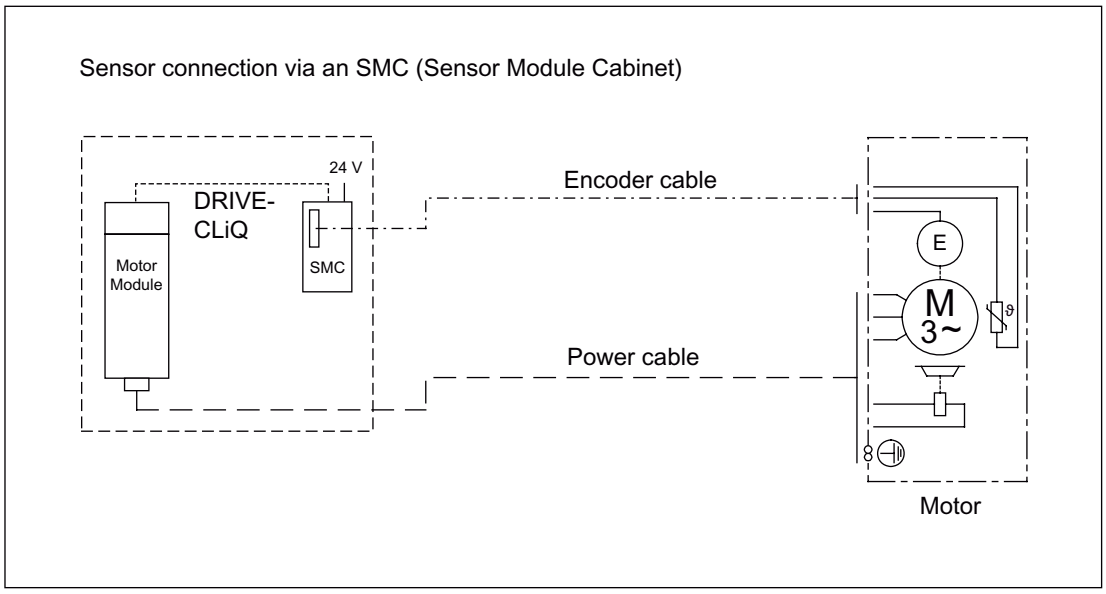


Figure 4-3 Sensor connection via an SMC (Sensor Module Cabinet)

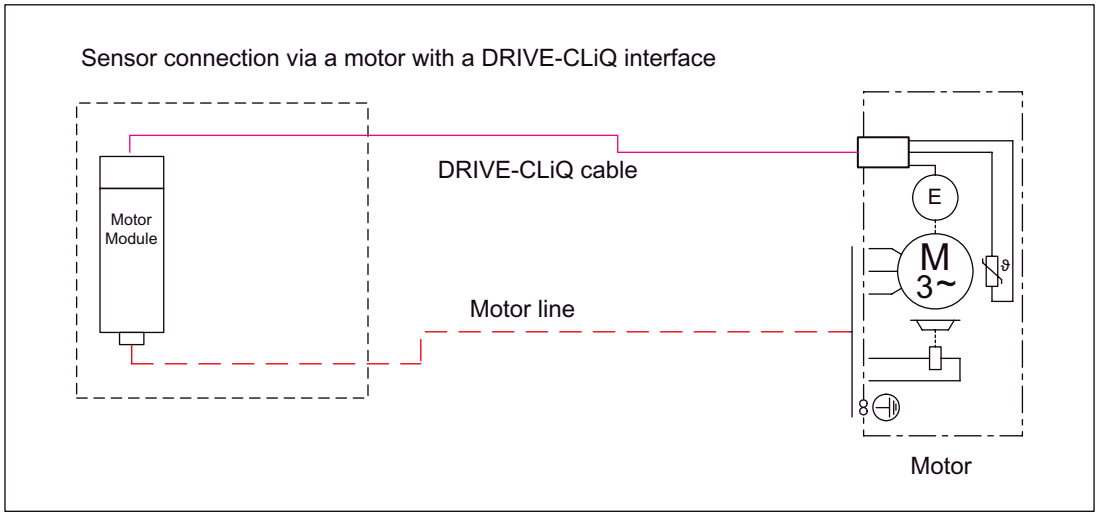


Figure 4-4 Sensor connection via a motor with a DRIVE-CLiQ interface

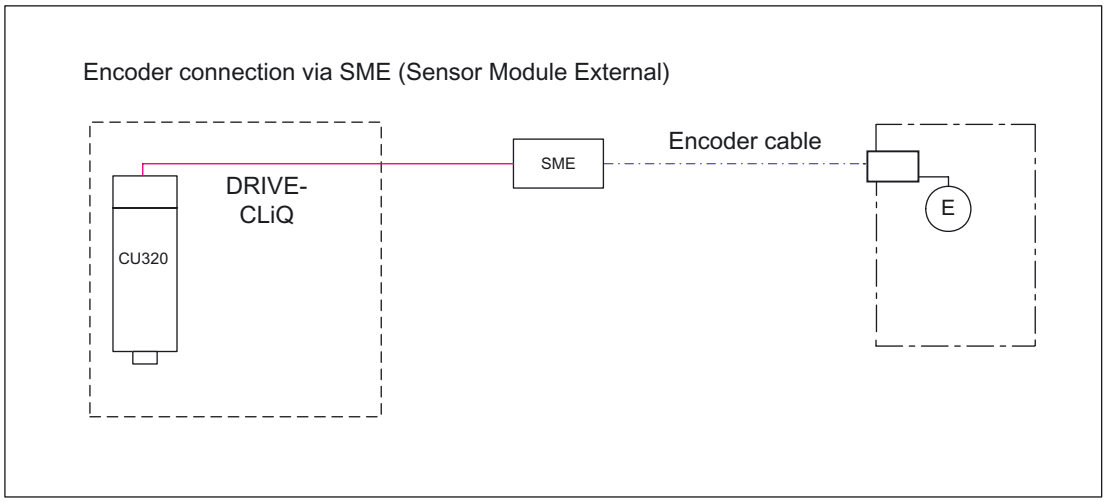


Figure 4-5 Sensor connection via an SME (Sensor Module External)

4.3 Sensor Module Cabinet-Mounted SMC10

4.3.1 Description

The Sensor Module Cabinet-Mounted SMC10 evaluates encoder signals and transmits the speed, actual position value, rotor position and, if necessary, the motor temperature via DRIVE-CLiQ to the Control Unit.

The SMC10 can be operated from firmware 2.2 and higher

The SMC10 is used to evaluate sensor signals from resolvers.

Table 4-2 Specification

	Value
Transmission ratio of the resolver	ü = 0.5
Exciting voltage on the SMC10 when ü=0.5	4.1 Vrms
Amplitude monitoring threshold (secondary tracks) of the SMC10	1 Vrms

The excitation voltage is 4.1 V rms and cannot be parameterized.

The excitation frequency is synchronized to the current controller clock cycle and lies in the range between 5 kHz and 10 kHz.

The ratio between the ohmic resistance R and the inductance L (the primary winding of the resolver) determines whether the resolver can be evaluated with the SMC10.
See the following diagram:

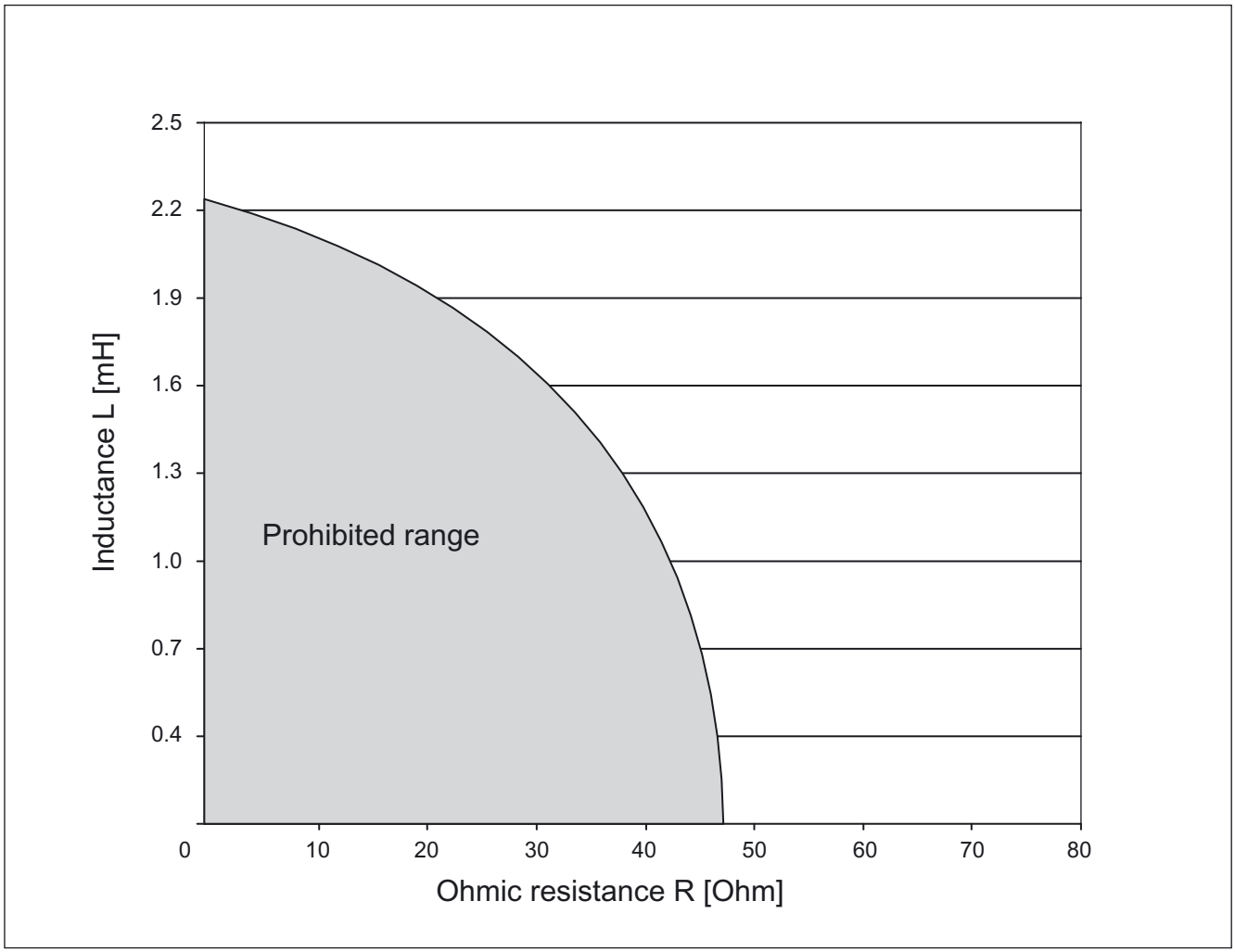


Figure 4-6 Connectable impedances with an exciting frequency f = 5000 Hz

The maximum sensor cable length is 130 m.

The component is snapped on to a mounting rail according to DIN EN 60715.

4.3.2 Safety Information

⚠ Warning

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

Notice

Only one measuring system can be connected to each Sensor Module.

Note

There may be no electrical connection between the measuring system housing and the measuring system electronics (this requirement is fulfilled for most encoder systems).
If this is not carefully observed, then under certain circumstances the system will not be able to reach the required noise immunity (there is then a danger of equalization currents flowing through the electronics ground).

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.

4.3.3 Interface description

4.3.3.1 Overview

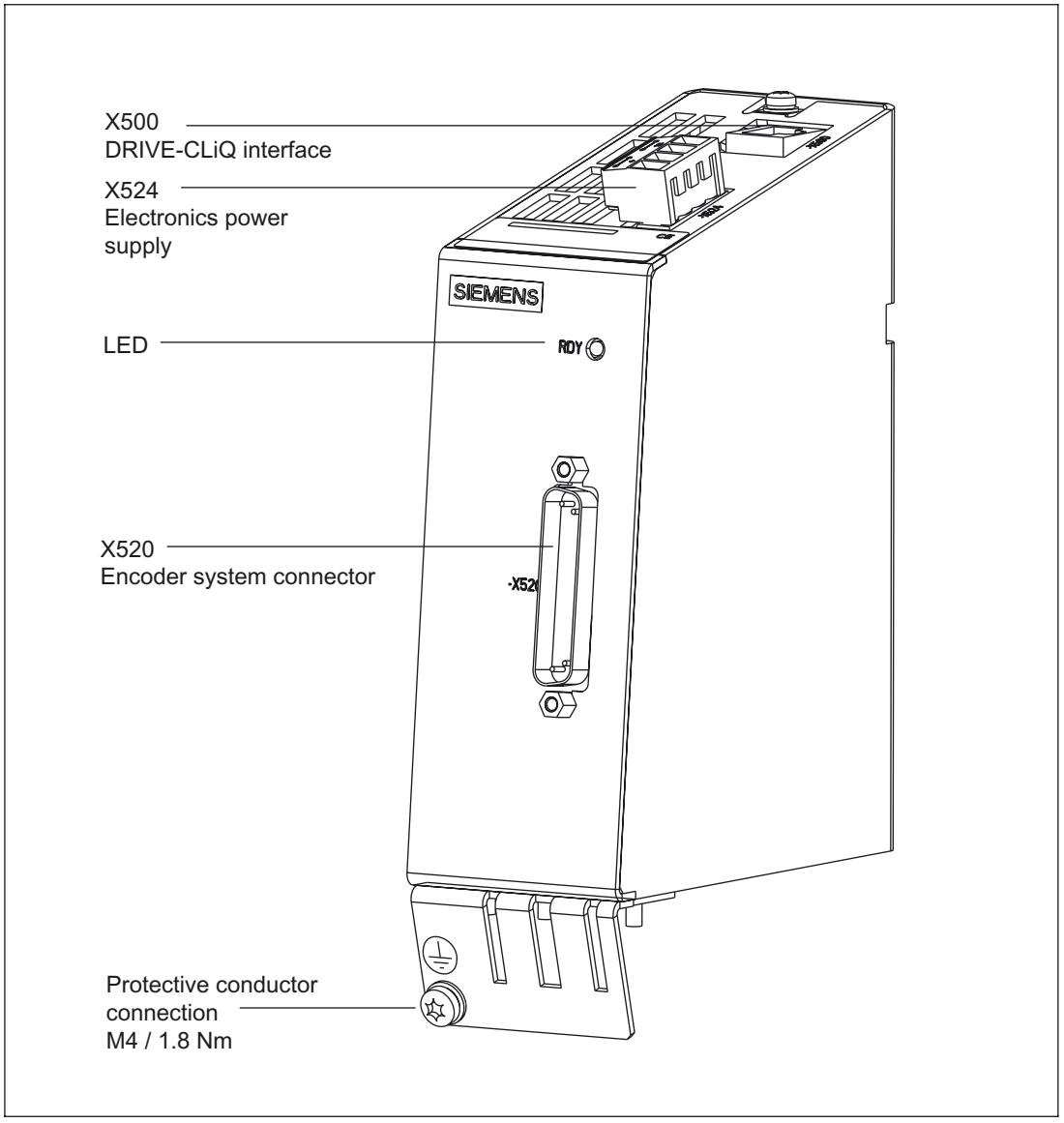
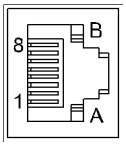


Figure 4-7 Interface description of the SMC10

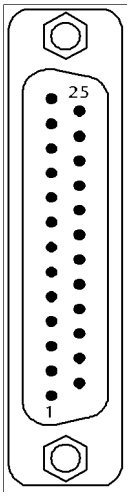
4.3.3.2 DRIVE-CLiQ interface X500

Table 4-3 DRIVE-CLiQ interface X500

	Pin	Signal name	Technical specifications
	1	TXP	Transmit data +
	2	TXN	Transmit data -
	3	RXP	Receive data +
	4	Reserved, do not use	
	5	Reserved, do not use	
	6	RXN	Receive data -
	7	Reserved, do not use	
	8	Reserved, do not use	
	A	Reserved, do not use	
	B	GND (0 V)	Electronic ground

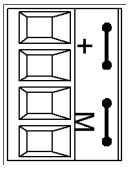
4.3.3.3 X520 sensor system

Table 4-4 Sensor interface X520

	Pin	Signal name	Technical data
	1	Reserved, do not use	
	2	Reserved, do not use	
	3	S2	Resolver signal A (sin+)
	4	S4	Inverse resolver signal A (sin-)
	5	Ground	Ground (for internal shield)
	6	S1	Resolver signal B (cos+)
	7	S3	Inverse resolver signal B (cos-)
	8	Ground	Ground (for internal shield)
	9	R1	Resolver excitation positive
	10	Reserved, do not use	
	11	R2	Resolver excitation negative
	12	Reserved, do not use	
	13	+Temp	Motor temperature measurement KTY84-1C130 (KTY+) Temperature sensor connection KTY84-1C130 / PTC
	14	Reserved, do not use	
	15	Reserved, do not use	
	16	Reserved, do not use	
	17	Reserved, do not use	
	18	Reserved, do not use	
	19	Reserved, do not use	
	20	Reserved, do not use	
	21	Reserved, do not use	
	22	Reserved, do not use	
	23	Reserved, do not use	
	24	Ground	Ground (for internal shield)
	25	-Temp	Motor temperature measurement KTY84-1C130 (KTY-) Temperature sensor connection KTY84-1C130 / PTC

4.3.3.4 Electronics power supply X524

Table 4-5 Terminal block X524

	Terminal	Function	Technical specifications
	+	Electronics power supply	Voltage: 24 V (20.4 V – 28.8 V) Current consumption: max. 0,35 A Maximum current via jumper in connector: 20 A at 55°C
	+	Electronics power supply	
	M	Electronic ground	
	M	Electronic ground	
Max. connectable cross-section: 2.5 mm² Type: Screw terminal 2 (see Appendix)			

Note

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

4.3.3.5 Description of the LEDs on the SMC10

Table 4-6 Description of the LEDs on the SMC10

LED	Color	State	Technical specifications
RDY	-	Off	Electronics power supply is missing or outside permissible tolerance range.
	Green	Steady light	The component is ready for operation and cyclic DRIVE-CLiQ communication is taking place.
	Orange	Steady light	DRIVE-CLiQ communication is being established.
	Red	Steady 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 (p0144) **Note:** Both options depend on the LED status when component recognition is activated via p0144 = 1.

Cause and rectification of faults

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

References: /IH1/ SINAMICS S, Commissioning Manual

4.3.4 Dimension drawing

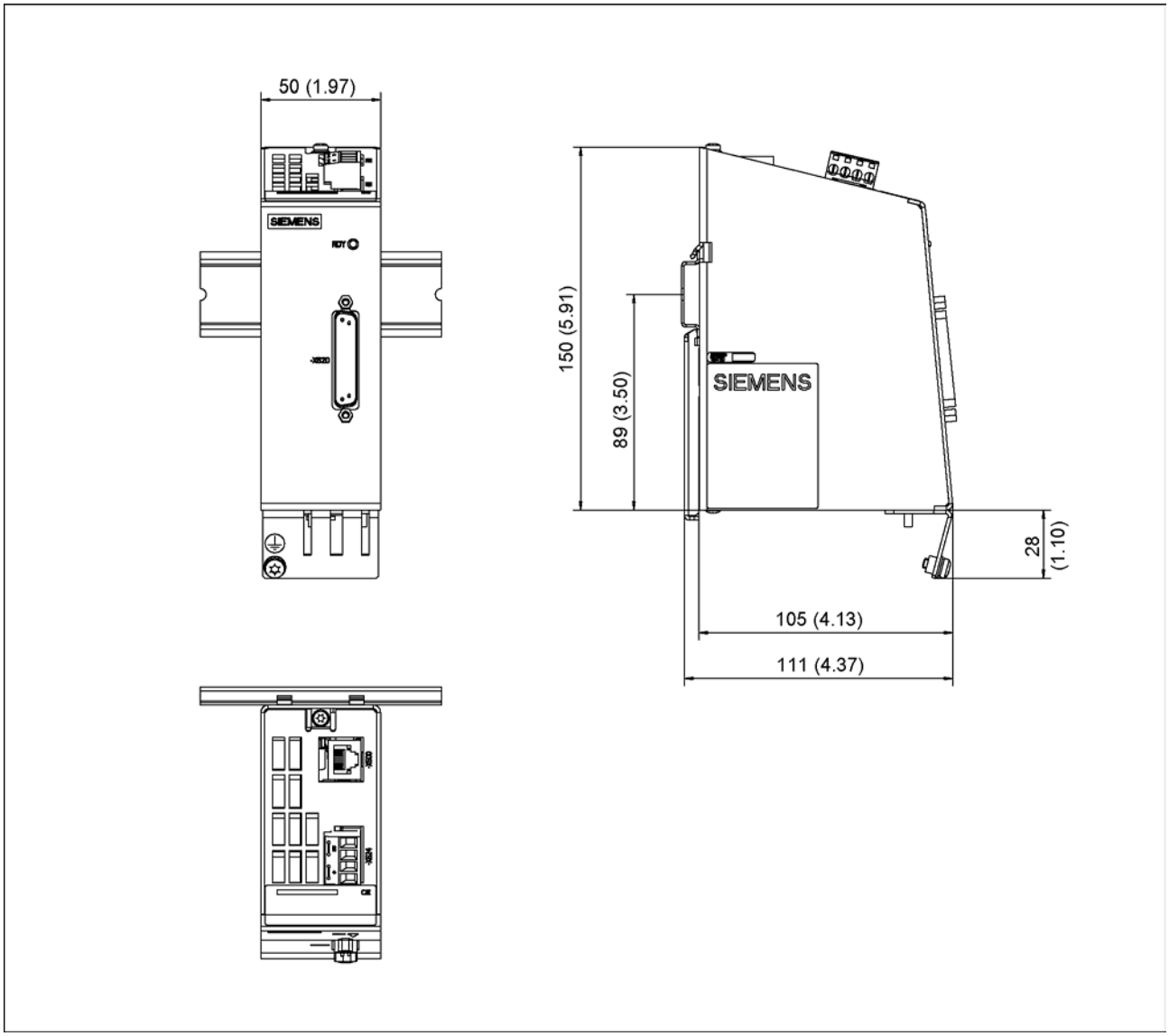


Figure 4-8 Dimension drawing of the SMC10

4.3.5 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.

Removal

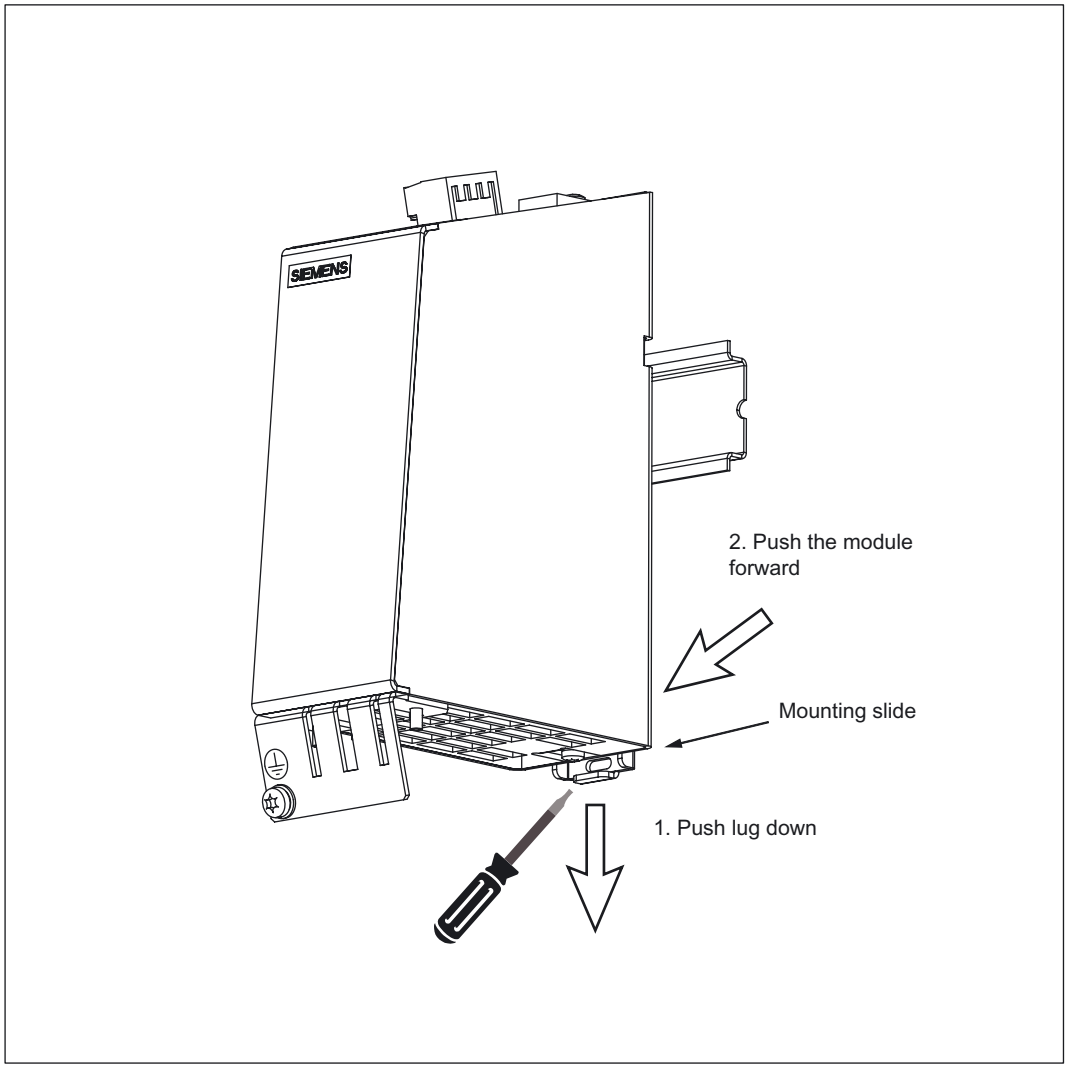


Figure 4-9 Releasing the component from a DIN rail

4.3.6 Technical data

Table 4-7 Technical specifications

Sensor Module Cabinet-Mounted SMC10 6SL3055-0AA00-5AAx	**Designation**	**Unit**	**Value**
Electronics power supply Voltage Current (without measuring system) Current (with measuring system) Power loss	 V_{DC} A_{DC} A_{DC} W	 V A A W	 24 DC (20.4 – 28.8) ≤ 0.20 ≤ 0.35 ≤ 10
Measuring system power supply Voltage Current		Refer to table "Specifications"	
Encoder frequency that can be evaluated	$f_{encoder}$	Refer to the table "Max. frequency that can be evaluated (speed)"	
PE/ground connection		On housing with M4/1.8 Nm screw	
Weight		kg	0,8
Degree of protection		IP20 or IPXXB	

Table 4-8 Max. frequency that can be evaluated (speed)

Resolver		**Max. speed resolver / motor**		
Number of poles	**Number of pole pairs**	**8kHz / 125 µsec**	**4kHz / 250 µsec**	**2kHz / 500 µsec**
2-pole	1	120,000 rpm	60,000 rpm	30,000 rpm
4-pole	2	60,000 rpm	30,000 rpm	15,000 rpm
6-pole	3	40,000 rpm	20,000 rpm	10,000 rpm
8-pole	4	30,000 rpm	15,000 rpm	7,500 rpm

4.4 Sensor Module Cabinet-Mounted SMC20

4.4.1 Description

The Sensor Module Cabinet-Mounted SMC20 evaluates encoder signals and transmits the speed, actual position value, rotor position and, if necessary, the motor temperature and reference point via DRIVE-CLiQ to the Control Unit.

The SMC20 can be operated from Firmware 2.2 onwards

Encoders that can be connected are incremental SIN/COS (1 Vpp) and absolute encoders with EnDat and SSI (with 5 V operating voltage, from firmware 2.4).

The maximum sensor cable length is 100 m.

The component is snapped on to a mounting rail according to DIN EN 60715.

4.4.2 Safety information

⚠ Warning

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

Notice

Only one measuring system can be connected to each Sensor Module.

Note

There may be no electrical connection between the measuring system housing and the measuring system electronics (this requirement is fulfilled for most encoder systems).
If this is not carefully observed, then under certain circumstances the system will not be able to reach the required noise immunity (there is then a danger of equalization currents flowing through the electronics ground).

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.

4.4.3 Interface description

4.4.3.1 Overview

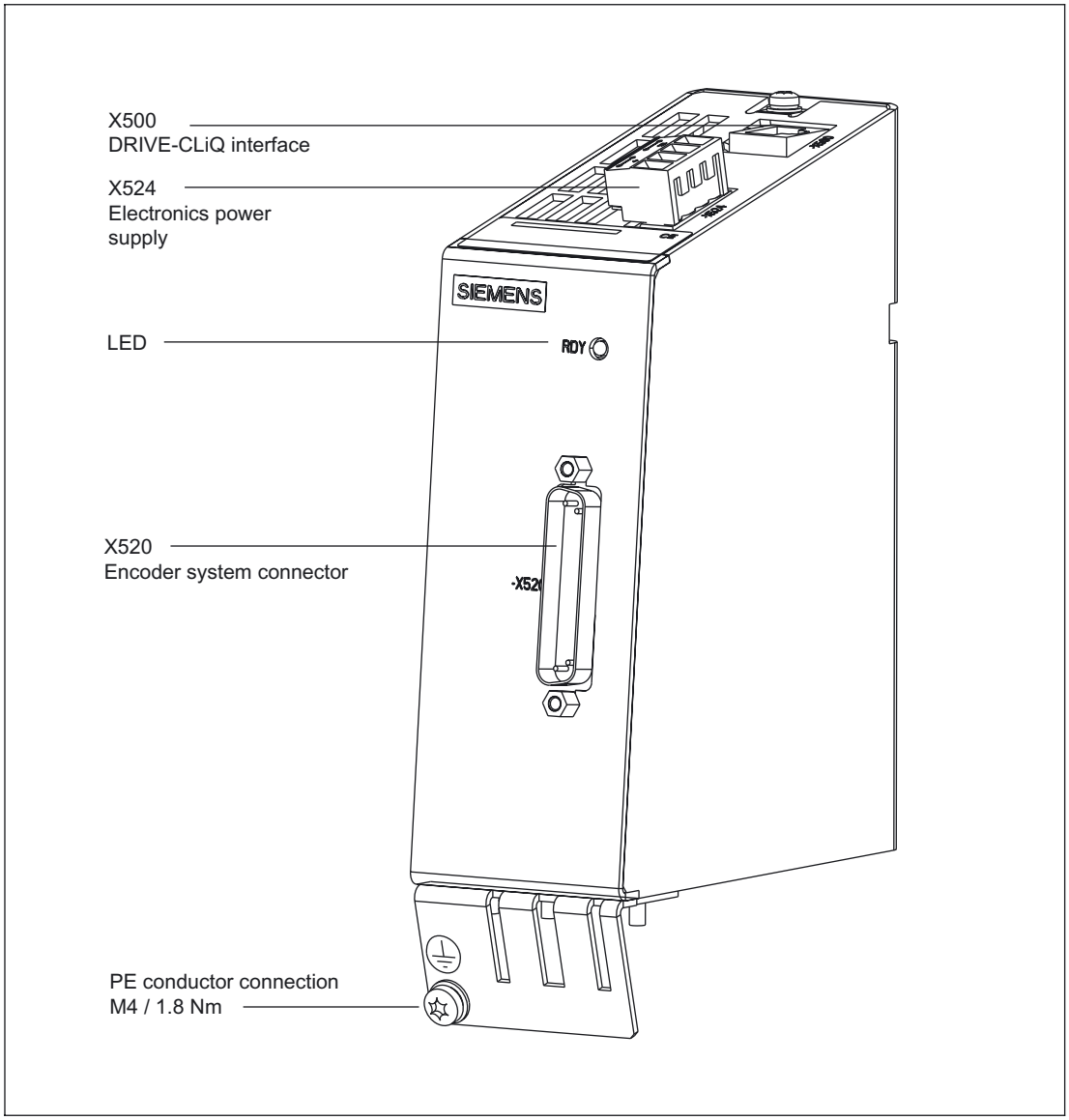
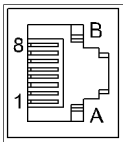


Figure 4-10 Interface description of the SMC20

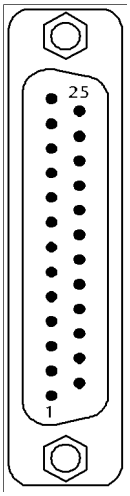
4.4.3.2 DRIVE-CLiQ interface X500

Table 4-9 DRIVE-CLiQ interface X500

	Pin	Signal name	Technical specifications
	1	TXP	Transmit data +
	2	TXN	Transmit data -
	3	RXP	Receive data +
	4	Reserved, do not use	
	5	Reserved, do not use	
	6	RXN	Receive data -
	7	Reserved, do not use	
	8	Reserved, do not use	
	A	Reserved, do not use	
	B	GND (0 V)	Electronic ground

4.4.3.3 X520 sensor system

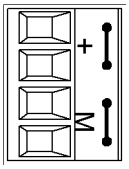
Table 4-10 Sensor interface X520

	Pin	Signal name	Technical data
	1	P encoder	Encoder power supply
	2	M encoder	Ground for encoder power supply
	3	A	Incremental signal A
	4	A*	Inverse incremental signal A
	5	Ground	Ground (for internal shield)
	6	B	Incremental signal B
	7	B*	Inverse incremental signal B
	8	Ground	Ground (for internal shield)
	9	Reserved, do not use	
	10	Clock	Clock EnDat interface, SSI clock[1)]
	11	Reserved, do not use	
	12	Clock*	Inverse clock, EnDat interface, Inverse SSI clock[1)]
	13	+ Temp	Motor temperature measurement KTY84-1C130 (KTY+) Temperature sensor connection KTY84-1C130 / PTC
	14	5 V Sense	Sense input encoder power supply
	15	Data	Data, EnDat interface, SSI data[1)]
	16	0 V Sense	Ground sense input encoder power supply
	17	R	Reference signal R
	18	R*	Inverse reference signal R
	19	C	Absolute track signal C
	20	C*	Inverse absolute value signal C
	21	D	Absolute track signal D
	22	D*	Inverse absolute track signal D
	23	Data*	Inverse data EnDat interface, Inverse SSI data[1)]
	24	Ground	Ground (for internal shield)
	25	- Temp	Motor temperature measurement KTY84-1C130 (KTY-) Temperature sensor connection KTY84-1C130 / PTC

[1)] Only from Firmware 2.4 onwards

4.4.3.4 Electronics power supply X524

Table 4-11 Terminal block X524

	Terminal	Function	Technical specifications
	+	Electronics power supply	Voltage: 24 V (20.4 V – 28.8 V) Current consumption: max. 0,35 A Maximum current via jumper in connector: 20 A at 55°C
	+	Electronics 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 the supply voltage is looped through.

4.4.3.5 Description of the LEDs on the SMC20

Table 4-12 Description of the LEDs on the SMC20

LED	Color	State	Technical specifications
RDY	-	OFF	Electronics power supply is missing or outside permissible tolerance range.
	Green	Steady light	The component is ready for operation and cyclic DRIVE-CLiQ communication is taking place.
	Orange	Steady light	DRIVE-CLiQ communication is being established.
	Red	Steady light	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	Component recognition via LED is activated (p0144) **Note:** Both options depend on the LED status when component recognition is activated via p0144 = 1.

Cause and rectification of faults

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

References: /IH1/ SINAMICS S, Commissioning Manual

4.4.4 Dimension drawing

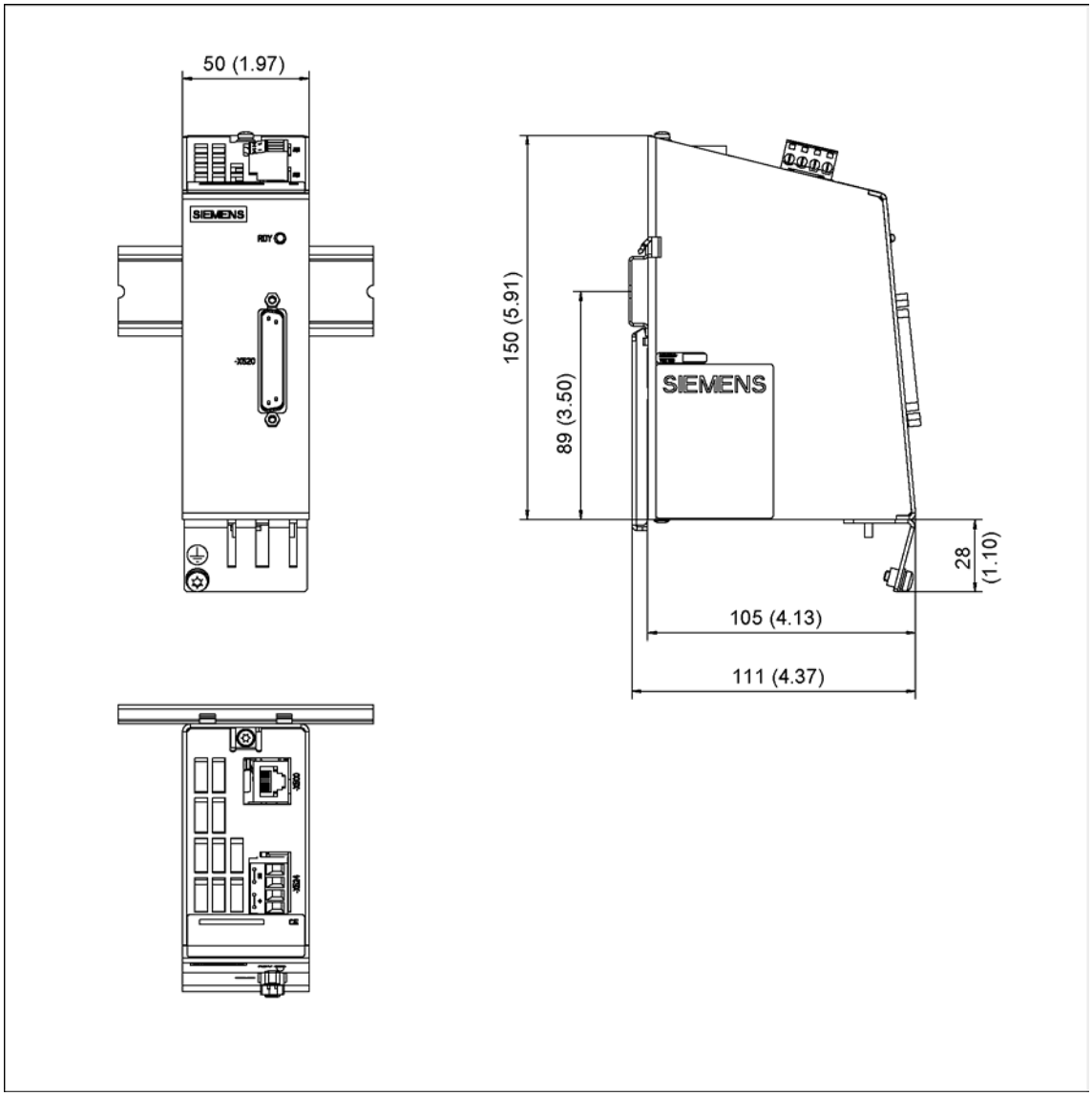


Figure 4-11 Dimension drawing of the SMC20

4.4.5 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.

Removal

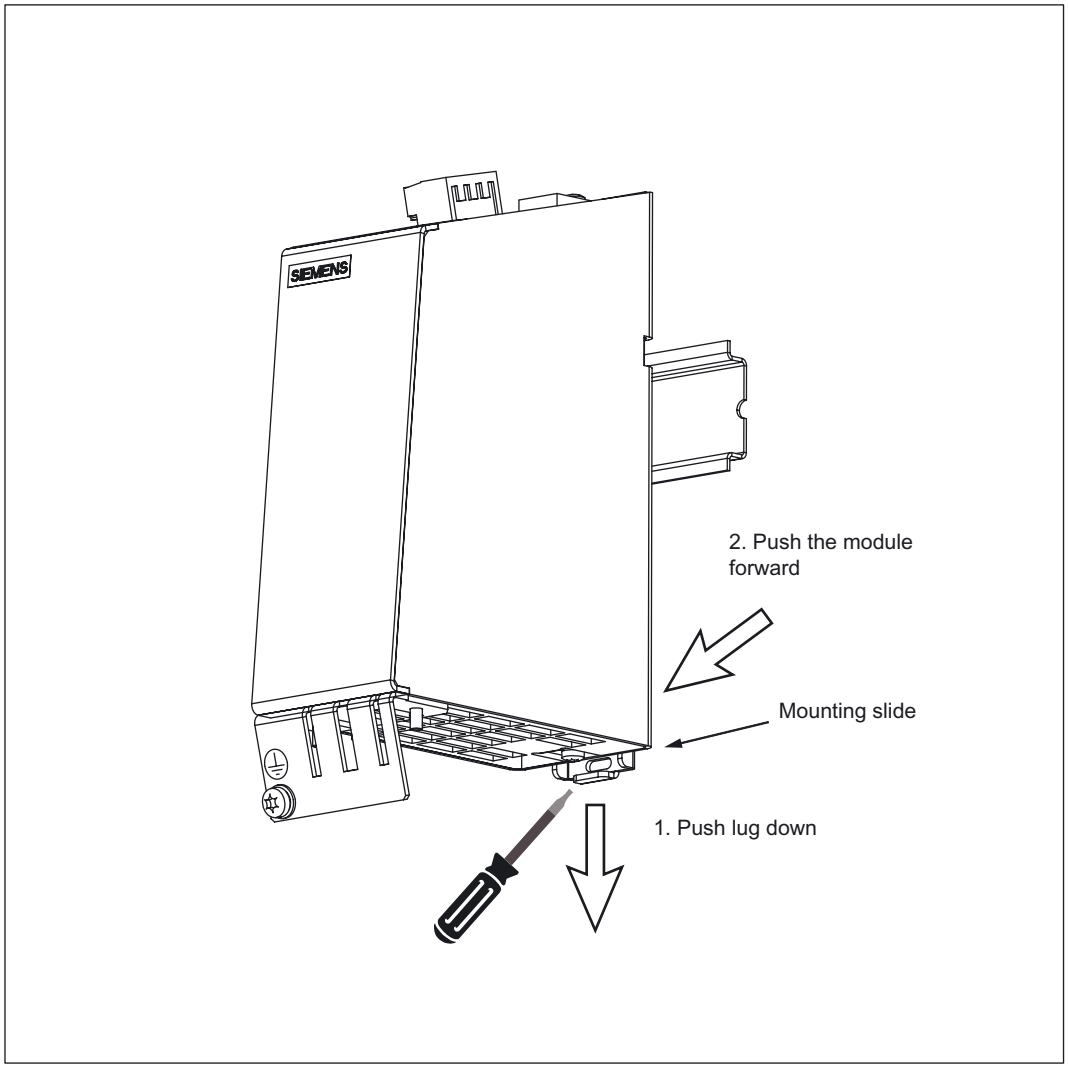


Figure 4-12 Releasing the component from a DIN rail

4.4.6 Technical Specifications

Table 4-13 Technical specifications

Sensor Module Cabinet-Mounted SMC20 6SL3055-0AA00-5BAx	**Designation**	**Unit**	**Value**
Electronics power supply Voltage Current (without measuring system) Current (with measuring system) SSI baud rate Power loss	 V_{DC} A_{DC} A_{DC} kHz W	 V A A kHz W	 24 DC (20.4 – 28.8) ≤ 0.20 ≤ 0.35 100 ≤ 10
Measuring system power supply Voltage Current	 $V_{encoder}$ $A_{encoder}$	 V A	 5 V DC (with Remote Sense) 0.35
Encoder frequency that can be evaluated	$f_{encoder}$	kHz	≤ 500
PE/ground connection		On housing with M4 / 1.8 Nm screw	
Weight		kg	0,8
Degree of protection		IP20 or IPXXB	

4.5 Sensor Module Cabinet-Mounted SMC30

4.5.1 Description

The Sensor Module Cabinet-Mounted SMC30 evaluates encoder signals and transmits the speed, actual position value, rotor position and, if necessary, the motor temperature and reference point via DRIVE-CLiQ to the Control Unit.

The SMC30 can be operated from Firmware 2.2 onwards

The measuring systems that can be connected have a TTL, HTL or SSI[1)] interface.

A combination of TTL/HTL signals and SSI absolute signal is possible at terminals X521/X531, if both are derived from the same measured variable.

Table 4-14 Encoders that can be connected

	X520 (D-Sub)	X521 (terminal)	X531 (terminal)	Cable breakage monitoring	Remote Sense[4)]
HTL bipolar 24 V	No / Yes[5)]	Yes		No / Yes[5)]	No
HTL unipolar 24 V[3)]	No / Yes[5)]	Yes (however, a bipolar connection is recommended)[3)]		No	No
TTL bipolar 24 V	Yes	Yes[1)]		Yes[2)]	No
TTL bipolar 5 V	Yes	Yes		Yes[2)]	To X520
SSI 24 V / 5 V[1)]	Yes	Yes		No	No
TTL unipolar	No				

[1)] Only from Order No. 6SL3055-0AA00-5CA1 and Firmware 2.4

[2)] For Order No. 6SL3055-0AA00-5CA0 only at X520

[3)] Because the physical transmission media is more robust, the bipolar connection should always be used. The unipolar connection should only be used if the encoder type does not output push-pull signals.

[4)] A controller compares the measuring system supply voltage - sensed via the remote sense cables - with the reference supply voltage of the measuring system and adjusts the supply voltage for the measuring system at the output of the drive module until the required supply voltage is obtained directly at the measuring system (only for 5 V measuring system power supply).

[5)] Only from Order No. 6SL3055-0AA00-5CA2 and Firmware 2.5 SP1

Table 4-15 Maximum encoder cable length

Sensor type	Maximum encoder cable length in m
TTL[1)]	100
HTL unipolar[2)]	100
HTL bipolar	300
SSI[3)]	100

[1)] For TTL encoders at X520 → Remote Sense → 100 m

[2)] Because the physical transmission media is more robust, the bipolar connection should always be used. The unipolar connection should only be used if the encoder type does not output push-pull signals.

[3)] Only from Order No. 6SL3055-0AA00-5CA1 and Firmware 2.4

For sensors with 5 V supply at X521 / X531, the cable lengths (for 0.5 mm^2 cable cross-sections) depend on the sensor current:

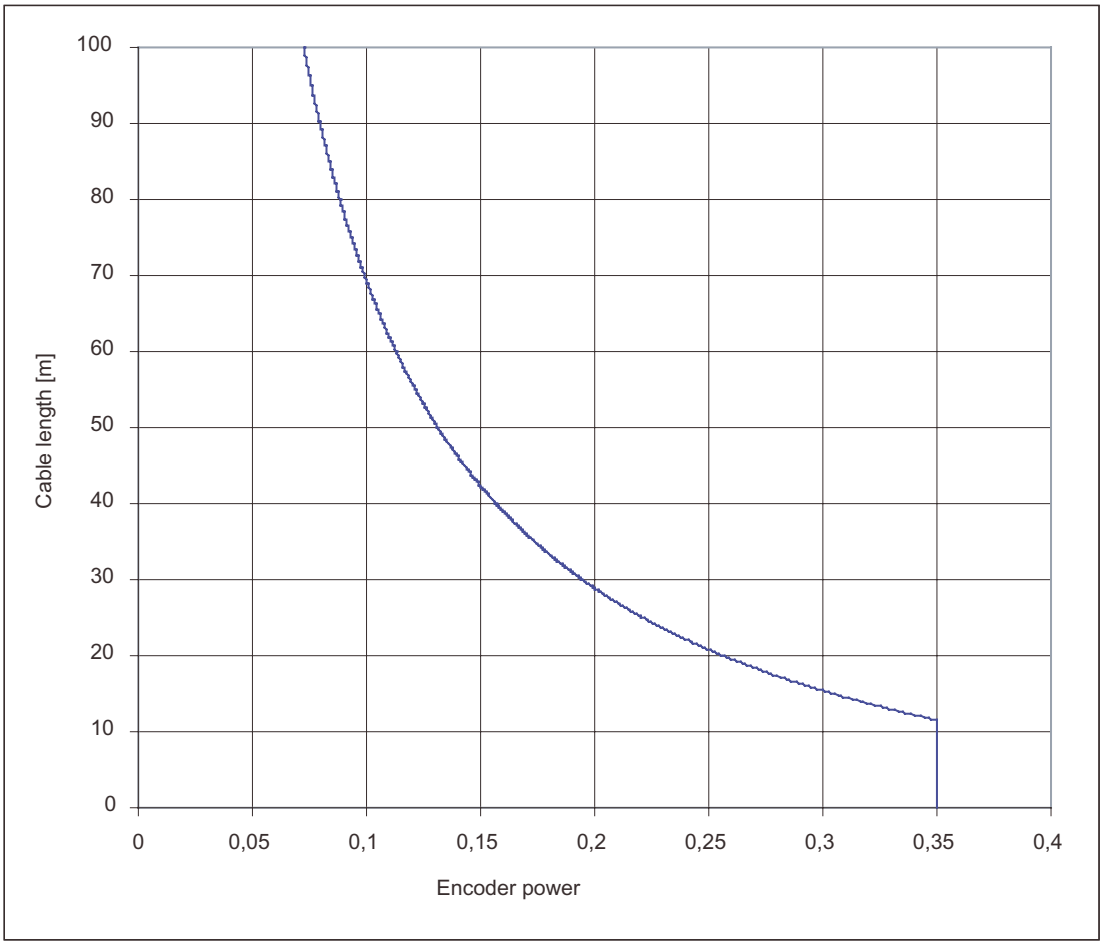


Figure 4-13 Max. cable length as a function of the encoder current drawn

4.5.2 Safety information

⚠ Warning

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

Notice

Only one measuring system can be connected to each Sensor Module.

Note

There may be no electrical connection between the measuring system housing and the measuring system electronics (this requirement is fulfilled for most encoder systems).
If this is not carefully observed, then under certain circumstances the system will not be able to reach the required noise immunity (there is then a danger of equalization currents flowing through the electronics ground).

Caution

When the measuring system is connected via terminals, make sure that the cable shield is connected to the component.

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.

4.5.3 Interface description

4.5.3.1 Overview

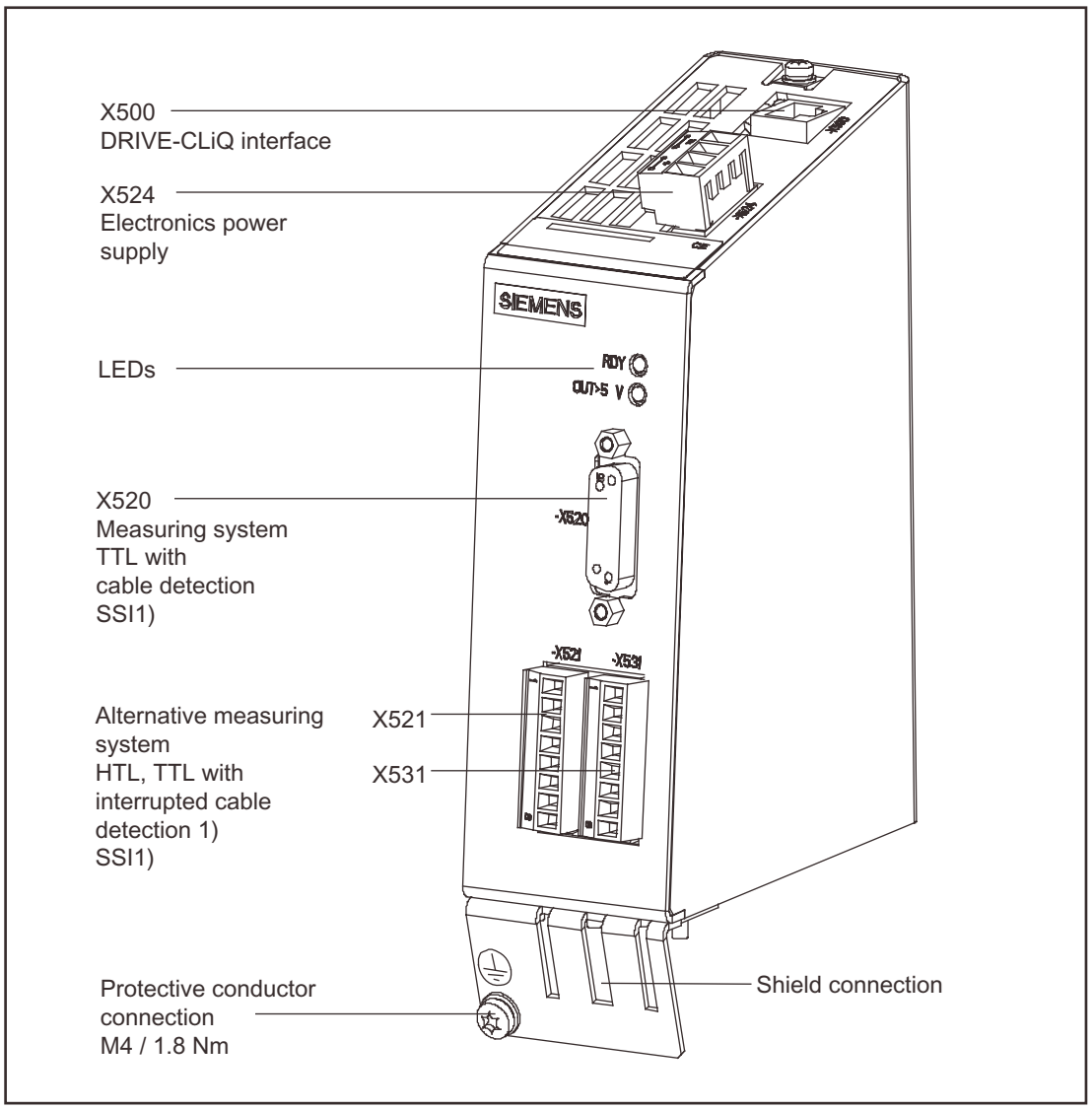


Figure 4-14 Interface description SMC30, 50 mm wide (Order No. 6SL3055-0AA00-5CA0, 6SL3055-0AA00-5CA1)

[1)] Only from Order No. 6SL3055-0AA00-5CA1 and Firmware 2.4

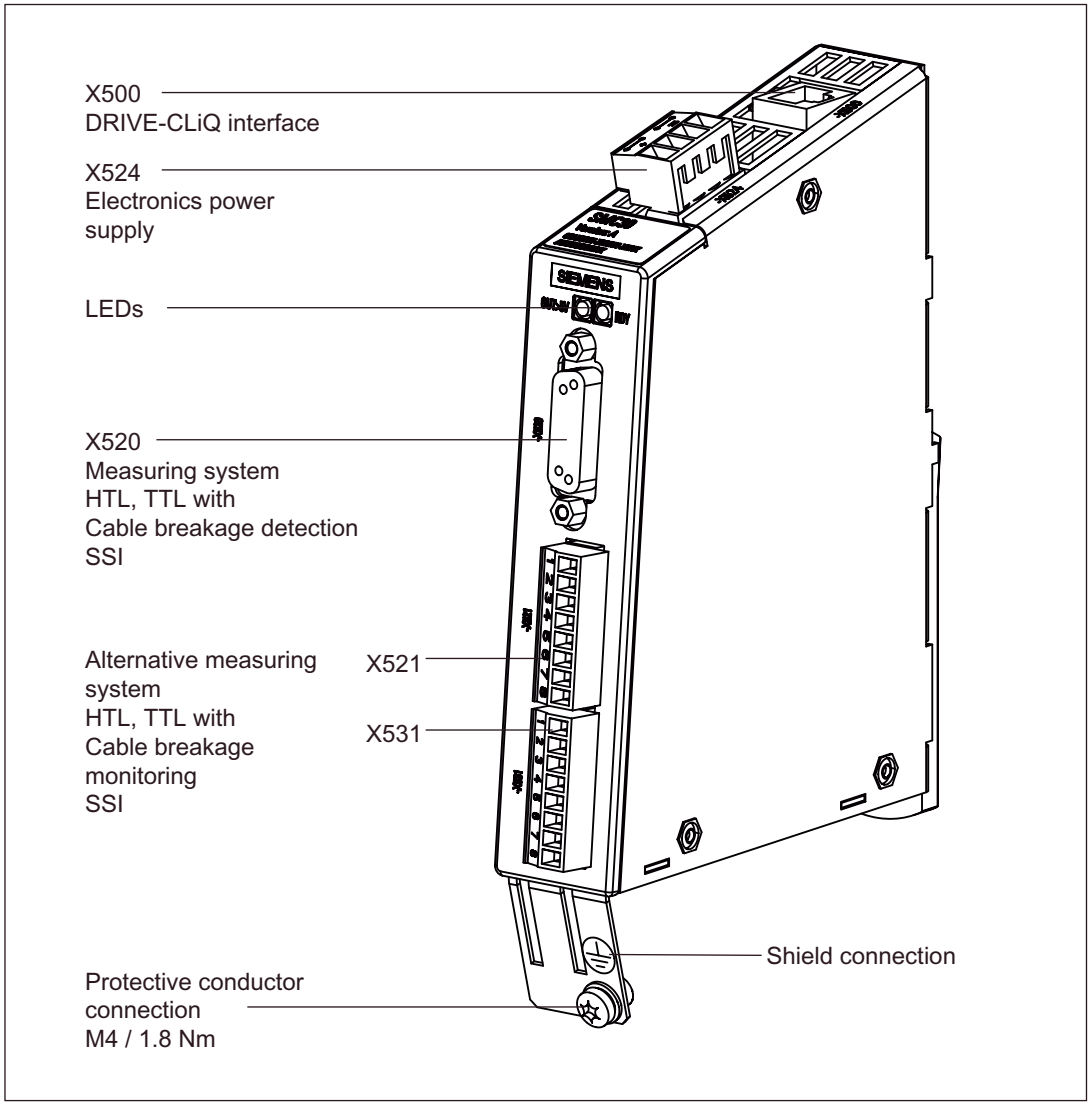


Figure 4-15 Interface description SMC30, 30 mm wide

Only from Order No. 6SL3055-0AA00-5CA2 and Firmware 2.5 SP1

4.5.3.2 Connection examples

Connection example 1: HTL encoder, bipolar, with reference signal

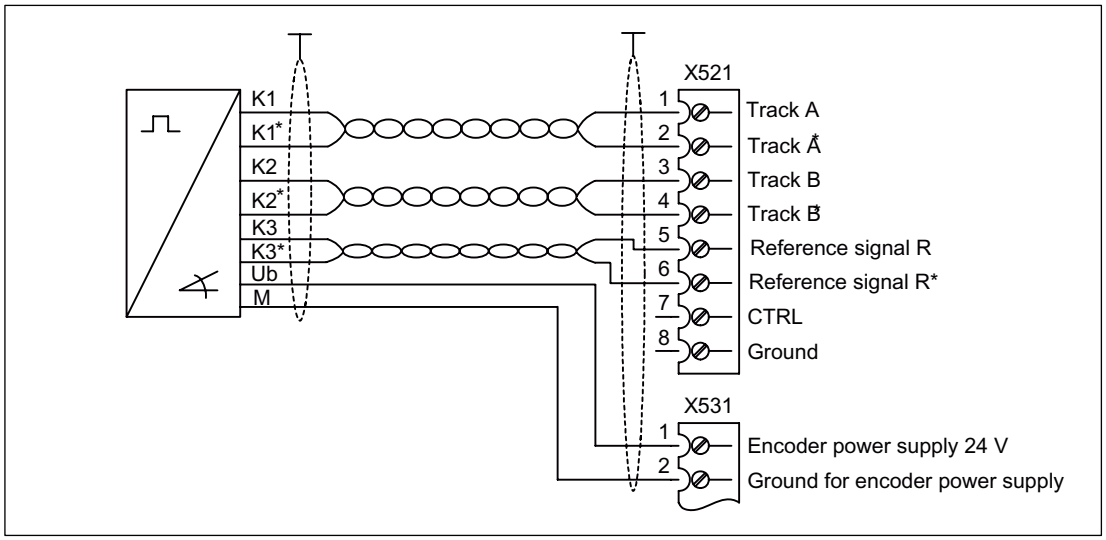


Figure 4-16 Connection example 1: HTL encoder, bipolar, with reference signal

Signal cables must be twisted in pairs in order to improve noise immunity against induced noise.

Connection example 2: HTL encoder, unipolar, with reference signal

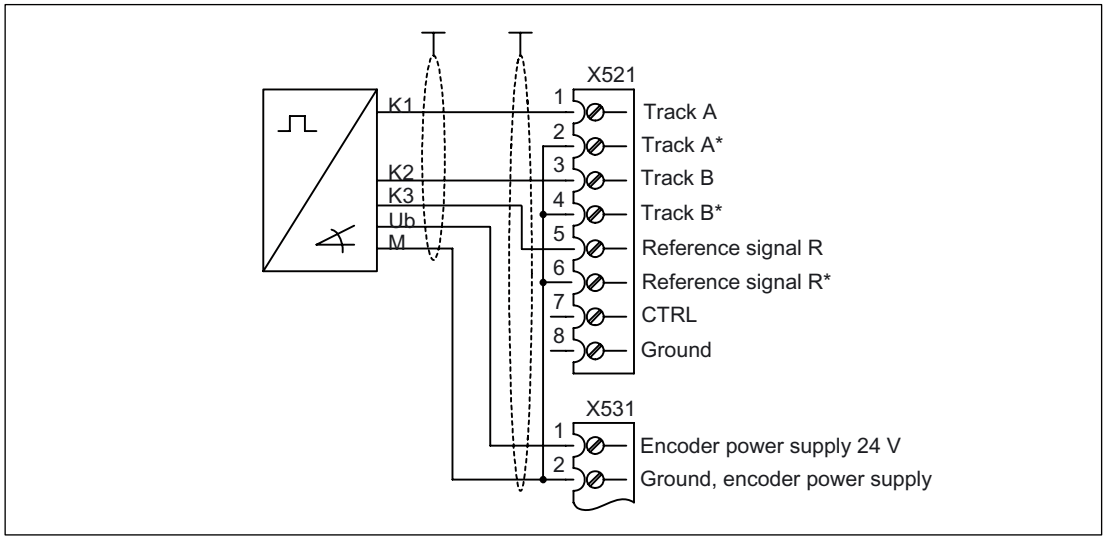
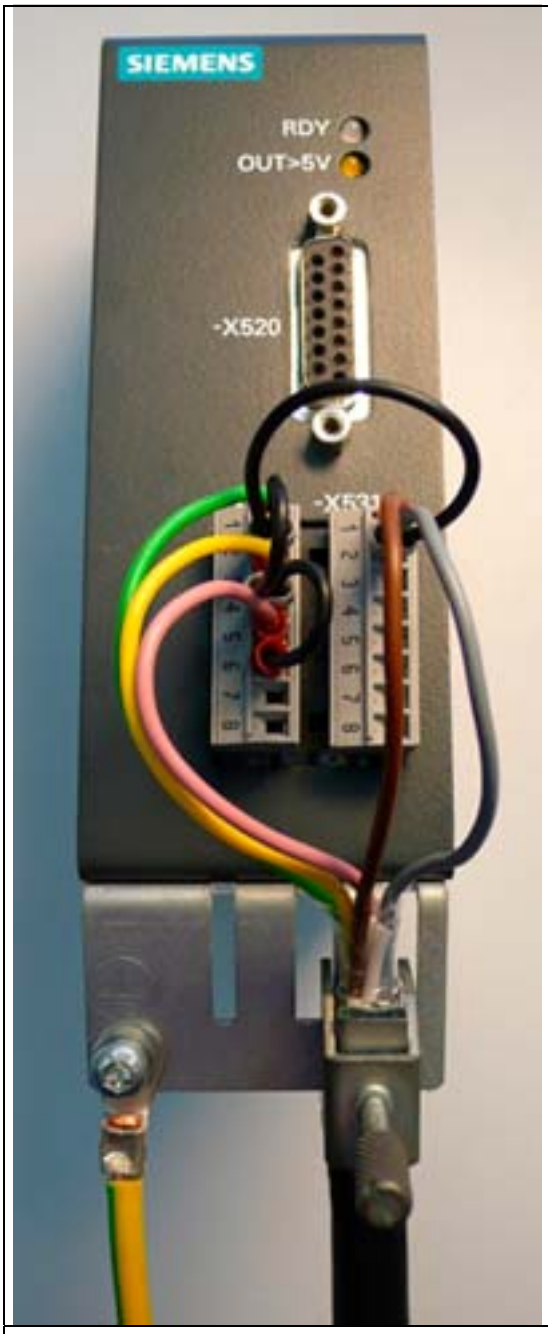
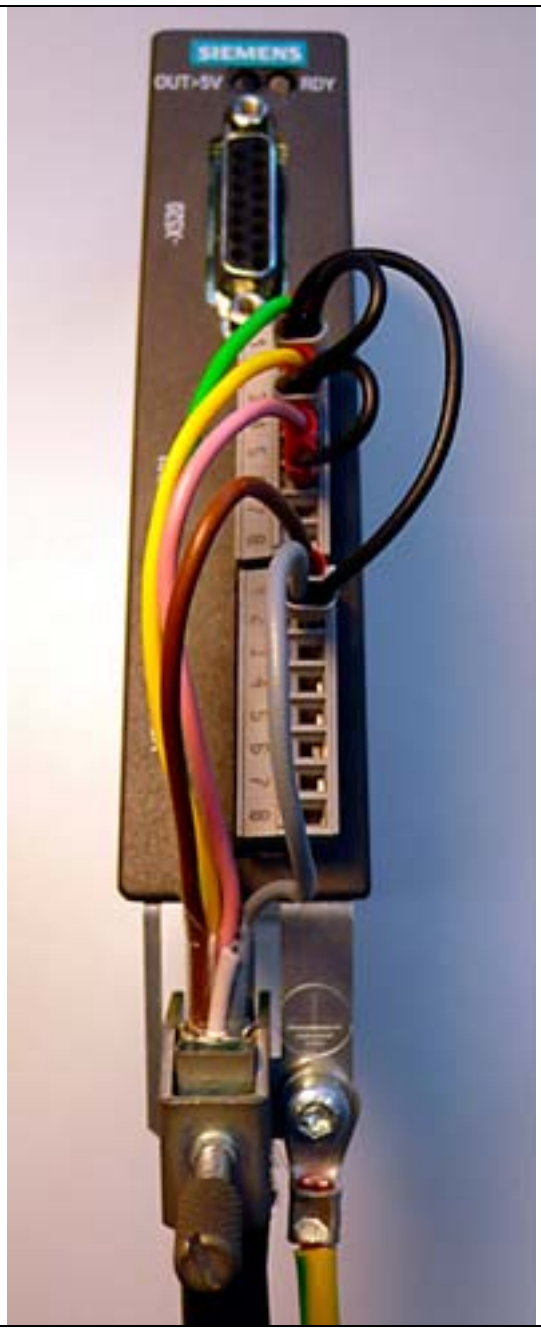


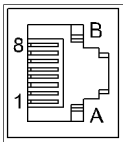
Figure 4-17 Connection example 2: HTL encoder, unipolar, with reference signal[1)]

[1)] Because the physical transmission media is more robust, the bipolar connection should always be used. The unipolar connection should only be used if the encoder type does not output push-pull signals.

	
Photo of connection example 2: SMC30, 50 mm wide, (Order No. 6SL3055-0AA00-5CA0, 6SL3055-0AA00-5CA1)	Photo of connection example 2: SMC30, 30 mm wide, from Order No. 6SL3055-0AA00-5CA2 and Firmware 2.5 SP1
Note: Diagram of the wire jumpers to connect unipolar HTL encoders with reference signal	

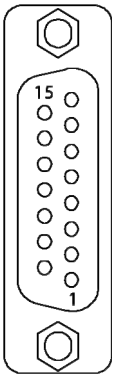
4.5.3.3 DRIVE-CLiQ interface X500

Table 4-16 DRIVE-CLiQ interface X500

	Pin	Signal name	Technical specifications
	1	TXP	Transmit data +
	2	TXN	Transmit data -
	3	RXP	Receive data +
	4	Reserved, do not use	
	5	Reserved, do not use	
	6	RXN	Receive data -
	7	Reserved, do not use	
	8	Reserved, do not use	
	A	Reserved, do not use	
	B	GND (0 V)	Electronic ground

4.5.3.4 X520 measuring system

Table 4-17 Measuring system connection X520

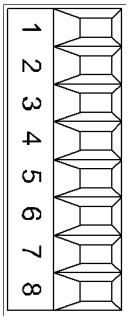
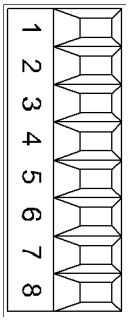
	Pin	Signal name	Technical data
	1	Reserved, do not use + Temp[2)]	Motor temperature measurement KTY84-1C130 (KTY+) Temperature sensor connection KTY84-1C130 / PTC
	2	Clock	SSI clock[1)]
	3	Clock*	Inverse SSI clock[1)]
	4	P_Encoder 5 V / 24 V	Encoder power supply
	5	P_Encoder 5 V / 24 V	
	6	P_Sense	Sense input encoder power supply
	7	M_Encoder (M)	Ground for encoder power supply
	8	Reserved, do not use - Temp[2)]	Motor temperature measurement KTY84-1C130 (KTY-) Temperature sensor connection KTY84-1C130 / PTC
	9	M_Sense	Ground sense input
	10	R	Reference signal R
	11	R*	Inverse reference signal R
	12	B*	Inverse incremental signal B
	13	B	Incremental signal B
	14	A* / data*	Inverse incremental signal A / inverse SSI data[1)]
	15	A / data	Incremental signal A / SSI data[1)]

[1)] Only from Order No. 6SL3055-0AA00-5CA1 and Firmware 2.4
[2)] Only from Order No. 6SL3055-0AA00-5CA2 and Firmware 2.5 SP1

Caution
The sensor power supply can be parameterized to 5 V or 24 V. The sensor may be destroyed if you enter the wrong parameters.

4.5.3.5 X521 / X531 alternative measuring system

Table 4-18 Measuring system connection X521 / X531

	Pin	Name	Technical data
X521  	1	A	Incremental signal A
	2	A*	Inverse incremental signal A
	3	B	Incremental signal B
	4	B*	Inverse incremental signal B
	5	R	Reference signal R
	6	R*	Inverse reference signal R
	7	CTRL	Control signal
	8	M	Ground
X531  	1	P_Encoder 5 V / 24 V	Encoder power supply
	2	M_Encoder	Ground for encoder power supply
	3	- Temp	Motor temperature measurement KTY84-1C130 (KTY-) Temperature sensor connection KTY84-1C130 / PTC
	4	+ Temp	Motor temperature measurement KTY84-1C130 (KTY+) Temperature sensor connection KTY84-1C130 / PTC
	5	Clock	SSI clock[2)]
	6	Clock*	Inverse SSI clock[2)]
	7	Data	SSI data[2)]
	8	Data*	Inverse SSI data[2)]
Max. connectable cross-section: 1.5 mm^2 When using unipolar HTL encoders, at the terminal block A*, B*, R* must be connected to (jumper) M_Encoder (X531)[1)].			

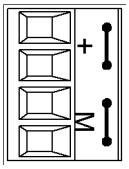
[1)] Because the physical transmission media is more robust, the bipolar connection should always be used. The unipolar connection should only be used if the encoder type does not output push-pull signals.

[2)] Only from Order No. 6SL3055-0AA00-5CA1 and Firmware 2.4

Caution
When the measuring system is connected via terminals, make sure that the cable shield is connected to the component. Refer to the Chapter "Electrical connection".

4.5.3.6 Electronics power supply X524

Table 4-19 Terminal block X524

	Terminal	Function	Technical data
	+	Electronics power supply	Voltage: 24 V (20.4 V – 28.8 V) Current consumption: max. 0,55 A Max. current across jumper in connector: 20 A at 55°C
	+	Electronics power supply	
	M	Electronics ground	
	M	Electronics 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 the supply voltage is looped through.

4.5.3.7 Description of the LEDs on the SMC30

Table 4-20 Description of the LEDs on the SMC30

LED	Color	State	Description
RDY	-	Off	Electronics power supply is missing or outside permissible tolerance range.
	Green	Steady light	The component is ready for operation and cyclic DRIVE-CLiQ communication is taking place.
	Orange	Steady light	DRIVE-CLiQ communication is being established.
	Red	Steady light	At least one fault is present in this component. **Note:** The LED is driven irrespective of the corresponding messages being reconfigured.
	Green/ Red	Flashing light 2 Hz	Firmware is being downloaded.
	Green/Orange or Red/Orange	Flashing light 2 Hz	Component recognition via LED is activated (p0144) **Note:** Both options depend on the LED status when component recognition is activated via p0144 = 1.
OUT > 5 V	-	Off	If the LED RDY is also in the off state (dark) then the electronics power supply is missing or is outside the permissible tolerance range. Otherwise, measuring system power supply <= 5V
	Orange	Steady light	Measuring system power supply > 5V **Notice** You must ensure that the connected encoder can be operated with a 24 V supply. If an encoder that is designed for a 5 V supply is operated with a 24 V supply, this can destroy the encoder electronics.

Cause and rectification of faults

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

Reference: /IH1/ SINAMICS S, Commissioning Manual

4.5.4 Dimension drawing

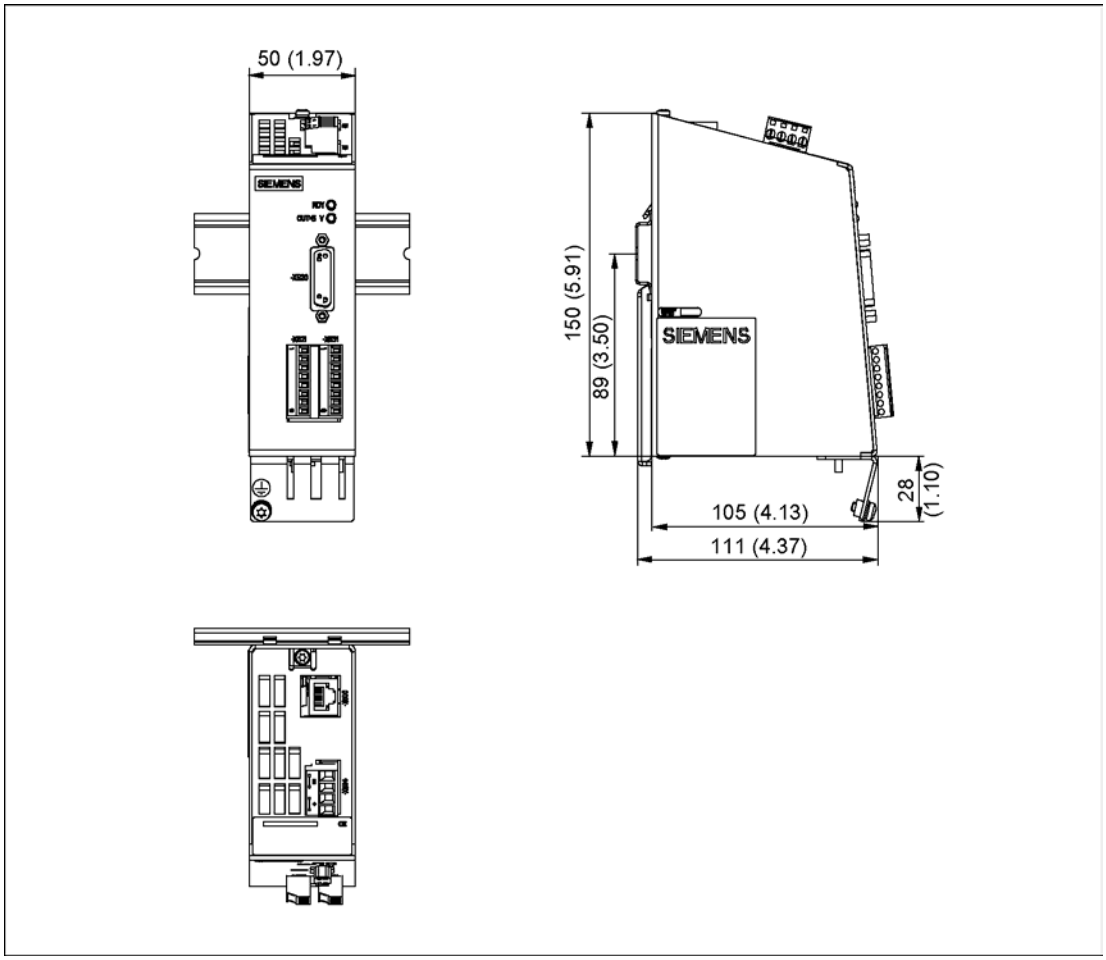


Figure 4-18 Dimension drawing SMC30: 50 mm wide

Order No.: 6SL3055-0AA00-5CA0, 6SL3055-0AA00-5CA1

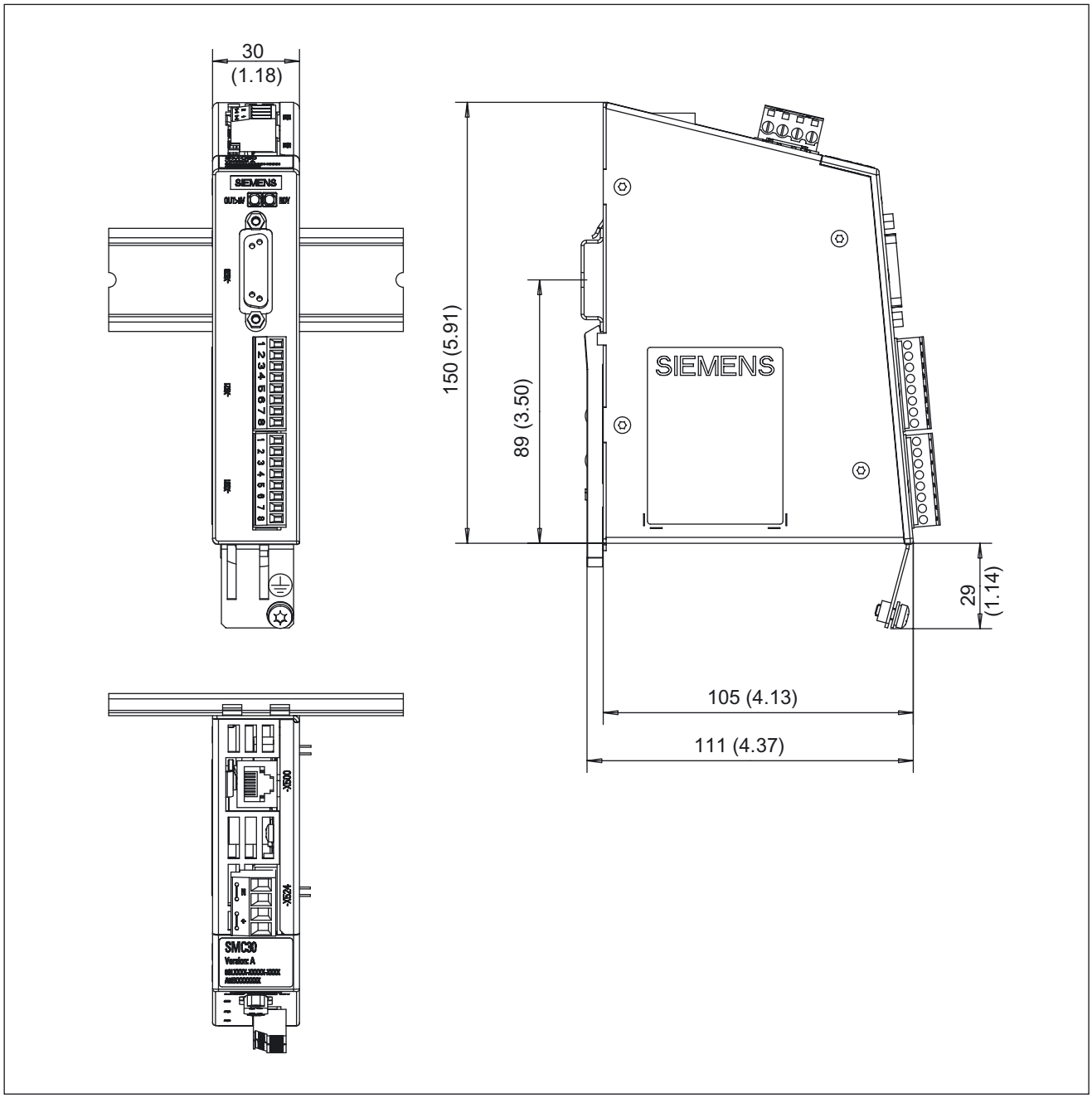


Figure 4-19 Dimension drawing SMC30: 30 mm wide

Only from Order No. 6SL3055-0AA00-5CA2 and Firmware 2.5 SP1

4.5.5 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.

Removal

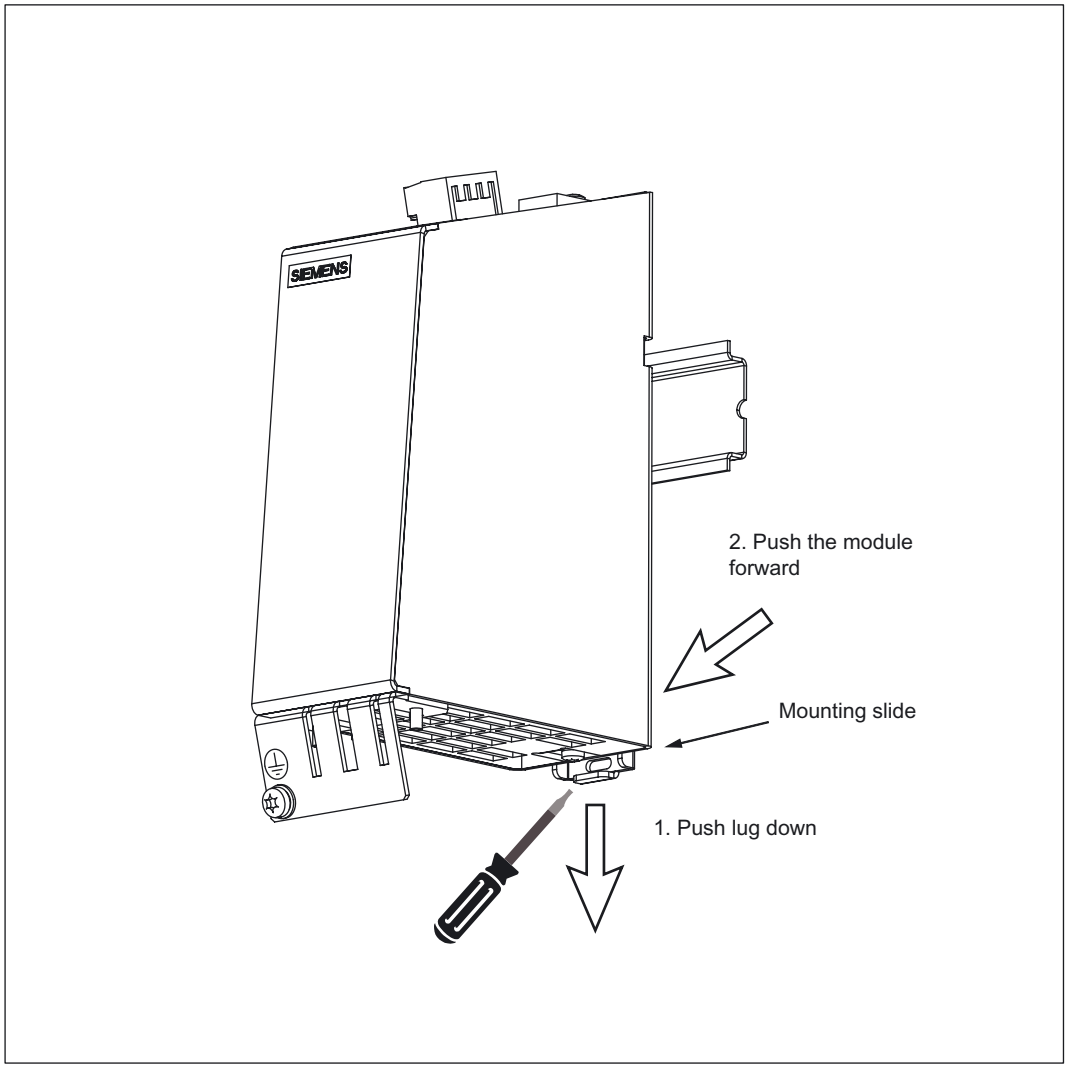


Figure 4-20 Releasing the component from a DIN rail

From Order No. 6SL3055-0AA00-5CA0, 6SL3055-0AA00-5CA1

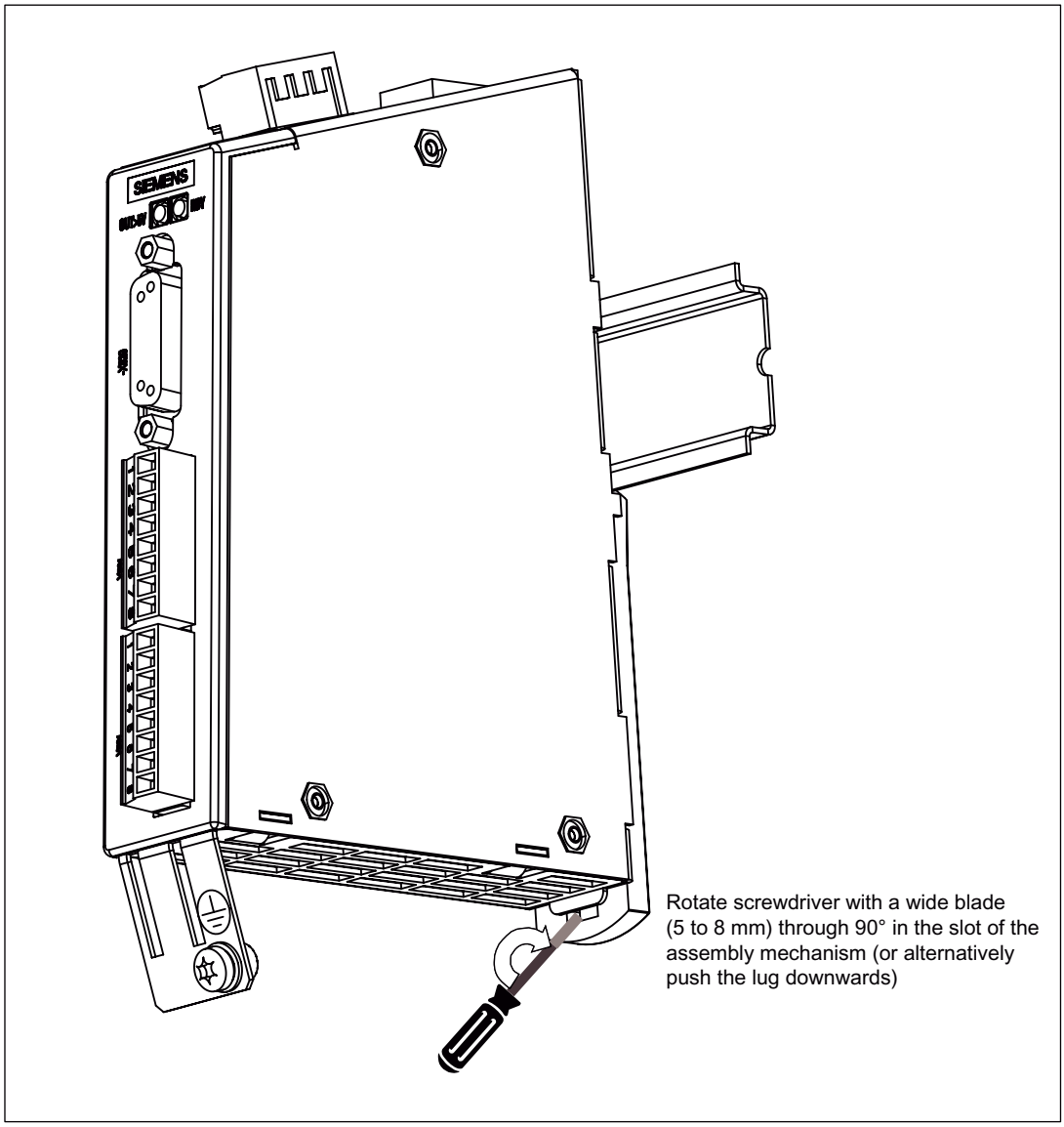


Figure 4-21 Removing: SMC30: 30 mm wide

Only from Order No. 6SL3055-0AA00-5CA2 and Firmware 2.5 SP1

4.5.6 Electrical Connection

Shield contacts are only required if the system is connected to X521/X531.

Shield contact for the SMC30 from Weidmüller

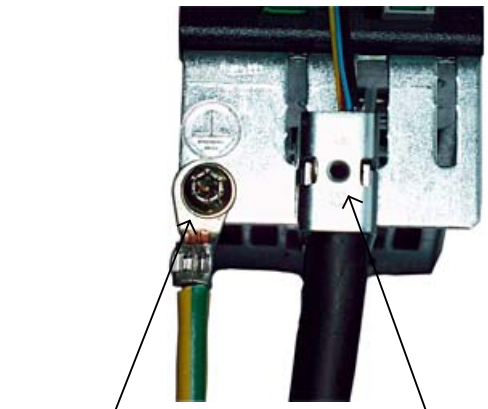


Figure 4-22 Shield contacts for the SMC30

Weidmüller: http://www.weidmueller.com

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

Notice
Only screws with a permissible screw-in depth of 4 - 6 mm may be used.

4.5.7 Technical Specifications

Table 4-21 Technical specifications

Sensor Module Cabinet-Mounted SMC30 6SL3055-0AA00-5CAx	**Designation**	**Unit**	**Value**
Electronics power supply			
Voltage	V_{DC}	V	24 DC (20.4 – 28.8)
Current (without measuring system)	A_{DC}	A	≤ 0.20
Current (with measuring system)	A_{DC}	A	≤ 0.35
SSI baud rate	kHz	kHz	100 - 250
Power loss	W	W	≤ 10
Measuring system power supply			
Voltage	$V_{encoder}$	V	5 V DC (with or without Remote Sense)[1] or V_{DC} - 1 V
Current	$A_{encoder}$	A	0.35
Encoder frequency that can be evaluated	$f_{encoder}$	kHz	≤ 500
PE / ground connection		On housing with M4 / 1.8 Nm screw	
Weight		kg	0,45 (Order No. 6SL3055-0AA00-5CA2) 0,8 (Order No. 6SL3055-0AA00-5CA0, 6SL3055-0AA00-5CA1)
Degree of protection		IP20 or IPXXB	

[1] Remote Sense only at X520

Table 4-22 Specification, measuring systems that can be connected

Parameter	Designation	Threshold	Min.	Max .	Unit
High signal level (TTL bipolar at X520 or X521/X531)[1]	U_{Hdiff}		2	5	V
Low signal level (TTL bipolar at X520 or X521/X531)[1]	U_{Ldiff}		-5	-2	V
Signal level high (HTL unipolar)	U_H[4]	High	17	V_{CC}	V
		Low	10	V_{CC}	V
Signal level low (HTL unipolar)	U_L[4]	High	0	7	V
		Low	0	2	V
High signal level (HTL bipolar)[2]	U_{Hdiff}		3	V_{CC}	V
Low signal level (HTL bipolar)[2]	U_{Ldiff}		$-V_{CC}$	-3	V
High signal level (SSI bipolar at X520 or X521/X531)[1][3]	U_{Hdiff}		2	5	V
Low signal level (SSI bipolar at X520 or X521/X531)[1][3]	U_{Ldiff}		-5	-2	V
Signal frequency	f_S		-	500	kHz
Edge clearance	t_{min}		100	-	ns
Zero pulse inactive time (before and after A=B=high)	t_{Lo}		500	$(t_{ALo-BHi} - t_{Hi})/2$ [5]	ns
Zero pulse active time (while A=B=high and beyond)	t_{Hi}		500	$t_{ALo-BHi} - 2*t_{Lo}$ [5]	ns

[1] Other signal levels according to the RS422 standard.

[2] The absolute level of the individual signals varies between 0 V and V_{CC} of the measuring system.

[3] Only from Order No. 6SL3055-0AA00-5CA1 and Firmware 2.4.

[4] Only from Order No. 6SL3055-0AA00-5CA2 and Firmware 2.5 SP1 this value can be configured using software. For older firmware releases and Order Nos. less than 6SL3055-0AA00-5CA2 then the "low" threshold applies.

[5] $t_{ALo-BHi}$ is not a specified value, but is the time between the falling edge of track A and the next but one rising edge of track B.

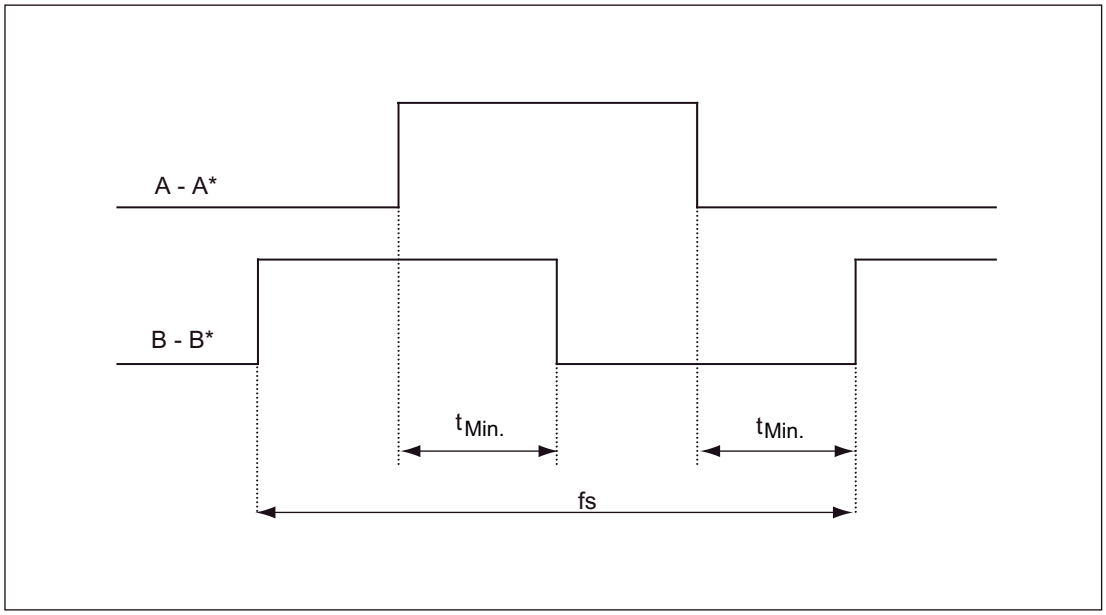


Figure 4-23 Signal characteristic of the A and B track between two edges: Time between two edges with pulse encoders

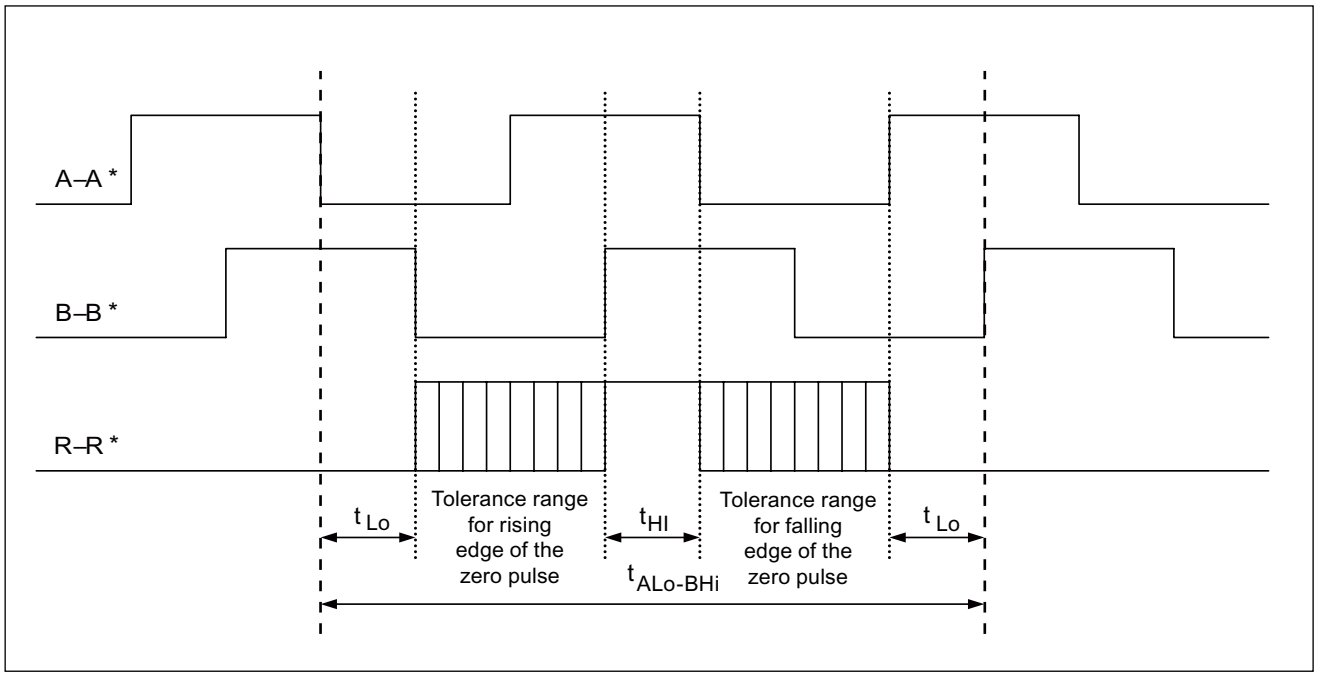


Figure 4-24 Position of the zero pulse to the track signals

4.6 Sensor Module External SME20

4.6.1 Description

Direct measuring systems outside the cabinet can be connected to the Sensor Module External SME20. The SME20 evaluates these measuring systems and converts the calculated values to DRIVE-CLiQ.
Neither motor nor encoder data are saved in the SME20.
Incremental direct measuring systems can be connected - SIN/COS (1 Vpp).

The maximum DRIVE-CLiQ cable length is 100 m.

The maximum sensor cable length is 3 m.

The SME20 can only be operated from Firmware 2.3 onwards.

4.6.2 Safety Information

Notice
Only measuring systems in which the power supply for the measuring system is not grounded may be connected.

4.6.3 Interface description

4.6.3.1 Overview

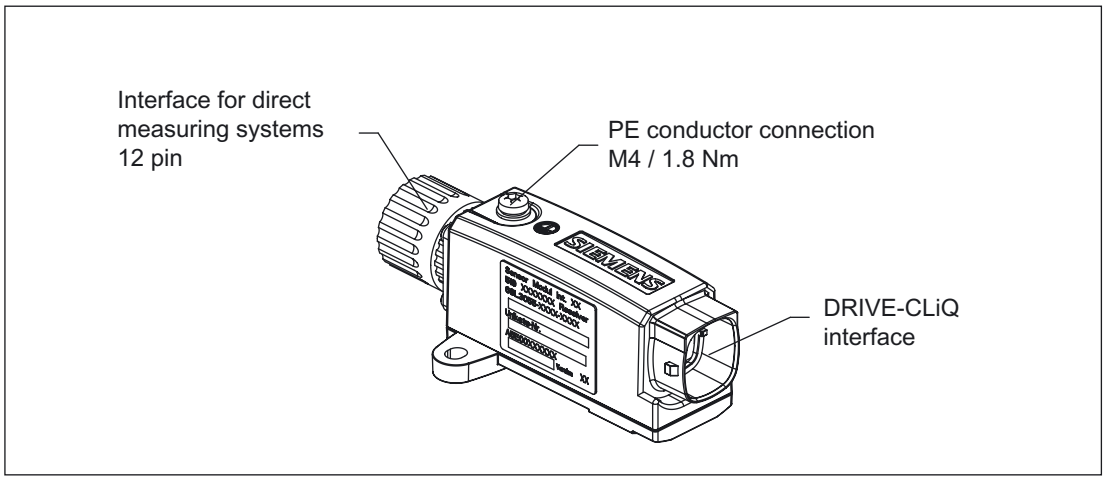
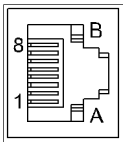


Figure 4-25 Interface description SME20

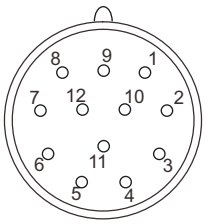
4.6.3.2 DRIVE-CLiQ interface

Table 4-23 DRIVE-CLiQ interface

	Pin	Signal name	Technical data
	1	TXP	Transmit data +
	2	TXN	Transmit data -
	3	RXP	Receive data +
	4	Reserved, do not use	
	5	Reserved, do not use	
	6	RXN	Receive data -
	7	Reserved, do not use	
	8	Reserved, do not use	
	A	+ (24 V)	Power supply
	B	M (0 V)	Electronics ground
Cover for the DRIVE-CLiQ interface is included in the scope of supply Current drain: max. 0.25 A			

4.6.3.3 Measuring system interface

Table 4-24 Measuring system interface SME20

	Pin	Signal name	Technical data
	1	B*	Inverse incremental signal B
	2	P5	Encoder power supply
	3	R	Reference signal R
	4	R*	Inverse reference signal R
	5	A	Incremental signal A
	6	A*	Inverse incremental signal A
	7	Reserved, do not use	
	8	B	Incremental signal B
	9	Reserved, do not use	
	10	M	Ground for encoder power supply
	11	M	Ground for encoder power supply
	12	P5	Encoder power supply
Blanking plate for measuring system interface: Pöppelmann GmbH & Co. KG, Lohne, Order No.: GPN 300 F211			

4.6.4 Dimension drawing

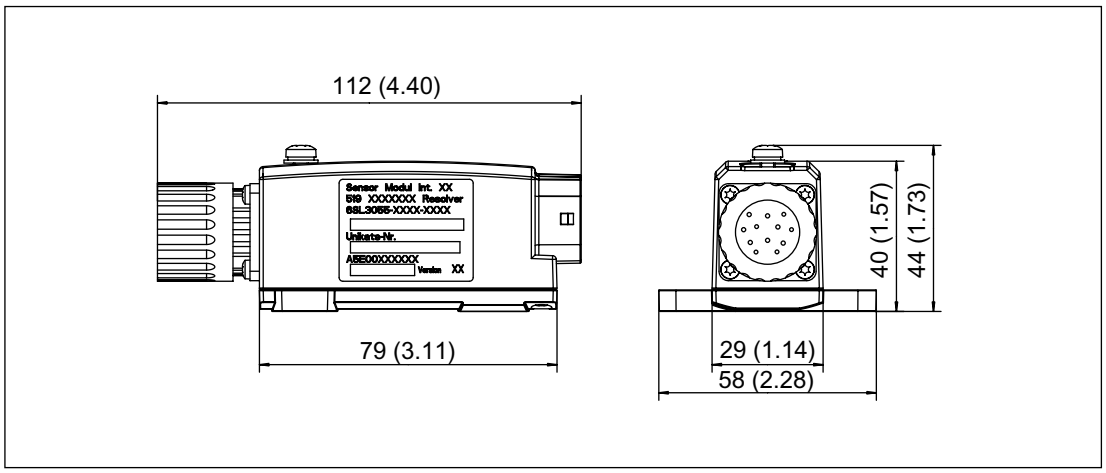
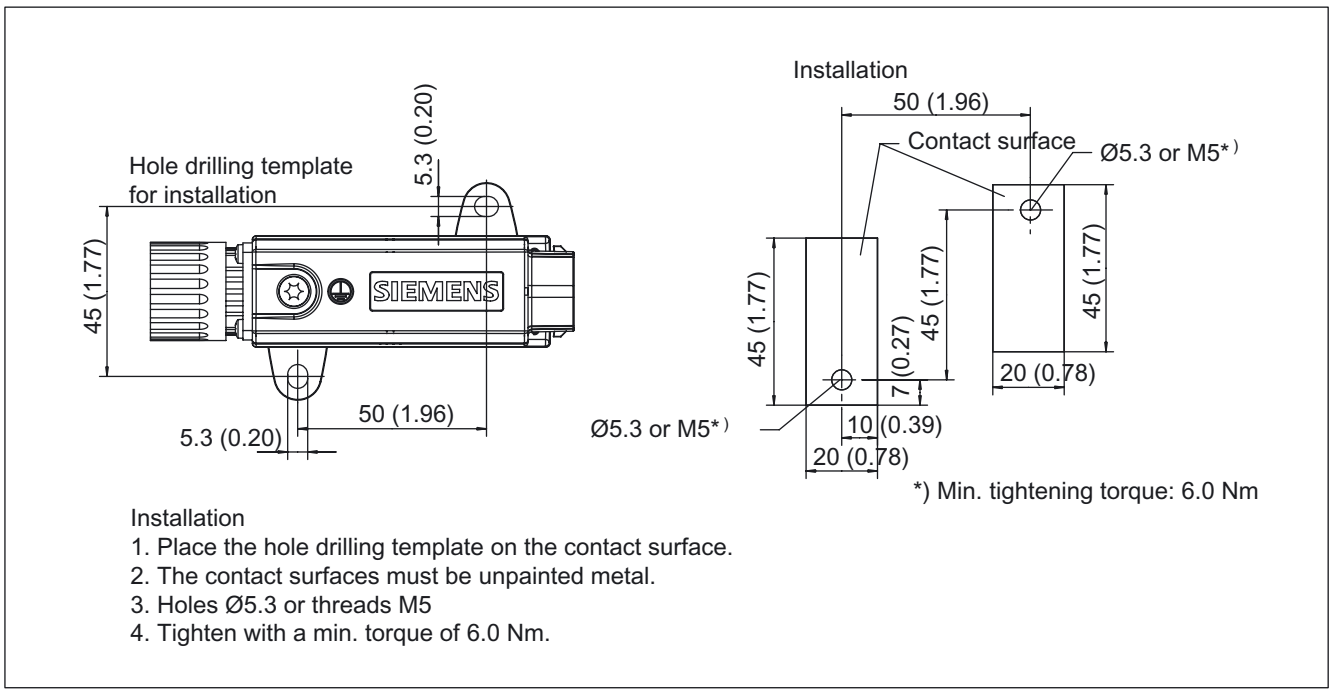


Figure 4-26 Dimension drawing of the SME20

4.6.5 Installation



Installation
1. Place the hole drilling template on the contact surface.
2. The contact surfaces must be unpainted metal.
3. Holes Ø5.3 or threads M5
4. Tighten with a min. torque of 6.0 Nm.

Figure 4-27 Installing the SME20/SME25

4.6.6 Technical specifications

Table 4-25 Technical specifications

Sensor Module External SME20 6SL3055-0AA00-5EAx	**Designation**	**Unit**	**Value**
Electronics power supply Voltage Current (without measuring system) Current (with measuring system) Power loss	 V_{DC} A_{DC} A_{DC} W	 V A A W	 24 DC (20.4 – 28.8) ≤ 0.15 ≤ 0.25 ≤ 4
Measuring system power supply Voltage Current	 $V_{encoder}$ $A_{encoder}$	 V A	 5 V DC 0.30
Encoder frequency that can be evaluated	$f_{encoder}$	kHz	≤ 500
PE / ground connection		On housing with M4 / 1.8 Nm screw	
Weight		kg	0,18
Degree of protection		IP67	

4.7 Sensor Module External SME25

4.7.1 Description

Direct measuring systems outside the cabinet can be connected to the Sensor Module External SME25. The SME25 evaluates these measuring systems and converts the calculated values to DRIVE-CLiQ.
Neither motor nor encoder data are saved in the SME25.
Direct measuring systems with EnDat or SSI (from Firmware 2.4) with SIN/COS (1 Vpp) incremental signals can be connected, however without reference signal.

The maximum DRIVE-CLiQ cable length is 100 m.

The maximum sensor cable length is 3 m.

The SME25 can be operated from Firmware 2.3 onwards.

4.7.2 Safety information

Notice
Only measuring systems in which the power supply for the measuring system is not grounded may be connected.

4.7.3 Interface description

4.7.3.1 Overview

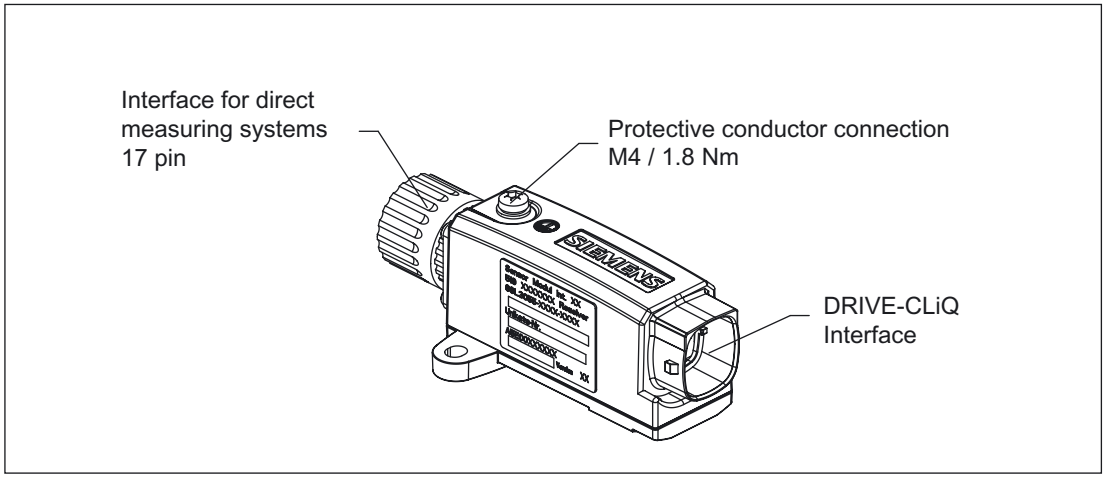
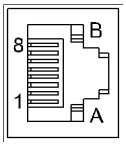


Figure 4-28 Interface description SME25

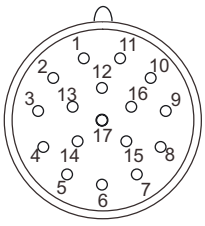
4.7.3.2 DRIVE-CLiQ interface

Table 4-26 DRIVE-CLiQ interface

	Pin	Signal name	Technical data
	1	TXP	Transmit data +
	2	TXN	Transmit data -
	3	RXP	Receive data +
	4	Reserved, do not use	
	5	Reserved, do not use	
	6	RXN	Receive data -
	7	Reserved, do not use	
	8	Reserved, do not use	
	A	+ (24 V)	Power supply
	B	M (0 V)	Electronics ground
Cover for the DRIVE-CLiQ interface is included in the scope of supply Current drain: max. 0.25 A			

4.7.3.3 Measuring system interface

Table 4-27 Measuring system interface SME25

	Pin	Signal name	Technical data
	1	P5	Encoder power supply
	2	Reserved, do not use	
	3	Reserved, do not use	
	4	M	Ground for encoder power supply
	5	Reserved, do not use	
	6	Reserved, do not use	
	7	P5	Encoder power supply
	8	Clock	Clock, EnDat interface, SSI clock 1)
	9	Clock*	Inverse clock, EnDat interface, inverse SSI clock 1)
	10	M	Ground for encoder power supply
	11	M	Ground for encoder power supply
	12	B	Incremental signal B
	13	B*	Inverse incremental signal B
	14	Data	Data, EnDat interface, SSI data[1)]
	15	A	Incremental signal A
	16	A*	Inverse incremental signal A

	Pin	Signal name	Technical data
	17	Data*	Inverse data EnDat interface, Inverse SSI data[1)]
Blanking plate for measuring system interface: Pöppelmann GmbH & Co. KG, Lohne, Order No.: GPN 300 F211			

1) Only from Firmware 2.4 onwards

4.7.4 Dimension drawing

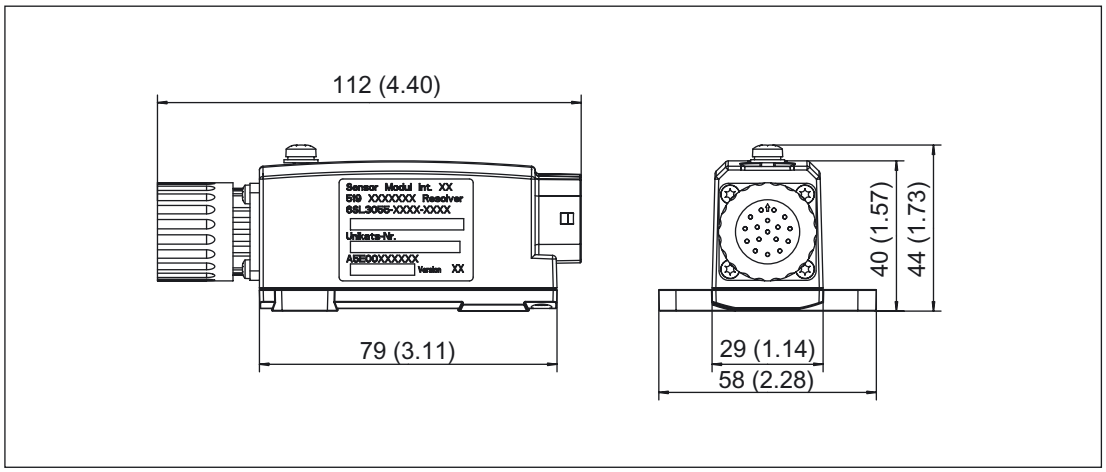
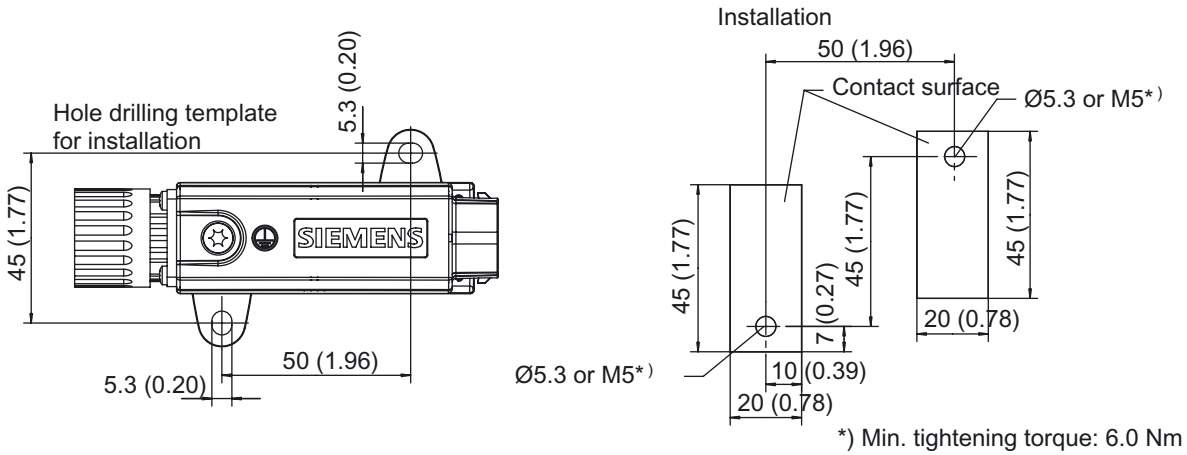


Figure 4-29 Dimension drawing of the SME25

4.7.5 Installation



Installation
1. Place the hole drilling template on the contact surface.
2. The contact surfaces must be unpainted metal.
3. Holes Ø5.3 or threads M5
4. Tighten with a min. torque of 6.0 Nm.

Figure 4-30 Installing the SME20/SME25

4.7.6 Technical specifications

Table 4-28 Technical specifications

Sensor Module External SME25 6SL3055-0AA00-5HAx	**Designation**	**Unit**	**Value**
Electronics power supply			
Voltage	V_{DC}	V	24 DC (20.4 – 28.8)
Current (without measuring system)	A_{DC}	A	≤ 0.15
Current (with measuring system)	A_{DC}	A	≤ 0.25
Baud rate	kHz	kHz	100
Power loss	W	W	≤ 4
Measuring system power supply			
Voltage	$V_{encoder}$	V	5 V DC
Current	$A_{encoder}$	A	0.30
Encoder frequency that can be evaluated	$f_{encoder}$	kHz	≤ 500
PE / ground connection		On housing with M4 / 1.8 Nm screw	
Weight		kg	0,18
Degree of protection		IP67	

4.8 Sensor Module External SME120

4.8.1 Description

Direct measuring systems outside the cabinet can be connected to the Sensor Module External SME120. The SME120 evaluates these measuring systems and converts the calculated value to DRIVE-CLiQ.

The SME120 can be operated from Firmware 2.4 onwards.

The components are always used when the temperature signals of the motors do not have protective separation or where this separation is not possible for certain reasons. A Hall sensor box can be connected to determine the commutation position of a linear motor. SME120 is mainly used in linear motor applications.

Neither motor nor encoder data are saved in the SME120.

Incremental direct SIN/COS (1 Vpp) measuring systems can be connected.

The maximum DRIVE-CLiQ cable length is 100 m.

The maximum sensor cable length is 3 m.

4.8.2 Safety information

Sensor Module External 120 is a device, safety class I.

Notice

Only measuring systems in which the power supply for the measuring system is not grounded may be connected.

⚠ Danger

Commissioning is prohibited until it has been clearly identified that the machine in which this component is to be installed fulfills the conditions of Machinery Directive 98/37/EC.

All of the work must be carried out by qualified, appropriately trained personnel. Prior to commencing any work on the Sensor Module External the 5 safety rules have to be observed:

- Disconnect the system.
- Protect against reconnection.
- Make sure that the equipment is de-energized.
- Ground and short-circuit
- Cover or enclose adjacent components that are still live.

Never disable protective functions and devices even for trial operation.

It is mandatory that a protective conductor with a minimum cross-section of 2.5 mm^2 is connected in order to guarantee safe protective separation.

In order to ensure the degree of protection all connections, even connections that are not used, must be closed with connectors or suitable sealing caps.

The specified torques must be observed.

The plastic covers of connections X100, X200 and X500 do not comply with the degree of protection and must be replaced by the corresponding connectors prior to commissioning.

It is not permitted to open up the drive units! It is possible that the units are no longer adequately sealed! Repair and maintenance work may only be performed by a SIEMENS service center.

The unit should not be put into operation if it is evident that the packaging has been damaged by water.

Note

The safety information on the Sensor Module must be observed.

After the product has served its lifetime, the individual parts should be disposed of in compliance with local regulations.

4.8.3 Interface description

4.8.3.1 Overview

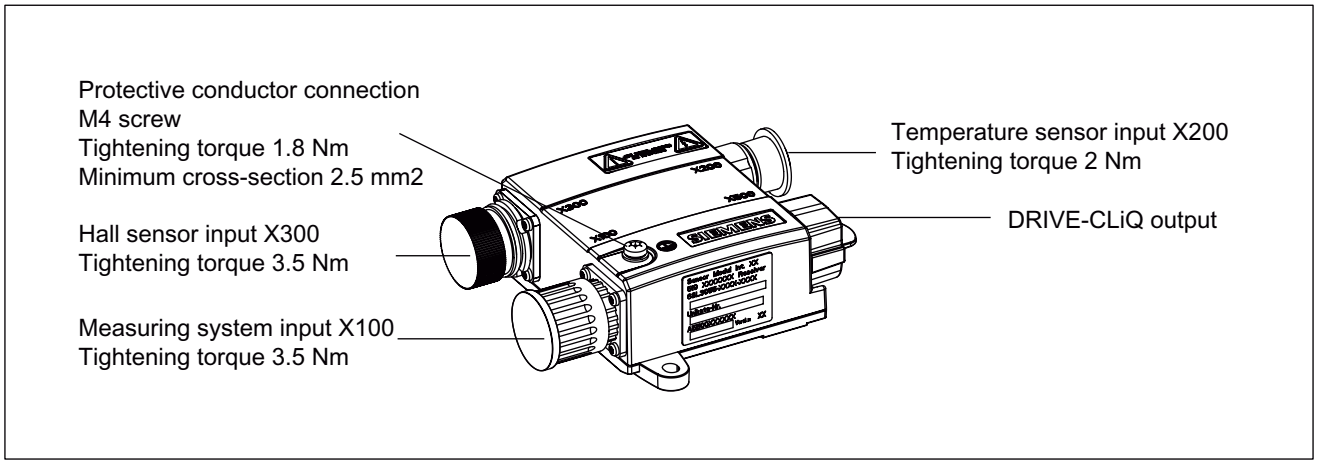


Figure 4-31 Interface description, SME120

4.8.3.2 Connection example

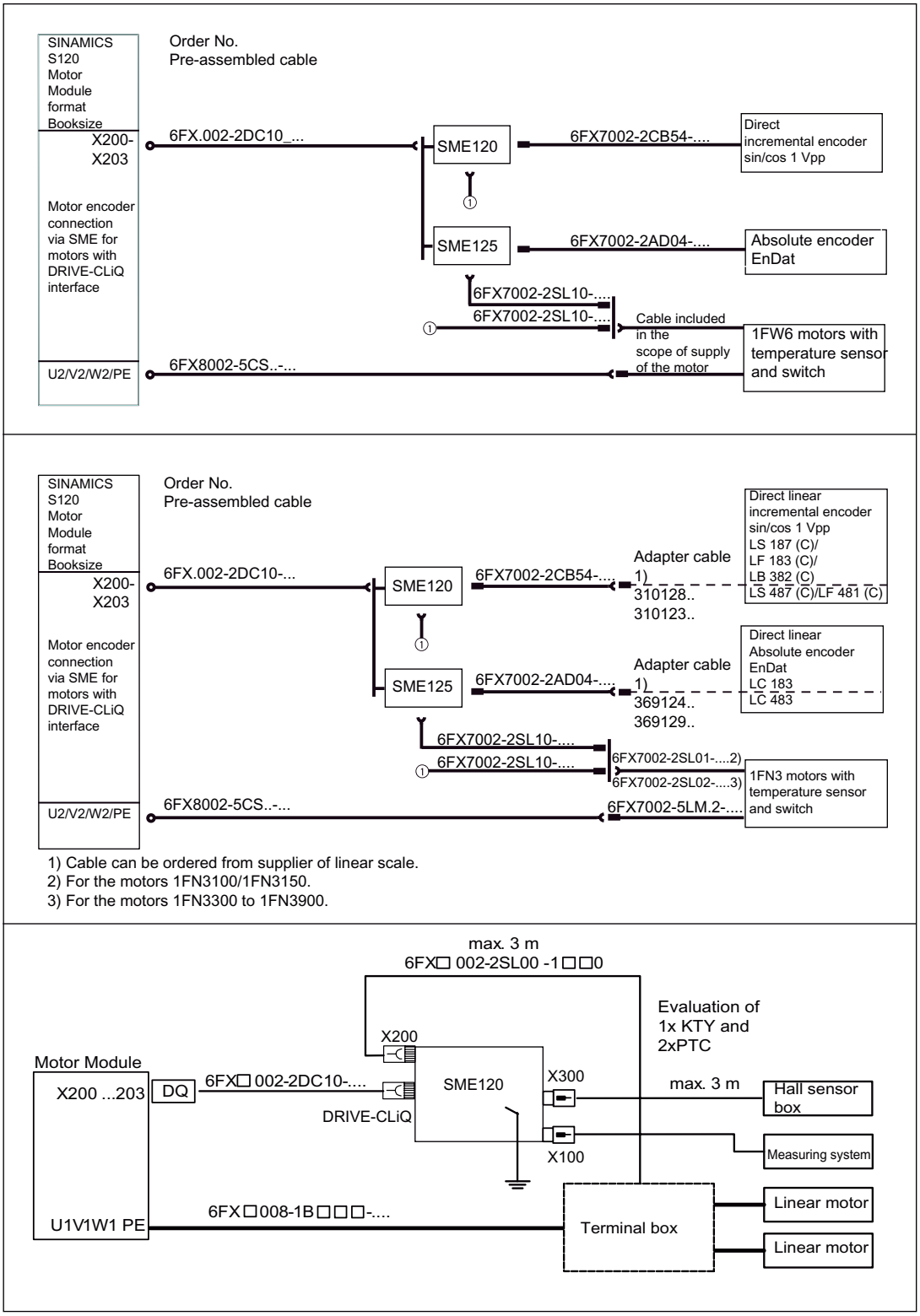
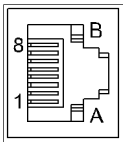


Figure 4-32 Connection examples, SME120

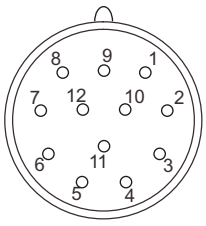
4.8.3.3 DRIVE-CLiQ interface

Table 4-29 DRIVE-CLiQ interface

	Pin	Signal name	Technical data
	1	TXP	Transmit data +
	2	TXN	Transmit data -
	3	RXP	Receive data +
	4	Reserved, do not use	
	5	Reserved, do not use	
	6	RXN	Receive data -
	7	Reserved, do not use	
	8	Reserved, do not use	
	A	+ (24 V)	Power supply
	B	M (0 V)	Electronics ground
Cover for the DRIVE-CLiQ interface is included in the scope of supply Current drain: max. 0.30 A			

4.8.3.4 X100 measuring system interface

Table 4-30 Measuring system interface, SME120

	Pin	Signal name	Technical data
	1	B*	Inverse incremental signal B
	2	P5	Encoder power supply
	3	R	Reference signal R
	4	R*	Inverse reference signal R
	5	A	Incremental signal A
	6	A*	Inverse incremental signal A
	7	Reserved, do not use	
	8	B	Incremental signal B
	9	Reserved, do not use	
	10	M	Ground for encoder power supply
	11	M	Ground for encoder power supply
	12	P5	Encoder power supply
Blanking plate for measuring system interface: Pöppelmann GmbH & Co. KG, Lohne, Order No.: GPN 300 F211			

4.8.3.5 X200 Temperature sensor

Table 4-31 Temperature sensor X200

Terminal	Function	Technical data
1	-Temp	Temperature sensor connection KTY84–1C130
2	+Temp	
3	PTC connection	Connection, PTC triplet 1 or bimetal 1
4	PTC connection	
5	PTC connection	Connection, PTC triplet 2
6	PTC connection	

4.8.3.6 X300 Hall sensor input

Table 4-32 Hall sensor input X300

Pin	Signal name	Technical data
1	C	Absolute track signal C
2	C*	Inverse absolute track signal C
3	P5	Encoder power supply
4	M	Ground for encoder power supply
5	D	Absolute track signal D
6	D*	Inverse absolute track signal D
7	Not assigned	
8	Not assigned	
9	Ground	Ground (for internal shield)

4.8.4 Dimension drawing

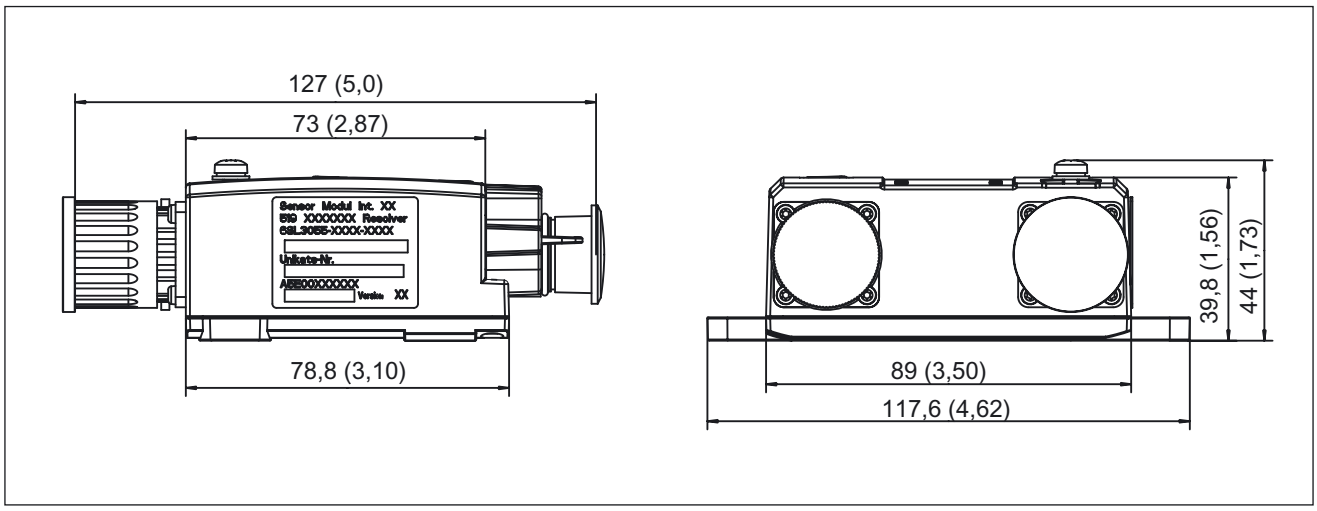
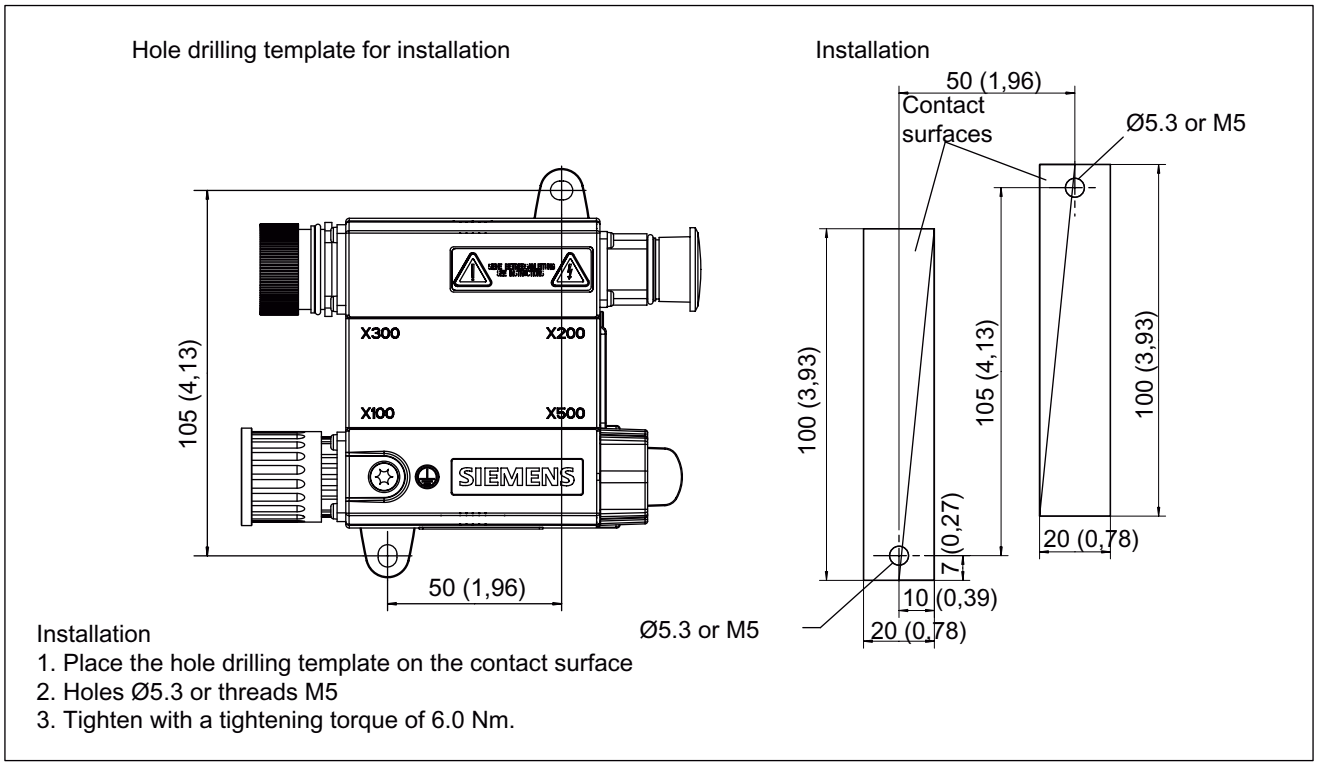


Figure 4-33 Dimension drawing, SME120

4.8.5 Mounting



Installation
1. Place the hole drilling template on the contact surface
2. Holes Ø5.3 or threads M5
3. Tighten with a tightening torque of 6.0 Nm.

Figure 4-34 Installation, SME120

4.8.6 Technical data

Table 4-33 Technical specifications

Sensor Module External SME120 6SL3055-0AA00-5JAx	**Designation**	**Unit**	**Value**
Electronics power supply			
Voltage	V_{DC}	V	24 DC (20.4 – 28.8)
Current (without measuring system)	A_{DC}	A	≤ 0.20
Current (with measuring system)	A_{DC}	A	≤ 0.30
Power loss	W	W	≤ 4.5
Measuring system power supply			
Voltage	$V_{encoder}$	V	5 V DC
Current	$A_{encoder}$	A	0.30
Encoder frequency that can be evaluated	$f_{encoder}$	kHz	≤ 500
PE / ground connection		On housing with M4 / 1.8 Nm screw	
Weight		kg	0,4
Degree of protection		IP67	

Notice

In order to guarantee the degree of protection, all of the plug connectors must be correctly screwed into place and appropriately locked.

4.9 Sensor Module External SME125

4.9.1 Description

Direct measuring systems outside the cabinet can be connected to the Sensor Module External SME125. The SME125 evaluates these measuring systems and converts the calculated values to DRIVE-CLiQ.

The SME125 can be operated from Firmware 2.4 onwards.

The components are always used when the temperature signals of the motors do not have protective separation or where this separation is not possible for certain reasons. SME125 is mainly used in linear motor applications.

Neither motor nor encoder data are saved in the SME125.

Direct measuring systems with EnDat or SSI (from Firmware 2.4) with SIN/COS (1 Vpp) incremental signals can be connected, however without reference signal.

The maximum DRIVE-CLiQ cable length is 100 m.

The maximum sensor cable length is 3 m.

4.9.2 Safety information

Sensor Module External 125 is a device, safety class I.

Notice

Only measuring systems in which the power supply for the measuring system is not grounded may be connected.

⚠ Danger

Commissioning is prohibited until it has been clearly identified that the machine in which this component is to be installed fulfills the conditions of Machinery Directive 98/37/EC.

All of the work must be carried out by qualified, appropriately trained personnel. Prior to commencing any work on the Sensor Module External the 5 safety rules have to be observed:

- Disconnect the system.
- Protect against reconnection.
- Make sure that the equipment is de-energized.
- Ground and short-circuit
- Cover or enclose adjacent components that are still live.

Never disable protective functions and devices even for trial operation.

It is mandatory that a protective conductor with a minimum cross-section of 2.5 mm^2 is connected in order to guarantee safe protective separation.

In order to ensure the degree of protection all connections, even connections that are not used, must be closed with connectors or suitable sealing caps.

The specified torques must be observed.

The plastic covers of connections X100, X200 and X500 do not comply with the degree of protection and must be replaced by the corresponding connectors prior to commissioning.

It is not permitted to open up the drive units! It is possible that the units are no longer adequately sealed! Repair and maintenance work may only be performed by a SIEMENS service center.

The unit should not be put into operation if it is evident that the packaging has been damaged by water.

Note

The safety information on the Sensor Module must be observed.

After the product has served its lifetime, the individual parts should be disposed of in compliance with local regulations.

4.9.3 Interface description

4.9.3.1 Overview

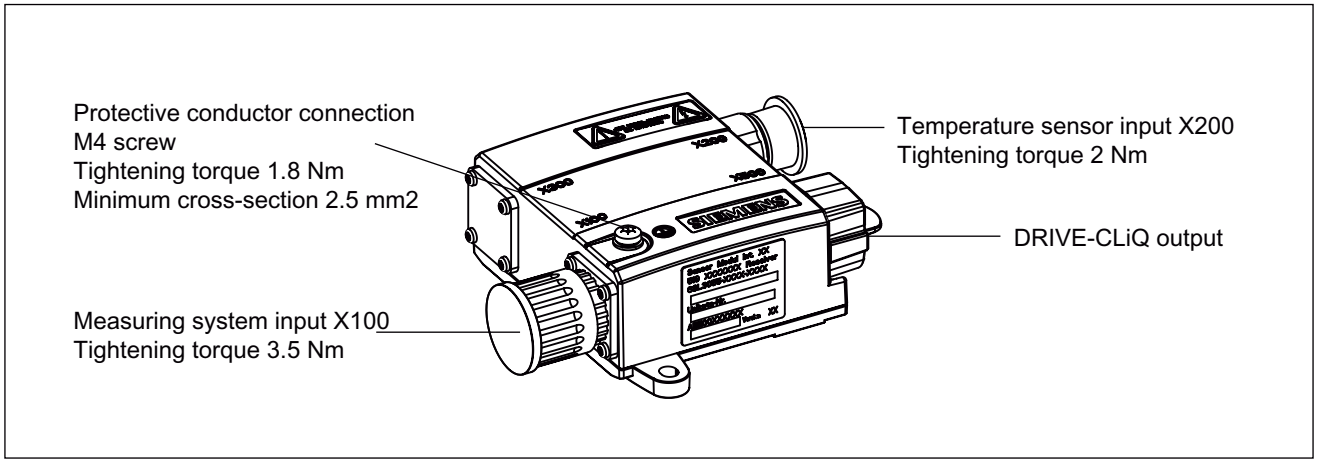


Figure 4-35 Interface description, SME125

4.9.3.2 Connection example

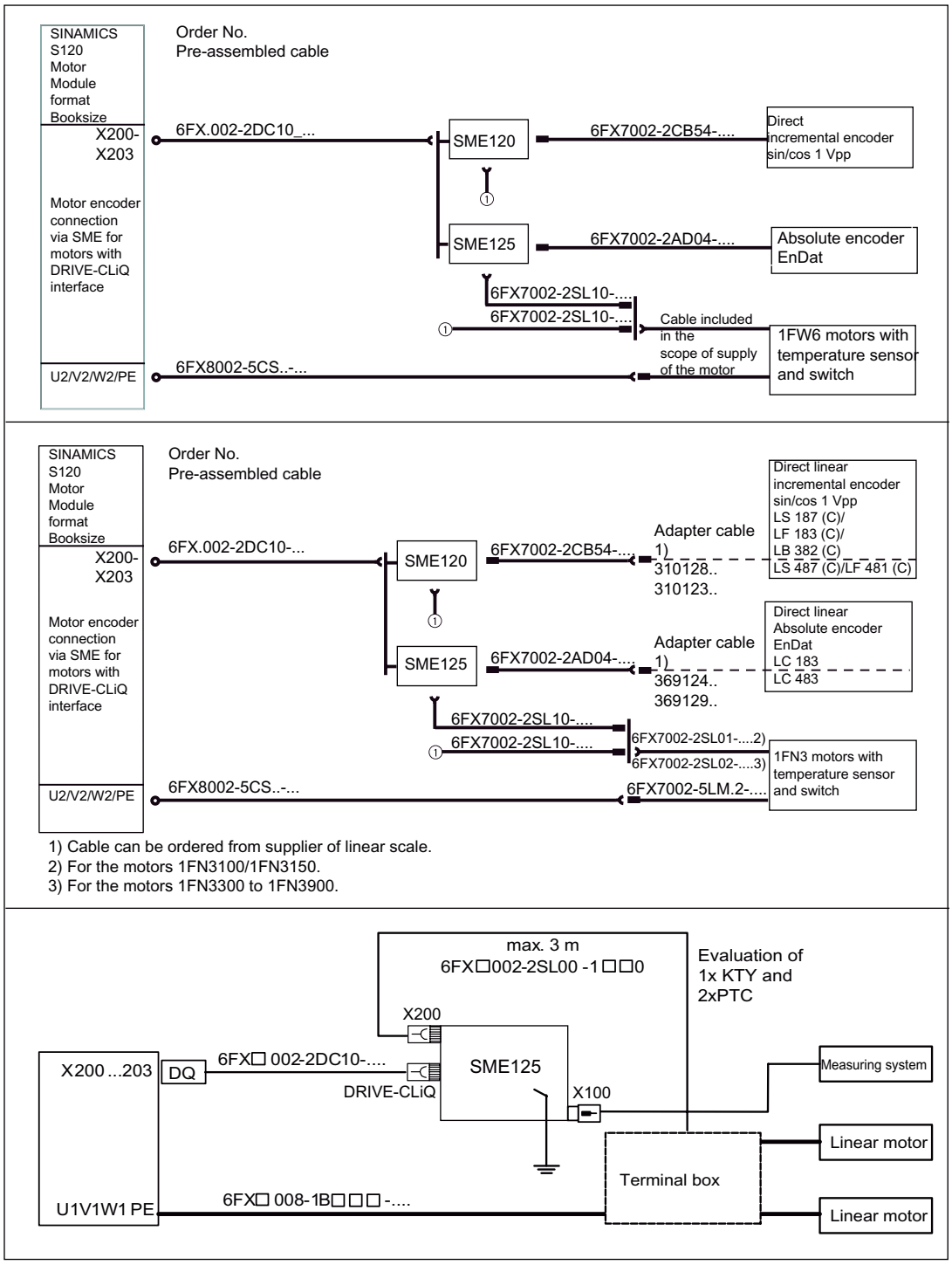
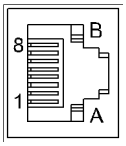


Figure 4-36 Connection examples, SME125

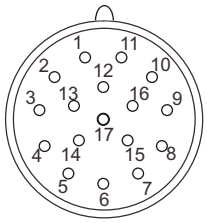
4.9.3.3 DRIVE-CLiQ interface

Table 4-34 DRIVE-CLiQ interface

	Pin	Signal name	Technical data
	1	TXP	Transmit data +
	2	TXN	Transmit data -
	3	RXP	Receive data +
	4	Reserved, do not use	
	5	Reserved, do not use	
	6	RXN	Receive data -
	7	Reserved, do not use	
	8	Reserved, do not use	
	A	+ (24 V)	Power supply
	B	M (0 V)	Electronics ground
Cover for the DRIVE-CLiQ interface is included in the scope of supply Current drain: max. 0.30 A			

4.9.3.4 X100 measuring system interface

Table 4-35 Measuring system interface, SME125

	Pin	Signal name	Technical data
	1	P5	Encoder power supply
	2	Reserved, do not use	
	3	Reserved, do not use	
	4	M	Ground for encoder power supply
	5	Reserved, do not use	
	6	Reserved, do not use	
	7	P5	Encoder power supply
	8	Clock	Clock, EnDat interface, SSI clock
	9	Clock*	Inverse clock EnDat interface Inverse SSI clock
	10	M	Ground for encoder power supply
	11	M	Ground for encoder power supply
	12	B	Incremental signal B
	13	B*	Inverse incremental signal B
	14	Data	Data, EnDat interface, SSI data
	15	A	Incremental signal A
	16	A*	Inverse incremental signal A
	17	Data*	Inverse data, EnDat interface, Inverse SSI data
Blanking plate for measuring system interface: Pöppelmann GmbH & Co. KG, Lohne, Order No.: GPN 300 F211			

* These connections do not have safe separation!

4.9.3.5 X200 Temperature sensor

Table 4-36 Temperature sensor X200

Terminal	Function	Technical data
1	-Temp	Temperature sensor connection KTY84–1C130
2	+Temp	
3	PTC connection	Connection, PTC triplet 1 or bimetal 1
4	PTC connection	
5	PTC connection	Connection, PTC triplet 2
6	PTC connection	

4.9.4 Dimension drawing

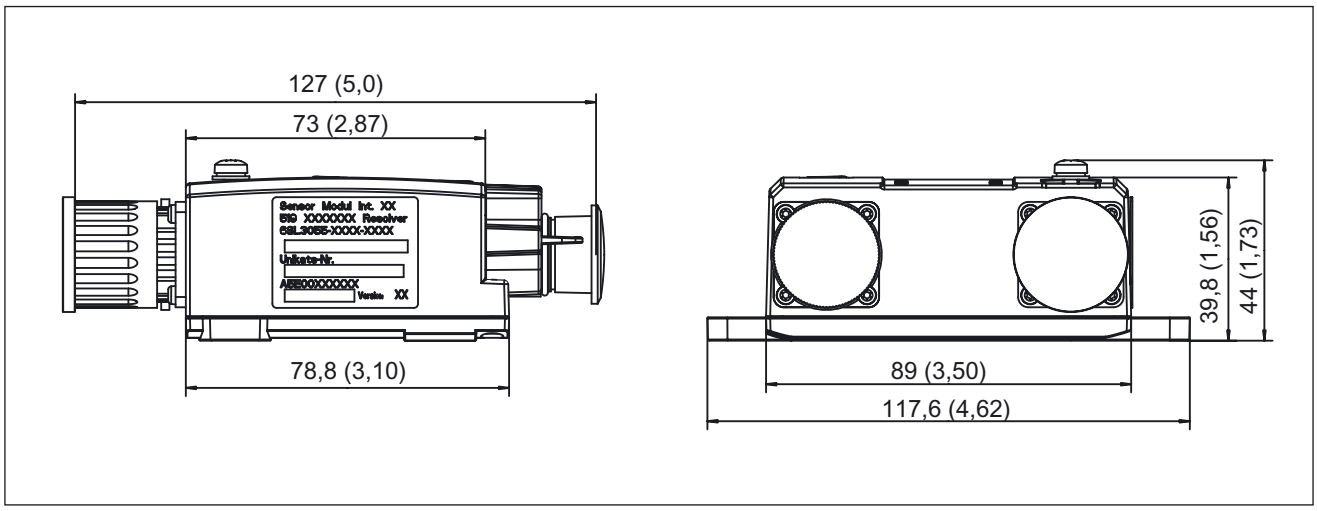


Figure 4-37 Dimension drawing, SME125

4.9.5 Mounting

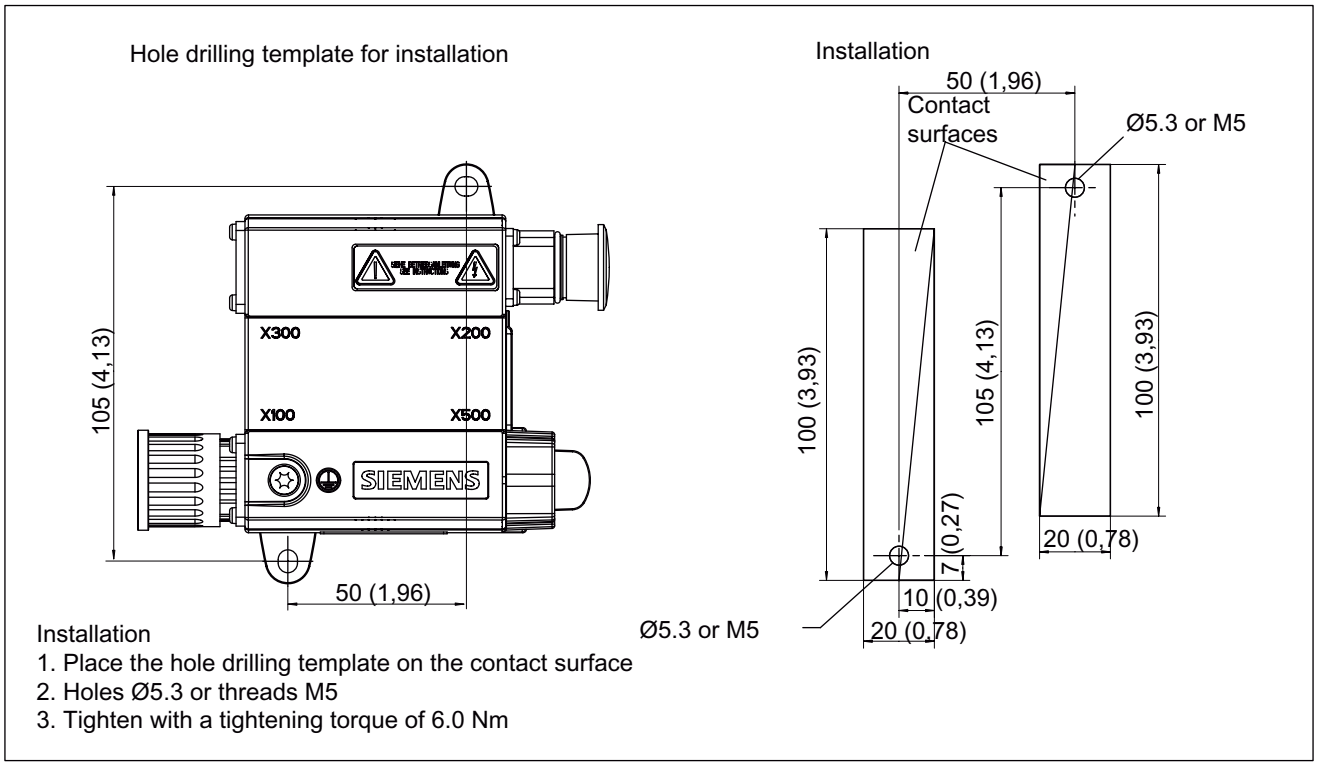


Figure 4-38 Mounting, SME125

4.9.6 Technical data

Table 4-37 Technical specifications

Sensor Module External SME125 6SL3055-0AA00-5KAx	**Designation**	**Unit**	**Value**
Electronics power supply Voltage Current (without measuring system) Current (with measuring system) Power loss	 V_{DC} A_{DC} A_{DC} W	 V A A W	 24 DC (20.4 – 28.8) ≤ 0.20 ≤ 0.30 ≤ 4.5
Measuring system power supply Voltage Current	 $V_{encoder}$ $A_{encoder}$	 V A	 5 V DC 0.30
Encoder frequency that can be evaluated	$f_{encoder}$	kHz	≤ 500
PE / ground connection		On housing with M4 / 1.8 Nm screw	
Weight		kg	0,4
Degree of protection		IP67	

Notice
In order to guarantee the degree of protection, all of the plug connectors must be correctly screwed into place and appropriately locked.

4.10 DRIVE-CLiQ encoder

4.10.1 Description

The DRIVE-CLiQ encoder is available as absolute encoder with integrated DRIVE-CLiQ interface. The encoder senses absolute position values extending over 4096 revolutions.

The most important advantages are:

- Automatic commissioning via DRIVE-CLiQ
- High operating temperatures of 100 °C are possible
- Integrated diagnostics concept

Table 4-38 Encoder for mounting with DRIVE-CLiQ

Designation	Order number	Description
DRIVE-CLiQ synchronous flange VW 6 mm	6FX2001-5FD13-0AAx	Absolute encoder with DRIVE-CLiQ, single-turn
DRIVE-CLiQ clamping flange VW 10 mm	6FX2001-5QD13-0AAx	Absolute encoder with DRIVE-CLiQ, single-turn
DRIVE-CLiQ hollow shaft 10 mm	6FX2001-5VD13-0AAx	Absolute encoder with DRIVE-CLiQ, single-turn
DRIVE-CLiQ hollow shaft 12 mm	6FX2001-5WD13-0AAx	Absolute encoder with DRIVE-CLiQ, single-turn
DRIVE-CLiQ synchronous flange VW 6 mm	6FX2001-5FD25-0AAx	Absolute encoder with DRIVE-CLiQ, multiturn
DRIVE-CLiQ clamping flange VW 10 mm	6FX2001-5QD25-0AAx	Absolute encoder with DRIVE-CLiQ, multiturn
DRIVE-CLiQ hollow shaft 10 mm	6FX2001-5VD25-0AAx	Absolute encoder with DRIVE-CLiQ, multiturn
DRIVE-CLiQ hollow shaft 12 mm	6FX2001-5WD25-0AAx	Absolute encoder with DRIVE-CLiQ, multiturn

4.10.2 Safety information

⚠ Caution

The encoder has direct contact to components that can be destroyed by electrostatic discharge (ESDS). Neither hands nor tools that could be electrostatically charged may come into contact with the connections.

4.10.3 Interface description

4.10.3.1 Overview

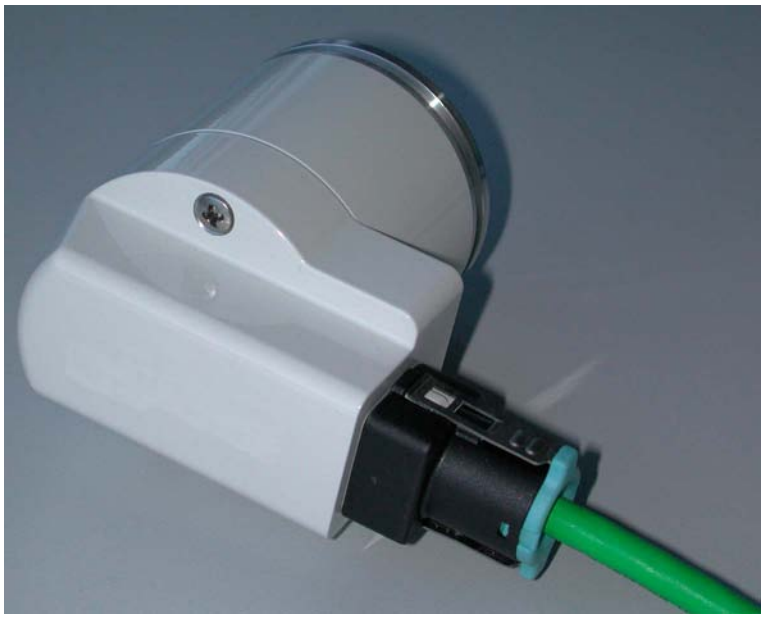
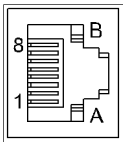


Figure 4-39 DRIVE-CLiQ encoder

4.10.3.2 DRIVE-CLiQ interface

Table 4-39 DRIVE-CLiQ interface

	Pin	Signal name	Technical data
	1	TXP	Transmit data +
	2	TXN	Transmit data -
	3	RXP	Receive data +
	4	Reserved, do not use	
	5	Reserved, do not use	
	6	RXN	Receive data -
	7	Reserved, do not use	
	8	Reserved, do not use	
	A	Reserved, do not use	
	B	M (0 V)	Electronics ground
Blanking plate for DRIVE-CLiQ interface: Yamaichi company, Order No.: Y-ConAS-13			

4.10.4 Dimension drawings

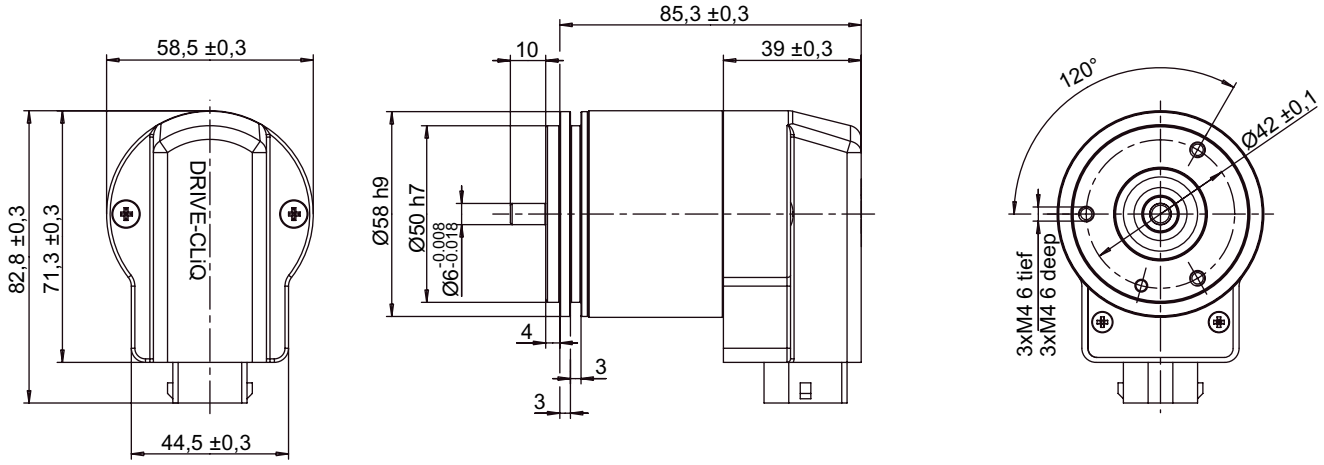


Figure 4-40 Dimension drawing: Synchronous flange

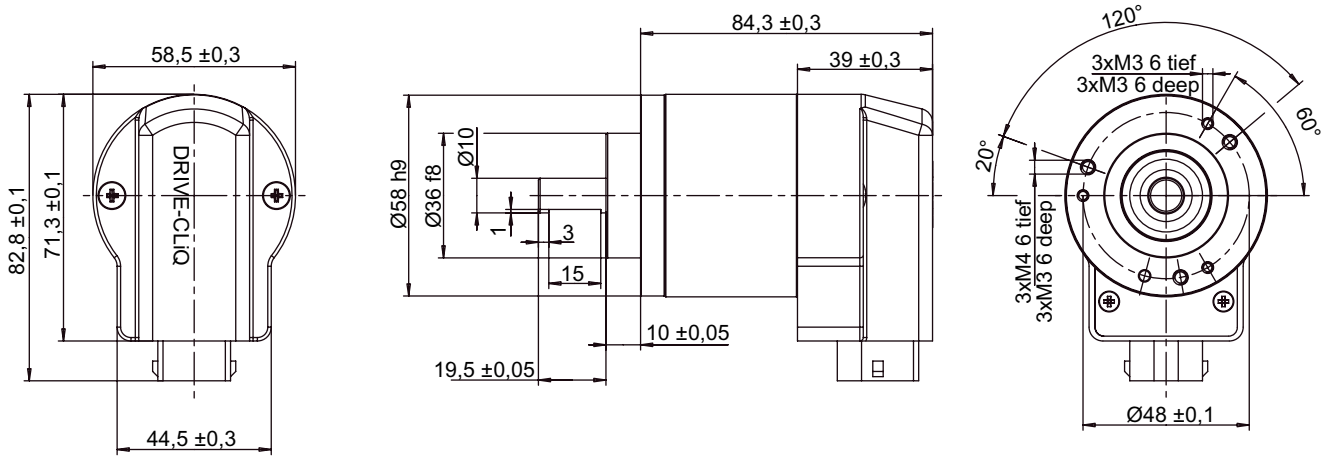


Figure 4-41 Dimension drawing: Clamping flange

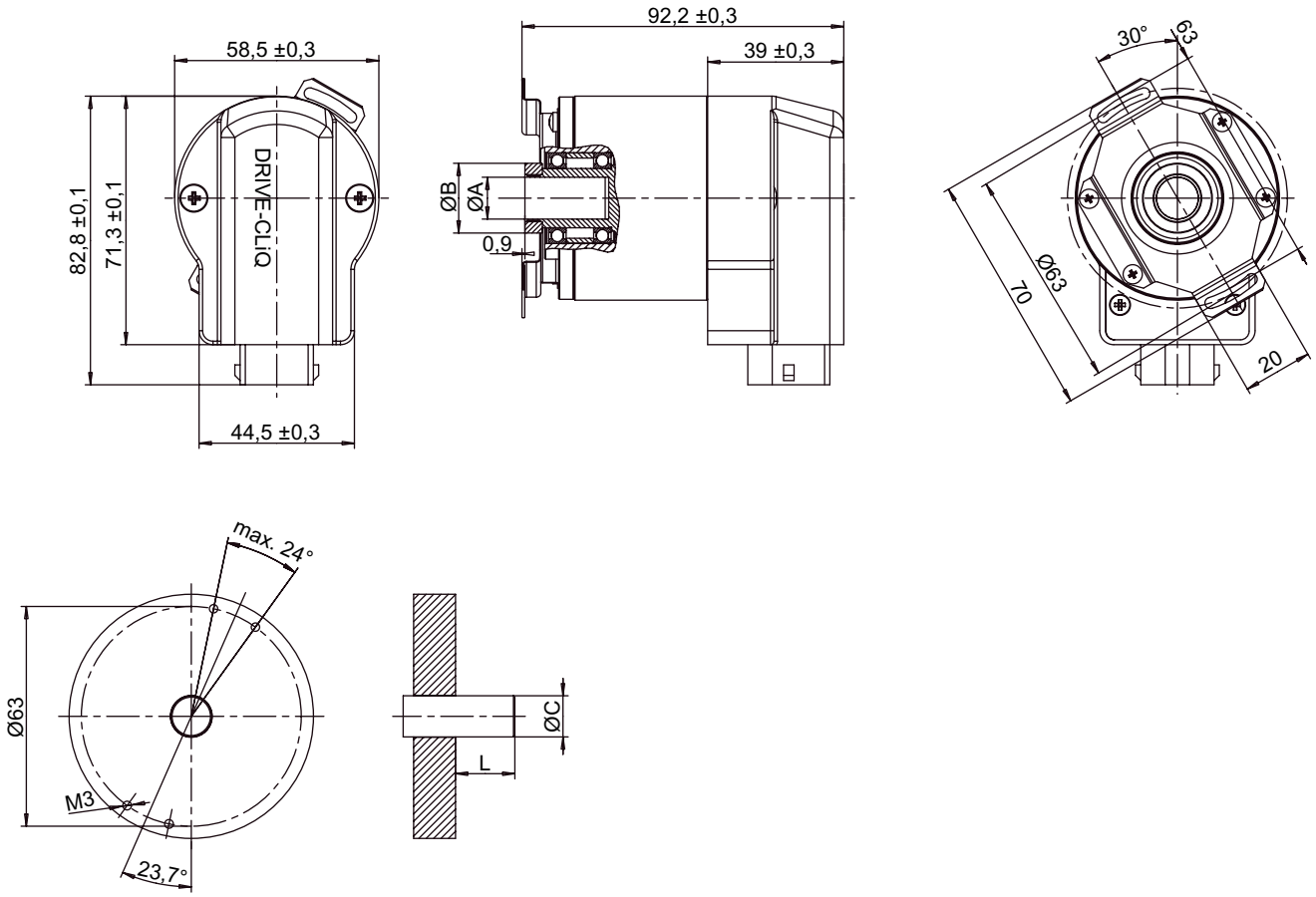


Figure 4-42 Dimension drawing: Hollow shaft with blink bore

Table 4-40 Dimensions

	Dimensions		Unit
Hollow shaft ØA	$10^{+0.012}$ (0.39)	$12^{+0.012}$ (0.47)	mm (inch)
Connection shafts ØC	10 (0.39)	12 (0.47)	mm (inch)
Clamping ring ØB	18 (0.70)	20 (0.78)	mm (inch)
L min.	15 (0.59)	18 (0.70)	mm (inch)
L max.	20 (0.78)	20 (0.78)	mm (inch)
Shaft code	2 (0.07)	7 (0.27)	mm (inch)

L = Engaged depth of the connection shaft into the encoder

4.10.5 Installation

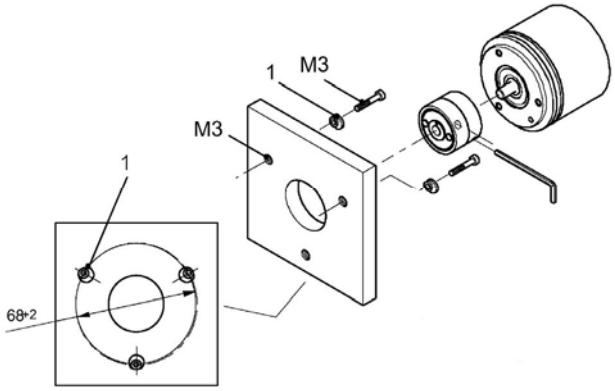


Figure 4-43 Installation: Synchronous flange, 1: Retaining eccentric element

Clamp straps / couplings

Clamp straps and couplings are required as mounting accessories. The clamp straps are used to fix the encoders with a synchronous flange.

Table 4-41 Selection and ordering data

Designation	Order No.
Clamp strap (No.1 in the drawing) for double-track encoder and encoder with synchronous flange (3 units are required)	6FX2001-7KP01
Spring disk coupling Shaft diameter:	
• 6 mm / 6 mm	6FX2001-7KF10
• 6 mm / 5 mm	6FX2001-7KF06
Plug-in coupling Shaft diameter:	
• 6 mm / 6 mm	6FX2001-7KS06
• 10 mm / 10 mm	6FX2001-7KS10

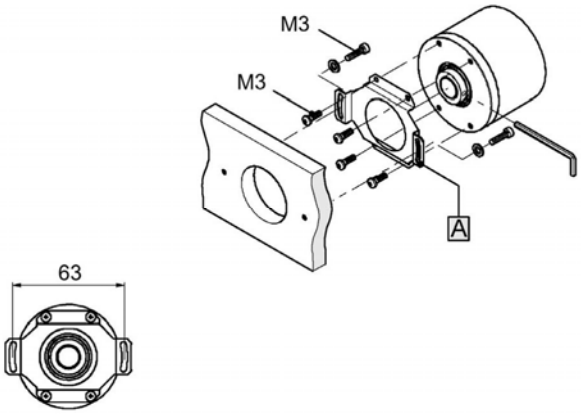


Figure 4-44 Installation: Hollow shaft, A: Spring plate (included in scope of supply)

Table 4-42 Installation instructions

Product name	Spring disk coupling	Plug-in coupling
Transmission torque, max.	0.8 Nm	0.7 Nm
Shaft diameter	6 mm both ends or d_1 = 6 mm, d_2 = 5 mm	6 mm both ends or 10 mm both ends
Center offset of shafts, max.	0.4 mm	0.5 mm
Axial offset	± 0.4 mm	± 0.5 mm
Angular displacement of shafts, max.	3°	1°
Torsional rigidity	150 Nm / rad	31 Nm / rad
Lateral spring stiffness	6 N / mm	10 N / mm
Moment of inertia	19 gcm^2	20 gcm^2
Max. speed	12000 rpm	12000 rpm
Operating temperature	-20 ... +150 °C	-20 ... +80 °C
Weight, approx.	16 g	20 g

4.10.6 Technical specifications

Table 4-43 Technical specifications DRIVE-CLiQ encoders

Design	Unit	Absolute encoder with DRIVE-CLiQ
Operating voltage at encoder	V	24 V -15 % + 20 %
Current drain Single-turn Multiturn	 mA mA	 approx. 245 approx. 325
Interface		DRIVE-CLiQ
Electrical speed, permissible	rpm	14.000
Mechanical speed, max.	rpm	10.000
Cable length to the downstream electronics	m	100
Connection		DRIVE-CLiQ connector, radial
Resolution Single-turn Multiturn	 Bit Bit	 22 34 (22 bit single-turn + 12 bit multiturn)
Accuracy	Angular seconds	+/- 35
Frictional torque	Nm	<= 0.01 (at 20 °C)
Starting torque	Nm	<= 0.01 (at 20 °C)
Shaft load capability d 10 x 19.5 70° n > 6000 rpm n <= 6000 rpm		 axial 40 N / radial 40 N at the shaft end axial 40 N / radial 60 N at the shaft end
Angular acceleration, max.	rad/s^2	10^5
Moment of inertia of the rotor, solid shaft Moment of inertia of the rotor, hollow shaft	kgm^2	1.90 * 10-6 kgm^2 2.80 * 10-6 kgm^2
Vibratory load acc. to DIN IEC 68-2-6	m/s^2	<= 100 (10 - 500 Hz)
Shock (6 ms) acc. to DIN IEC 68-2-27	m/s^2	<= 1000 (6 ms)
Operating temperature min. Operating temperature, max.	°C °C	- 20 100
Degree of protection (acc. to DIN EN 60529)		IP67 at the frame IP64 at the shaft input
Weight Single-turn Multiturn	 kg kg	 0,40 0,44
CE mark		Yes

5 Information on electromagnetic compatibility (EMC)

5.1 Cabinet design and EMC: booksize

Information on cabinet design and electromagnetic compatibility (EMC) can be found in:

/GH2/ SINAMICS S120

Equipment Manual for Booksize Power Sections

Order No.: 6SL3097-2AC00-0AP3, Edition: 03.2006

Spring-Loaded Terminals/Screw Terminals

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	Rigid, flexible With wire end ferrule, without plastic sleeve With wire end ferrule, with plastic sleeve	0.08 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	Rigid, flexible With wire end ferrule, without plastic sleeve With wire end ferrule, with plastic sleeve	0.08 mm^2 to 2.5 mm^2 0.5 mm^2 to 2.5 mm^2 0.5 mm^2 to 1.5 mm^2
	Insulation stripping length	7 mm	
	Tool	Screwdriver 0.6 x 3.5 mm	
	Tightening torque	0.5 to 0.6 Nm	
3	Connectable conductor cross-sections	Flexible With wire end ferrule, without plastic sleeve With wire end ferrule, with plastic sleeve	0.2 mm^2 to 2.5 mm^2 0.25 mm^2 to 1 mm^2 0.25 mm^2 to 1 mm^2
	Insulation stripping length	9 mm	
	Tool	Screwdriver 0.6 x 3.5 mm	
	Tightening torque	0.5 to 0.6 Nm	

Screw terminal type			
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	

List of Abbreviations

B

B.1 List of Abbreviations

Table B-1 List of abbreviations

Abbreviation	German	English
A		
A...	Warnung	Alarm
AC	Wechselstrom	Alternating Current
ADC	Analog-Digital-Konverter	Analog Digital Converter
AI	Analogeingang	Analog Input
AIM	Active Interface Module	Active Interface Module
ALM	Active Line Module	Active Line Module
AO	Analogausgang	Analog Output
AOP	Advanced Operator Panel	Advanced Operator Panel
APC	Advanced Positioning Control	Advanced Positioning Control
ASC	Ankerkurzschluss	Armature Short-Circuit
ASCII	Amerikanische Code-Norm für den Informationsaustausch	American Standard Code for Information Interchange
ASM	Asynchronmotor	Induction motor
B		
BB	Betriebsbedingung	Operating condition
BERO	Firmenname für einen Näherungsschalter	Tradename for a type of proximity switch
BI	Binektoreingang	Binector Input
BIA	Berufsgenossenschaftliches Institut für Arbeitssicherheit	German Institute for Occupational Safety
BICO	Binektor-Konnektor-Technologie	Binector Connector Technology
BLM	Basic Line Module	Basic Line Module
BO	Binektorausgang	Binector output
BOP	Basic Operator Panel	Basic Operator Panel
C		
C	Kapazität	Capacitance
C...	Safety-Meldung	Safety message
CAN	Serielles Bussystem	Controller Area Network
CBC	Kommunikationsbaugruppe CAN	Communication Board CAN
CD	Compact Disc	Compact Disc

Abbreviation	German	English
CDS	Befehlsdatensatz	Command Data Set
CF	CompactFlash	CompactFlash
CI	Konnektoreingang	Connector Input
CNC	Computerunterstützte numerische Steuerung	Computer Numerical Control
CO	Konnektorausgang	Connector Output
CO/BO	Konnektor-/Binektorausgang	Connector Output/Binector Output
COB-ID	CAN Object-Identification	CAN Object-Identification
COM	Mittelkontakt eines Wechselkontaktes	Common contact of a change-over relay
CP	Kommunikationsprozessor	Communications Processor
CPU	Zentrale Recheneinheit	Central Processing Unit
CRC	Checksummenprüfung	Cyclic Redundancy Check
CSM	Control Supply Module	Control Supply Module
CU	Control Unit	Control Unit
D		
DAC	Digital-Analog-Konverter	Digital Analog Converter
DC	Gleichstrom	Direct Current
DCN	Gleichstrom negativ	Direct Current Negative
DCP	Gleichstrom positiv	Direct Current Positive
DDS	Antriebsdatensatz	Drive Data Set
DI	Digitaleingang	Digital Input
DI/DO	Digitaleingang/-ausgang bidirektional	Bidirectional Digital Input/Output
DMC	DRIVE-CLiQ Module Cabinet (Hub)	DRIVE-CLiQ Module Cabinet (Hub)
DO	Digitalausgang	Digital Output
DO	Antriebsobjekt	Drive Object
DP	Dezentrale Peripherie	Decentralized Peripherals
DPRAM	Speicher mit beidseitigem Zugriff	Dual-Port Random Access Memory
DRAM	Dynamischer Speicher	Dynamic Random Access Memory
DRIVE-CLiQ	Drive Component Link with IQ	Drive Component Link with IQ
DSC	Dynamic Servo Control	Dynamic Servo Control
E		
EDS	Geberdatensatz	Encoder Data Set
EGB	Elektrostatisch gefährdete Baugruppen	Electrostatic Sensitive Devices (ESD)
ELP	Erdschlussüberwachung	Earth Leakage Protection
EMK	Elektromagnetische Kraft	Electromagnetic Force
EMC	Elektromagnetische Verträglichkeit	Electromagnetic Compatibility (EMC)
EN	Europäische Norm	European Standard
EnDat	Geber-Schnittstelle	Encoder-Data-Interface
EP	Impulsfreigabe	Enable Pulses
EPOS	Einfachpositionierer	Basic positioner
ES	Engineering System	Engineering System
ESB	Ersatzschaltbild	Equivalent circuit diagram
ESR	Erweitertes Stillsetzen und Rückziehen	Extended Stop and Retract

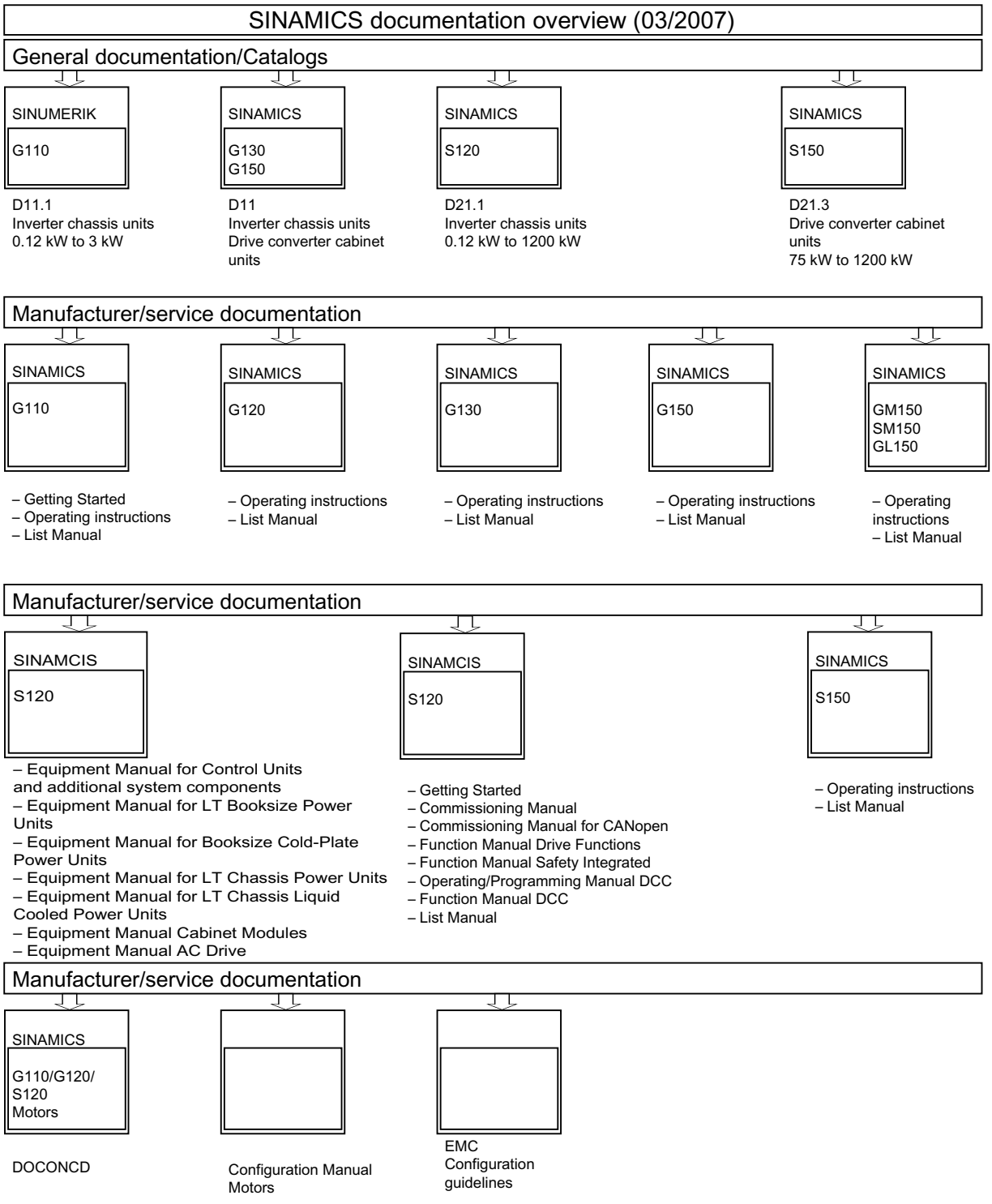
Abbreviation	German	English
F		
F…	Störung	Fault
FAQ	Häufig gestellte Fragen	Frequently Asked Questions
FBL	Freie Funktionsblöcke	Free Blocks
FCC	Function Control Chart	Function Control Chart
FCC	Flussstromregelung	Flux Current Control
F-DI	Fehlersicherer Digitaleingang	Failsafe Digital Input
F-DO	Fehlersicherer Digitalausgang	Failsafe Digital Output
FEM	Fremderregter Synchronmotor	Separately excited synchronous motor
FEPROM	Schreib- und Lesespeicher nichtflüchtig	Flash-EPROM
FG	Funktionsgenerator	Function Generator
FI	Fehlerstrom-Schutzschalter	Residual-Current Circuit-Breaker (RCCB)
FP	Funktionsplan	Function diagram
FPGA	Field Programmable Gate Away	Field Programmable Gate Away
FW	Firmware	Firmware
G		
GB	Gigabyte	Gigabyte
GC	Global-Control-Telegramm (Broadcast-Telegramm)	Global Control Telegram (broadcast telegram)
GSD	Gerätestammdatei: beschreibt die Merkmale eines PROFIBUS-Slaves	Device master file: describes the features of a PROFIBUS slave
GSV	Gate Supply Voltage	Gate Supply Voltage
GUID	Globally Unique Identifier	Globally Unique Identifier
H		
HF	Hochfrequenz	High Frequency
HFD	Hochfrequenzdrossel	High frequency reactor
HLG	Hochlaufgeber	Ramp-function generator
HMI	Mensch-Maschine-Schnittstelle	Human Machine Interface
HTL	Logik mit hoher Störschwelle	High-Threshold Logic
HW	Hardware	Hardware
I		
i. V.	in Vorbereitung: diese Eigenschaft steht zur Zeit nicht zur Verfügung	In preparation: this feature is currently not available
IBN	Inbetriebnahme	Commissioning
I/O	Eingang/Ausgang	Input/Output
ID	Identifizierung	Identifier
IEC	Internationale Norm in der Elektrotechnik	International Electrotechnical Commission
IF	Interface	Interface
IGBT	Bipolartransistor mit isolierter Steuerelektrode	Insulated Gate Bipolar Transistor
IL	Impulslöschung	Pulse suppression
IP	Internet Protokoll	Internet Protocol
IPO	Interpolatortakt	Interpolator clock

Abbreviation	German	English
IT	Drehstromversorgungsnetz ungeerdet	Insulated three-phase supply network
IVP	Interner Spannungsschutz	Internal Voltage Protection
J		
JOG	Tippen	Jogging
K		
KDV	Kreuzweiser Datenvergleich	Data cross-checking
KIP	Kinetische Pufferung	Kinetic buffering
Kp	Proportionalverstärkung	Proportional gain
KTY	Spezieller Temperatursensor	Special temperature sensor
L		
L	Induktivität	Inductance
LED	Leuchtdiode	Light Emitting Diode
LIN	Linear motor	Linear motor
LR	Lageregler	Position controller
LSB	Niederwertigstes Bit	Least Significant Bit
LSS	Netzschalter	Line Side Switch
LU	Längeneinheit	Length Unit
LWL	Lichtwellenleiter	Fiber-optic cable
M		
M	Masse	Reference potential, zero potential
MB	Megabyte	Megabyte
MCC	Motion Control Chart	Motion Control Chart
MDS	Motordatensatz	Motor Data Set
MLFB	Maschinenlesbare Fabrikatebezeichnung	Machine-readable product designation
MMC	Mensch Maschine Kommunikation	Man-Machine Communication
MSB	Höchstwertigstes Bit	Most Significant Bit
MSCY_C1	Zyklische Kommunikation zwischen Master (Klasse 1) und Slave	Master Slave Cycle Class 1
MSR	Motorstromrichter	Motor side converter (MSC)
MT	Messtaster	Measuring probe
N		
N. C.	Nicht angeschlossen	Not Connected
N...	Keine Meldung oder Interne Meldung	No Report
NAMUR	Normenarbeitsgemeinschaft für Mess- und Regeltechnik in der chemischen Industrie	Standardization association for instrumentation and control in the chemical industry
NC	Öffner	Normally Closed contact
NC	Numerische Steuerung	Numerical Control
NEMA	Normengremium in USA (United States of America)	National Electrical Manufacturers Association
NM	Nullmarke	Zero Mark
NO	Schließer	Normally Open contact
NSR	Netzstromrichter	Line side converter (LSC)

Abbreviation	German	English
O		
OA	Open Architecture	Open Architecture
OEM	Original Equipment Manufacturer	Original Equipment Manufacturer
OLP	Busstecker für Lichtleiter	Optical Link Plug
OMI	Option Module Interface	Option Module Interface
P		
p…	Einstellparameter	Adjustable parameter
PB	PROFIBUS	PROFIBUS
PcCtrl	Steuerungshoheit	Master Control
PD	PROFIdrive	PROFIdrive
PDS	Leistungsteildatensatz	Power unit Data Set
PE	Schutzerde	Protective Earth
PEM	Permanenterregter Synchronmotor	Permanent-magnet synchronous motor
PG	Programmiergerät	Programming terminal
PI	Proportional Integral	Proportional Integral
PID	Proportional Integral Differential	Proportional Integral Differential
PLC	Speicherprogrammierbare Steuerung (SPS)	Programmable Logic Controller
PLL	Phase-Locked Loop	Phase Locked Loop
PN	PROFINET	PROFINET
PNO	PROFIBUS Nutzerorganisation	PROFIBUS user organisation
PPI	Punkt zu Punkt Schnittstelle	Point to Point Interface
PRBS	Weißes Rauschen	Pseudo Random Binary Signal
PROFIBUS	Serieller Datenbus	Process Field Bus
PS	Stromversorgung	Power Supply
PSA	Power Stack Adapter	Power Stack Adapter
PTC	Positiver Temperaturkoeffizient	Positive Temperature Coefficient
PTP	Punkt zu Punkt	Point To Point
PWM	Pulsweitenmodulation	Pulse Width Modulation
PZD	PROFIBUS Prozessdaten	PROFIBUS process data
Q		
R		
r …	Beobachtungsparameter (nur lesbar)	Display parameter (read only)
RAM	Speicher zum Lesen und Schreiben	Random Access Memory
RCCB	Fehlerstrom-Schutzschalter	Residual Current Circuit Breaker
RCD	Fehlerstrom-Schutzschalter	Residual Current Device
RJ45	Norm. Beschreibt eine 8-polige Steckverbindung mit Twisted-Pair Ethernet.	Standard. Describes an 8-pole plug connector with twisted pair Ethernet.
RKA	Rückkühlanlage	Cooling system
RO	Nur lesbar	Read Only
RPDO	Receive Process Data Object	Receive Process Data Object
RS232	Serielle Schnittstelle	Serial Interface
RS485	Norm. Beschreibt die Physik einer digitalen seriellen Schnittstelle.	Standard. Describes the physical characteristics of a digital serial interface.

Abbreviation	German	English
RTC	Echtzeituhr	Real Time Clock
RZA	Raumzeigerapproximation	Space vector approximation (SVA)
S		
S1	Dauerbetrieb	Continuous operation
S3	Aussetzbetrieb	Periodic duty
SBC	Sichere Bremsenansteuerung	Safe Brake Control
SBH	Sicherer Betriebshalt	Safe operating stop
SBR	Sichere Bremsrampe	Safe Brake Ramp
SBT	Sicherer Bremsentest	Safe Brake Test
SCA	Sicherer Nocken	Safe Cam
SDI	Sichere Richtung	Safe Direction
SE	Sicherer Software-Endschalter	Safe software limit switch
SG	Safely Limited Speed	Safely reduced speed
SGA	Sicherheitsgerichteter Ausgang	Safety-relevant output
SGE	Sicherheitsgerichteter Eingang	Safety-related input
SH	Sicherer Halt	Safe standstill
SI	Safety integrated	Safety integrated
SIL	Sicherheitsintegritätsgrad	Safety Integrity Level
SLI	Sicheres Schrittmaß	Safely Limited Increment
SLM	Smart Line Module	Smart Line Module
SLP	Sicher begrenzte Position	Safely-Limited Position
SLS	Sicher begrenzte Geschwindigkeit	Safely-Limited Speed
SLVC	Geberlose Vektorregelung	Sensorless Vector Control
SM	Sensor Module	Sensor Module
SMC	Sensor Module Cabinet	Sensor Module Cabinet
SME	Sensor Module External	Sensor Module External
SN	Sicherer Software-Nocken	Safe software cam
SOS	Sicherer Betriebshalt	Safe Operating Stop
SPC	Sollwertkanal	Setpoint Channel
SPS	Speicherprogrammierbare Steuerung	Programmable Logic Controller (PLC)
SS1	Safe Stop 1	Sicherer Stop 1
SS2	Safe Stop 2	Sicherer Stop 2
SSI	Synchron Serielle Schnittstelle	Synchronous Serial Interface
SSM	Sichere Rückmeldung der Geschwindigkeitsüberwachung (n < nx)	Safe Speed Monitor
SSR	Sichere Bremsrampe	Safe Stop Ramp
STO	Sicher abgeschaltetes Moment	Safe Torque Off
STW	PROFIBUS Steuerwort	PROFIBUS control word
T		
TB	Terminal Board	Terminal Board
TIA	Totally Integrated Automation	Totally Integrated Automation
TM	Terminal Module	Terminal Module

Abbreviation	German	English
TN	Drehstromversorgungsnetz geerdet	Grounded three-phase supply network
Tn	Nachstellzeit	Integral time
TPDO	Transmit Process Data Object	Transmit Process Data Object
TT	Drehstromversorgungsnetz geerdet	Grounded three-phase supply network
TTL	Transistor-Transistor-Logik	Transistor-Transistor Logic
U		
UL	Underwriters Laboratories Inc.	Underwriters Laboratories Inc.
USV	Unterbrechungsfreie Stromversorgung	Uninterruptible Power Supply (UPS)
V		
VC	Vektorregelung	Vector Control
Vdc	Zwischenkreisspannung	DC link voltage
VdcN	Teilzwischenkreisspannung negativ	Partial DC link voltage negative
VdcP	Teilzwischenkreisspannung positiv	Partial DC link voltage positive
VDE	Verband Deutscher Elektrotechniker	Association of German Electrical Engineers
VDI	Verein Deutscher Ingenieure	Association of German Engineers
Vpp	Volt Spitze zu Spitze	Volt peak to peak
VSM	Voltage Sensing Module	Voltage Sensing Module
W		
WEA	Wiedereinschaltautomatik	Automatic restart
WZM	Werkzeugmaschine	Machine tool
X		
XML	Erweiterbare Auszeichnungssprache (Standardsprache für Web-Publishing und Dokumentenmanagement)	Extensible Markup Language
Y		
Z		
ZK	Zwischenkreis	DC Link
ZSW	PROFIBUS Zustandswort	PROFIBUS status word


SINAMICS documentation overview (03/2007)
General documentation/Catalogs
SINUMERIK
G110
D11.1
Inverter chassis units
0.12 kW to 3 kW
SINAMICS
G130
G150
D11
Inverter chassis units
Drive converter cabinet units
SINAMICS
S120
D21.1
Inverter chassis units
0.12 kW to 1200 kW
SINAMICS
S150
D21.3
Drive converter cabinet units
75 kW to 1200 kW
Manufacturer/service documentation
SINAMICS
G110
– Getting Started
– Operating instructions
– List Manual
SINAMICS
G120
– Operating instructions
– List Manual
SINAMICS
G130
– Operating instructions
– List Manual
SINAMICS
G150
– Operating instructions
– List Manual
SINAMICS
GM150
SM150
GL150
– Operating instructions
– List Manual
Manufacturer/service documentation
SINAMCIS
S120
– Equipment Manual for Control Units and additional system components
– Equipment Manual for LT Booksize Power Units
– Equipment Manual for Booksize Cold-Plate Power Units
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SINAMCIS
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– Getting Started
– Commissioning Manual
– Commissioning Manual for CANopen
– Function Manual Drive Functions
– Function Manual Safety Integrated
– Operating/Programming Manual DCC
– Function Manual DCC
– List Manual
SINAMICS
S150
– Operating instructions
– List Manual
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Suggestions and/or corrections

Index

B

Basic Operator Panel BOP20, 49

C

Communication Board CBC10, 53
Communication Board CBE20, 59
Components
  Basic Operator Panel BOP20, 49
  Communication Board CBC10, 53
  Communication Board CBE20, 59
  Control Unit CU320, 30
  DRIVE-CLiQ encoder, 219
  DRIVE-CLiQ Hub Module DMC20, 132
  Sensor Module Cabinet-Mounted SMC10, 156
  Sensor Module Cabinet-Mounted SMC30, 176
  Sensor Module External SME120, 203
  Sensor Module External SME125, 211
  Sensor Module External SME25, 199
  Terminal Board TB30, 64
  Terminal Module TM15, 72
  Terminal Module TM31, 86
  Terminal Module TM41, 102
  Terminal Module TM54F, 114
  Voltage Sensing Module VSM10, 139
Control Unit CU320, 30
Current in OFF state - input, 84

D

Dimension drawings
  Control Unit CU320, 42
  DRIVE-CLiQ encoder, 221
  DRIVE-CLiQ Hub Module DMC20, 136
  Sensor Module Cabinet-Mounted SMC10, 164
  Sensor Module Cabinet-Mounted SMC30, 187
  Sensor Module External SME120, 209
  Sensor Module External SME125, 217
  Sensor Module External SME20, 197
  Sensor Module External SME25, 201
  Terminal Module TM15, 80
  Terminal Module TM54F, 129
  TM31 Terminal Module, 97
  TM41 Terminal Module, 110
  Voltage Sensing Module VSM10, 147
DRIVE-CLiQ encoder, 219
DRIVE-CLiQ Hub Module DMC20, 132

E

Electrical connections
  Terminal Module TM31, 99, 149
  Terminal Modules, 112
  Voltage Sensing Module VSM10, 149
Electrical Connections
  Sensor Module Cabinet-Mounted SMC30, 191
  Terminal Board TB30, 71
  Terminal Module 15 (TM15), 82
Enclosure specification, 85
Encoder, 176
Encoder cable length, 177

F

Field of application, 17

H

Humidity, 84

I

IEC enclosure specification, 85
Impedance - Input, 84
Input, technical specifications
  Current in the OFF state, 84
  Impedance, 84
  Max. voltage in OFF state, 84
Installation
  Basic Operator Panel BOP20, 52
  Communication Board Ethernet (CBE20), 63
  Control Unit CU320, 43
  DRIVE-CLiQ encoder, 223
  Option Board, 58, 70
  Sensor Module External SME120, 209

Sensor Module External SME20/SME25, 197, 202
Interface descriptions
Control Unit CU320, 31
DRIVE-CLiQ Hub Module DMC20, 133
Terminal Module TM54F, 115
Interface Descriptions
Terminal Module TM15, 73
Terminal Module TM31, 87
Terminal Module TM41, 103
Introduction, 19

M

Max voltage in OFF state - input, 84
Max. switching frequency - output, 84
Min. output pulse, 84

O

Output, technical specifications
Leakage current in OFF state, 84
Max. switching frequency, 84
Min. output pulse, 84
Voltage drop, 84
Voltage drop in ON state, 84

P

Platform Concept, 18
PROFINET cable, 61

R

Relative humidity, 84
Residual risks, 10

S

Safety information
Communication Board Ethernet (CBE20), 59
Control Unit CU320, 30
Sensor Module Cabinet-Mounted SMC10, 158
Sensor Module Cabinet-Mounted SMC30, 178
Sensor Module External SME120, 204
Sensor Module External SME125, 212
Sensor Module External SME20, 195
Sensor Module External SME25, 199
Voltage Sensing Module 10 (VSM10), 140
Safety Information
Communication Board CAN (CBC10), 53
Sensor Module Cabinet-Mounted SMC20, 167
Terminal Board 30 (TB30), 64
Screw terminals, 229
Sensor Module Cabinet-Mounted SMC10, 156
Sensor Module Cabinet-Mounted SMC30, 176
Sensor Module External SME120, 203
Sensor Module External SME125, 211
Sensor Module External SME25, 199
Sensor Modules, 153
Sensor systems, 153
Specification, measuring systems that can be connected, 193
Spring-loaded terminals, 229
Storage temperature, 84
System Data, 24

T

Technical specifications
Basic Operator Panel BOP20, 53
Communication Board CBC10, 58
Control Unit CU320, 47
DRIVE-CLiQ encoder, 225
DRIVE-CLiQ Hub Module DMC20, 138
Sensor Module Cabinet-Mounted SMC10, 166
Sensor Module Cabinet-Mounted SMC20, 175
Sensor Module Cabinet-Mounted SMC30, 192
Sensor Module External SME120, 210
Sensor Module External SME125, 218
Sensor Module External SME20, 198
Sensor Module External SME25, 202
Terminal Board TB30, 71
Terminal Module TM15, 83
Terminal Module TM31, 101
Terminal Module TM41, 113
Terminal Module TM54F, 131
Voltage Sensing Module VSM10, 149
Temperature range
Storage, 84
Terminal Board TB30, 64
Terminal Module TM15, 72
Terminal Module TM31, 86
Terminal Module TM41, 102
Terminal Module TM54F, 114
Totally Integrated Automation, 18

V

Versions, 18
Voltage drop - output, 84
Voltage drop in the ON state - output, 84

Voltage Sensing Module VSM10, 139

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